Former Mill No. 2 Site
Niagara County, New York

SITE MANAGEMENT PLAN

NYSDEC BCP Site Number: C932150

Prepared for:
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Revisions to Final Approved Site Management Plan:

Revision #	Submitted Date	Summary of Revision	DEC Approval Date

JUNE 2012

Certification Statement
Site Management Plan

I, John Mohlin, certify that I am currently a NYS registered professional engineer and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.



John Mohlin, P.E.
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6/8/12
Date

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ACRONYMS AND ABBREVIATIONS

BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
C&S	C&S Engineers, Inc.
CAMP	Community Air Monitoring Program
COC	Certificate of Completion
COPCs	Contaminants of Potential Concern
cpm	Counts per Minute
DER	Division of Environmental Remediation
DUSR	Data Usability Summary Report
ERM	ERM Consulting & Engineering, Inc.
ESCP	Erosion Control Sediment Plan
ETA	Existing Transformer Area
EVS	Environmental Visualization Software©
EWP	Excavation Work Plan
FER	Final Engineering Report
Greenpac	Greenpac Mill, LLC
HASP	Health and Safety Plan
IC	Institutional Controls
MW	Monitoring Well
Norampac	Norampac Industries, Inc.
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PID	Photoionization Detector
QA/QC	Quality Assurance / Quality Control
RAD	Radiologically affected
RAWP	Remedial Action Work Plan
RI	Remedial Investigation
SCOs	Soil Cleanup Objectives
SMP	Site Management Plan
SVOCs	Semivolatile Organic Compounds
TAL	Target Analyte List
VOCs	Volatile Organic Compounds

SITE MANAGEMENT PLAN

1.0 INTRODUCTION AND DESCRIPTION OF REMEDIAL PROGRAM

1.1 INTRODUCTION

This document is required as an element of the remedial program at the Former Mill No. 2 Site located at 4400 Royal Avenue in the City of Niagara Falls, Niagara County, New York (hereinafter referred to as the "Site"; see Figure 1-1) under the New York State (NYS) Brownfield Cleanup Program (BCP) administered by New York State Department of Environmental Conservation (NYSDEC). The Site was remediated by Greenpac Mill, LLC (Greenpac) participating in the BCP as a Volunteer as defined in ECL 27-1405(1)(b) in accordance with Brownfield Cleanup Agreement (BCA) Index# C932150-03-10, Site # C932150, which was originally executed by the NYSDEC on 6 April 2010 and last amended by the NYSDEC and Greenpac on 14 December 2011 (Amendment #3).

1.1.1 General

Greenpac entered into a BCA with the NYSDEC to remediate an 18.52 acre property located in the City of Niagara Falls, Niagara County, New York. This BCA required the Remedial Party, Greenpac, to investigate and remediate contaminated media at the Site. Figures showing the location and boundaries of this Site are provided as Figure 1-1 and 1-2. The boundaries of the Site are more fully described in the metes and bounds Site description (Appendix A) that is part of the Environmental Easement (Appendix B). The final Environmental Easement was approved by NYSDEC on 4 June 2012 and filed with Niagara County on 6 June 2012. Appendix C provides a drawing showing the planned facility layout as of May 2012.

After completion of the remedial work described in the Remedial Action Work Plan, some contamination was left in the subsurface at this Site, which is hereafter referred to as 'remaining contamination." This Site Management Plan (SMP) was prepared to manage remaining contamination at the Site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State.

This SMP was prepared by ERM Consulting & Engineering, Inc. (ERM), on behalf of Greenpac, in accordance with the requirements in NYSDEC Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10), dated May 2010, and the guidelines provided by

NYSDEC. This SMP addresses the means for implementing the Institutional Controls (ICs) that are required by the Environmental Easement for the Site.

1.1.2 Purpose

The Site contains contamination left after completion of the remedial action. ICs have been incorporated into the Site remedy to control exposure to remaining contamination during the use of the Site to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Niagara County Clerk, will require compliance with this SMP and all ICs placed on the Site. The ICs place restrictions on Site use, and mandate operation, maintenance, monitoring and reporting measures for all ICs. This SMP specifies the methods necessary to ensure compliance with all ICs required by the Environmental Easement for contamination that remains at the Site. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

This SMP provides a detailed description of all procedures required to manage remaining contamination at the Site after completion of the Remedial Action, including: (1) implementation and management of all ICs; (2) sampling requirements; and (3) performance of periodic inspections, certification of results, and submittal of Periodic Review Reports.

To address these needs, this SMP includes two plans: (1) an Institutional Control Plan for implementation and management of ICs; (2) an Inspection & Sampling Plan for implementation of routine inspections and sampling (if conducted).

This plan also includes a description of Periodic Review Reports for the periodic submittal of data, information, recommendations, and certifications to NYSDEC.

It is important to note that:

- This SMP details the Site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the environmental easement, which is grounds for revocation of the Certificate of Completion (COC);
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the BCA Index # C932150-03-10, Site # C932150, and thereby subject to applicable penalties.

1.1.3 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. In accordance with the Environmental Easement for the Site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.2 SITE BACKGROUND

1.2.1 Site Location and Description

The Site is located in the City of Niagara Falls, County of Niagara, New York and is designated on the Tax Map of the County Clerk of Niagara as tax map parcel numbers: Section 160.09 Block 1 Lot 3 and Section 700.00 Block 41 Lot 2. The Site is an approximately 18.52-acre area bounded by an active paper mill (Mill No. 1) operated by Norampac Industries, Inc. (Norampac) to the north, National Grid property to the west; Royal Avenue, Frank's Vacuum Service, and the Former Frontier Chemical Site (NYSDEC Inactive Hazardous Waste Disposal Site No. 9-32-110) to the south; and the former Frontier Chemical Site, 47th Street, and Sentry Metal Services to the east (see Figure 1-2). The boundaries of the Site are more fully described in Appendix A – Metes and Bounds.

1.2.2 Site History

Buildings, facilities, and operations associated with the Former Mill No. 2 historically housed paper manufacturing, finishing, and packaging operations of finished goods. The facility was originally constructed in the 1920s and was expanded several times. The northern part of the Site (referred to as the Northern Extension) included a five story warehouse building (Building 10) and the on-Site Wastewater Treatment Plant. Historic plant drawings indicate that Building No. 10 was apparently constructed in 1936 and the Wastewater Treatment Plant was originally constructed in 1940 with additions and improvements being constructed during ensuing years. Paper manufacturing, finishing, and packaging operations continued at the Site until the Former Mill No. 2 became inactive in 1982.

Greenpac entered into a BCA with the NYSDEC in 2010 to address the significant environmental, legal, and financial barriers that hinder redevelopment of the Site. Former Mill No. 2 structures have been demolished to allow construction of a new, state-of-the-art fiberboard recycling facility by Greenpac.

Several subsurface investigations were conducted at the Site to evaluate soil and ground water quality. Previous subsurface investigations performed by others at the Site included:

- Preliminary Subsurface Assessment (Labella, 2008);
- Subsurface Investigation, Main Parcel (C&S, 2009);
- Subsurface Investigation, Northern Extension (C&S, 2010a); and
- CSX Corridor Phase II Investigation (Benchmark, 2011).

ERM was retained by Greenpac to perform a RI at the Site. The goal of the RI was to provide a comprehensive evaluation of soil and ground water across the Site using existing data from previous investigations and new data generated during implementation of the RI in conformance with two NYSDEC-approved RI Work Plans for the Site: one for the Main Parcel (C&S, 2009) and the other for the Northern Extension (ERM, 2011a). The results of the RI effort are summarized in Section 1.3. Between July 2011 and March 2012, and consistent with the NYSDEC-approved Soil Excavation IRM Work Plan (ERM, 2011c) and the approved Addendum to the Soil Excavation IRM Work Plan (ERM, 2011e), a Track 2 cleanup was implemented that achieved the Industrial Soil Cleanup Objectives (SCOs) for the top 15-feet of soil, or to the top of bedrock, whichever is shallower. The results of the remedial efforts are summarized in Section 1.4.

1.2.3 Geologic Conditions

Geologic units encountered at the Site during the Remedial Investigation (RI) include (listed from surface down to bedrock):

- brown to black gravel and historic fill material (Unit 1);
- light colored silty sand to sandy-silt gravel (Unit 2);
- reddish-brown silt and silty gravel (Unit 3);
- dark gray dolomitic limestone of the Lockport Formation (bedrock).

A geologic section is shown in Figure 1-3. The gravel and historic fill unit consists predominantly of brown to gray gravel fill or dark gray to black historic fill. The fill material is widespread across the Site and is generally less than 3-feet thick, but ranges from 0.3- to 13.5-feet in thickness.

The light-colored silty sand to sandy-silt gravel unit consists predominantly of yellow-brown sandy silt with trace amounts of dark gray gravel. Thickness ranges from 0- to 8-feet.

The reddish-brown silt and silty gravel unit consists predominantly of reddish-brown clayey silt to silty gravel. Gravel is often found in horizontal layers. This unit rests on top of bedrock and pieces of bedrock are contained in the lowest layers of this zone. The thickness of Unit 3 ranges between 2.5- and 9-feet.

Bedrock consists of gray dolomitic limestone of the Upper Silurian Lockport Formation (Rickard and Fisher, 1970). The depth to bedrock is generally 12-feet below ground surface but ranges from 7.5- to 20-feet and appears to slope from the northeast to the southwest.

There is very little shallow overburden ground water at the Site as evidenced by the lack of water present in the main excavation at the Site. When present, ground water consists of thin, isolated lenses that are perched on top of bedrock. Depths to ground water measurements in Site wells indicate that ground water, when present, was encountered at depths ranging from approximately 6- to 8-feet bgs. These data suggest the presence of isolated perched ground water lenses sitting on top of relatively impermeable bedrock. Therefore, a ground water contour map was not prepared during the RI due to the apparent lack of laterally continuous shallow ground water at the Site. Where ground water is present, ground water flow at the Site is expected to be predominantly downwards into bedrock based to downward hydraulic gradients typically present in overburden deposits in this area. The relatively impermeable nature of Unit 3 suggests most ground water flow would occur vertically through fractures, macropores, or other more permeable zones (i.e., gravelly areas).

1.3 SUMMARY OF REMEDIAL INVESTIGATION FINDINGS

A RI was performed to characterize the nature and extent of contamination at the Site. The results of the RI are described in detail in the Remedial Investigation Report (ERM, 2012). Generally, the RI determined that remediation of soil was required at the Site but that additional investigation or remediation of ground water, soil vapor, or other environmental media or ecological resources were not required. A qualitative human health exposure assessment was performed and potential exposure pathways were evaluated. Below is a summary of Site conditions when the RI was performed in 2011.

Soil

The current and future contemplated use of the Site is industrial. Chemical analytical results for soil were compared to the Title 6, New York Code of Rules and Regulations [6 NYCRR] Part 375 SCOs for Industrial Use, referred to as the Industrial SCOs (NYSDEC, 2006). Additionally, areas of elevated radioactivity were discovered at the Site during implementation of the Soil Excavation IRM. Radiological field screening results were compared to the NYSDEC-approved Site-specific excavation guidance value of 10,000 counts per minute (cpm) as measured using a Ludlum Model 2221 meter with a 44-10 probe. As instructed by the NYSDEC, radiation readings were subject to the professional judgment of the radiological field technician and NYSDEC and New York State Department of Health (NYSDOH) specialists in radioactive materials removal.

Review and evaluation of resulting chemical data and radiological investigation results, comparison with applicable standards, criteria, and guidance (SCGs), and mapping through use of a geostatistical software program (Environmental Visualization Software© [EVS]) resulted in the lateral and vertical delineation of areas of soil that contain one or more contaminants of potential concern (COPCs) at concentrations above applicable SCGs. Figure 1-4 summarizes the extent of COPCs exceeding the Industrial SCOs at the Site prior to the implementation of the Soil Excavation IRM.

Volatile organic compounds (VOCs) were not detected at concentrations above the Industrial SCOs. However, VOCs were detected at concentrations above the applicable Site-specific field screening guidance value of 5 parts-per-million (ppm) as measured using a calibrated photoionization detector (PID) in two areas: chemical hotspots C-6 and C-10.

Elevated radiation was associated with slag and slag-like materials contained in historic fill materials or bedding associated with Site utilities and foundations. The slag and slag-like materials are consistent with materials produced during historic industrial operations in western New York. Areas of elevated radiation occurred predominantly in excavation Phases 3, 4, and 5 associated with the construction of the new building. Additionally, seven areas of elevated radiation designated as radiologically-affected (RAD) Zones 1 through 7 were identified in areas outside of the main excavation for the new building.

The following semivolatile organic compounds (SVOCs) and metals were detected in one or more soil samples at concentrations above the Industrial SCOs.

SVOCs

- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(a)pyrene
- Dibenzo(a,h)anthracene
- Indeno(1,2,3-cd)pyrene

Metals

- Arsenic
- Manganese
- Mercury

Table 1-1 summarizes analytical results for COPCs present in Site soil at concentrations above the Industrial SCOs.

Ground Water

There is very little shallow overburden ground water at the Site as evidenced by the lack of water present in the main excavation at the Site. Shallow ground water at the Site is limited to thin isolated areas perched on top of bedrock and is laterally and vertically discontinuous. Therefore, lateral contaminant transport in ground water is not anticipated to be significant at the Site. Shallow ground water flow at the Site is expected to be predominantly downwards towards bedrock due to downward hydraulic gradients typically present in overburden deposits in this area as documented during the hydrogeologic investigation of overburden and bedrock at the adjacent Frontier Chemical site (ERM, 2012).

Where shallow ground water is present at the Site, COPCs in Site soil typically are not present in ground water at concentrations above ambient ground water quality standards and guidance values. Areas of soil containing COPCs at concentrations above Industrial SCOs were permanently removed from the subsurface during implementation of the Soil Excavation IRM. Therefore, the Soil Excavation IRM also acted as a source removal and control action for the protection of ground water, further reducing the potential for contamination of ground water on-Site or off-Site.

Figure 1-5 summarizes analytical results for ground water samples collected at the Site during the RI and previous investigations. VOCs and SVOCs were not detected in shallow ground water at the Site at concentrations exceeding ambient ground water quality standards and guidance values with the exception of two monitoring wells (MW) installed by Labella in 2008 (wells MW-2 and MW-3) located near the southeastern property line in the perceived down-gradient direction from the Frontier Chemical site. The following COPCs were detected in these two wells at concentrations exceeding ambient ground water quality standards and guidance values.

- Bis(2-ethylhexyl)phthalate
- Chlorobenzene
- 1,2-Dichlorobenzene
- 1,3-Dicholorbenzene
- 1,4-Dichlorobenzene
- cis-1,2-Dichlorethene

These compounds are consistent with compounds reported by the NYSDEC as COPCs at the Frontier Chemical site, and therefore, additional investigation or remediation of compounds solely attributable to an off-Site source is not warranted as set forth in 6 NYCRR Part 375-1.8(d)2. Areas of VOCs in Site soil

have been permanently removed from the Site during implementation of the Soil Excavation IRM.

Other ground water quality exceedances in shallow ground water samples collected at the Site are limited to some isolated occurrences of the following metals:

- Antimony
- Iron
- Magnesium
- Manganese
- Sodium

The occurrence and observed concentrations of these naturally-occurring metals is consistent with the anticipated geochemical character of ground water at the Site based on typically low organic carbon content of glacial deposits (Units 2 and 3) and the near-reducing geochemical conditions encountered in Site ground water. Manganese was detected in Site soil at concentrations above NYSDEC Part 375 Protection of Ground Water SCOs. Areas of manganese soil exceeding the Industrial SCO were permanently removed from the Site during implementation of the Soil Excavation IRM.

These metals are considered as predominantly naturally occurring at the Site and raising only aesthetic and not environmental concerns. Additionally, the lack of significant mobile ground water at the Site, the City of Niagara Falls Local Law #4 of 2010 (which prohibits the use of ground water for drinking), the proposed use of ICs at the Site (an Environmental Easement) to prohibit the use of ground water for drinking, and the soil source area removals performed during implementation of the Soil Excavation IRM all suggest that implementation of ground water quality restoration or plume containment/stabilization are not required at the Site.

Soil Vapor Intrusion

The NYSDEC and the NYSDOH indicated at a meeting on 5 April 2011 that assessment of the soil vapor matrix at the Site would not be required if soil containing VOCs at concentrations above 5 ppm above background, as measured in the field using a calibrated PID, was removed during remedial action at the Site. Two such areas were identified during the RI – chemical hotspot C-6 and hotspot C-10. VOC-affected soil in these two areas was removed during the Soil Excavation IRM. Therefore, investigation of soil vapor at the Site was not performed during the RI as approved by the NYSDEC and the NYSDOH.

Qualitative Human Health Exposure Assessment

Potential exposure pathways at the Site that were complete prior to remedial action at the Site included direct contact with soil, incidental ingestion of soil, and inhalation of soil for on-Site commercial workers and on-Site construction or utility workers. Direct contact with soil and inhalation of soil represent the greatest risk concerning frequency and duration of exposure for on-Site commercial workers and on-Site construction and utility workers. The risk is greatest during intrusive activities (e.g., disturbance of surface soil or subsurface soil excavation). Control measures such as proper implementation and compliance with the Site-specific Health and Safety Plan (HASP), use of appropriate personal protective equipment (PPE), dust suppression techniques, and the use of ICs will greatly reduce the potential risk of exposure. Soil containing COPCs or radiation above applicable SCGs was permanently removed from the Site through remedial activities. Therefore, previously complete exposure pathways are considered incomplete for current and future industrial use of the Site subsequent to the completion of remedial action.

The Site and surrounding areas are serviced by municipal water and the use of ground water for drinking is currently prohibited by the City of Niagara Falls Local Law #4 of 2010. Use of ground water at the Site for drinking will be further prohibited through filing of an Environmental Easement. Therefore, current and future potential pathways for ground water are not complete based on current and future legal restrictions of ground water use at the Site and surrounding areas.

Fish and Wildlife Resources Impact Analysis

The Site is largely developed with buildings, roads, utilities infrastructure, paved or concrete surfaces, and little or no significant vegetation. The NYSDEC's decision key contained in Appendix 3C of DER-10 (NYSDEC, 2010) was utilized to evaluate whether or not performance of a Fish and Wildlife Resources Impact Analysis was needed. The RI demonstrated that there is evidence that COPCs were released into the environment at the Site. Therefore, the Site can be considered to have been affected by one or more discharge or spill events.

The National Grid property and the New York Power Authority (NYPA) property to the west of the Site are zoned "OS" (Open Space) by the City of Niagara Falls. These two properties contain ecological resources consisting of grassy fields and shrubby areas. Other ecological resources may also be present on these two properties. Review of the NYSDEC's internet-based Environmental Resource Mapper suggests that the Site and adjacent properties may contain rare plants or rare animals. However, evidence of significant on-Site ecological resources was not observed during the RI. Additionally, there is no evidence

that contamination present at the Site has the potential to migrate to and impact potential off-Site ecological resources on the National Grid and NYPA properties. Therefore, a Fish and Wildlife Resources Impact Analysis was not needed based on interpretation of NYSDEC guidance (DER-10 Appendix 3C).

1.4 SUMMARY OF REMEDIAL ACTIONS

The Site was remediated in accordance with the following NYSDEC-approved Work Plans:

- Interim Remedial Measure Work Plan – Demolition of Mill No. 2 (C&S, 2010b);
- IRM Work Plan for Demolition of Building No. 10 and the Wastewater Pre-Treatment Plant (ERM, 2011b);
- Soil Excavation IRM Work Plan (ERM, 2011c); and
- Revised Addendum to the Soil Excavation Work Plan (ERM, 2011d).

The following is a summary of the Remedial Actions performed at the Site:

1. Excavation of soil/fill exceeding Industrial SCOs, and Site-specific screening criteria listed in Table 1-2, to a depth of 15 feet or bedrock, whichever was shallower;
2. Demolition of the Former Mill No. 2, Building 10, and the two southernmost tanks for the Wastewater Treatment Plant
3. Execution and recording of an Environmental Easement to restrict land use, as well as to prohibit use of ground water underlying the Site without treatment rendering it safe for intended use.
4. Development and implementation of a SMP for long term management of remaining contamination as required by the Environmental Easement, which includes plans for: (1) ICs, (2) sampling, and (3) reporting;

Remedial excavation activities were substantially complete on 31 December 2011. Demolition activities were substantially completed in February 2012.

1.4.1 Removal of Contaminated Materials from the Site

As stated in the Soil Excavation IRM Work Plan, the remedial activities would involve excavation of affected soil containing compounds of potential concern at concentrations above applicable SCOs as defined in 6 NYCRR Part 375-6.8. Because Greenpac desired a Track 2 cleanup, the SCOs were intended to be applied to the top 15 feet of soil (or to bedrock if less than 15 feet) consistent with

NYSDEC's "Soil Cleanup Guidance" Policy dated 21 October 2011 (CP-51) (NYSDEC, 2011). The current and contemplated use for the Site is industrial. Therefore, the remedy consisted of excavation and off-Site disposal of soil above Industrial SCOs (referred to as the "Chemical Hot Spots" in areas outside the Main Excavation in the footprint of the new building). Furthermore, the NYSDEC and the NYSDOH indicated in a meeting on 5 April 2011 that assessment or mitigation of vapor intrusion at the Site would not be required if soil containing VOCs at concentrations above 5 ppm as measured in the field using a calibrated PID was removed during remedial action at the Site. Therefore, in addition to the two areas identified during the RI, screening of excavated soil was conducted with a PID, and soil exhibiting measurements above 5 ppm was also removed. During the excavation activities, RAD soil was encountered at the Site. Based on measured background levels, the NYSDEC approved an excavation screening criteria of 10,000 cpm for the Site (as measured with a Ludlum 2221 with a 44-10 probe). During the RI, these areas were identified, and are referred to as "RAD Hot Spots". A list of the SCOs for the primary COPCs and applicable land use for this Site, as well as the screening criteria, is provided in Table 1-2.

With the exception of two inaccessible areas (see discussion of the transformer area and soil in the vicinity of sample CONF-110 in Section 1.4.3), and a sample location below a depth of 15 feet, all soil above Industrial SCOs and RAD Hot Spots, as well as all soil above the Site-specific PID and radiologically screening levels, have been excavated and disposed off-Site.

In addition to excavation of soil from the Chemical and RAD Hot Spots, soil was also excavated as part of the construction and installation of foundations for the new recycling facility building (i.e., the new building footprint, also referred to as the Main Excavation) and all other required foundation areas within the Site (e.g., the Wastewater Treatment Plant).

Upon initiation of excavation work at the Site, all Soil Management at the Site was performed according to Table 1-3 (this table was presented as Table 4-1 – Soil Management by Categories as presented in the June 2011 Soil Excavation IRM Work Plan). Excavated soil in the new building footprint that was suitable for reuse in off-Site areas pending soil analysis in accordance with Part 375 and DER-10 was classified as "clean". Excavated soil that was greater than the Residential SCO was classified as "contaminated" during the Site excavation and required transportation and disposal off-Site at a NYSDEC-approved soil disposal, recycling, or reuse facility. As excavation work proceeded, additional details regarding these "clean" and "contaminated" classifications were discussed and more fully evaluated with the NYSDEC. Based upon these revised evaluations, ultimate soil reuse and soil disposal was performed according to Table 1-4 (this table was presented as Table 4-2 – Summary of

Actual Soil Excavation, Handling and Disposal in the June 2011 Soil Excavation IRM Work Plan).

All excavated soils were screened in the field and segregated for reuse on-Site, reuse off-Site, or disposal off-Site at a permitted soil disposal or recycling facility pending the results of sampling and laboratory analyses in conformance with NYSDEC technical requirements for soil reuse and remedial action implementation compliance as contained in DER-10.

Excavated soils were examined in the field for visual, olfactory, or PID field screening evidence of potential contamination by the on-Site competent person. Based on these field evaluations, Figure 1-6 shows the extent of the excavation for the proposed new building for the paperboard recycling facility and the actual extent of Chemical and RAD Hot Spot excavations completed during the Soil Excavation IRM which was generally performed between 9 July 2011 and 31 December 2011. Backfill consisting of crushed rock and/or crushed concrete was used in the Hot Spot excavations, as well as portions of the main building foundation. In summary, the following approximate quantities of soil were shipped off-Site:

- 67,827 tons to Allied Landfill in Niagara Falls, New York for reuse;
- 135,839 tons to Allied & Modern Landfills in Niagara Falls, New York for disposal; and
- 20,087 tons of radiologically-affected soil to Environmental Quality Landfill in Belleville, Michigan.

Additional excavations for utility lines and drainage structures were performed in discrete areas of the Site in early 2012. These volumes represent a small fraction of the above totals and are not reflected here.

The effectiveness of the Soil Excavation IRM was assessed through collection of confirmation soil samples in conformance with DER-10 technical requirements and comparison of the post-remediation sampling results with pre-remediation sampling results.

In addition, although not a component of the Soil Excavation IRM, the building demolition activities covered under the following two documents were completed:

- Interim Remedial Measure Work Plan – Demolition of Mill No. 2 (C&S, 2010b); and
- IRM Work Plan for Demolition of Building No. 10 and the Wastewater Pre-Treatment Plant (ERM, 2011b).

1.4.2 Site-Related Treatment Systems

No long-term treatment systems were installed as part of the Site remedy.

1.4.3 Remaining Contamination

Since Track 1 Unrestricted SCOs were not the selected remedy and residual contaminated soil and ground water/soil vapor is to remain beneath the Site after the remedy is complete, ICs will be required for long term management to protect human health and the environment. Long-term management of ICs and of residual contamination would be executed under this Site-specific SMP.

As identified in the RI, historic fill material is present across much of the Site. The majority of this material contains chemical constituents in excess of the Unrestricted SCOs. For this reason, all historic fill material is anticipated to exceed the Unrestricted SCOs, and additional tables and maps are not provided.

While the remedial action has achieved a BCP Track 2 cleanup for the Industrial SCOs, some areas remain where soil contains chemical constituents above the Industrial SCOs. Table 1-5 summarizes the results of all soil samples remaining at the Site after completion of Remedial Action that exceed the Industrial SCOs. The data from these and other sample locations remaining at the Site, were input into a geostatistical software program (EVS) to generate the lateral and vertical delineation of areas of soil that contain one or more compounds of potential concern (COPCs) at concentrations above the Industrial SCOs. This mapping is presented as Figures 1-7a through 1-7e. Further details regarding the sample locations and adjacent areas are detailed below.

B-01 and B-01F (Existing Transformer Area)

These samples are part of the area referred to as Chemical Hot Spot C-1 in the Soil Excavation IRM Work Plan. These samples are also located in the Existing Transformer Area (ETA) which is presented in Figure 1-2. A portion of RAD Hot Spot R-1 is also located within the ETA (see Figure 1-7). During the Soil Excavation IRM, these areas were not accessible, and soil was not excavated. Once the existing electrical substation within the ETA is accessible, these areas will be addressed within 90 days. The work will be conducted following the Excavation Work Plan in Appendix D. Soil will be excavated to the extents shown in Figures 1-7a through 1-7e. The excavated soil will be screened and managed in accordance with Table 1-6. Confirmation sampling for the remaining areas of Chemical Hot Spot C-1 will be conducted in accordance with the Soil Excavation IRM Work Plan. The samples will be analyzed for the area-specific compounds of concern. The confirmation sampling locations and analytes will be approved by NYSDEC prior to excavation. Soil excavation will continue until screening criteria are met and confirmation samples results are less than the Industrial SCOs. RAD Hot Spot R-1 will be excavated following the

requirements of the Soil Excavation IRM Work Plan Addendum (ERM, 2011). A report of the excavation activities will be prepared following the requirements for a Construction Completion Report outlined in DER-10 Section 5.8, and submitted to NYSDEC within 90 days after completion of the excavation.

B-201E

Sample location B-201E is located just outside the ETA. After consultation with NYSDEC, it was agreed that soil in the vicinity of this sample location would be excavated at the same time as soil within the ETA was addressed. The excavation of this area will proceed as described above for the ETA.

CONF-110

At confirmation soil sample CONF-110, arsenic and mercury were detected at concentrations above the Industrial SCOs. This sample is located beneath an active steam line in an area that cannot be further excavated without removing the active steam line, which is necessary for ongoing Norampac production operations. Greenpac has submitted a demonstration to the NYSDEC of the technical impracticability of additional soil excavation in this area as a basis for preservation of a BCP Track 2 cleanup for the Site. In a letter dated 4 May 2012, NYSDEC approved this document (NYSDEC, 2012a), and indicated that no further remediation is required in this area. However, if the steam line is relocated or de-energized, or if soil is disturbed in this area, soil excavation activities must be conducted in accordance with the Excavation Work Plan (Appendix D), and the soil must be managed in accordance with Table 1-6.

SB-11

Mercury was detected from this sample above the Industrial SCO at a depth of 16 to 20 feet. As part of the BCP Track 2 cleanup, only soil at depths of 15 feet or less was required to be addressed. If soil is disturbed in this area, soil excavation activities must be conducted in accordance with the Excavation Work Plan (Appendix C), and the soil must be managed in accordance with Table 1-6.

Previous reuse and disposal of soil at local landfills has been dictated on whether or not Residential SCOs are met. Therefore, Table 1-7 is provided showing all sample results for soil remaining at the Site in excess of Residential SCOs. Based on these data, EVS modeling was conducted to identify areas of soil remaining above Residential SCOs, and this is presented in Figures 1-8a through 1-8e.

2.0 INSTITUTIONAL & ENGINEERING CONTROL PLAN

2.1 INTRODUCTION

2.1.1 General

Since remaining contaminated soil and ground water exists beneath the Site, ICs are required to protect human health and the environment. This Institutional Control Plan describes the procedures for the implementation and management of all ICs at the Site. The IC Plan is one component of the SMP and is subject to revision by NYSDEC.

2.1.2 Purpose

This plan provides:

- A description of all ICs on the Site;
- The basic implementation and intended role of each IC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the features to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of ICs, such as the implementation of the Excavation Work Plan for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the Site; and
- Any other provisions necessary to identify or establish methods for implementing the ICs required by the Site remedy, as determined by the NYSDEC.

2.2 INSTITUTIONAL CONTROLS

A series of ICs is required by the Decision Document (NYSDEC, 2012b) to: (1) prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination; and, (2) limit the use and development of the Site to industrial uses only. Adherence to these ICs on the Site is required by the Environmental Easement and will be implemented under this SMP. These ICs are:

- Compliance with the Environmental Easement and this SMP by the Grantor and the Grantor's successors and assigns;

- Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in this SMP;

ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement.

The Site has a series of ICs in the form of Site restrictions. Adherence to these ICs is required by the Environmental Easement. Site restrictions that apply to the Controlled Property are:

- The property may only be used for industrial use provided that the long-term ICs included in this SMP are employed.
- The property may not be used for a higher level of use, such as unrestricted, residential, restricted residential, or commercial use without additional remediation and amendment of the Environmental Easement, as approved by the NYSDEC;
- All future activities on the property that will disturb soil must be conducted in accordance with this SMP;
- The use of ground water underlying the Site is prohibited without treatment rendering it safe for the intended use;
- Vegetable gardens and farming on the property are prohibited;
- The Site owner or remedial party will submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) land use and ground water restrictions employed at the Controlled Property are unchanged from the previous certification or that any changes to the restrictions were approved by the NYSDEC; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow and will be made by an expert that the NYSDEC finds acceptable.

2.2.1 Excavation Work Plan

The Site has been remediated for restricted industrial use. Any future intrusive work that will encounter or disturb the remaining contamination, including the planned excavation in and adjacent to, the ETA will be performed in compliance with the Excavation Work Plan (EWP) that is attached as Appendix D to this SMP. Any work conducted pursuant to the EWP must also be conducted in

accordance with the procedures defined in a HASP and Community Air Monitoring Plan (CAMP) prepared for the Site. A sample HASP is attached as Appendix E to this SMP that is in current compliance with DER-10, and 29 CFR 1910, 29 CFR 1926, and all other applicable Federal, State and local regulations. A Site-Specific Radiological Safety Plan that was used during removal of radiological materials during the IRM is also provided in Appendix E. Based on future changes to State and federal health and safety requirements, and specific methods employed by future contractors, the HASP and CAMP will be updated and re-submitted with the notification provided in Section B-1 of the EWP. Any intrusive construction work will be performed in compliance with the EWP, HASP and CAMP, and will be included in the periodic inspection and certification reports submitted under the Site Management Reporting Plan (See Section 5).

The Site owner and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are completely responsible for the safe performance of all intrusive work, the structural integrity of excavations, proper disposal of excavation de-water, control of runoff from open excavations into remaining contamination, and for structures that may be affected by excavations (such as building foundations and bridge footings). The Site owner will ensure that Site development activities will not interfere with, or otherwise impair or compromise, the ICs described in this SMP.

2.2.2 Soil Vapor Intrusion Evaluation

The NYSDEC and NYSDOH indicated in a meeting on 5 April 2011 that investigation or mitigation of VOCs for the vapor intrusion pathway would not be required at the Site if VOC-affected soil was addressed during the Soil Excavation IRM (as it has been). Therefore, an evaluation of soil vapor intrusion is not applicable.

2.3 *ENGINEERING CONTROLS*

Engineering controls are not necessary at this Site.

2.4 INSPECTIONS AND NOTIFICATIONS

2.4.1 Inspections

Inspections will be conducted at the frequency specified in the SMP Sampling/Inspection Plan schedule. A comprehensive Site-wide inspection will be conducted annually, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ICs remain in place;

- If these controls continue to be protective of human health and the environment; and
- Compliance with requirements of this SMP and the Environmental Easement.

Inspections will be conducted in accordance with the procedures set forth in the Inspection & Sampling Plan of this SMP (Section 3). The reporting requirements are outlined in the Periodic Review Reporting section of this plan (Section 5).

If an emergency, such as a natural disaster occurs, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the ICs implemented at the Site by a qualified environmental professional as determined by NYSDEC.

2.4.2 Notifications

Notifications will be submitted by the property owner to the NYSDEC as needed for the following reasons:

- 60-day advance notice of any proposed changes in Site use that are required under the terms of the BCA, 6NYCRR Part 375, and/or Environmental Conservation Law.
- 7-day advance notice of any proposed ground-intrusive activities pursuant to the Excavation Work Plan.

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser has been provided with a copy of the BCA, and all approved work plans and reports, including this SMP
- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing.

2.5 CONTINGENCY PLAN

Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions.

2.5.1 Emergency Telephone Numbers

In the event of any environmentally related situation or unplanned occurrence requiring assistance, the Owner or Owner's representative(s) should contact the appropriate party from the contact list below. For emergencies, appropriate emergency response personnel should be contacted. Prompt contact should also be made to Site management. These emergency contact lists must be maintained in an easily accessible location at the Site.

Table 2-1: Emergency Contact Numbers

Medical, Fire, and Police:	911
One Call Center:	(800) 272-4480 (3 day notice required for utility markout)
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
NYSDEC Spills Hotline	(800) 457-7362
Mount St. Mary's Hospital	(716) 297-4800

Security must be notified of any Site emergency to allow emergency services access to the Site.

Table 2-2: Other Contact Numbers

Owner: Luc Nadeau (Greenpac)	(450) 461-8603
On-Site Owner's Representative: Srini Balaji (MiniMill Technologies, Inc.)	(315) 692-4557
NYSDEC Regional Remediation Engineer	(716) 851-7220
Qualified Environmental Professional: Jon Fox (ERM)	(315) 256-5352 (cell)
Project Director: John Kuhn (ERM)	(585) 820-3957 (cell)
ERM Syracuse Office	(315) 445-2554

* Note: Contact numbers subject to change and should be updated as necessary

2.5.2 Map and Directions to Nearest Health Facility

Site Location: 4400 Royal Avenue
Niagara Falls, NY 14304 (Location A)

Nearest Hospital Name: Mount St. Mary's Hospital

Hospital Location: 5300 Military Road
Lewiston, NY 14092 (Location B)

Hospital Telephone: (716) 297-4800

Directions to the Hospital:

1. Head east on Royal Ave toward 47th St for 0.2 miles

2. Turn left onto 47th St and go 0.4 miles

3. Take the 1st right onto Niagara Falls Blvd and go 1.0 mile

4. Turn left to merge onto I-190 N for 5.3 miles

5. Take exit 25A for NY-265 toward Lewiston and go 0.1 mi

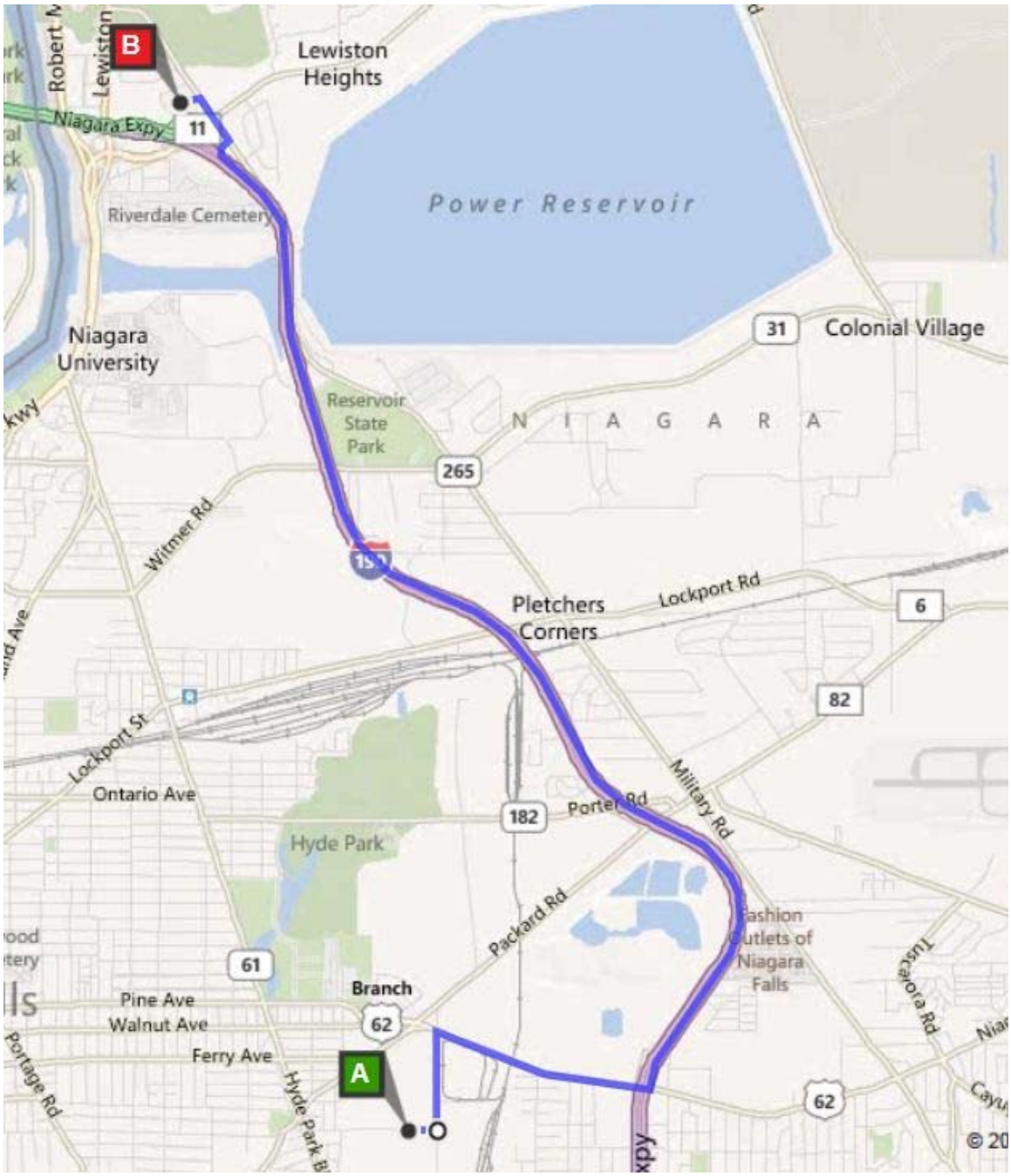
6. Turn left onto NY-265 N/Military Rd and go 0.3 miles

Destination will be on the left

Approximate Total Distance: 7.3 miles

Total Estimated Time: 13 minutes

Figure 2-1 - Map Showing Route from the Site to the Hospital:



2.5.3 Response Procedures

As appropriate, the fire department and other emergency response group will be notified immediately by telephone of the emergency. The emergency telephone number list is found at the beginning of this Contingency Plan (Table 2-1). The list will also be posted prominently at the Site and made readily available to all personnel at all times.

2.5.3.1 Spill Procedures

Should a spill occur, it should be properly contained if possible, then the Owner should be contacted immediately. The Owner will determine what agencies, if any, need to be notified and will make these notifications.

2.5.3.2 Evacuation Plan

In the event that an emergency alarm sounds at the facility, Site personnel will comply with the Greenpac facility specific emergency evacuation procedures.

2.5.3.3 Management of Change – Contingency Plan

Should the contingency plan need to be modified, the modification should be noted on the cover of the SMP, included herein and provided to the NYSDEC for inclusion in the Master File.

3.0 INSPECTION & SAMPLING PLAN

3.1 INTRODUCTION

3.1.1 General

This Inspection & Sampling Plan describes the measures for evaluating the performance and effectiveness of the remedy and to confirm that the remedy continues to be effective for the protection of public health and the environment. This Plan may only be revised with the approval of NYSDEC.

3.1.2 Purpose and Schedule

With the exceptions noted in Section 1.4.3, all soil containing contaminants in excess of Industrial SCOs have been remediated to Track 2 requirements (i.e., removed to bedrock or 15 feet below grade surface whichever is shallower). In addition, the RI determined that ground water quality restoration or plume containment/stabilization is not required at the Site. For these reasons, no routine media monitoring is required. However, routine inspection shall be performed to ensure all ICs remain in place and the SMP is being implemented as required.

This Inspection & Sampling Plan describes the methods to be used for:

- Sampling and analysis during excavation in the ETA (in particular the confirmation soil samples);
- Any sampling and analysis conducted during implementation of the Excavation Work Plan (Appendix D);
- Evaluating Site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment; and
- Preparing the necessary reports for any sampling activities.

To adequately address these issues, this Plan provides information on:

- Sampling locations, protocol, and frequency;
- Analytical requirements;
- Reporting requirements;
- Quality Assurance/Quality Control (QA/QC) requirements;
- Monitoring well decommissioning procedures; and
- Annual inspection and periodic certification.

Inspection and sampling programs are summarized in Table 3-1 and outlined in detail in Sections 3.2 and 3.3 below.

Table 3-1: Sampling/Inspection Schedule

Task	Frequency*	Matrix	Analysis
Confirmation soil sampling during excavation in, and adjacent to, the ETA	One-time event	Soil	TCL SVOCs plus 20 TICs (EPA Method 8270) Target Analyte List (TAL) Metals (not including cyanide) (EPA Method 6010B) plus Mercury (EPA Method 7471A)
Site-Wide Inspection (per Section 3.3)	Annual	Not applicable	None

* The frequency of events will be conducted as specified until otherwise approved by NYSDEC and NYSDOH

3.2 CONFIRMATION SOIL SAMPLING

During the soil excavation activities to be performed in (and adjacent to) the ETA, confirmation samples will be collected as described in Section 1.4.3.

3.3 WELL DECOMMISSIONING

While a ground water monitoring program is not part of the Site remedy, a network of monitoring wells exists at the Site. There are seven on-Site wells (MW-01, MW-02, MW-03, MW-06, MW-07, MW-08, and MW-09), and one off-Site well (MW-05). MW-04 and MW-10 were destroyed during Site construction activities. These wells were all installed as part of the RI and their locations are presented in Figure 1-5. Other wells shown on this map were not observed at the Site and are presumed to no longer exist.

Following the issuance of the Certificate of Completion, all Site-related wells (both on-Site and off-Site) will be abandoned. Well abandonment will be performed in accordance with NYSDEC's "Groundwater Monitoring Well Decommissioning Procedures." A record of the abandonment will be provided in the first Periodic Review Report.

3.4 SITE-WIDE INSPECTION

Site-wide inspections will be performed on a regular schedule at a minimum of once a year. During these inspections, an inspection form will be completed (Appendix F). The form will compile sufficient information to assess the following:

- Compliance with all ICs, including Site usage;
- Whether ICs continue to perform as intended and are protective of human health and the environment;
- General Site conditions at the time of the inspection; and
- Documentation of any soil disturbance activities.

3.5 QUALITY ASSURANCE/QUALITY CONTROL

Routine sampling is not required. However, sampling will be performed during excavation activities in, and adjacent to, the ETA. In addition, sampling may be necessary during implementation of soil disturbance activities (as outlined in Appendix D – Excavation Work Plan). Any sampling and analyses will be performed in accordance with the requirements of the Sampling & Analysis Plan contained in the NYSDEC-approved Remedial Investigation Work Plan for the BCP Main Parcel dated April 2010, revised August 2010 (Appendix G). Main Components of the plan include:

- QA/QC Objectives for Data Measurement;
- Sampling Program:
  - Sample containers will be properly washed, decontaminated, and appropriate preservative will be added (if applicable) prior to their use by the analytical laboratory. Containers with preservative will be tagged as such.
  - Sample holding times will be in accordance with the NYSDEC ASP requirements.
  - Field QC samples (e.g., trip blanks, coded field duplicates, and matrix spike/matrix spike duplicates) will be collected as necessary.
- Sample Tracking and Custody;
- Calibration Procedures:
  - All field analytical equipment will be calibrated immediately prior to each day's use. Calibration procedures will conform to manufacturer's standard instructions.

- The laboratory will follow all calibration procedures and schedules as specified in USEPA SW-846 and subsequent updates that apply to the instruments used for the analytical methods.

- Analytical Procedures; and
- Preparation of a Data Usability Summary Report (DUSR), which will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain of custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method.

3.6 REPORTING REQUIREMENTS

Forms and any other information generated during inspections and any sampling will be kept on file on-Site. All forms, and other relevant reporting formats used during the inspection and any sampling events, will be (1) subject to approval by NYSDEC and (2) submitted at the time of the Periodic Review Report, as specified in the Reporting Plan of this SMP.

Any sampling results will be reported to NYSDEC on a periodic basis in the Periodic Review Report. The report will include, at a minimum:

- Date of event;
- Personnel conducting sampling;
- Description of the activities performed;
- Type of samples collected (e.g., soil, proposed backfill, etc);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format); and
- Any observations, conclusions, or recommendations.

Data will be reported in hard copy or digital format as determined by NYSDEC. A summary of the inspection and sampling program deliverables are summarized in Table 3-2 below.

Table 3-2: Schedule of Sampling/Inspection Reports

Task	Reporting Frequency*
Confirmation soil sampling during excavation in, and adjacent to, the ETA	Once, within 90 days after completion of excavation (see Section 1.4.3 for reporting requirements)
Site-Wide Inspection	Report results in Periodic Review Reports (see Section 5.3 for reporting requirements)

* The frequency of events will be conducted as specified until otherwise approved by NYSDEC

4.0 OPERATION AND MAINTENANCE PLAN

The Site remedy does not rely on any mechanical systems, such as sub-slab depressurization systems or air sparge/ soil vapor extraction systems to protect public health and the environment. Therefore, the operation and maintenance of such components is not included in this SMP.

5.0 INSPECTIONS, REPORTING AND CERTIFICATIONS

5.1 SITE INSPECTIONS

5.1.1 Inspection Frequency

All inspections will be conducted at the frequency specified in the schedules provided in Section 3 Inspection & Sampling Plan. At a minimum, a Site-wide inspection will be conducted annually. If an emergency, such as a natural disaster occurs, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the ICs implemented at the Site by a qualified environmental professional as determined by NYSDEC.

5.1.2 Inspection Forms, Sampling Data, and Maintenance Reports

A general Site-wide inspection form will be completed during the annual Site-wide inspection, as well as all other inspections (see Appendix F). This form is subject to NYSDEC revision.

All applicable inspection forms and other records, including all media sampling data and system maintenance reports, generated for the Site during the reporting period will be provided in electronic format in the Periodic Review Report.

5.1.3 Evaluation of Records and Reporting

The results of the inspection will be evaluated as part of the IC certification to confirm that the:

- ICs are in place, are performing properly, and remain effective;
- The Inspection & Sampling Plan is being implemented;
- The Site remedy continues to be protective of public health and the environment and is performing as designed in the Remedial Action Work Plan (RAWP) and Final Engineering Report (FER).

5.2 CERTIFICATION OF INSTITUTIONAL CONTROLS

After the last inspection of the reporting period, a qualified environmental professional or Professional Engineer licensed to practice in New York State will prepare the following certification:

For each institutional identified for the Site, I certify that all of the following statements are true:

- The institutional control employed at this Site is unchanged from the date the control was put in place, or last approved by the Department;
- Nothing has occurred that would impair the ability of the control to protect the public health and environment;
- Nothing has occurred that would constitute a violation or failure to comply with any SMP for this control;
- Access to the Site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;
- Use of the Site is compliant with the environmental easement.
- The information presented in this report is accurate and complete.
- I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner or Owner's Designated Site Representative] (if the Site consists of multiple properties) [and I have been authorized and designated by all Site owners to sign this certification] for the Site.
- No new information has come to my attention, including ground water monitoring data from wells located at the Site boundary, if any, to indicate that the assumptions made in the qualitative exposure assessment of off-Site contamination are no longer valid; and

  Every five years, the following certification will be added:

- The assumptions made in the qualitative exposure assessment remain valid.

The signed certification will be included in the Periodic Review Report described below.

5.3 PERIODIC REVIEW REPORT

A Periodic Review Report will be submitted to the Department every year, beginning eighteen months after the Certificate of Completion or equivalent document e.g., Satisfactory Completion Letter, No Further Action Letter, etc. is issued. In the event that the Site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the Site described in Appendix A (Metes and Bounds). The report will

be prepared in accordance with NYSDEC DER-10 and submitted within 45 days of the end of each certification period. Media sampling results will also incorporated into the Periodic Review Report. The report will include:

- Identification, assessment and certification of all ICs required by the remedy for the Site;
- Results of the required annual Site inspections and severe condition inspections, if applicable;
- All applicable inspection forms and other records generated for the Site during the reporting period in electronic format;
- Data summary tables of contaminants of concern by media (soil, proposed fill material, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted;
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted electronically in a NYSDEC-approved format;
- A Site evaluation, which includes the following:
    - The compliance of the remedy with the requirements of the Remedial Alternatives Analysis and Interim Remedial Measure Construction Completion Report;
    - Any new conclusions or observations regarding Site contamination based on inspections or data generated by the Inspection & Sampling Plan;
    - Recommendations regarding any necessary changes to the remedy and/or the Inspection and Sampling Plan; and
    - The overall performance and effectiveness of the remedy.

The Periodic Review Report will be submitted, in hard-copy format, to the NYSDEC Central Office and Regional Office in which the Site is located, and in electronic format to NYSDEC Central Office, Regional Office and the NYSDOH Bureau of Environmental Exposure Investigation.

5.4 CORRECTIVE MEASURES PLAN

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional control, a corrective measures plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing

work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the corrective measures plan until it is approved by the NYSDEC.

REFERENCES CITED

Benchmark, 2011. Phase II Site Investigation Report- CSX Corridor. Project Number 0229-001-100. Buffalo, NY, 12 August 2011.

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ERM, 2011b. IRM Work Plan for Demolition of Building No. 10 and the Wastewater Pre-Treatment Plant. Former Mill No. 2 Site, Niagara Falls, New York; NYSDEC BCP Site Number C932150, June 2011.

ERM, 2011c. Soil Excavation Interim Remedial Measure Work Plan. Former Mill No. 2 Site, Niagara Falls, New York; NYSDEC BCP Site Number C932150, June 2011.

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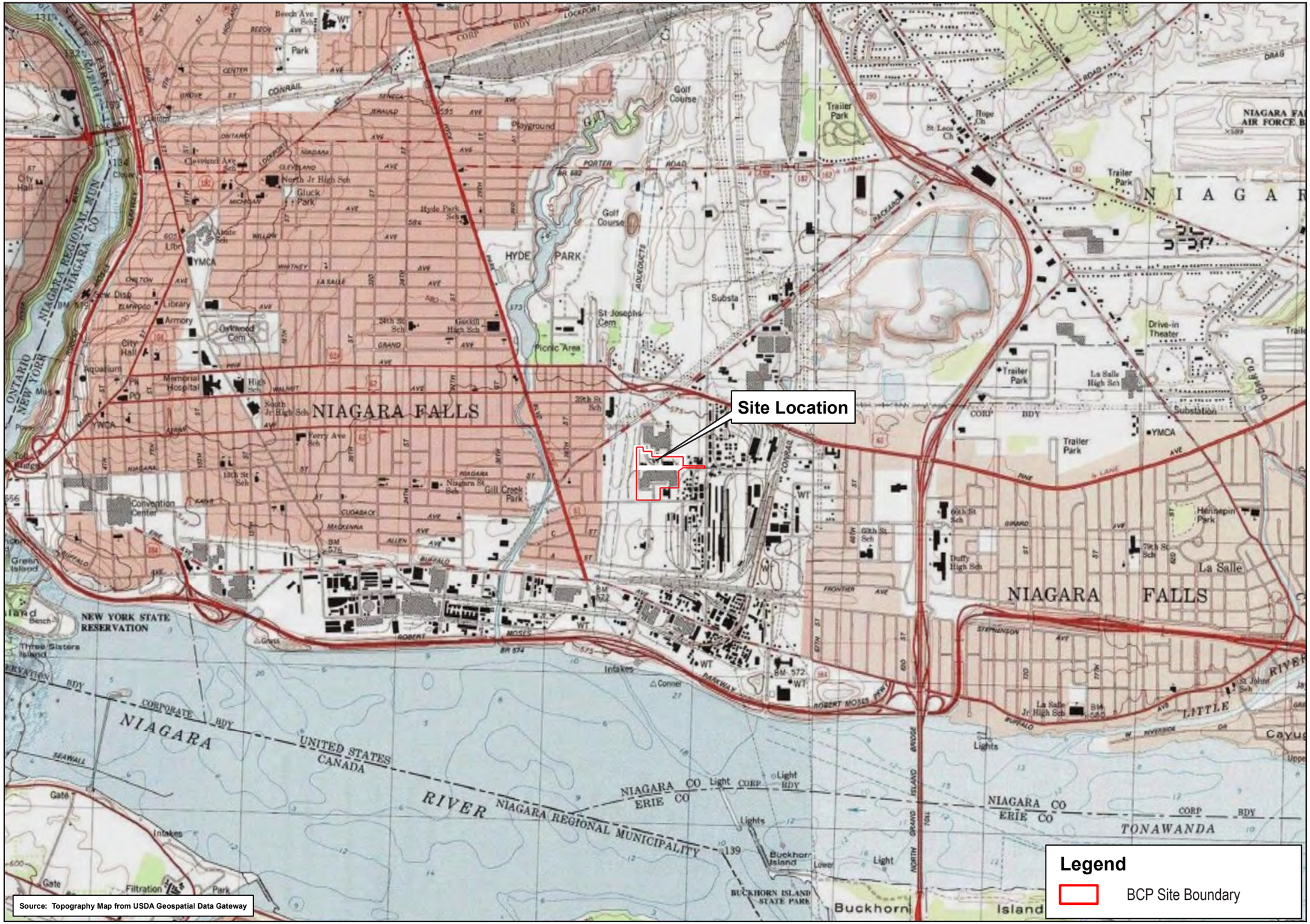
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Figures



N

0 2,000 Feet

Figure 1-1- Site Location Map
Greenpac Mill, LLC
Niagara Falls, New York
NYSDEC BCP Site #C932150

ERM

N

Packard Road

47th Street

WWTP A

WWTP B

WWTP C

Phase 1

Phase 2

Phase 3

Phase 4

Phase 5

Existing
Electrical Substation

Proposed
Electrical Substation

Royal Ave

Legend:

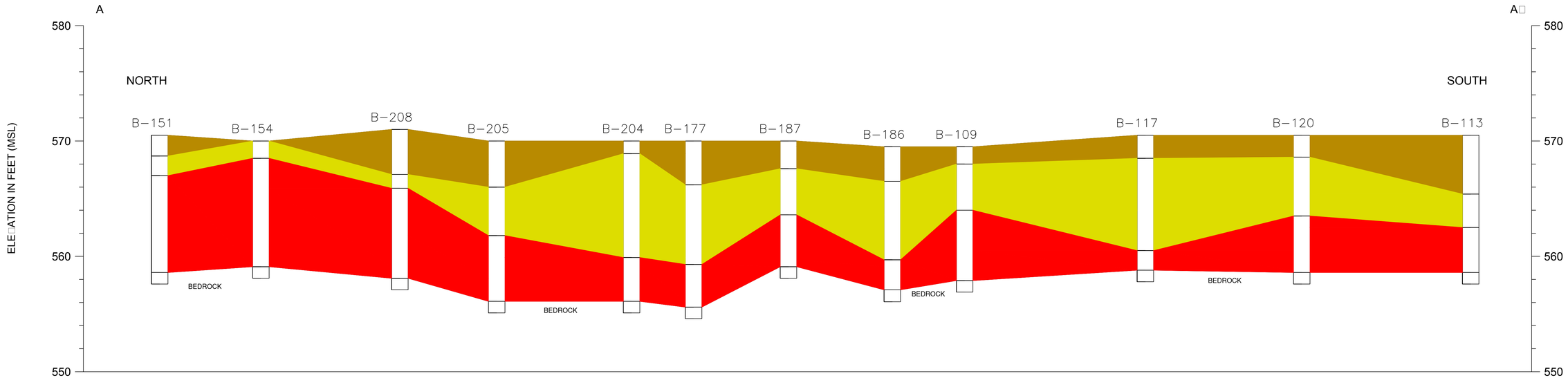
- Norampac's No Dig Zone
- Greenpac Mill Proposed Building Outline
- Main Excavation Phases
- BCP Site Boundary
- ETA Area
- Former Building Outline
- Excavation Grid

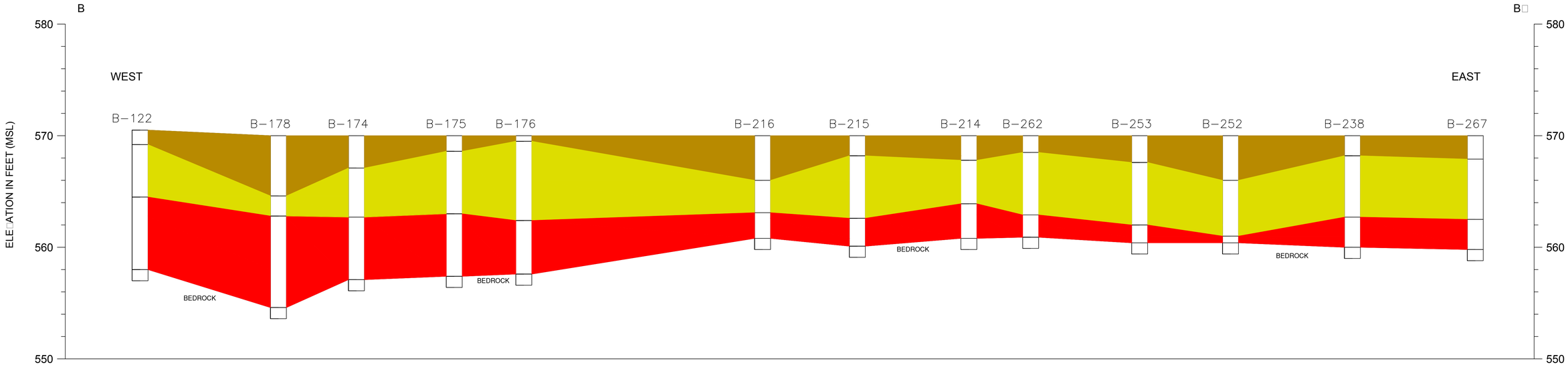
Source: Aerial photography (April 2008) from New York State GIS Clearinghouse.
Data for all property lines, perimeters and building outlines were obtained from the MiniMill Technologies provided CAD files.

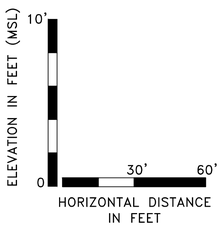
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Figure 1-2 - Site Layout Map
Greenpac Mill, LLC
NYSDEC BCP Site No. C932150
Niagara Falls, New York

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VERTICAL EXAGGERATION = 7X

LEGEND

Gravel and historic fill (Unit 1) : This stratigraphic unit consists of brown to gray silty sand, sandy silt, gravelly silt and gravel fill and/or dark gray to black historic fill. The fill material exists across the site generally less than 3-feet deep, but can range from 0.3- to 13.5- deep.

Light colored silty sand to sandy-silt gravel (Unit 2): This stratigrahic unit consists of yellow-brown, brownish-gray to lesser amounts of reddish-brown sandy silt and silty sand with a few gravel. Gravel content in places may increase with depth. The contact with Unit 1 is sharp and variable across the Site. Unit 2 may contain stringers of the reddish-brown unit 3 generally found below. The thickness of Unit 2 ranges from 0 to 8-feet.

Reddish-brown silt and silty gravel (Unit 3): This stratigrahic unit is found above bedrock and consists of reddish-brown clayey silt to silty gravel. Gravel is often found in horizontal layers interrupted to be high energy flow events of layers of drop stones. In places this unit contains glacial varves. Gravel size generally increases with depth and includes cobbles and a few boulders. Pieces of the dolomitic bedrock are contained in the lowest horizons of this zone. Although stringers of this layer are often included in Unit 2, we defined this stratigrahic unit as containing only reddish-brown soil materials. This unit rests unconformably on bedrock. The thickness of Unit 3 ranges between 2.5- and 9-feet.

Dolomitic Limestone: Bedrock consists of dolomitic limestone of the Silurian Lockport Formation. The depth to bedrock is generally 12-feet below ground surface but ranges in depth from 7.5- to 20-feet and appears to slope from the northeast to the southwest. Bedrock was encountered deeper in a man-made cut containing storm and sanitary lines that run north to south in the central portion of the Site. Bedrock was also deeper in the northwestern section of the BCP area.

Note: See Figure 1-4, Remedial Investigation Soil Contamination Summary

TITLE

GEOLOGIC CROSS SECTIONS A-A' & B-B'

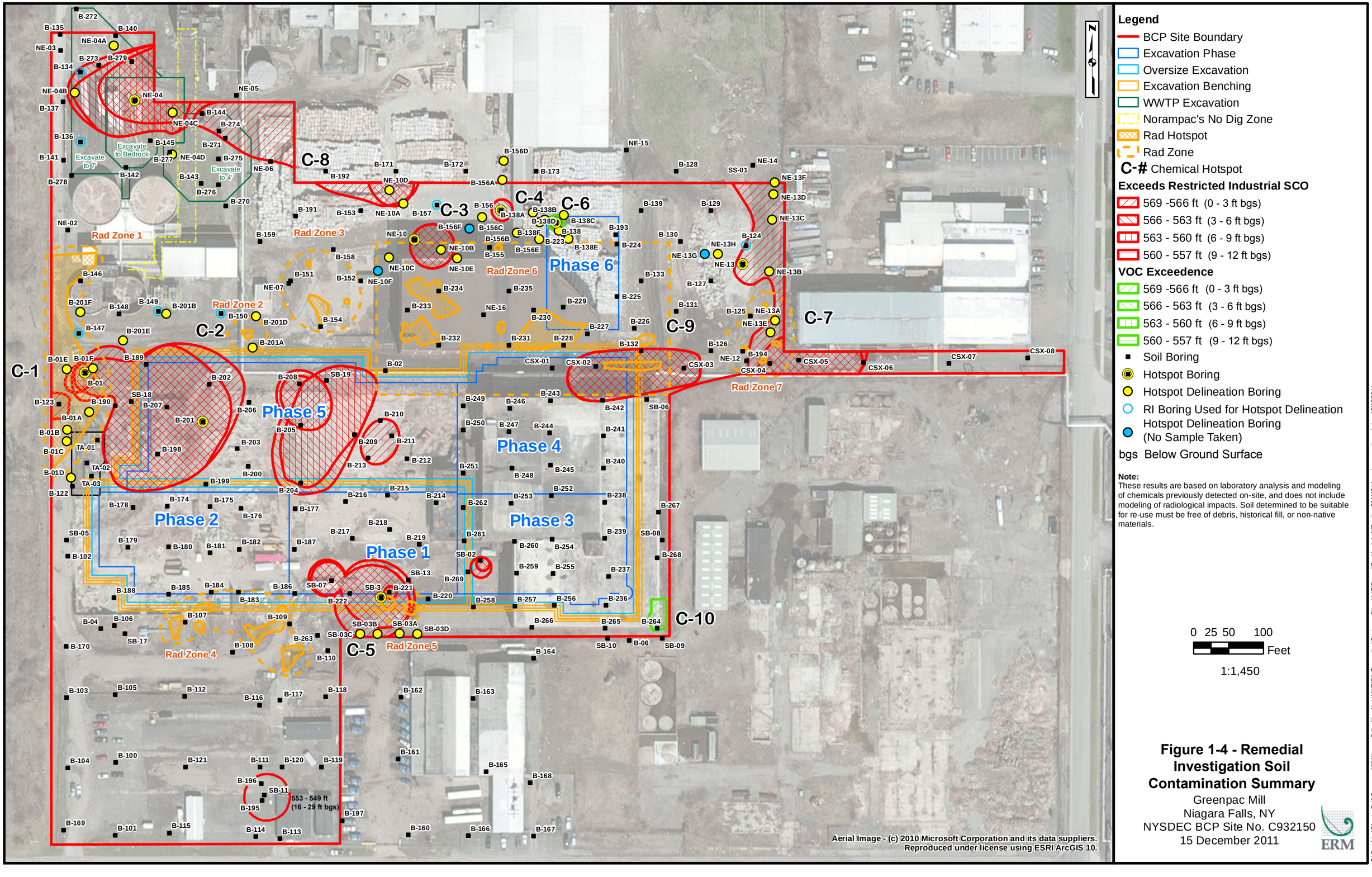
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GREENPAC MILL

Environmental Resources Management

DRAWN:	JOB NO.:	FILE NAME:	SCALE	DATE	FIGURE
EFR/EMF	0128439.11	0128439-11-001	GRAPHIC	12/12/11	1-3

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Legend

- BCP Site Boundary
- Excavation Phase
- Oversize Excavation
- Excavation Benching
- WWTP Excavation
- Norampac's No Dig Zone
- Rad Hotspot
- Rad Zone
- C-# Chemical Hotspot

Exceeds Restricted Industrial SCO

- 569 -566 ft (0 - 3 ft bgs)
- 566 - 563 ft (3 - 6 ft bgs)
- 563 - 560 ft (6 - 9 ft bgs)
- 560 - 557 ft (9 - 12 ft bgs)

VOC Exceedence

- 569 -566 ft (0 - 3 ft bgs)
- 566 - 563 ft (3 - 6 ft bgs)
- 563 - 560 ft (6 - 9 ft bgs)
- 560 - 557 ft (9 - 12 ft bgs)
- Soil Boring
- Hotspot Boring
- Hotspot Delineation Boring
- RI Boring Used for Hotspot Delineation
- Hotspot Delineation Boring (No Sample Taken)

bgs Below Ground Surface

Note:
These results are based on laboratory analysis and modeling of chemicals previously detected on-site, and does not include modeling of radiological impacts. Soil determined to be suitable for re-use must be free of debris, historical fill, or non-native materials.

0 25 50 100 Feet

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Figure 1-4 - Remedial Investigation Soil Contamination Summary

Greenpac Mill
Niagara Falls, NY
NYSDEC BCP Site No. C932150
15 December 2011

ERM

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N

Packard Road

47th Street

Royal Ave

WWTP A

WWTP B

WWTP C

Phase 1

Phase 2

Phase 3

Phase 4

Phase 5

Phase 6

Existing Electrical Substation

Proposed Electrical Substation

MW-01 (B-169)

MW-02 (B-170)

MW-03 (B-147)

MW-04 (B-137)

MW-05 (B-171)

MW-06 (B-150)

MW-07(B-194)

MW-08 (B-197)

MW-09 (B-263)

MW-10 (B-264)

MW-11

MW-1 (SB-5)

MW-2 (SB-8)

MW-3 (SB-9)

MW-4 (SB-10)

MW-04 Exceedances of New York State TOGS 1.1.1

Constituent	TOGS 1.1.1 Standard or Guidance Value (ug/L)	6/17/2011 (ug/L)
Iron	300	**33,400**
Magnesium	35,000	**212,000**
Manganese	300	**1,760**
Sodium	20,000	**179,000**

MW-03 Exceedances of New York State TOGS 1.1.1

Constituent	TOGS 1.1.1 Standard or Guidance Value (ug/L)	6/17/2011 (ug/L)
Magnesium	35,000	**333,000**
Manganese	300	**526**
Sodium	20,000	**217,000**

MW-1 Exceedances of New York State TOGS 1.1.1

Constituent	TOGS 1.1.1 Standard or Guidance Value (ug/L)	4/17/2008 (ug/L)
None	-	-

MW-02 Exceedances of New York State TOGS 1.1.1

Constituent	TOGS 1.1.1 Standard or Guidance Value (ug/L)	6/16/2011 (ug/L)
Sodium	20,000	**440,000**

MW-09 Exceedances of New York State TOGS 1.1.1

Constituent	TOGS 1.1.1 Standard or Guidance Value (ug/L)	6/17/2011 (ug/L)
Antimony	3	**4.9**
Sodium	20,000	**39,900**

MW-08 Exceedances of New York State TOGS 1.1.1

Constituent	TOGS 1.1.1 Standard or Guidance Value (ug/L)	6/16/2011 (ug/L)	6/16/2011 DUP (ug/L)
Magnesium	35,000	**502,000**	**507,000**
Sodium	20,000	**178,000**	**179,000**

MW-2 Exceedances of New York State TOGS 1.1.1

Constituent	TOGS 1.1.1 Standard or Guidance Value (ug/L)	4/17/2008 (ug/L)
Bis(2-ethylhexyl) phthalate	5	**11**

MW-3 Exceedances of New York State TOGS 1.1.1

Constituent	TOGS 1.1.1 Standard or Guidance Value (ug/L)	4/17/2008 (ug/L)
1,2-Dichlorobenzene	3	**21**
1,3-Dichlorobenzene	3	**34**
1,4-Dichlorobenzene	3	**25**
1,2-Dichloroethane	0.6	**0.7**
Chlorobenzene	5	**6**
cis-1,2-Dichloroethene	5	**13**

Legend:

- RI Monitoring Well
- Labella Monitoring Well (2008)
- Attempted Monitoring Well
- Norampac's No Dig Zone
- Greenpac Mill Proposed Building Outline
- Main Excavation Phases
- BCP Site Boundary
- Former Building Outline

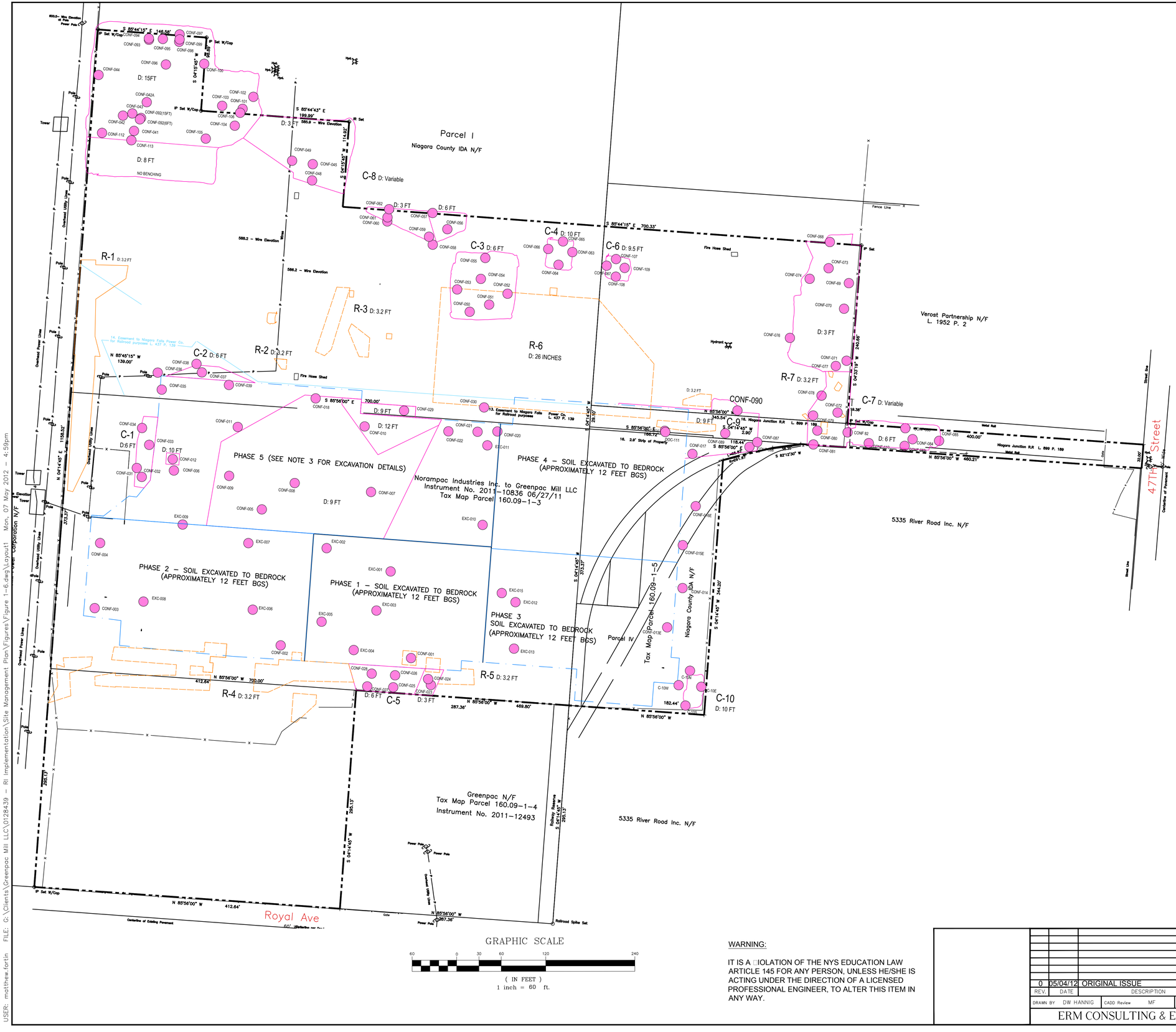
Source: Aerial photography (April 2008) from New York State GIS Clearinghouse.
Data for all property lines, perimeters and building outlines were obtained from the MiniMill Technologies provided CAD files.

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Figure 1-5 - Remedial Investigation Groundwater Contamination Summary
Greenpac Mill, LLC
NYSDEC BCP Site No. C932150
Niagara Falls, New York

ERM

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LEGEND

- MAIN EXCA□ATION EXTENT
- PHASE BOUNDARY FOR MAIN EXCA□ATION
- CHEMICAL HOTSPOT EXCA□ATION EXTENT
- RADIOLOGICAL HOTSPOT EXCA□ATION EXTENT
- D: X FT — FINAL EXCA□ATION DEPTH
- CONF-000 — APPROXIMATE CONFIRMATION/EXCA□ATION DOCUMENTATION SAMPLE LOCATION
- BCP BOUNDARY
- PROPERTY LINE
- ACTI□E STREAM LINE
- FENCE LINE
- P — POWER POLE
- O□ERHEAD UTILITY
- HYDRANT

NOTES:

1. ALL EXCA□ATIONS GREATER THAN 4 FEET IN DEPTH WERE BENCHED AT APPROXIMATELY A 1:1 HORI□ONTAL TO □ERTICAL RATIO, UNLESS OTHERWISE INDICATED.
2. THE PRESENTED DEPTHS OF SOIL EXCA□ATION BELOW THE GROUND SURFACE WERE BASED ON MODELED DATA FROM THE RI THAT UTILI□ED APPROXIMATE SITE ELE□ATIONS TO DESIGNATE THE DEPTH OF SOILS EXCEEDING SOIL CLEANUP OB□ECTI□ES. CONFIRMATION SAMPLES WERE TAKEN TO □ERIFY THE FINAL EXCA□ATION DEPTH WAS SUFFICIENT FOR REMO□AL OF IMPACTED SOIL.
3. THE PRESENTED MAIN EXCA□ATION EXTENTS WERE DELINEATED FROM SUR□EY DATA PERFORMED BY D.W. HANNIG. THE BOUNDARIES OF PHASE 1 THRU 5 WERE BASED ON FIELD MARKINGS BY MINIMILL. ALL SOIL WITHIN PHASES 1 THRU 4 OF THE MAIN EXCA□ATION EXTENTS WAS REMO□ED TO BEDROCK AT A DEPTH OF APPROXIMATELY 12 FEET. THE TARGET DEPTH WAS 6 FEET FOR PHASE 5. SOIL WAS REMO□ED TO THE EXTENTS SHOWN TO ACHIE□E INDUSTRIAL SCOs IN THOSE AREAS OF PHASE 5. THESE EXTENTS WERE DELINEATED BASED ON FIELD MEASUREMENTS AND OBSER□ATIONS RECORDED BY ERM AND MINIMILL. ADDITIONAL SOIL WAS REMO□ED FROM PHASE 5 FOR STRUCTURAL PURPOSES AND THOSE EXTENTS ARE NOT PRESENTED.
4. THE PRESENTED CHEMICAL HOTSPOT EXTENTS WERE DELINEATED FROM FIELD MEASUREMENTS AND OBSER□ATIONS RECORDED BY ERM.
5. THE PRESENTED RADIOLOGICAL HOTSPOT EXTENTS WERE DELINEATED FROM FIELD MEASUREMENTS RECORDED BY ERM AND FIELD MARKINGS BY MINIMILL.
6. CONFIRMATION AND DOCUMENTATION SAMPLE LOCATIONS WERE DOCUMENTED BY ERM USING GPS E□UIPMENT AND FIELD OBSER□ATIONS.
7. THE BASE INFORMATION SHOWN HEREIN IS FROM AN ALTA/ASCM LAND TITLE SUR□EY PREPARED BY D.W. HANNIG L.S., P.C., AND COMPLETED 08 MARCH 2011 AND RE□ISED ON 13 FEBRUARY 2012. ADDITIONAL FEATURES INCLUDING EXCA□ATION EXTENTS, PHASE DELINEATION, AND CONFIRMATION SAMPLE LOCATIONS WERE PRO□IDED BY ERM.

WARNING:

IT IS A □IOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE/SHE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

REV.	DATE	DESCRIPTION	BY	CHK
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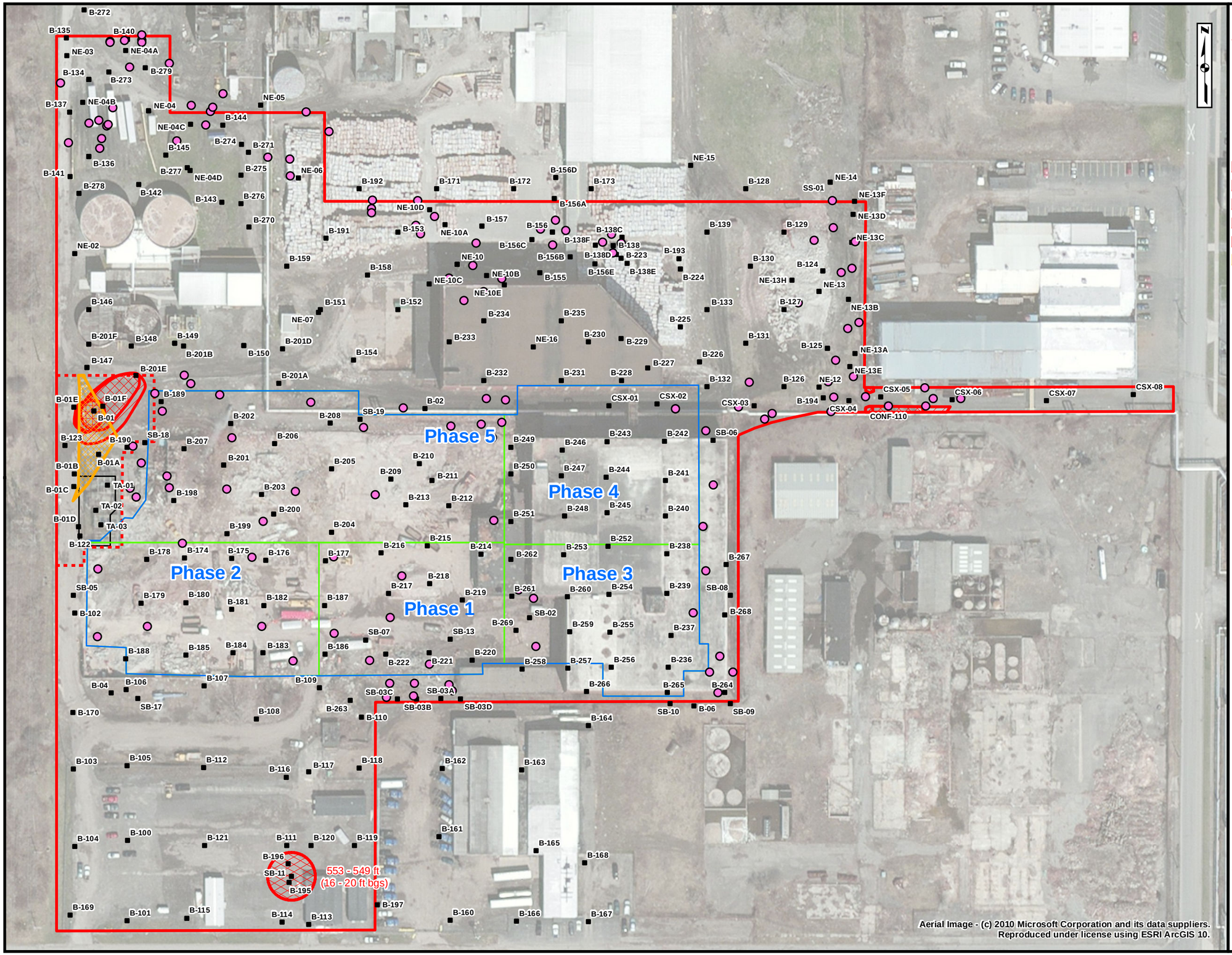
ERM CONSULTING & ENGINEERING, INC.

GREENPAC MILL, LLC
NYSDEC BCP SITE NO. C932150
NIAGARA FALLS, NEW YORK

EXTENT OF REMEDIAL EXCAVATION PERFORMED

SCALE	PROJECT NUMBER	DRAWING	REV.
AS NOTED	0128439	FIGURE 1-6	0
DATE 05/04/2012			

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Legend

- BCP Site Boundary
- Main Excavation Area
- Excavation Phase
- Existing Transformer Area
- Electrical Substation

Post-Remedy Areas

Exceeds Industrial SCO

- 569 -566 ft (0 - 3 ft bgs)
- 566 - 563 ft (3 - 6 ft bgs)
- 563 - 560 ft (6 - 12 ft bgs)
- 560 - 557 ft (9 - 12 ft bgs)
- 553 - 549 ft (16 - 20 ft bgs)
- Rad Hotspot 569 - 566 ft (0 - 3 ft bgs)
- Soil Boring
- Confirmation/Excavation Location

Note:
bgs = below ground surface

The results presented are based on laboratory analysis, modeling of chemical previously detected on-site, and consideration to the remedy of excavation as delineated from field measurements and observations recorded by ERM and MiniMill.

For clarity, only confirmation sample locations containing contaminants above the applicable Soil Cleanup Objectives are presented.

0 50 100 200 Feet

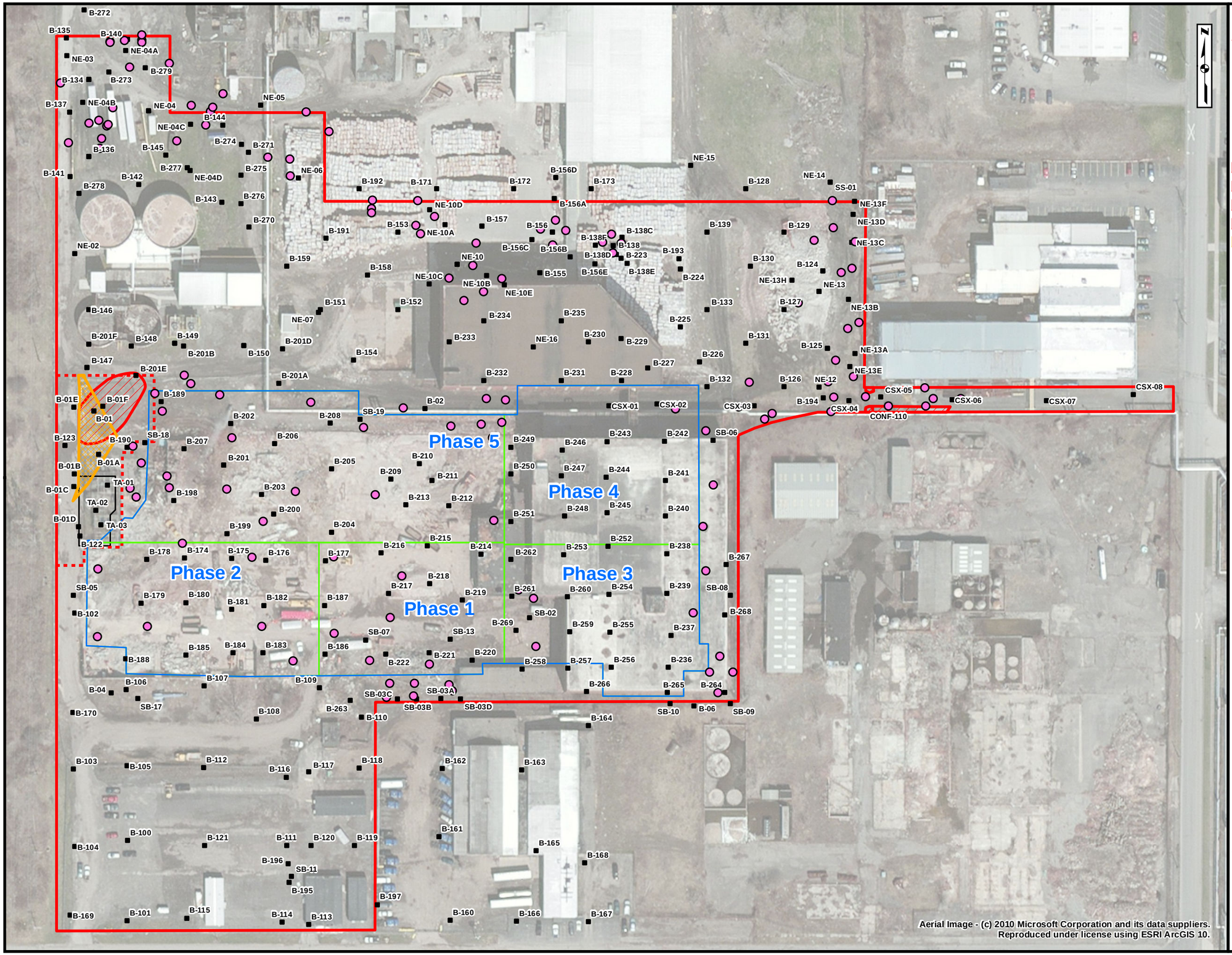
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Figure 1-7a - Location of Remaining Soil Contamination Above Restricted Industrial SCOs

Greenpac Mill
Niagara Falls, NY
NYSDEC BCP Site No. C932150
04 April 2012

ERM

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Legend

- BCP Site Boundary
- Main Excavation Area
- Excavation Phase
- Existing Transformer Area
- Electrical Substation

Post-Remedy Areas

Exceeds Industrial SCO

- 569 -566 ft (0 - 3 ft bgs)
- 566 - 563 ft (3 - 6 ft bgs)
- 563 - 560 ft (6 - 9 ft bgs)
- 560 - 557 ft (9 - 12 ft bgs)
- Rad Hotspot 569 - 566 ft (0 - 3 ft bgs)
- Soil Boring
- Confirmation/Excavation Location

Note:
bgs = below ground surface

The results presented are based on laboratory analysis, modeling of chemical previously detected on-site, and consideration to the remedy of excavation as delineated from field measurements and observations recorded by ERM and MiniMill.

For clarity, only confirmation sample locations containing contaminants above the applicable Soil Cleanup Objectives are presented.

0 50 100 200 Feet

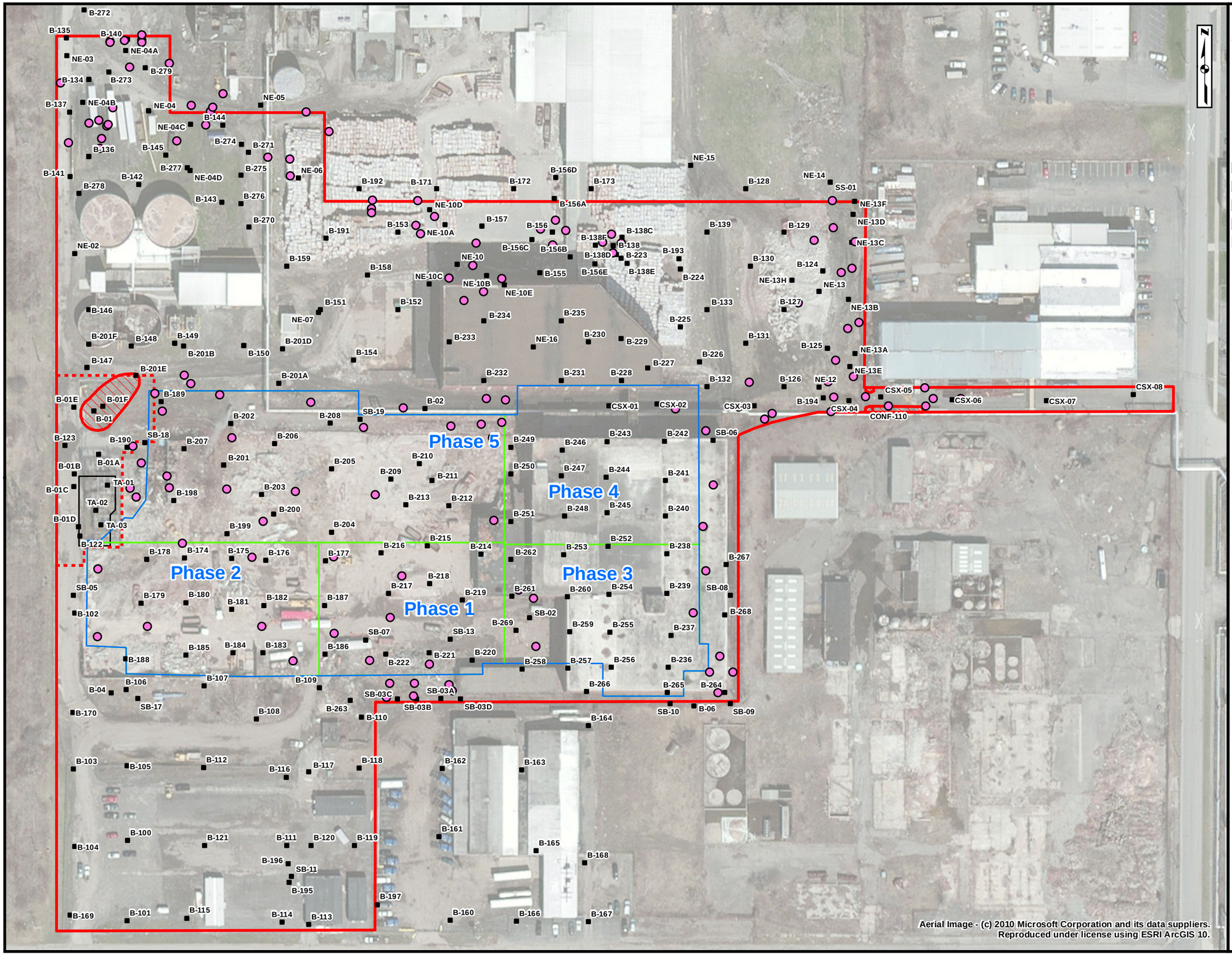
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Figure 1-7b - Location of Remaining Soil Contamination Above Restricted Industrial SCOs 0 - 3 ft bgs

Greenpac Mill
Niagara Falls, NY
NYSDEC BCP Site No. C932150
04 April 2012

ERM

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Legend

- BCP Site Boundary
- Main Excavation Area
- Excavation Phase
- Existing Transformer Area
- Electrical Substation

Post-Remedy Areas

Exceeds Industrial SCO

- 569 -566 ft (0 - 3 ft bgs)
- 566 - 563 ft (3 - 6 ft bgs)
- 563 - 560 ft (6 - 9 ft bgs)
- 560 - 557 ft (9 - 12 ft bgs)
- Rad Hotspot 569 - 566 ft (0 - 3 ft bgs)
- Soil Boring
- Confirmation/Excavation Location

Note:
bgs = below ground surface

The results presented are based on laboratory analysis, modeling of chemical previously detected on-site, and consideration to the remedy of excavation as delineated from field measurements and observations recorded by ERM and MiniMill.

For clarity, only confirmation sample locations containing contaminants above the applicable Soil Cleanup Objectives are presented.

0 50 100 200 Feet

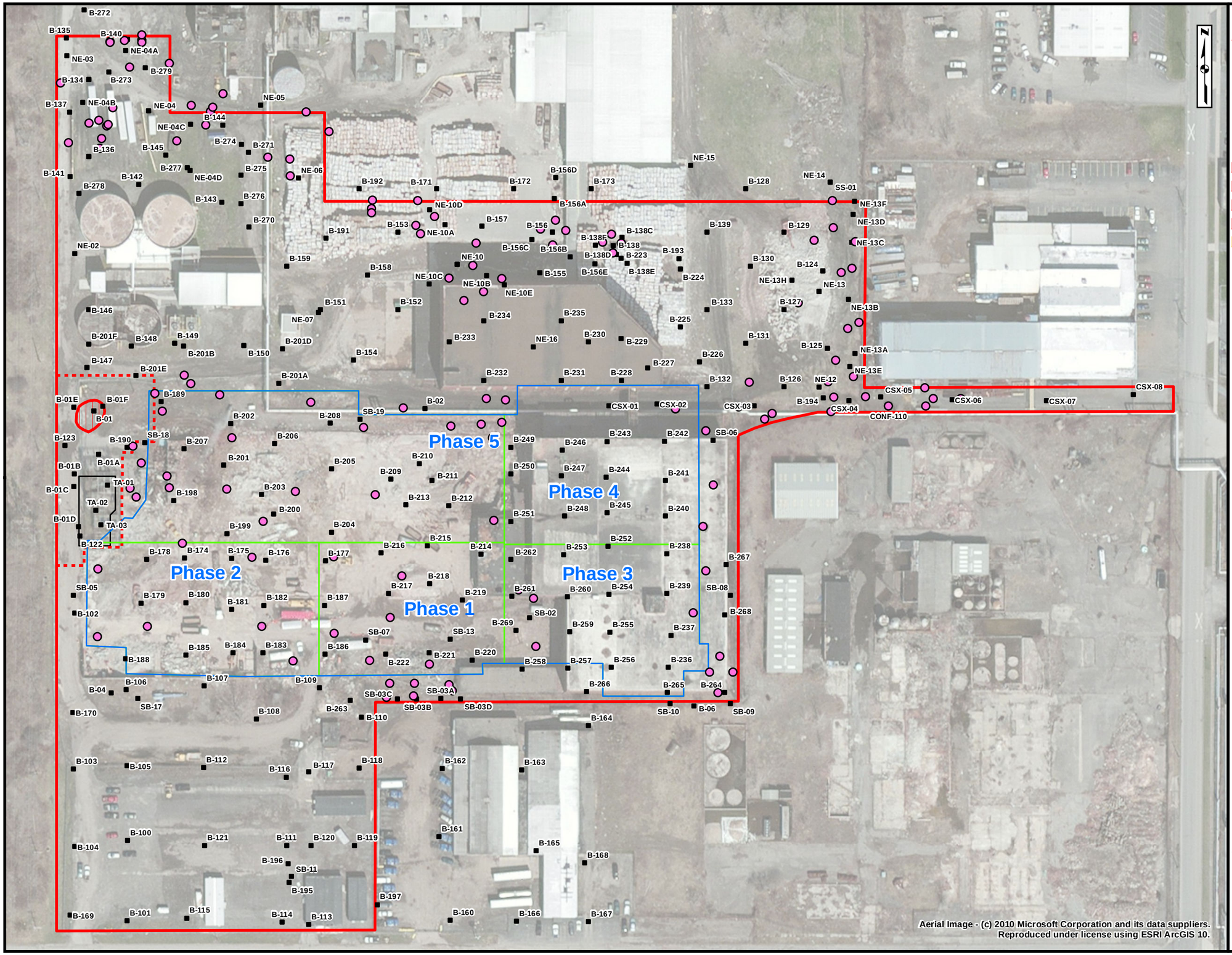
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Figure 1-7c - Location of Remaining Soil Contamination Above Restricted Industrial SCOs 3 - 6 ft bgs

Greenpac Mill
Niagara Falls, NY
NYSDEC BCP Site No. C932150
04 April 2012

ERM

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Legend

- BCP Site Boundary
- Main Excavation Area
- Excavation Phase
- Existing Transformer Area
- Electrical Substation

Post-Remedy Areas

Exceeds Industrial SCO

- 569 -566 ft (0 - 3 ft bgs)
- 566 - 563 ft (3 - 6 ft bgs)
- 563 - 560 ft (6 - 9 ft bgs)
- 560 - 557 ft (9 - 12 ft bgs)
- Rad Hotspot 569 - 566 ft (0 - 3 ft bgs)
- Soil Boring
- Confirmation/Excavation Location

Note:
bgs = below ground surface

The results presented are based on laboratory analysis, modeling of chemical previously detected on-site, and consideration to the remedy of excavation as delineated from field measurements and observations recorded by ERM and MiniMill.

For clarity, only confirmation sample locations containing contaminants above the applicable Soil Cleanup Objectives are presented.

0 50 100 200 Feet

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Figure 1-7d - Location of Remaining Soil Contamination Above Restricted Industrial SCOs 6 - 9 ft bgs

Greenpac Mill
Niagara Falls, NY
NYSDEC BCP Site No. C932150
04 April 2012

ERM

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Phase 1

Phase 2

Phase 3

Phase 4

Phase 5

N

Legend

- BCP Site Boundary
- Main Excavation Area
- Excavation Phase
- Existing Transformer Area
- Electrical Substation

Post-Remedy Areas

Exceeds Industrial SCO

- 569 -566 ft (0 - 3 ft bgs)
- 566 - 563 ft (3 - 6 ft bgs)
- 563 - 560 ft (6 - 9 ft bgs)
- 560 - 557 ft (9 - 12 ft bgs)
- Rad Hotspot 569 - 566 ft (0 - 3 ft bgs)
- Soil Boring
- Confirmation/Excavation Location

Note:
bgs = below ground surface

The results presented are based on laboratory analysis, modeling of chemical previously detected on-site, and consideration to the remedy of excavation as delineated from field measurements and observations recorded by ERM and MiniMill.

For clarity, only confirmation sample locations containing contaminants above the applicable Soil Cleanup Objectives are presented.

0 50 100 200 Feet

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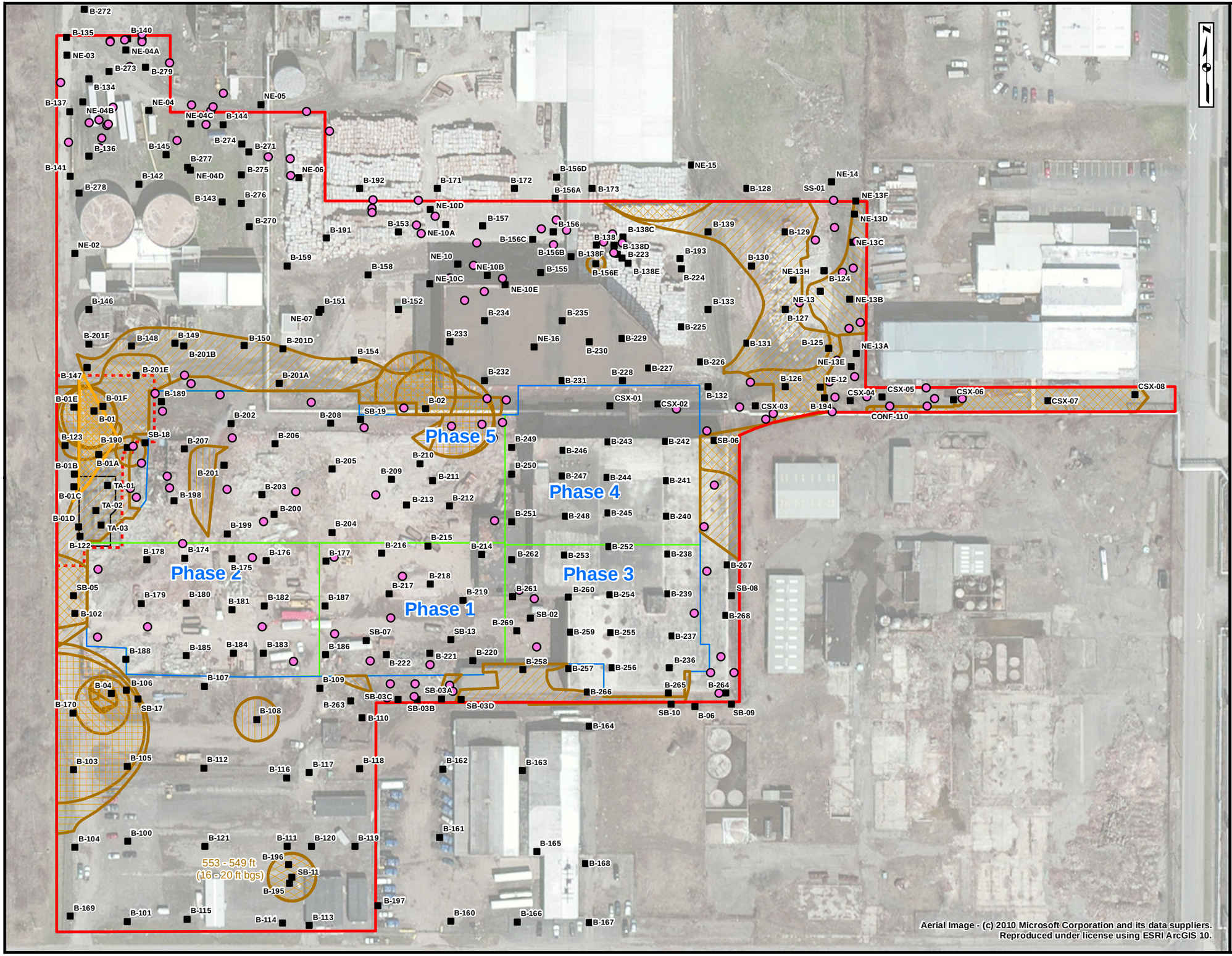
Figure 1-7e - Location of Remaining Soil Contamination Above Restricted Industrial SCOs 9 - 12 ft bgs

Greenpac Mill
Niagara Falls, NY
NYSDEC BCP Site No. C932150
04 April 2012

ERM

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Legend

- BCP Site Boundary
- Main Excavation Area
- Excavation Phase
- Existing Transformer Area
- Electrical Substation

Post-Remedy Areas

Exceeds Residential SCO

- 569 -566 ft (0 - 3 ft bgs)
- 566 - 563 ft (3 - 6 ft bgs)
- 563 - 560 ft (6 - 9 ft bgs)
- 560 - 557 ft (9 - 12 ft bgs)
- 553 - 549 ft (16 - 20 ft bgs)
- Rad Hotspot 569 - 566 ft (0 - 3 ft bgs)
- Soil Boring
- Confirmation/Excavation Location

Note:
bgs = below ground surface

The results presented are based on laboratory analysis, modeling of chemical previously detected on-site, and consideration to the remedy of excavation as delineated from field measurements and observations recorded by ERM and MiniMill.

For clarity, only confirmation sample locations containing contaminants above the applicable Soil Cleanup Objectives are presented.

0 50 100 200 Feet

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Figure 1-8a - Location of Remaining Soil Contamination Above Residential SCOs

Greenpac Mill
Niagara Falls, NY
NYSDEC BCP Site No. C932150
04 April 2012

ERM

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Phase 1

Phase 2

Phase 3

Phase 4

Phase 5

Legend

- BCP Site Boundary
- Main Excavation Area
- Excavation Phase
- Existing Transformer Area
- Electrical Substation

Post-Remedy Areas

Exceeds Residential SCO

- 569 - 566 ft (0 - 3 ft bgs)
- 566 - 563 ft (3 - 6 ft bgs)
- 563 - 560 ft (6 - 9 ft bgs)
- 560 - 557 ft (9 - 12 ft bgs)
- Rad Hotspot 569 - 566 ft (0 - 3 ft bgs)
- Soil Boring
- Confirmation/Excavation Location

Note:
bgs = below ground surface

The results presented are based on laboratory analysis, modeling of chemical previously detected on-site, and consideration to the remedy of excavation as delineated from field measurements and observations recorded by ERM and MiniMill.

For clarity, only confirmation sample locations containing contaminants above the applicable Soil Cleanup Objectives are presented.

0 50 100 200 Feet

1:1,450

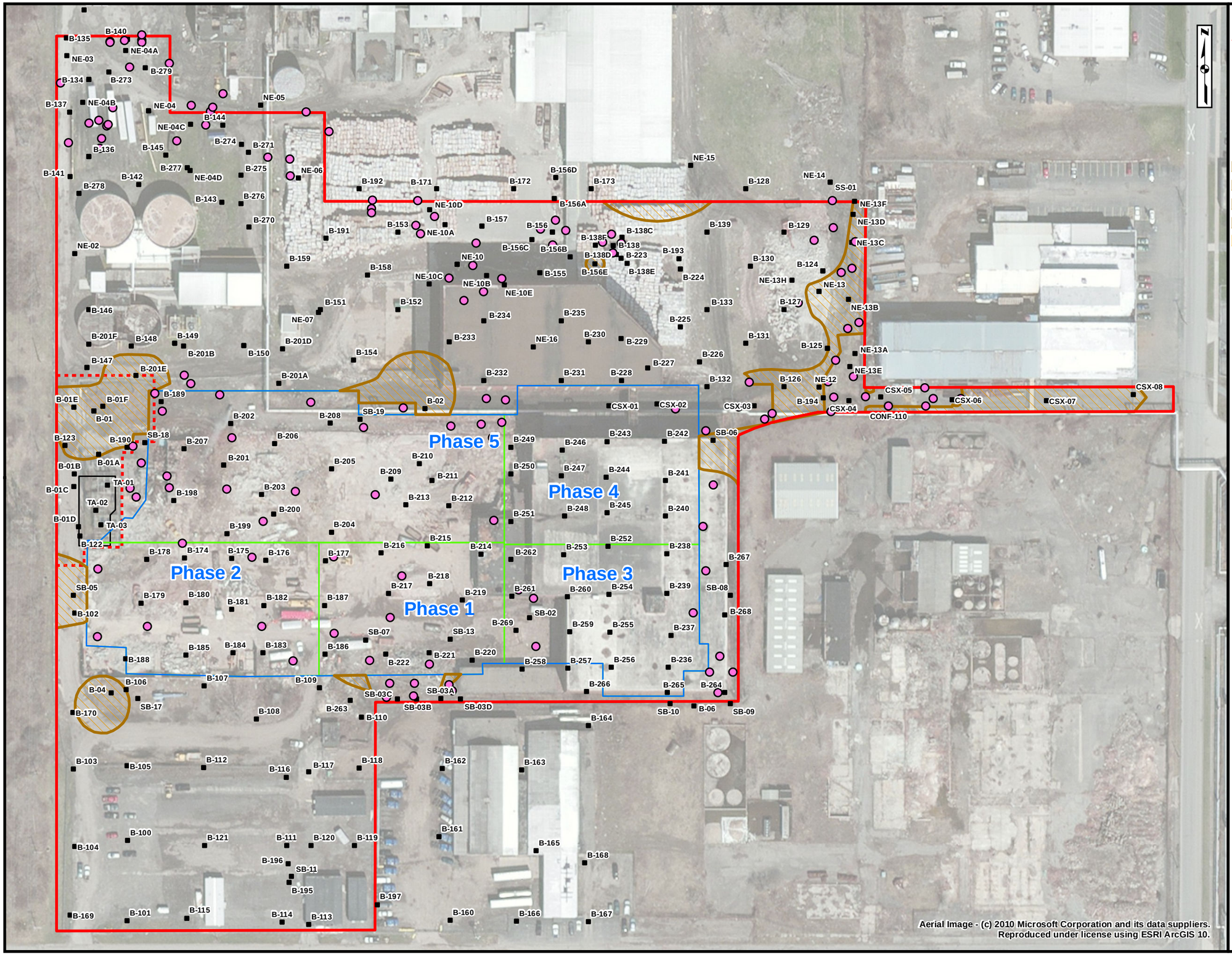
Figure 1-8b - Location of Remaining Soil Contamination Above Residential SCOs 0 - 3 ft bgs

Greenpac Mill
Niagara Falls, NY
NYSDEC BCP Site No. C932150
04 April 2012

ERM

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Legend

- BCP Site Boundary
- Main Excavation Area
- Excavation Phase
- Existing Transformer Area
- Electrical Substation

Post-Remedy Areas

Exceeds Residential SCO

- 569 - 566 ft (0 - 3 ft bgs)
- 566 - 563 ft (3 - 6 ft bgs)
- 563 - 560 ft (6 - 9 ft bgs)
- 560 - 557 ft (9 - 12 ft bgs)
- Rad Hotspot 569 - 566 ft (0 - 3 ft bgs)
- Soil Boring
- Confirmation/Excavation Location

Note:
bgs = below ground surface

The results presented are based on laboratory analysis, modeling of chemical previously detected on-site, and consideration to the remedy of excavation as delineated from field measurements and observations recorded by ERM and MiniMill.

For clarity, only confirmation sample locations containing contaminants above the applicable Soil Cleanup Objectives are presented.

0 50 100 200 Feet

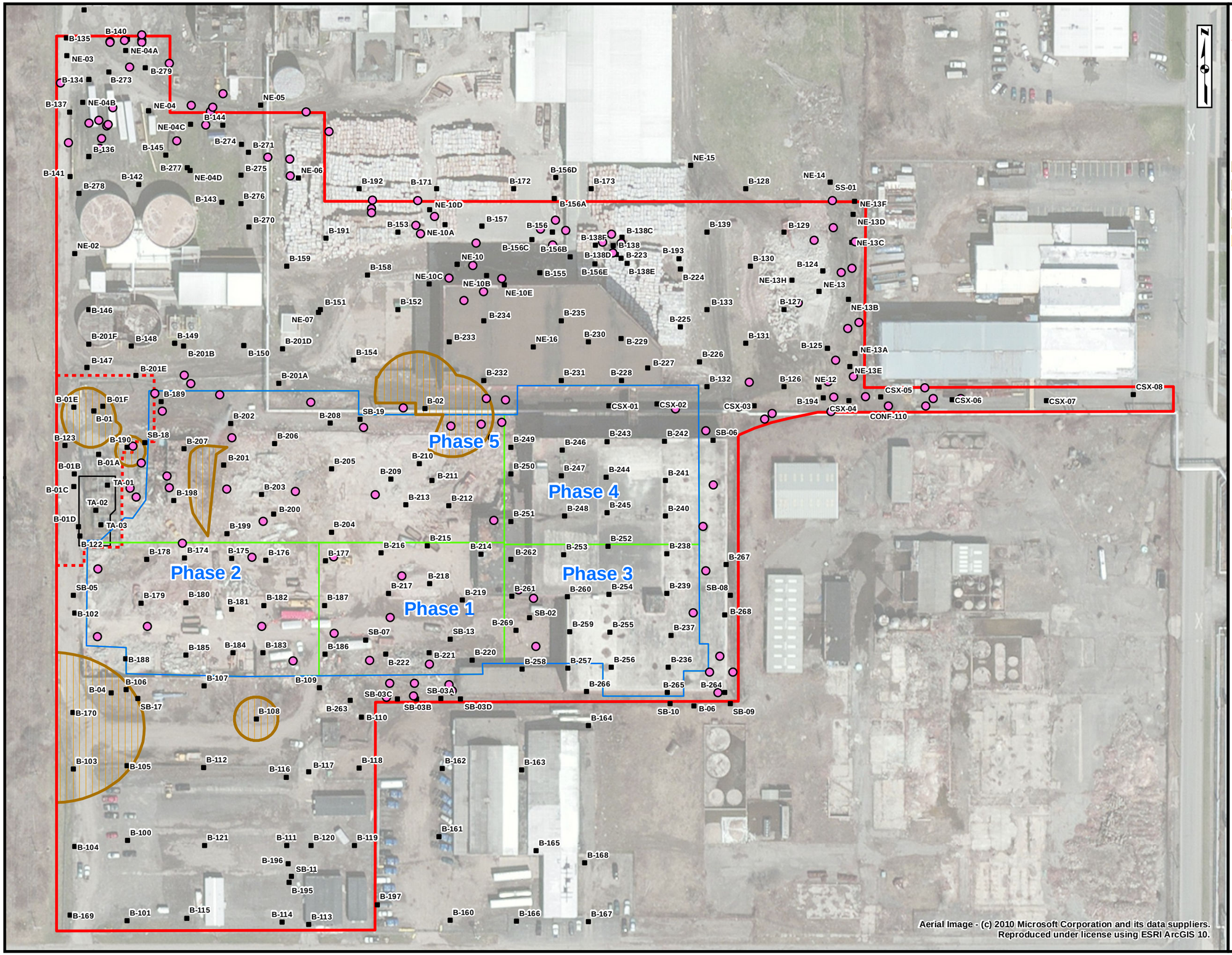
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Figure 1-8c - Location of Remaining Soil Contamination Above Residential SCOs 3 - 6 ft bgs

Greenpac Mill
Niagara Falls, NY
NYSDEC BCP Site No. C932150
04 April 2012

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Legend

- BCP Site Boundary
- Main Excavation Area
- Excavation Phase
- Existing Transformer Area
- Electrical Substation

Post-Remedy Areas

Exceeds Residential SCO

- 569 - 566 ft (0 - 3 ft bgs)
- 566 - 563 ft (3 - 6 ft bgs)
- 563 - 560 ft (6 - 9 ft bgs)
- 560 - 557 ft (9 - 12 ft bgs)
- Rad Hotspot 569 - 566 ft (0 - 3 ft bgs)
- Soil Boring
- Confirmation/Excavation Location

Note:
bgs = below ground surface

The results presented are based on laboratory analysis, modeling of chemical previously detected on-site, and consideration to the remedy of excavation as delineated from field measurements and observations recorded by ERM and MiniMill.

For clarity, only confirmation sample locations containing contaminants above the applicable Soil Cleanup Objectives are presented.

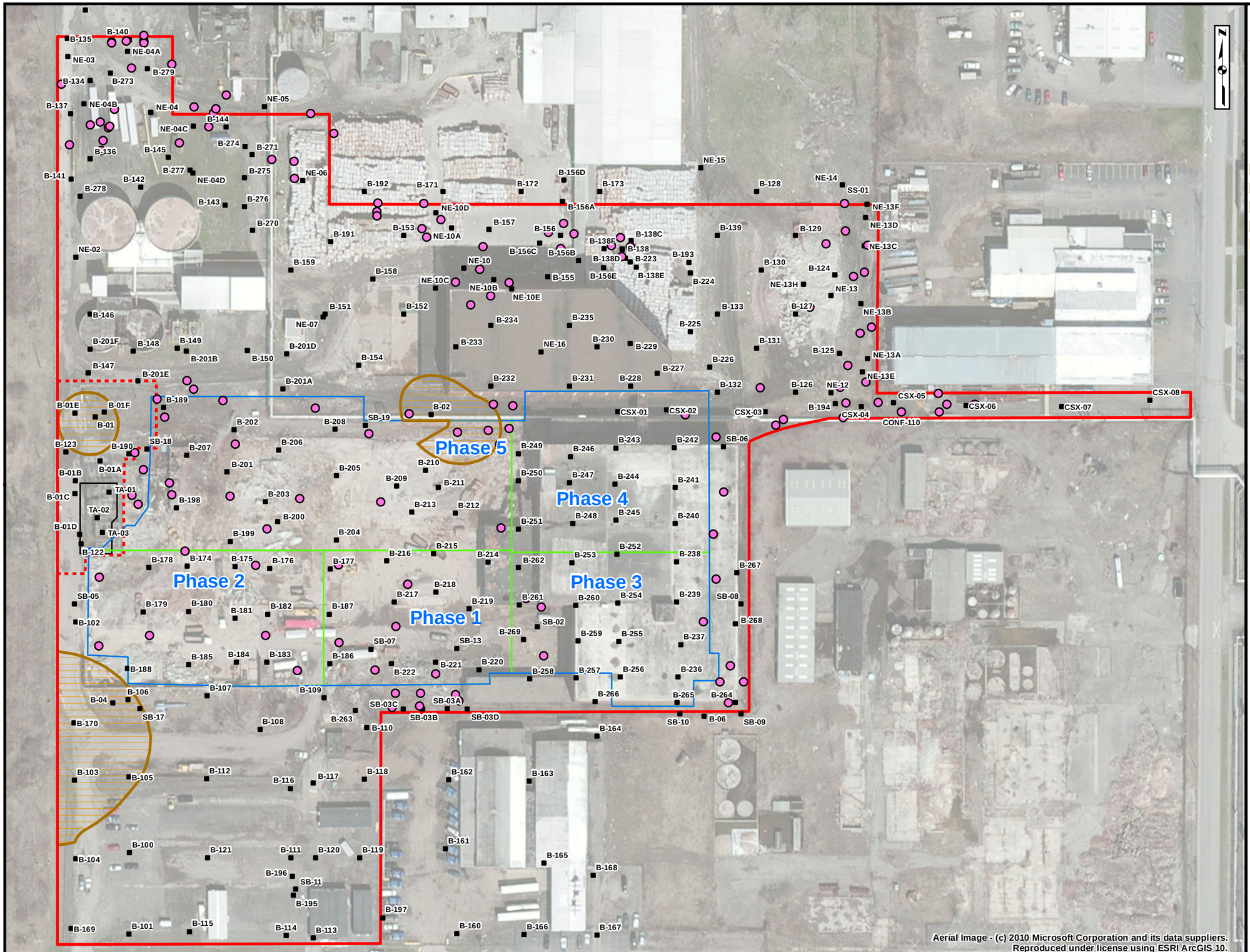
0 50 100 200 Feet

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Figure 1-8d - Location of Remaining Soil Contamination Above Residential SCOs
6 - 9 ft bgs
Greenpac Mill
Niagara Falls, NY
NYSDEC BCP Site No. C932150
04 April 2012

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Legend

- BCP Site Boundary
- Main Excavation Area
- Excavation Phase
- Existing Transformer Area
- Electrical Substation

Post-Remedy Areas

Exceeds Residential SCO

- 569 - 566 ft (0 - 3 ft bgs)
- 566 - 563 ft (3 - 6 ft bgs)
- 563 - 560 ft (6 - 9 ft bgs)
- 560 - 557 ft (9 - 12 ft bgs)
- Rad Hotspot 569 - 566 ft (0 - 3 ft bgs)
- Soil Boring
- Confirmation/Excavation Location

Note:
bgs = below ground surface

The results presented are based on laboratory analysis, modeling of chemical previously detected on-site, and consideration to the remedy of excavation as delineated from field measurements and observations recorded by ERM and MiniMill.

For clarity, only confirmation sample locations containing contaminants above the applicable Soil Cleanup Objectives are presented.

0 50 100 200 Feet

1:1,450

Figure 1-8e - Location of Remaining Soil Contamination Above Residential SCOs
9 - 12 ft bgs
Greenpac Mill
Niagara Falls, NY
NYSDEC BCP Site No. C932150
04 April 2012

ERM

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Tables

Table 1-1
Remedial Investigation Soil Contamination Summary
Former Mill No. 2 Site
Niagara Falls, New York
NYSDEC BCP Site Number C932150

Exceedances of Industrial SCOs in Native Soil

Analytes	Soil Criteria	Number of Samples Analyzed	Number of Samples in Exceedance of Criteria	Minimum Exceedance Concentration	Maximum Exceedance Concentration
SVOCs (ug/kg)					
Benzo(a)anthracene	11000	260	2	15000	28000
Benzo(a)pyrene	1100	260	6	1400	17000
Benzo(b)fluoranthene	11000	260	2	12000	17000
Dibenzo(a,h)anthracene	1100	260	2	1200	3200
Metals (mg/kg)					
Arsenic	16	248	3	17.5	43.9
Manganese	10000	248	2	10400	48800
Mercury	5.7	248	1	8.4	8.4

Exceedances of Industrial SCOs in Historic Fill

Analytes	Soil Criteria	Number of Samples Analyzed	Number of Samples in Exceedance of Criteria	Minimum Exceedance Concentration	Maximum Exceedance Concentration
SVOCs (ug/kg)					
Benzo(a)anthracene	11000	260	2	33000	43000
Benzo(a)pyrene	1100	260	15	1200	36000
Benzo(b)fluoranthene	11000	260	2	36000	70000
Dibenzo(a,h)anthracene	1100	260	2	5800	6600
Indeno(1,2,3-cd)pyrene	11000	260	2	18000	22000
Metals (mg/kg)					
Arsenic	16	248	15	16.6	244
Manganese	10000	248	4	12800	55000

Notes:

- Soil Criteria from 6 NYCCR Part 375 Industrial Soil Cleanup Objectives (SCO)

Table 1-2
Soil Cleanup Objectives and Screening Criteria
Former Mill No. 2 Site
Niagara Falls, New York
NYSDEC BCP Site No. C932150

Soil Cleanup Objectives

CONSTITUENT	6NYCRR Part 375 Industrial SCO
SVOCs (µg/kg)	
Benzo(a)anthracene	11,000
Benzo(a)pyrene	1,100
Benzo(b)fluoranthene	11,000
Dibenzo(a,h)anthracene	1,100
Indeno(1,2,3-cd)pyrene	11,000
Metals (mg/kg)	
Arsenic	16
Manganese	10,000
Mercury	5.7

Soil Screening Criteria

During the RI or soil excavation activities, soil exhibiting any of the following characteristics required excavation and off-Site disposal:

- PID readings above 5 ppm; or

- Radiation Scanning on Ludlum 2221 with a 44-10 probe > 10,000 counts per minute (cpm)

TABLE 1-3 – SOIL MANAGEMENT DURING THE REMEDIAL ACTION
SOIL EXCAVATION IRM WORK PLAN
FORMER MILL NO. 2 SITE – NIAGARA FALLS, NEW YORK
NYSDEC BCP SITE NUMBER C932150

Number	Type	Soil Characterization: Field Observation Criteria	Sampling/Analysis	Example Materials/ Comments
1	Visibly "Clean" Soil or Material	• Less than 5 ppm PID **and** • No nuisance (odor, sheen, product, etc.) characteristics; **and** • No recognizable C&D or other industrial waste (ash, slag, etc.)	• May be reused on-site or off-site if sampled and reused in accordance with DER-10 Table 5.4(e)4	• Topsoil • Native soil beneath fill • Crushed concrete • Acceptable borrow materials (i.e., clean gravels, sand, etc.)
2	Solid Waste (Visibly Contaminated Soil or Exceeds Industrial SCOs)	• Over 5 ppm PID **and** • Exhibits nuisance characteristics	• Will be disposed at a permitted disposal or recycling facility[1] • May be sampled for parameters as determined by the disposal facility	• Grossly-contaminated soil or materials
3	Soil "Deemed" Solid Waste	• Less than 5 ppm PID **and** • No nuisance characteristics, **but** typically exceeds SCOs **and/or** contains recognizable C&D waste or other industrial waste (ash, slag, etc.)	• May be reused on site if under a 6 NYCRR Part 360 BUD and located >1-foot below ground surface[2]; **or** • May be reused off-site at a NYSDEC-approved location if sampled and reused in accordance with DER-10 Table 5.4(e)4. and all contaminants are below site-specific cleanup goals and deposited >1-foot below ground surface; **or** • May be disposed at a permitted disposal or recycling facility	• Fill • An approved location subject to institutional controls and a 6 NYCRR Part 360 BUD will have to be identified and approved by NYSDEC after details of the location, placement, and use of the soil/waste is defined.
4	Radiological Affected Soil	• Greater than 10,000 counts per minute (CPM) as measured by the radiological technician (Greater Radiological Dimensions, Inc. (GRD)) using a Ludlum Model 2221 meter with a 44-10 probe	• As per the Los Alamos Technical Associates, Inc. (LATA) Site Operations Plan (Section 8.0) - "If the material is identified as Technically Enhanced Naturally Occurring Radioactive material (TENORM (i.e. slag)) or material scanned in excess of 10,000	• Slag • Fill • Gravel derived from limestone

			cpm that is determined through the professional judgment of the radiological technician to be impacted and consistent with the existing approved waste profile, the excavated material will be direct loaded into end dump trailers and transported to the approved disposal facility or placed into a dump truck and transported to an on-site temporary waste staging area for future loading and transport to the disposal facility. Any material scanned in excess of 10,000 cpm that is determined to be anomalous will be investigated further and may require additional sampling to determine final disposition.	

[1] Although a 6 NYCRR Part 360 beneficial use determination (BUD; a BUD means the material is not, by definition, a "solid waste") allows the reuse of *contaminated* soil on-site if used as fill in the same site if the work is completed under a Department-approved remedial program (Section 360-1.15(b)8)). We do not expect to be utilizing this BUD.
[2] Track 4 (restricted use) remedial goals can be achieved for industrial use if the top 1-foot meets Industrial SCOs. Track 1 remedial goals can be achieved for unrestricted use if all soils above bedrock meet Unrestricted Use SCOs (375-3.8(e)(1)). Track 1 may be achievable for this project.

The above footnotes are as presented in the original table from the Soil Excavation IRM Work Plan. Greenpac has implemented a Track 2 Cleanup using Industrial SCOs. Therefore, except as noted in Section 1.4.3 of the Site Management Plan, all soil containing constituents above Industrial SCOs and present above a depth of 15 feet (or top of bedrock) has been excavated and disposed off-Site.

TABLE 1-4
Summary of Actual Soil Excavation, Handling, & Disposal
Former Mill No. 2 Site
Niagara Falls, New York
NYSDEC BCP Site No. C932150

Excavation Requirements for Selected BCP Track 2 Cleanup

To achieve the Selected Track 2 Cleanup for the Site, soil exhibiting any of the following characteristics was excavated and disposed off-Site:

- Chemical constituents exceeding the Industrial SCOs in soil above a depth of 15 ft, or top of bedrock, whichever is shallower (i.e., Chemical Hot Spots C-1 thru C-5 and C-7 thru C-9);

- PID readings above 5 ppm as identified during the RI (i.e., Chemical Hot Spots C-6 and C-10); or

- Radiation Scanning on Ludlum Instrumentation > 10,000 counts per minute (cpm) as identified during the RI (RAD Hot Spots R-1 thru R-7)

Soil from Chemical Hot Spots was disposed at Allied Waste Services (Allied) or Modern Corporation (Modern) in Niagara Falls, New York. Soil from RAD Hot Spots was disposed at EQ Landfill in Belleville, Michigan.

Management of Soil Excavated as Part of Site Redevelopment (e.g., Main Building footprint and WWTP area)

Part 375 Soil Cleanup Objectives [1]		Soil Type [2]		RAD Soil [3]	PID >5 ppm [4]	Allowable Soil Handling per NYSDEC discussions/e-mails/letters for soil excavated from Site	Actual Soil Re-Use/Disposal Method
< Residential	> Residential < Industrial	Native	Fill / Nuisance				
X		X		X	X	Send off-site to permitted disposal facility	Sent to EQ Landfill - Michigan - disposal as Radiological Waste
X		X		X		Send off-site to permitted disposal facility	Sent to EQ Landfill - Michigan - disposal as Radiological Waste
X		X			X	Send off-site to permitted disposal facility	Sent to Allied or Modern Landfills disposal as "contaminated"
X		X				Reuse on Site or off site with no restrictions (except no agricultural areas).	Sent to Allied landfill as "clean" - staged for future re-use as landfill cover and/or Greenpac staged on Site to re-use as backfill on Site.
X			X	X	X	Send off-site to permitted disposal facility	Sent to EQ Landfill - Michigan - disposal as Radiological Waste
X			X	X		Send off-site to permitted disposal facility	Sent to EQ Landfill - Michigan - disposal as Radiological Waste
X			X		X	Send off-site to permitted disposal facility	Sent to Allied or Modern Landfills disposal as "contaminated"
X			X			Backfill may be reused on Site in the same location as where it was excavated provided no nuisance characteristics are present. Otherwise, it must be sent off-Site to a permitted disposal facility.	Backfill material without nuisance characteristics was sent to Allied or Modern Landfill as "contaminated" material, or re-used on-Site in the same area. If nuisance characteristics were present it was sent to Aliied or Modern landfills as "contaminated"
	X	X		X	X	Send off-site to permitted disposal facility	Sent to EQ Landfill - Michigan - disposal as Radiological Waste
	X	X		X		Send off-site to permitted disposal facility	Sent to EQ Landfill - Michigan - disposal as Radiological Waste
	X	X			X	Send off-site to permitted disposal facility	Sent to Allied or Modern Landfills disposal as "contaminated"
	X	X				Reuse either on Site or off-site only if institutional controls are/will be in place per NYSDEC Specific Remedial Program	Greenpac staged on Site for re-use on Site and/or sent to Allied or Modern Landfills as "contaminated".
	X		X	X	X	Send off-site to permitted disposal facility	Sent to EQ Landfill - Michigan - disposal as Radiological Waste
	X		X	X		Send off-site to permitted disposal facility	Sent to EQ Landfill - Michigan - disposal as Radiological Waste
	X		X		X	Send off-site to permitted disposal facility	Sent to Allied or Modern Landfills disposal as "contaminated"
	X		X			Backfill may be reused on Site in the same location as where it was excavated provided no nuisance characteristics are present. Otherwise, it must be sent off-Site to a permitted disposal facility.	Backfill material without nuisance characteristics was sent to Allied or Modern Landfill as "contaminated" material, or re-used on-Site in the same area. If nuisance characteristics were present it was sent to Aliied or Modern landfills as "contaminated"

[1] Contains chemical constituents above or below the applicable SCO below

[2] Native - indicates site soil that has not been affected by man-made processes; Fill/ Nuisance = Fill material or soil exhibiting odor, sheen, or presence of waste materials (e.g., ash or slag) and/or any soil material above elevation 569 ft.

[3] Radiologically-affected soil as defined in Table 1-3; i.e. - Radiation Scanning on Ludlum Instrumentation > 10,000 counts per minute (cpm)

[4] Soil screened with a PID exhibit VOC concentrations greater than 5 ppm

"Contaminated" - soil was disposed at the landfill as opposed to being reused for purposes of roadways, cover material, etc.

TABLE 1-5
Summary of Remaining Soil Contamination Above Industrial SCOs
Former Mill No. 2 Site
Niagara Falls, New York
NYSDEC BCP Site No. C932150

CONSTITUENT	UNITS	6NYCRR Part 375 Restricted SCO Industrial	B-01 12/3/2009	B-01F 9/9/2011	B-201E 9/7/2011	CONF-110 12/16/2011	SB-11 5/27/2008
Starting depth (ft) ⇒			10	0	2	2.5	16
Ending depth (ft) ⇒			12	2	4	3	20
SVOCs							
Benzo(a)pyrene	(ug/kg)	1100	2700	1400			
Metals							
Arsenic	(mg/kg)	16				60.9	
Manganese	(mg/kg)	10000			10400		
Mercury	(mg/kg)	5.7				6.9	8.4

TABLE 1-6
Criteria for Re-use and Disposal of Excavated Material
Former Mill No. 2 Site
Niagara Falls, New York
NYSDEC BCP Site No. C932150

Part 375 Soil Cleanup Objectives [1]		Soil Type				RAD Soil [4]	PID >5 ppm [5]	Allowable Soil Handling for Soil Excavated at the BCP Site	Previous Soil Re-Use/Disposal Method During the Soil Interim Remedial Measure (IRM)
< Residential	> Residential < Industrial	Backfill in previous remedial excavations [2] Crushed Concrete	Crushed Rock	Native [3]	Fill / Nuisance [3]				
NA	NA	X		NA	NA	NA	NA	Send off-site to a permitted disposal facility or re-use on-site.	Crushed concrete was used on-Site as backfill in the areas excavated during the Soil IRM as noted in Figure 1-6
NA	NA		X	NA	NA	NA	NA	Reuse on Site or off site with no restrictions (except no agricultural areas).	Crushed rock was used on-Site as backfill in the areas excavated during the Soil IRM as noted in Figure 1-6
NA	NA	X	X	NA	NA	NA	NA	Send off-site to a permitted disposal facility or re-use on-site.	Combined crushed concrete & crushed rock was used on-Site as backfill in the areas excavated during the Soil IRM as noted in Figure 1-6
X				X		X	X	Send off-site to permitted disposal facility	Previously sent to EQ Landfill - Michigan - disposal as Radiological Waste
X				X		X		Send off-site to permitted disposal facility	Previously sent to EQ Landfill - Michigan - disposal as Radiological Waste
X				X			X	Send off-site to permitted disposal facility	Previously sent to Allied or Modern Landfills disposal as "contaminated".
X				X				Reuse on-Site or off-site with no restrictions (except no agricultural areas).	Previously sent to Allied landfill as "clean" - staged for future re-use as landfill cover and/or Greenpac has staged on Site to re-use as backfill on Site.
X					X	X	X	Send off-site to permitted disposal facility	Previously sent to EQ Landfill - Michigan - disposal as Radiological Waste
X					X	X		Send off-site to permitted disposal facility	Previously sent to EQ Landfill - Michigan - disposal as Radiological Waste
X					X		X	Send off-site to permitted disposal facility	Previously sent to Allied or Modern Landfills disposal as "contaminated".
X					X			Historic fill may be reused on Site in the same location as where it was excavated provided no nuisance characteristics are present. Otherwise, it must be sent off-Site to a permitted disposal facility.	Historic fill material without nuisance characteristics was previously sent to Allied or Modern Landfill as "contaminated" material, or re-used on-Site in the same area. If backfill material has nuisance characteristics previously it was sent to Aliied or Modern landfills as "contaminated".
	X			X		X	X	Send off-site to permitted disposal facility	Previously sent to EQ Landfill - Michigan - disposal as Radiological Waste
	X			X		X	X	Send off-site to permitted disposal facility	Previously sent to EQ Landfill - Michigan - disposal as Radiological Waste
	X			X			X	Send off-site to permitted disposal facility	Previously sent to Allied or Modern Landfills disposal as "contaminated".
	X			X				Reuse either on Site or off-site only if institutional controls are/will be in place per NYSDEC Specific Remedial Program	Greenpac has previously staged on Site for re-use on Site and/or sent to Allied or Modern Landfills as "contaminated".
	X				X	X	X	Send off-site to permitted disposal facility	Previously sent to EQ Landfill - Michigan - disposal as Radiological Waste
	X				X	X		Send off-site to permitted disposal facility	Previously sent to EQ Landfill - Michigan - disposal as Radiological Waste
	X				X		X	Send off-site to permitted disposal facility	Previously sent to Allied or Modern Landfills disposal as "contaminated".
	X				X			Historic fill may be reused on Site in the same location as where it was excavated provided no nuisance characteristics are present. Otherwise, it must be sent off-Site to a permitted disposal facility.	Historic fill material without nuisance characteristics was previously sent to Allied or Modern Landfill as "contaminated" material, or re-used on-Site in the same area. If backfill material has nuisance characteristics previously it was sent to Aliied or Modern landfills as "contaminated".

Notes:

[1] Contains chemical constituents above or below the applicable SCO below

[2] Backfill in previous remedial excavations - Crushed rock and crushed concrete was used during the Soil IRM to backfill areas excavated during the Soil IRM. Locations of these areas are presented in Figure 1-6.

[3] Native - indicates site soil that has not been affected by man-made processes; Fill/ Nuisance = Historic fill material or soil exhibiting odor, sheen, or presence of waste materials (e.g., ash or slag) and/or any soil material above elevation 569.

[4] Radiologically-affected soil as defined in Table 1-3; i.e. - Radiation Scanning on Ludlum Instrumentation > 10,000 counts per minute (cpm)

[5] Soil screened with a PID exhibit VOC concentrations greater than 5 ppm

"Contaminated" - soil was disposed at the landfill as opposed to being reused for purposes of roadways, cover material, etc.

In the vicinity of boring CONF-110 (refer to Figure 1-7), if any soil is excavated or disturbed, it shall be managed as exceeding Industrial SCOs and sent off-site for disposal.

Table 1-7

Summary of Remaining Soil Contamination Above Residential SCOs
Former Mill No. 2 Site
Niagara Falls, New York
NYSDEC BCP No. C932150

CONSTITUENT	UNITS	6NYCRR Part 375 Restricted SCO Residential	B-01 12/3/2009	B-01F 9/9/2011	B-02 12/3/2009	B-102 1/31/2011	B-108 2/1/2011	B-156E [1] 10/19/2011	B-190 5/6/2011
Starting depth (ft) ⇒			10	0	0	0	7	2	8
Ending depth (ft) ⇒			12	2	10	2	9	4	10
SVOCs									
Benzo(a)anthracene	(ug/kg)	1000	2700	1200					
Benzo(b)fluoranthene	(ug/kg)	1000	3200	2200	1300				
Benzo(k)fluoranthene	(ug/kg)	1000	1100						
Benzo(a)pyrene	(ug/kg)	1000	2700	1400					
Chrysene	(ug/kg)	1000	2900	1500					
Dibenzo(a,h)anthracene	(ug/kg)	330	460						
Indeno(1,2,3-cd)pyrene	(ug/kg)	500	1800	620	700				
Metals									
Arsenic	(mg/kg)	16							
Barium	(mg/kg)	350							
Cadmium	(mg/kg)	2.5							4.3
Chromium	(mg/kg)	36					39.3		
Copper	(mg/kg)	270							
Lead	(mg/kg)	400							
Mercury	(mg/kg)	0.81						1.4	
Manganese	(mg/kg)	2000				2520			
PCBs [2]									
Total PCBs	(ug/kg)	1000							

Notes:
[1] Sample B-156E is from a blind duplicate sample. There were no exceedances of the Residential SCO in the primary sample.
[2] The Residential SCO for PCBs is 1000 ug/kg. There is no SCO for individual Aroclor compounds.

Table 1-7

Summary of Remaining Soil Contamination Above Residential SCOs
Former Mill No. 2 Site
Niagara Falls, New York
NYSDEC BCP No. C932150

CONSTITUENT	UNITS	6NYCRR Part 375 Restricted SCO Residential	B-201E 9/7/2011	B-201E 9/8/2011	CONF-110 12/16/2011	CSX-07 7/22/2011	CSX-08 7/22/2011	SB-06 4/14/2008	SB-11 5/27/2008
Starting depth (ft) ⇒			2	0	2.5	0	0	0	16
Ending depth (ft) ⇒			4	2	3	4	4	4	20
SVOCs									
Benzo(a)anthracene	(ug/kg)	1000		1400					
Benzo(b)fluoranthene	(ug/kg)	1000			1500		1300		
Benzo(k)fluoranthene	(ug/kg)	1000							
Benzo(a)pyrene	(ug/kg)	1000							
Chrysene	(ug/kg)	1000							
Dibenzo(a,h)anthracene	(ug/kg)	330							
Indeno(1,2,3-cd)pyrene	(ug/kg)	500		580	690	1200	2500		
Metals									
Arsenic	(mg/kg)	16			60.9				
Barium	(mg/kg)	350	2160	1270					
Cadmium	(mg/kg)	2.5							
Chromium	(mg/kg)	36	139	62.8	269	39.7	56.9	86.4	
Copper	(mg/kg)	270			478				
Lead	(mg/kg)	400			1280				
Mercury	(mg/kg)	0.81			6.9				8.4
Manganese	(mg/kg)	2000	10400	8460					
PCBs [2]									
Total PCBs	(ug/kg)	1000							2290

Notes:
[1] Sample B-156E is from a blind duplicate sample. There were no exceedances of the Residential SCO in the primary sample.
[2] The Residential SCO for PCBs is 1000 ug/kg. There is no SCO for individual Aroclor compounds.

Table 1-7

Summary of Remaining Soil Contamination Above Residential SCOs
Former Mill No. 2 Site
Niagara Falls, New York
NYSDEC BCP No. C932150

CONSTITUENT Starting depth (ft) ⇒ Ending depth (ft) ⇒	UNITS	6NYCRR Part 375 Restricted SCO Residential	TA-01 4/12/2011 0 0.4	TA-01 4/12/2011 0.4 0.8	TA-03 4/12/2011 0 0.5	TA-03 4/12/2011 1 1.5
SVOCs						
Benzo(a)anthracene	(ug/kg)	1000				
Benzo(b)fluoranthene	(ug/kg)	1000				
Benzo(k)fluoranthene	(ug/kg)	1000				
Benzo(a)pyrene	(ug/kg)	1000				
Chrysene	(ug/kg)	1000				
Dibenzo(a,h)anthracene	(ug/kg)	330				
Indeno(1,2,3-cd)pyrene	(ug/kg)	500				630
Metals						
Arsenic	(mg/kg)	16				
Barium	(mg/kg)	350				
Cadmium	(mg/kg)	2.5				
Chromium	(mg/kg)	36				
Copper	(mg/kg)	270				
Lead	(mg/kg)	400				
Mercury	(mg/kg)	0.81				
Manganese	(mg/kg)	2000				
PCBs [2]						
Total PCBs	(ug/kg)	1000	4400	1300	2200	

Notes:
[1] Sample B-156E is from a blind duplicate sample. There were no exceedances of the Residential SCO in the primary sample.
[2] The Residential SCO for PCBs is 1000 ug/kg. There is no SCO for individual Aroclor compounds.

Appendix A
Metes & Bounds

D. W. HANNIG L. S., P.C.
SURVEYORS - PLANNERS - CONSULTANTS
THE MARKET PLACE, BUILDING # 1
MANLIUS, NEW YORK 13104
PHONE: (315) 682-5225 - FAX: (315) 682-7774

LEGAL DESCRIPTION

DESCRIPTION OF 18.52+- ACRE PARCEL (DEC ALTA PARCEL), CITY OF NIAGARA FALLS, NIAGARA COUNTY, NEW YORK.

BEGINNING AT A POINT, said point being N. 85-56-00 W a distance of 1441.15 feet from the intersection of the northerly line Royal Avenue and the westerly line of 47th Street.

THENCE North 04 degrees 14 minutes 45 seconds East for a distance of 1158.52 feet to a point;
THENCE South 85 degrees 44 minutes 15 seconds East for a distance of 146.58 feet to a point;
THENCE South 04 degrees 15 minutes 45 seconds West for a distance of 98.89 feet to a point;
THENCE South 85 degrees 44 minutes 43 seconds East for a distance of 199.99 feet to a point;
THENCE South 04 degrees 15 minutes 45 seconds West for a distance of 114.92 feet to a point;
THENCE South 85 degrees 44 minutes 15 seconds East for a distance of 700.33 feet to a point;
THENCE South 04 degrees 33 minutes 19 seconds West for a distance of 240.66 feet to a point;
THENCE South 85 degrees 56 minutes 00 seconds East for a distance of 400.00 feet to a point;
THENCE South 04 degrees 33 minutes 19 seconds West for a distance of 32.00 feet to a point;
THENCE North 85 degrees 56 minutes 00 seconds West for a distance of 460.21 feet to a point;
THENCE South 82 degrees 12 minutes 30 seconds West for a distance of 38.35 feet to a point;
THENCE along a curve to the left having a radius of 291.67 feet and an arc length of 68.82 feet, being subtended by a chord of South 76 degrees 00 minutes 16 seconds West for a distance of 68.66 feet to a point;
THENCE South 04 degrees 14 minutes 45 seconds West for a distance of 344.20 feet to a point;
THENCE North 85 degrees 56 minutes 00 seconds West for a distance of 469.80 feet to a point;
THENCE South 04 degrees 14 minutes 45 seconds West for a distance of 295.13 feet to a point on the north line of Royal Avenue;

D. W. HANNIG L. S., P.C.
SURVEYORS - PLANNERS - CONSULTANTS
THE MARKET PLACE, BUILDING # 1
MANLIUS, NEW YORK 13104
PHONE: (315) 682-5225 - FAX: (315) 682-7774

THENCE North 85 degrees 56 minutes 00 seconds West for a distance of 412.64 feet along the north line of Royal Avenue **TO THE POINT AND PLACE OF BEGINNING**.

Together with and subject to covenants, easements, and restrictions of record.

Said property contains 18.52+- acres (806.859+- sq. ft.) more or less.

J090155 1/26/2012 RMP Rev'd 1/31/2012 Rev'd 2-13-2012 Rev'd 5-17-2012

Appendix B
Environmental Easement

NIAGARA COUNTY - STATE OF NEW YORK
WAYNE F. JAGOW - NIAGARA COUNTY CLERK
P.O. BOX 461, LOCKPORT, NEW YORK 14095-0461

COUNTY CLERK'S RECORDING PAGE
THIS PAGE IS PART OF THE DOCUMENT - DO NOT DETACH

RECEIPT NO. : 2012121155

Clerk: BH
Instr #: 2012-11402
Rec Date: 06/06/2012 12:41:05 PM
Doc Grp: DEED
Descrip: EASEMENT
Num Pgs: 15

Party1: GREENPAC MILL LLC
Party2: DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PEOPLE OF THE STATE OF NEW YORK
Town: NIAGARA FALLS

Recording:

Cover Page	0.00
Recording Fee	0.00
Cultural Ed	0.00
Records Management - Coun	0.00
Records Management - Stat	0.00
TP584	0.00
Sub Total:	0.00
Transfer Tax	
Transfer Tax	0.00
Sub Total:	0.00
Total:	0.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****

Transfer Tax# : 4385

Consideration: 0.00
Transfer Tax: 0.00

ORIGINAL FILED

JUN 06 2012

WAYNE F. JAGOW
NIAGARA COUNTY CLERK

Record and Return To:

HARTER, SECREST & EMERY
TWELVE FOUNTAIN PLAZA SUITE 400
BUFFALO NY 14202-2228

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made this 4th day of June, 2012, between Owner(s) Greenpac Mill, LLC, having an office at 4400 Royal Avenue, County of Niagara, State of New York (the "Grantor"), and The People of the State of New York (the "Grantee."), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 4400 Royal Avenue in the City of Niagara Falls, County of Niagara and State of New York, known and designated on the tax map of the County Clerk of Niagara as tax map parcel numbers: Section 160.09 Block 1 Lot 3 and 5; Section 700.00 Block: 41 Lot: 2 and part of Section 160.05 Block: 2 Lot 5.1 being the same as that property conveyed to Grantor by deed dated June 24, 2011 and recorded in the Niagara County Clerk's Office in Instrument No. 2011-10836 and by deed dated December 2, 2011 and recorded in the Niagara County Clerk's Office as Instrument No. : 2011-21550. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 18.52 +/- acres, and hereinafter more fully described in the Land Title Survey dated March 8, 2011 and revised on May 23, 2012, prepared by D.W. Hannig L.S., P.C. Surveyors, Planners, Consultants, which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the

protection of human health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Number: C932150-03-10, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement")

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv);

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(5) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(6) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(7) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(8) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP; and

(9) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential, Restricted Residential or Commercial purposes as defined in 6NYCRR 375-1.8(g)(i), (ii) and (iii), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall annually, or such time as NYSDEC may allow, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3);

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved b the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement; and

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement.

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: C932150
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

GRANTOR: GREENPAC MILL, LLC

By: _____

Print Name: MARC-ANDRE DÉPIN,

Title: PRESIDENT Date: May 28, 2012

Grantor's Acknowledgment

PROVINCE OF QUEBEC)
) ss:
COUNTRY OF CANADA)

On the 28 day of 2012, in the year 2012, before me, the undersigned, personally appeared Marc-André Dépin, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Andrée Duquette, Commissioner for Oaths for
The Province of Quebec, Canada
Commission expiration: July 2 2012

COMMISSAIRE À L'ASSERMENTATION
ANDRÉE DUQUETTE
#182 754
JUDICIAIRES POUR LES DISTRICTS DE LONGUEUIL ET DE MONTRÉAL

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: _____
Robert W. Schick, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 4th day of JUNE, in the year 2012, before me, the undersigned, personally appeared Robert W. Schick, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

David J. Chiusano
Notary Public, State of New York
No. 01CH5032146
Qualified in Schenectady County
Commission Expires August 22, 2014

SCHEDULE "A"
ENVIRONMENTAL EASEMENT

ADDRESS: 4400 Royal Avenue, Niagara Falls, New York
TAX MAP: 160.09-1-3; 160.09-1-5; 700.00-41-2 and P/O 160.05-2-5.1

LEGAL DESCRIPTION

DESCRIPTION OF 18.52+- ACRE PARCEL (DEC ALTA PARCEL), CITY OF NIAGARA FALLS, NIAGARA COUNTY, NEW YORK.

BEGINNING AT A POINT, said point being N. 85-56-00 W a distance of 1441.15 feet from the intersection of the northerly line Royal Avenue and the westerly line of 47th Street.

THENCE North 04 degrees 14 minutes 45 seconds East for a distance of 1158.52 feet to a point;
THENCE South 85 degrees 44 minutes 15 seconds East for a distance of 146.58 feet to a point;
THENCE South 04 degrees 15 minutes 45 seconds West for a distance of 98.89 feet to a point;
THENCE South 85 degrees 44 minutes 43 seconds East for a distance of 199.99 feet to a point;
THENCE South 04 degrees 15 minutes 45 seconds West for a distance of 114.92 feet to a point;
THENCE South 85 degrees 44 minutes 15 seconds East for a distance of 700.33 feet to a point;
THENCE South 04 degrees 33 minutes 19 seconds West for a distance of 240.66 feet to a point;
THENCE South 85 degrees 56 minutes 00 seconds East for a distance of 400.00 feet to a point;
THENCE South 04 degrees 33 minutes 19 seconds West for a distance of 32.00 feet to a point;
THENCE North 85 degrees 56 minutes 00 seconds West for a distance of 460.21 feet to a point;
THENCE South 82 degrees 12 minutes 30 seconds West for a distance of 38.35 feet to a point;
THENCE along a curve to the left having a radius of 291.67 feet and an arc length of 68.82 feet, being subtended by a chord of South 76 degrees 00 minutes 16 seconds West for a distance of 68.66 feet to a point;
THENCE South 04 degrees 14 minutes 45 seconds West for a distance of 344.20 feet to a point;
THENCE North 85 degrees 56 minutes 00 seconds West for a distance of 469.80 feet to a point;

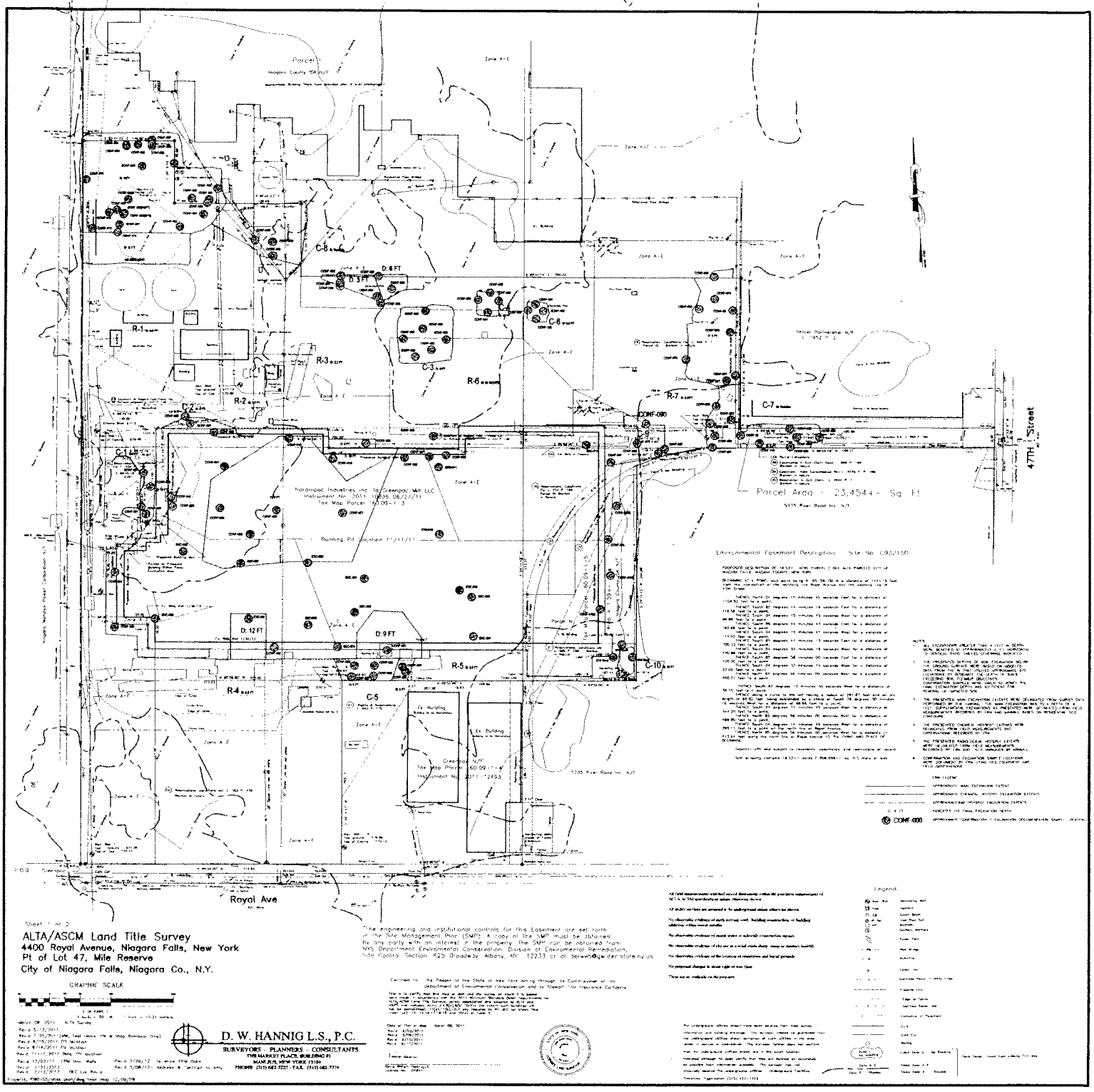
THENCE South 04 degrees 14 minutes 45 seconds West for a distance of 295.13 feet to a point on the north line of Royal Avenue;

THENCE North 85 degrees 56 minutes 00 seconds West for a distance of 412.64 feet along the north line of Royal Avenue **TO THE POINT AND PLACE OF BEGINNING**.

Together with and subject to covenants, easements, and restrictions of record.

Said property contains 18.52+- acres (806.859+- sq. ft.) more or less.

J090155 1/26/2012 RMP Rev'd 1/31/2012 Rev'd 2-13-2012 Rev'd 5-17-2012


Parcel Area = 23,454± Sq. Ft.
47TH Street
Royal Ave
Environmental Easement Description Site No. C932150
Legend
ALTA/ASCM Land Title Survey
4400 Royal Avenue, Niagara Falls, New York
Pt of Lot 47, Mile Reserve
City of Niagara Falls, Niagara Co., N.Y.
GRAPHIC SCALE
D. W. HANNIG L.S., P.C.
SURVEYORS - PLANNERS - CONSULTANTS

Greenpac Description

PROPOSED DESCRIPTION OF 17.98+- ACRE PARCEL, CITY OF NIAGARA FALLS, NIAGARA COUNTY, NEW YORK.

BEGINNING AT A POINT, said point being N 85-38-00 W a distance of 1441.15 feet from the intersection of the northerly line of Royal Avenue with the westerly line of 47th street;

THENCE North 04 degrees 14 minutes 45 seconds East for a distance of 1158.53 feet to a point;
THENCE South 85 degrees 44 minutes 15 seconds East for a distance of 146.58 feet to a point;
THENCE South 04 degrees 15 minutes 45 seconds West for a distance of 98.59 feet to a point;
THENCE South 85 degrees 44 minutes 43 seconds East for a distance of 188.89 feet to a point;
THENCE South 04 degrees 15 minutes 45 seconds West for a distance of 114.87 feet to a point;
THENCE South 85 degrees 44 minutes 13 seconds East for a distance of 700.33 feet to a point;
THENCE South 04 degrees 33 minutes 19 seconds West for a distance of 240.96 feet to a point;
THENCE North 86 degrees 58 minutes 00 seconds West for a distance of 343.54 feet to a point;
THENCE South 04 degrees 14 minutes 45 seconds West for a distance of 29.10 feet to a point;
THENCE South 86 degrees 58 minutes 00 seconds East for a distance of 186.72 to a point;
THENCE South 04 degrees 14 minutes 45 seconds West for a distance of 2.90 feet to a point;
THENCE South 85 degrees 58 minutes 00 seconds East for a distance of 178.44 feet to a point;
THENCE South 82 degrees 12 minutes 30 seconds West for a distance of 38.35 feet to a point;
THENCE along a curve to the left having a radius of 281.87 feet and an arc length of 88.82 feet, being subtended by a chord of South 76 degrees 00 minutes 18 seconds West for a distance of 88.45 feet to a point;
THENCE South 04 degrees 14 minutes 45 seconds West for a distance of 344.20 feet to a point;
THENCE North 85 degrees 58 minutes 00 seconds West for a distance of 448.80 feet to a point;
THENCE South 04 degrees 14 minutes 45 seconds West for a distance of 295.13 feet to a point on the north line of Royal Avenue;
THENCE North 85 degrees 58 minutes 00 seconds West for a distance of 612.64 feet along the north line of Royal Avenue TO THE POINT AND PLACE OF BEGINNING.

Together with and subject to covenants, easements, and restrictions of record.

Said property contains 17.98 acres more or less.

Notes Corresponding to Schedule B Section II for Greenpac
Base upon Title Commitment No. HSE 10-2479 of Stewart Title Insurance Company having an effective date of June 16, 2011

(7) Reservations, conditions, exceptions and agreements contained in deed to Kimberly-Clark Corporation recorded in Liber 457 of Deeds at Page 139 on Feb. 24, 1926. Plotted on Map

(14) Reservations, conditions, restriction and agreements contained in deed to Kimberly-Clark Corporation recorded in Liber 563 of Deeds at Page 470 on September 2, 1930
Blanket in Nature - Parcel B

(7) Reservations, conditions, covenants and agreements contained in deed to Kimberly-Clark Corporation recorded in Liber 616 of Deeds at Page 550 on May 11, 1936. Plotted on Map

(16) Reservations, conditions, covenants and agreements contained in deed to Niagara Junction Railway Company recorded in Liber 896 of Deeds at Page 187 on January 8, 1948 and also modification deed to Kimberly-Clark Corporation recorded in Liber 980 at Deeds at Page 1 on October 24, 1949.
Plotted on Map

(18) Reservations, conditions, covenants and agreements contained in deed to the Carborundum Company recorded in Liber 632 of Deeds at Page 1 and 8 on May 14, 1934. Plotted on Map

(19) Reservations, conditions, covenants and agreements contained in deed to Union Carbide Company recorded in Liber 1764 of Deeds at Page 1 and also consented to deed to Kimberly-Clark Corporation as set out in Liber 1964 of Deeds at Page 476 on November 22, 1961 with additional language.
Blanket in Nature - Parcel B
(27) Reservations, conditions, covenants and agreements contained in deed to Power Corporation recorded in Liber 414 of Deeds at Page 189 on June 30, 1921.
Blanket in Nature - Parcel M
(2) Reservations, conditions, covenants and agreements contained in deed to Penn Chemicals Company recorded as Liber 569 of Deeds at Page 248 on May 1, 1930
Blanket in Nature - Parcel N

(13) Easement for water main crossing railroads in the Niagara Falls Power Company to Municipality recorded in Liber 1, Misc. Deeds at Page 340 on May 13, 1934.
Blanket in Nature - Parcel W
(3) Possible effect of a ditch or claim thereto, possession made by Arnold E. Packard to Spalding, Tim and Cook, Inc. Reservations for the preservation of Griffon Road October 30, 1972 are referred to in deed recorded in Liber 1081 of Deeds at Page 65 on February 12, 1990.
Plotted on Map

Sheet 2 of 2

ALTA/ASCM Land Title Survey
Pt of Lot 47, Mile Reserve
City of Niagara Falls, Niagara Co., N.Y.

GRAPHIC SCALE

(IN FEET)
1 inch = 60 ft.

March 08, 2011 - ALTA Survey
Revised 5/12/2011
Revised 5/17/2011

D. W. HANNIG L.S., P.C.
SURVEYORS - PLANNERS - CONSULTANTS
THE MARKET PLACE, BUILDING #1
MANLIUS, NEW YORK 13104
PHONE: (315) 682-5225 - FAX: (315) 682-7774

Projects/.090155/base plan/dwg/final map 12/09/09

CSX Schedule A Description

ALL THAT TRACT OR PARCEL OF LAND, situate in the City of Niagara Falls, County of Niagaraand State of New York, being part of Lots 47 and 48 of the Mile Reserve, bounded and described asfollows:BEGINNING at a rail monument set on the west line of 47th Street, at the southeast corner of landsdescribed under the caption "Parcel B" in the deed from Power Comapny to the Union Carbide Company,dated December 15, 1928, recorded in Niagara County Clerk's Office in Liber 558 of Deeds at Page 1;thence southerly along the west line of 47th Street, 32 feet more or less to an iron pin set on the northeastcorner oflands conveyed by Power Company to Penn Chemical Company by deed dated January 30,1928, recorded in Niagara County Clerk's Office in Liber 516 of Deeds at Page 272; thence westerlyalong the north line of lands so conveyed to the Penn Chemical Company and continuing westerly alongthe north line of lands conveyed to the Kimberly-Clark Company, Inc. as described under the caption"Parcel A" in the deed dated April 30, 1930, recorded in the Niagara County Clerk's Office in Liber 563of Deeds at Page 458, a distance of 745.54 feet more or less to the southeast corner oflands conveyed byPower Company to Kimberly-Clark Company, Inc., by deed dated March 3 1, 1920, recorded in NiagaraCounty Clerk's Office in Liber 437 of Deeds at Page 136; thence northerly along the east line of lands soconveyed to Kimberly-Clark Company by said deed dated March 31, 1920, a distance of 32 feet more orless to the southwest corner of lands conveyed to the Union Carbide Company as aforesaid; thenceeasterly along the south line of lands so conveyed, 745.54 feet more or less to the point of beginning

EXCEPTING THEREFROM, lands conveyed to Kimberly-Clark Corporation by Deed recorded in Liber1997 of Deeds at Page 1 on 10-24-1949.

Revised CSX Description

PROPOSED DESCRIPTION OF THE CSX PARCEL TO BE CONVEYED - SITUATE AT 47TH STREET, CITY OF NIAGARA FALLS, NIAGARA COUNTY, NEW YORK.

BEGINNING AT A POINT, said point being the southeast corner of the Vanest Partnership L. 1952 P. 2 at the west line of 47th Street.

THENCE South 04 degrees 33 minutes 19 seconds West for a distance of 32.00 feet along the west line of 47th Street to a point;
THENCE North 85 degrees 58 minutes 00 seconds West for a distance of 573.65 feet to a point;
THENCE North 04 degrees 14 minutes 45 seconds East for a distance of 2.90 feet to a point;
THENCE North 85 degrees 58 minutes 00 seconds West for a distance of 168.72 feet to a point;
THENCE North 04 degrees 14 minutes 45 seconds East for a distance of 29.10 feet to a point;
THENCE South 85 degrees 58 minutes 00 seconds East for a distance of 745.54 feet TO THE POINT AND PLACE OF BEGINNING.

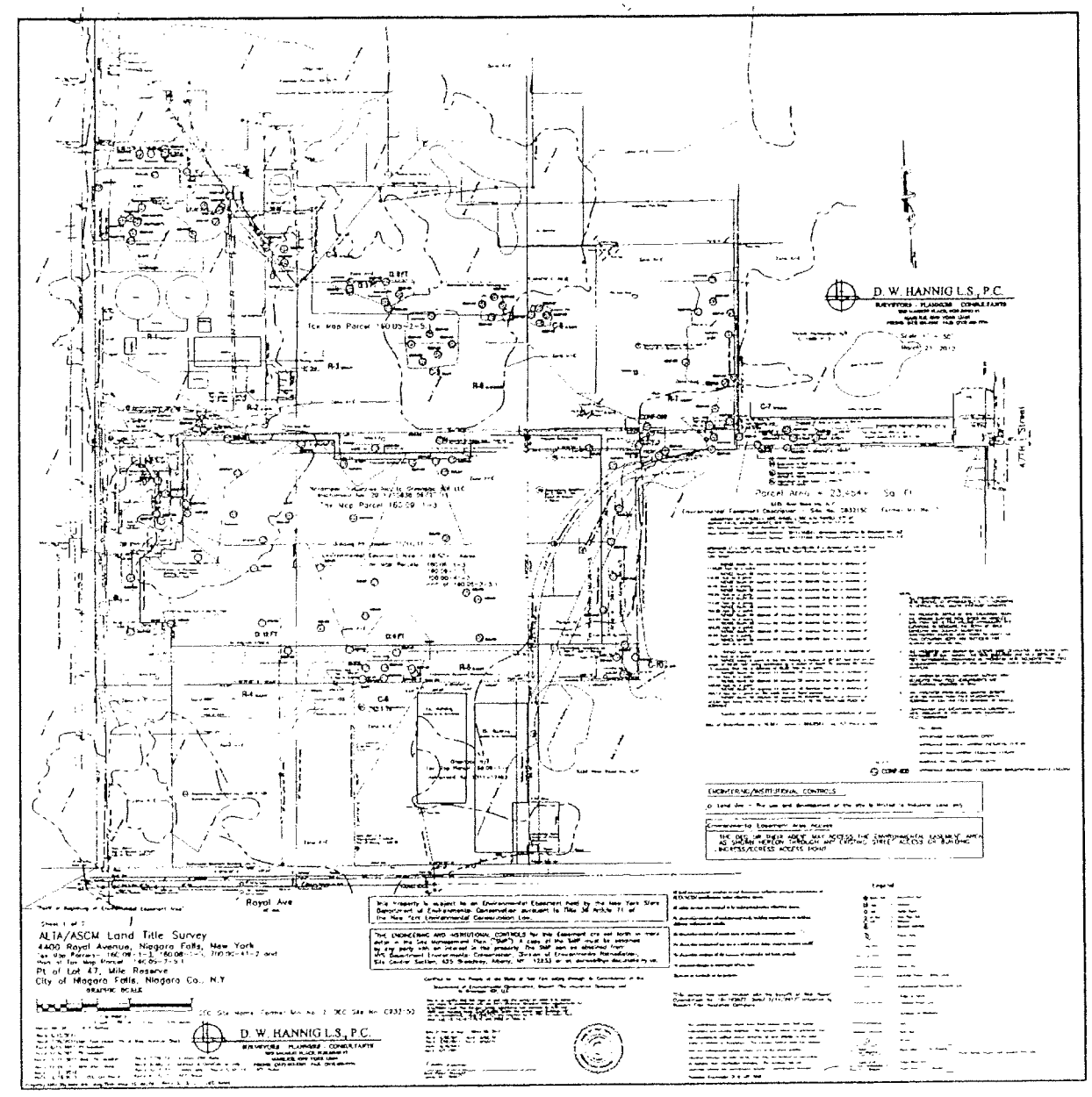
Together with and subject to covenants, easements, and restrictions of record.

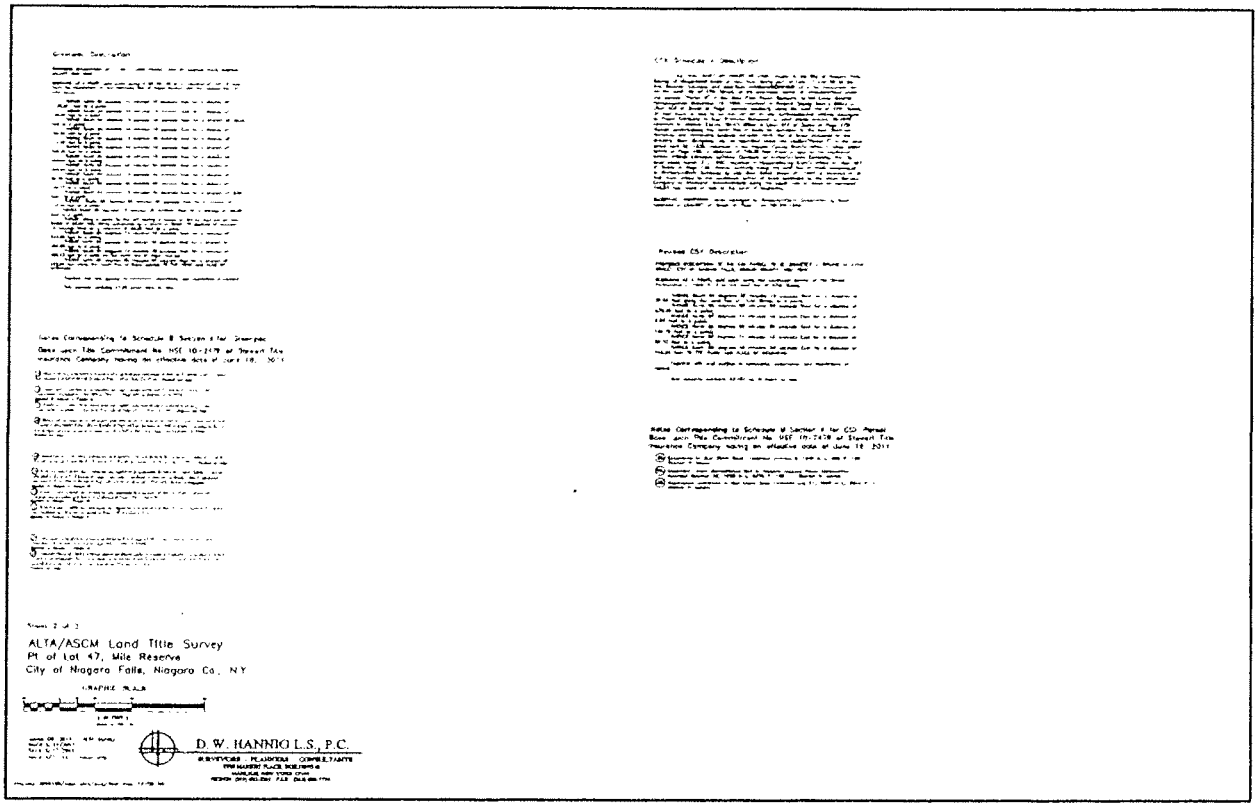
Said property contains 23,464 sq. ft more or less.

Notes Corresponding to Schedule B Section II for CSX Parcel
Base upon Title Commitment No. HSE 10-2479 of Stewart Title Insurance Company having an effective date of June 16, 2011

(28) Easements in Quit Claim Deed recorded January 8, 1948 in L. 899 P. 188
Blanket in nature
(29) Easement from Consolidated Rail to Niagara Mohawk Power Corporation recorded October 22, 1993 in L. 2475 P. 198. Blanket in nature
(30) Reservation contained in Quit Claim Deed recorded July 21, 1999 in L. 2944 P. 1
Blanket in nature

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D. W. HANNIG L.S., P.C.
ALTA/ASCM Land Title Survey
4400 Royal Avenue, Niagara Falls, New York
Pt. of Lot 47, Mile Reserve
City of Niagara Falls, Niagara Co., N.Y.
Royal Ave
D. W. HANNIG L.S., P.C.


ALTA/ASCM Land Title Survey
Pt of Lot 47, Mile Reserve
City of Niagara Falls, Niagara Co., N.Y.
D. W. HANNIO L.S., P.C.

NIAGARA COUNTY CLERK
WAYNE F. JAGOW

RECEIPT

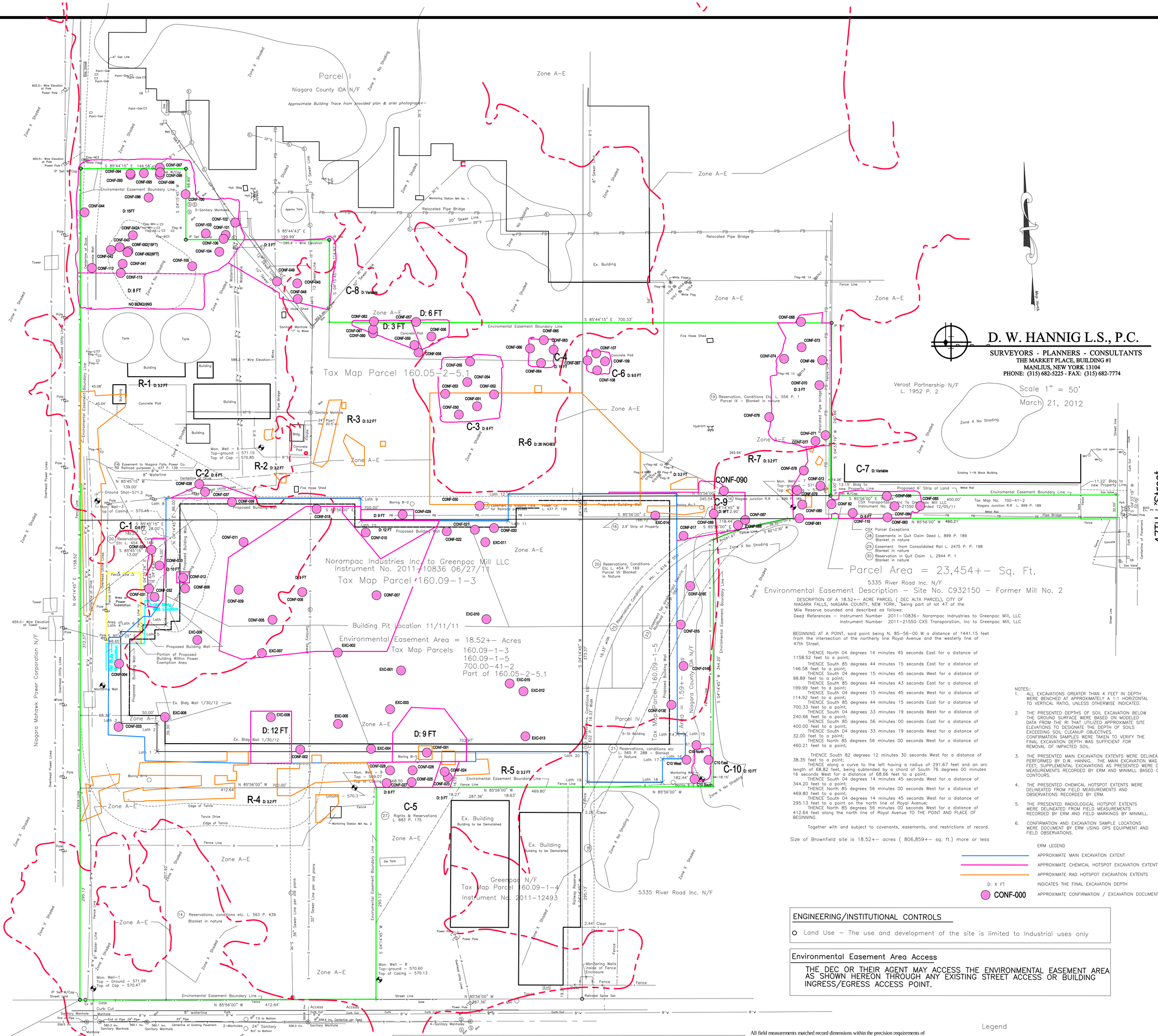
Create Time: 6/6/2012 12:41:06 PM
RECEIPT # 2012121155

Recording Clerk: BH
Account: cash3
Rec'd Frm: HARTER, SECREST & EMERY
By Mail/In Person (M/P): P

Instr#: 2012-11402
DOC: EASEMENT
DEED STAMP: 4385
OR Party: GREENPAC MILL LLC
EE Party: DEPARTMENT OF ENVIRONMENTAL

DEEDTP		
Cover Page 1		$0.00
Recording Fee 14		$0.00
Cultural Ed 1		$0.00
Records Management - County	1	$0.00
Records Management - State	1	$0.00
TP584 1		$0.00
Transfer Tax		
Transfer Tax		$0.00
Receipt Summary		
TOTAL RECEIPT: ---->		$0.00
TOTAL RECEIVED: ---->		$0.00
		____.__
Cash Back		$0.00
PAYMENTS		
Cash ->		$0.00

P.O. Box 461, Lockport, New York 14095-0461 Phone (716) 439-7022 FAX (716) 439-7066


Parcel I
Niagara County IDA N/F
Approximate Building Trace from provided plan & ariel photograph+-
Tax Map Parcel 160.05-2-5.1
Norampac Industries Inc. to Greenpac Mill LLC
Instrument No. 2011-10836 06/27/11
Tax Map Parcel 160.09-1-3
Building Pit Location 11/11/11
Environmental Easement Area = 18.52+- Acres
Tax Map Parcels 160.09-1-3
160.09-1-5
700.00-41-2
Part of 160.05-2-5.1
Greenpac N/F
Tax Map Parcel 160.09-1-4
Instrument No. 2011-12493
5335 River Road Inc. N/F
Parcel IV
Tax Map Parcel 160.09-1-5
Area = 1.59+- Acres
Niagara County IDA N/F
Verost Partnership N/F
L. 1952 P. 2
Parcel Area = 23,454+- Sq. Ft.
5335 River Road Inc. N/F
Environmental Easement Description - Site No. C932150 - Former Mill No. 2
Royal Ave
60' Wide
47TH Street
60' Wide
Zone A-E
Zone X Shaded
Zone X No Shading
R-1 D: 3.2 FT
R-2 D: 3.2 FT
R-3 D: 3.2 FT
R-4 D: 3.2 FT
R-5 D: 3.2 FT
R-6 D: 26 INCHES
R-7 D: 3.2 FT
C-1 D: 5 FT
C-2 D: 6 FT
C-3 D: 6 FT
C-4 D: 11 FT
C-5
C-6 D: 9.5 FT
C-7 D: Variable
C-8 D: Variable
C-10 D: 10 FT
CONF-090
Monitoring Station Mill No. 1
Monitoring Station Mill No. 2
Mon. Well - 1 Top - Ground - 571.09 Top of Cap - 570.47
Mon. Well - 2 Top-ground - 571.15 Top of Cap - 570.85
Mon. Well - 3 Top of Casing - 570.45
Mon. Well - 7 Top-ground - 571.38 Top of Cap - 570.98
Mon. Well - 8 Top-ground - 570.60 Top of Casing - 570.13
Mon. Well - 9 Top - 569.07 Top of Casing - 568.50
Ground Shot-571.2
Ground - 570.3
Ex. Building
Building to be Demolished
Ex. Bldg Wall 1/30/12
Proposed Building Wall
Proposed Building Pad
Relocated Pipe Bridge
Pipe Bridge
Fire Hose Shed
Concrete Pad
Tank
Building
Sanitary Manhole
Hydrant
Power Pole
Monitoring Well
Boring B-1
Boring B-2
Boring B-3
Boring B-4
Boring B-5
Boring B-6
Boring B-7
Boring B-8
Boring B-9
Environmental Easement Boundary Line
Fence Line
Edge of Tarvia
Tarvia Drive
Railroad Spike Set
IP Set W/Cap
Gate
Access
Curb Cut
Catch Basin
Manhole
Gas Valve
Overhead Utility Lines
Overhead Power Lines
Waterline
Centerline of Pavement
Centerline of Drive
Street Line
Proposed 6' Strip of Land
11.22' Bldg to new Property Line
13.15' Bldg to new Property Line
Metal Rail
Pipe Bridge
Fence
Concrete
Curb
Tax Map No. 700-41-2
Niagara Junction R.R L. 899 P. 189
Conc to Grav Mill LLC
Instrument No. 2011-21550
Recorded 12/05/11
CSX Transportation Inc
Instrument No. 2011-21550
Blanket in nature
Easement from Consolidated Rail L. 2475 P. 198
Blanket in nature
Reservation in Quit Claim L. 2944 P. 1
Blanket in nature
Reservations, Conditions Etc L. 556 P. 1
Parcel IX - Blanket in nature
Reservations, Conditions Etc L. 454 P. 169
Parcel VII Blanket in Nature
Reservations, conditions etc L. 565 P. 288 - Blanket in Nature
Reservations, conditions etc. L. 563 P. 439
Blanket in nature
Rights & Reservations L. 683 P. 175
Easement to Niagara Falls Power Co. for Railroad purposes L. 437 P. 139
2.9' Strip of Property
Existing 1-St Block Building
Die Tank
Proposed Building Pad
Portion of Proposed Building Within Power Exemption Area
Area of Power Substation
Old Bldg. Pit Location
New Bldg. Pit Location
Area of Lath 6
Area of Lath 7
Area of Lath 8
Area of Lath 9
Area of Lath 10
Area of Lath 11
Area of Lath 12
Area of Lath 13
Area of Lath 14
Area of Lath 15
Area of Lath 16
Area of Lath 17
Area of Lath 18
Area of Lath 19
Area of Lath 20
Area of Lath 1
Area of Lath 2
Area of Lath 3
Area of Lath 4
Area of Lath 5
Area of Lath 6
Area of Lath 7
Area of Lath 8
Area of Lath 9
Area of Lath 10
Area of Lath 11
Area of Lath 12
Area of Lath 13
Area of Lath 14
Area of Lath 15
Area of Lath 16
Area of Lath 17
Area of Lath 18
Area of Lath 19
Area of Lath 20
"Point of Beginning of Enviromental Easement Area"
Enviromental Easement Boundary Line
Proposed Building Wall
Proposed Building Pad
Proposed Pipe Bridge
Proposed Waterline
Proposed Sanitary Sewer
Proposed Manhole
Proposed Catch Basin
Proposed Curb Cut
Proposed Gate
Proposed Fence
Proposed Monitoring Well
Proposed Boring
Proposed Flood Zone X - No Shading
Proposed Flood Zone A-E
Proposed Flood Zone X - Shaded
Proposed Flood Zones, Traced from existing Firm Map
Proposed Sanitary Sewer Line
Proposed Centerline of Pavement
Proposed Curb
Proposed Curb Cut
Proposed Overhead Power / Utility Lines
Proposed Edge of Tarvia
Proposed Fence Line
Proposed Waterline
Proposed Pipe Bridge
Proposed Gate
Proposed Access
Proposed Manhole
Proposed Catch Basin
Proposed Curb Cut
Proposed Sanitary Manhole

Greenpac Description

PROPOSED DESCRIPTION OF 17.99+– ACRE PARCEL, CITY OF NIAGARA FALLS, NIAGARA COUNTY, NEW YORK.

BEGINNING AT A POINT, said point being N 85–56–00 W. a distance of 1441.15 feet from the intersection of the northerly line of Royal Avenue with the westerly line of 47th street.

THENCE North 04 degrees 14 minutes 45 seconds East for a distance of 1158.52 feet to a point;
THENCE South 85 degrees 44 minutes 15 seconds East for a distance of 146.58 feet to a point;
THENCE South 04 degrees 15 minutes 45 seconds West for a distance of 98.89 feet to a point;
THENCE South 85 degrees 44 minutes 43 seconds East for a distance of 199.99 feet to a point;
THENCE South 04 degrees 15 minutes 45 seconds West for a distance of 114.92 feet to a point;
THENCE South 85 degrees 44 minutes 15 seconds East for a distance of 700.33 feet to a point;
THENCE South 04 degrees 33 minutes 19 seconds West for a distance of 240.66 feet to a point;
THENCE North 85 degrees 56 minutes 00 seconds West for a distance of 345.54 feet to a point;
THENCE South 04 degrees 14 minutes 45 seconds West for a distance of 29.10 feet to a point;
THENCE South 85 degrees 56 minutes 00 seconds East for a distance of 166.72 to a point;
THENCE South 04 degrees 14 minutes 45 seconds West for a distance of 2.90 feet to a point;
THENCE South 85 degrees 56 minutes 00 seconds East for a distance of 118.44 feet to a point;
THENCE South 82 degrees 12 minutes 30 seconds West for a distance of 38.35 feet to a point;
THENCE along a curve to the left having a radius of 291.67 feet and an arc length of 68.82 feet, being subtended by a chord of South 76 degrees 00 minutes 16 seconds West for a distance of 68.66 feet to a point;
THENCE South 04 degrees 14 minutes 45 seconds West for a distance of 344.20 feet to a point;
THENCE North 85 degrees 56 minutes 00 seconds West for a distance of 469.80 feet to a point;
THENCE South 04 degrees 14 minutes 45 seconds West for a distance of 295.13 feet to a point on the north line of Royal Avenue;
THENCE North 85 degrees 56 minutes 00 seconds West for a distance of 412.64 feet along the north line of Royal Avenue TO THE POINT AND PLACE OF BEGINNING.

Together with and subject to covenants, easements, and restrictions of record.

Said property contains 17.99 acres more or less.

Notes Corresponding to Schedule B Section II for Greenpac

Base upon Title Commitment No. HSE 10–2479 of Stewart Title Insurance Company having an effective date of June 16, 2011

(13) Reservations, conditions, covenants and agreements contained in deed to Kimberly-Clark Company, Inc. recorded in Liber 437 of Deeds at Page 139 on July 29, 1920. Plotted on Map

(14) Reservations, conditions, covenants and agreements contained in deed to Kimberly-Clark Corporation recorded in Liber 563 of Deeds at Page 439 on September 4, 1930.
Blanket in Nature – Parcel III

(15) Reservations, conditions, covenants and agreements contained in deed to Kimberly-Clark Corporation recorded in Liber 616 of Deeds at Page 556 on May 11, 1936. Plotted on Map

(16) Reservations, conditions, covenants and agreements contained in deed to Niagara Junction Railway Company recorded in Liber 899 of Deeds at Page 189 on January 8, 1948 and also contained in deed to Kimberly-Clark Corporation recorded in Liber 967 of Deeds at Page 1 on October 24, 1949.
Plotted on Map

(18) Reservations, conditions, covenants and agreements contained in deeds to Isco Chemical Company, Inc. or Incorporated recorded in Liber 622 of Deeds at Pages 1 and 8 on May 11, 1936. Plotted on Map

(19) Reservations, conditions, covenants and agreements contained in deed to Union Carbide Company recorded in Liber 556 of Deeds at Page 1 and later contained in deed to Kimberly-Clark Corporation recorded in Liber 594 of Deeds at Page 456 on November 22, 1934 with additional language.
Blanket in Nature – Parcel IX

(20) Reservations, conditions, covenants and agreements contained in deed to Paper Converting Corporation recorded in Liber 454 of Deeds at Page 169 on June 30, 1921.
Blanket in Nature – Parcel VII

(21) Reservations, conditions, covenants and agreements contained in deed to Isco Chemical Company, Inc. recorded in Liber 565 of Deeds at Page 288 on May 3, 1930.
Blanket in Nature – Parcel IV

(23) Easement for single tract electric railroad to The Niagara Falls Power Company by instrument recorded in Liber 616 of Deeds at Page 560 on May 11, 1936.
Blanket in Nature – Parcel IV

(24) Possible effect of a ditch or drain across premises made by Josiah S. Packard to Spalding, Trott and Cronk, Commissioners for the construction of ditches dated October 10, 1872 and referred to in deed recorded in Liber 198 of Deeds at Page 65 on February 12, 1890.
Plotted on Map

CSX Schedule A Description

ALL THAT TRACT OR PARCEL OF LAND, situate in the City of Niagara Falls, County of Niagaraand State of New York, being part of Lots 47 and 48 of the Mile Reserve, bounded and described asfollows:BEGINNING at a rail monument set on the west line of 47th Street, at the southeast comer of landsdescribed under the caption "Parcel B" in the deed fTom Power Company to the Union Carbide Companydated December 15, 1928, recorded in Niagara County Clerk's Office in Liber 556 of Deeds at Page 1;thence southerly along the west line of 47th Street, 32 feet more or less to an iron pin set on the northeastcomer oflands conveyed by Power Company to Isco Chemical Company by deed dated January 30,1926, recorded in Niagara County Clerk's Office in Liber 516 of Deeds at Page 272; thence westerlyalong the north line of lands so conveyed to the Isco Chemical Company and continuing westerly alongthe north line of lands conveyed to the Kimberly–Clark Company, Inc. as described under the caption"Parcel A" in the deed dated April 30, 1930, recorded in the Niagara County Clerk's Office in Liber 563of Deeds at Page 439, a distance of 745.36 feet more or less to the southeast corner oflands conveyed byPower Company to Kimberly–Clark Company, Inc., by deed dated March 3 l, 1920. recorded in NiagaraCounty Clerk's Office in Liber 437 of Deeds at Page 139; thence northerly along the east line of lands soconveyed to Kimberly–Clark Company by said deed dated March 31, 1920, a distance of 32 feet more orless to the southwest corner of lands conveyed to the Union Carbide Company as aforesaid; thenceeasterly along the south Hne of lands so conveyed, 745.54 feet more or less to the point of beginning.

EXCEPTING THEREFROM, lands conveyed to Kimberly–Clark Corporation by Deed recorded in Liber967 of Deeds at Paee 1 on 10–24–1949.

Revised CSX Description

PROPOSED DESCRIPTION OF THE CSX PARCEL TO BE CONVEYED – SITUATE AT 47TH STREET, CITY OF NIAGARA FALLS, NIAGARA COUNTY, NEW YORK.

BEGINNING AT A POINT, said point being the southeast corner of the Verost Partnership L. 1952 P. 2 at the west line of 47th Street.

THENCE South 04 degrees 33 minutes 19 seconds West for a distance of 32.00 feet along the west line of 47th Street to a point;
THENCE North 85 degrees 56 minutes 00 seconds West for a distance of 578.65 feet to a point;
THENCE North 04 degrees 14 minutes 45 seconds East for a distance of 2.90 feet to a point;
THENCE North 85 degrees 56 minutes 00 seconds West for a distance of 166.72 feet to a point;
THENCE North 04 degrees 14 minutes 45 seconds East for a distance of 29.10 feet to a point;
THENCE South 85 degrees 56 minutes 00 seconds East for a distance of 745.54 feet TO THE POINT AND PLACE OF BEGINNING.

Together with and subject to covenants, easements, and restrictions of record.

Said property contains 23,454 sq. ft more or less.

Notes Corresponding to Schedule B Section II for CSX Parcel

Base upon Title Commitment No. HSE 10–2479 of Stewart Title Insurance Company having an effective date of June 16, 2011

(28) Easements in Quit Claim Deed recorded January 8, 1948 in L. 899 P. 189
Blanket in nature

(29) Easement from Consolidated Rail to Niagara Mohawk Power Corporation recorded October 22, 1993 in L. 2475 P. 198. Blanket in nature

(30) Reservation contained in Quit Claim Deed recorded July 21, 1999 in L. 2944 P. 1
Blanket in nature

Sheet 2 of 2

ALTA/ASCM Land Title Survey
Pt of Lot 47, Mile Reserve
City of Niagara Falls, Niagara Co., N.Y.

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

March 08, 2011 – ALTA Survey
Rev'd 5/12/2011
Rev'd 6/17/2011
Rev'd 4/11/12 – notes only

D. W. HANNIG L.S., P.C.
SURVEYORS - PLANNERS - CONSULTANTS
THE MARKET PLACE, BUILDING #1
MANLIUS, NEW YORK 13104
PHONE: (315) 682-5225 - FAX: (315) 682-7774

Projects/J090155/base plan/dwg/final map 12/09/09

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Appendix C
Proposed Facility Layout-May 2012

REV. —

CLIENT DRAWING NO.

GRAPHIC SCALE 0 4' 8'

NORTH PARCEL
SOUTH PARCEL

LIMIT OF BOILER HOUSE DEMO
DEMO STEAM PIER
EX STEAM PIER TO REMAIN
EX TANK
DEMO EX-PUMP HOUSE
RELOCATE STEAM PIER
EX STEAM PIERS TO REMAIN
FIRE PUMP HOUSE
FIRE LANE (20' WIDE)
OCC STORAGE AREA SOUTH
OCC STORAGE AREA
UNLOADING DOCK
RETAINING WALL, SEE DWG C-401
OCC UNLOAD BLDG 16,789 SF
N/F VEROST PARTNERSHIP
COORDINATE PAVEMENT LIMIT W/ CSX STANDARDS
EX BLDG
EX BLDG 5,000 SF
REACTOR SEWER VAULT
RETAINING WALL SEE DWG C-402
RAMP UP
RAIL UNLOADING DOCK
RAIL SIDING
RAIL SWITCH
STARCH TANKS
DUMPSTER
RAMP
RAIL LOADING DOCK
CANOPY 4,146 SF
WASTE OUTBOUND
DRIVE OVER ALLOWANCE
EDGE OF PAVEMENT
MILL 231,905 SF
CHAINLINK FENCE (TYP)
N/F NIAGARA MOHAWK POWER CORPORATION
12.00' EASEMENT
AUTO PARKING WEST
AUTO PARKING EAST
ELECTRIC SUBSTATION
TRAILER PARKING
N/F 5335 RIVER ROAD INC.
BCP Site Boundary
47th STREET
ROYAL AVENUE
GRANITE CURB INSIDE OF ROW
IRON PIN
CURB CUT
ROW
N=10000.00, E=10000.00
DATUM POINT

TRUE NORTH
4.219879°
TRUE NORTH
BUILDING NORTH

NOTE:
1. COORDINATES DETERMINED FROM DATUM POINT (N=10000.000, E=10000.000) NEAR SOUTHWEST PROPERTY CORNER AND BUILDING NORTH.

COORDINATE SYSTEM

NORTH PARCEL
SOUTH PARCEL

SITE KEY PLAN
SCALE: NONE

A LAYOUT PLAN – SOUTH
SCALE: 1"=50'

50 0 50 100
SCALE: 1"=100'

COORDINATE SCHEDULE – SOUTH

ELEMENT	ID	NORTHING	EASTING
DATUM POINT		10000.00	10000.00
MILL (BLDG FOUNDATION CORNER)	PM-1	10688.95	10130.86
	PM-2	10694.29	10630.86
	PM-3	10694.29	10813.86
	PM-4	10357.29	10110.86
OCC UNLOAD BLDG (BLDG FOUNDATION CORNER)	PO-1	10897.54	10705.86
	PO-2	10897.54	10808.86
	PO-3	10734.54	10808.86
	PO-4	10734.54	10705.86
TRAILER PARKING (PAVEMENT CORNER)	TP-1	10189.29	10366.79
	TP-2	10014.29	10366.79
	TP-3	10014.29	10210.79
ELECTRICAL SUBSTATION (FENCE CORNER)	ES-1	10127.96	10031.60
	ES-2	10127.96	10167.60
	ES-3	10002.96	10167.60
	ES-4	10002.96	10031.60
AUTO PARKING – WEST (PAVEMENT CORNER)	WP-1	10307.29	10276.36
	WP-2	10327.29	10285.36
	WP-3	10327.29	10420.36
	WP-4	10217.29	10420.36
	WP-5	10197.29	10411.36
	WP-6	10197.29	10285.36
	WP-7	10217.29	10276.36
AUTO PARKING – EAST (PAVEMENT CORNER)	EP-1	10327.29	10546.36
	EP-2	10327.29	10681.36
	EP-3	10217.29	10681.36
	EP-4	10197.29	10672.36
	EP-5	10197.29	10555.36
	EP-6	10217.29	10546.36
OCC STORAGE AREA – SOUTH (CONCRETE CORNER)	OS-1	11052.88	10298.07
	OS-2	11055.97	10299.75
	OS-3	10729.29	10705.86
	OS-4	10729.29	10226.38
	OS-5	10749.29	10226.38
	OS-6	10749.29	10323.39
	OS-7	10831.29	10323.39
	OS-8	10850.54	10271.53
	OS-9	11007.59	10271.53
	OS-10	11032.37	10277.57
MISCELLANEOUS PAVEMENT (PAVEMENT CORNER)	MD-1	10264.29	10264.36
	MD-2	10239.29	10264.36
	MD-3	10534.29	10841.86
	MD-4	10534.29	10866.86
	MD-5	10001.40	10496.88
	MD-6	10000.09	10026.39

APPROVED :

DATE :
FEBURARY 10, 2012

SIGNATURE SEAL

BEARDSLEY DESIGN ASSOCIATES
Architecture, Engineering, Landscape Architecture, P.C.
5789 Widewaters Parkway
Dewitt, New York 13214
Ph 315.422.6900
Fax 315.422.2522
E-mail BDA@Beardsley.com

V.I.P. Structures
ARCHITECTS WHO BUILD

NO.	DATE	REVISIONS	DWN	CKD	ZONE
1	2/10/12	ISSUED FOR CONSTRUCTION			
0	7/29/11	ISSUED FOR BID			

DRAWN BY: FJS — DATE — CHECKED BY — DATE
DESIGNED BY: RNC — DATE — APPROVED BY — DATE

NEW PAPER MILL
NIAGARA FALLS, NY
GREENPAC MILL, LLC
4400 ROYAL AVENUE
NIAGARA FALLS, NEW YORK 14303

LAYOUT PLAN – SOUTH

SCALE: 1:50
CONTRACT
DRAWING NO. C-101
FILE: CONSTRUCTION PLAN.DWG
CLIENT DRAWING NO.
REV.

PLOTTED: 6/4/2012 10:05:7 PM BY: MATTHEW FORTIN
FILE NAME: C:\USERS\MATTHEW.FORTIN\DESKTOP\GREENPAC\CONSTRUCTION PLAN.DWG

Appendix D
Excavation Work Plan

APPENDIX D – EXCAVATION WORK PLAN

D-1 NOTIFICATION

At least 5 days prior to the start of any soil disturbance activity, the Site owner or their representative will notify the Department. Currently, this notification will be made to:

Regional Remediation Engineer
New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 9
270 Michigan Avenue
Buffalo, New York
716-851-7220

This notification will include:

- A description of the work to be performed, including the location and areal extent, plans for Site re-grading, intrusive elements or utilities to be installed below the soil cover, and estimated volumes of contaminated soil to be excavated;
- A summary of environmental conditions anticipated in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A statement that the work will be performed in compliance with this Excavation Work Plan (EWP) and 29 CFR 1910.120;
- A copy of the contractor's health and safety plan(s) (HASP), in electronic format, if it differs from the HASP and the Site-Specific Radiological Safety Plan provided in Appendix D of this SMP;
- Identification of disposal facilities for potential waste streams;
- Identification of any areas where excavated material will be reused on-Site; and
- Identification of sources of any anticipated backfill, along with required chemical testing results (if applicable).

D-2 SOIL SCREENING METHODS

Any excavated material will be segregated and managed based on soil screening results and previous environmental data as summarized in Table 1-6, Criteria for Re-Use and Disposal of Excavated Material, in this SMP. Visual, olfactory and instrument-based soil screening will be performed by a qualified environmental professional or person under their supervision during all excavations, including all excavation and intrusive work performed during Site development, such as excavations for foundations and utility work, after issuance of the COC. During all excavation work, PID screening for volatile organic compounds (VOCs) and radiation screening with a Ludlum Model 2221 radiation meter with a 44-10 probe will be used.

D-3 STOCKPILE METHODS

Soil stockpiles will be completely encircled with a berm and/or silt fence. Hay bales or other adequate control measures will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC.

D-4 MATERIALS EXCAVATION AND LOAD OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The Site owner of the property is responsible for safe execution of all invasive and other work performed under this EWP.

Prior to initiating excavation work, all underground utilities and easements potentially affected by the project will be identified by the Site owner. Requests will be filed with Dig Safely New York to facilitate the identification, location, and marking of subsurface utilities. In addition, private utility clearance using ground penetrating radar (GPR) and/or other appropriate technologies will also be conducted. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the Site. As appropriate, certain utilities may need to be protected and remain active while

others should be shutdown/de-energized, terminated, and/or removed to facilitate excavation activities.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

A truck wash will be operated on-Site if necessary based on Site conditions. The qualified environmental professional will determine if truck washing is necessary. The Site owner will be responsible for ensuring that all outbound trucks will be washed if necessary before leaving the Site until the activities performed under this section are complete.

Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-Site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed by the Site owner as needed to maintain a clean condition with respect to Site-derived materials.

D-5 MATERIALS TRANSPORT OFF-SITE

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

All trucks will be washed prior to leaving the Site if necessary based on Site conditions. Truck wash waters will be disposed in an appropriate manner.

Truck transport routes are subject to daily traffic conditions in the Site area. All routes should be approved for commercial vehicle operation. The current anticipated route to Niagara Falls Boulevard and a nearby landfill (Allied Waste Services, which was used during implementation of the Soil Excavation IRM) is provided as Figure D-1.

This route takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city-mapped truck routes; (c) prohibiting off-Site queuing of trucks entering the facility; (d) limiting total distance to major

highways; (e) promoting safety in access to highways; and (f) overall safety in transport; and (g) community input (when necessary).

Trucks will be prohibited from stopping and idling in the neighborhoods outside the project Site.

Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development.

Queuing of trucks will be performed on-Site in order to minimize off-Site disturbance. Off-Site queuing will be prohibited.

D-6 MATERIALS DISPOSAL OFF-SITE

All solid materials excavated and removed from the Site will be treated as contaminated (if applicable) and regulated material and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. All excavated material will be screened and handled following the requirements of Table 1-6. If disposal of soil/fill from this Site is proposed for unregulated off-Site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-Site management of materials from this Site will not occur without written NYSDEC approval.

Off-Site disposal locations for excavated materials will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e., hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, Construction/Demolition (C/D) recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in Periodic Review Reports. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

D-7 MATERIALS REUSE ON-SITE

Chemical criteria for on-Site reuse of material have been approved by the NYSDEC and are listed in Table 1-6. The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-Site.

Any demolition material proposed for reuse on-Site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-Site will not be performed without prior NYSDEC

approval. Based on the plan developed and approved by NYSDEC during the Soil Excavation IRM, previous crushing of concrete generated from the demolition of Site structures was performed in accordance with the following approach. Crushed concrete was segregated into approximate 1,000-cubic yard piles. Two composite samples (consisting of three to five discrete samples) were collected for the first 1,000-cubic yards for the following analysis:

- Target Compound List (TCL) semivolatile organic compounds (SVOCs) plus 20 tentatively-identified compounds (TICs) (EPA Method 8270);
- TCL polychlorinated biphenyls (PCBs; EPA Method 8082);
- TCL Pesticides (EPA Method 8081A); and
- Target Analyte List (TAL) Metals (not including cyanide; EPA Method 6010B) plus Mercury (EPA Method 7471A).

In addition, five discrete samples were analyzed for TCL VOCs plus 10 TICs (EPA Method 8260) from the first 1,000 cubic yards.

Following this initial set of samples, one composite sample (consisting of three to five discrete samples) was collected for each subsequent 1,000-cubic yards for the following analysis:

- TCL SVOCs plus 20 TICs;
- TCL PCBs;
- TCL Pesticides; and
- TAL Metals (not including cyanide) plus Mercury.

In addition, one discrete sample will be analyzed for TCL VOCs plus 10 TICs from each subsequent 2,000-cubic yards. If all analytical results were less than the Industrial SCOs, the corresponding crushed concrete pile(s) was re-used on-Site. If any results exceed the Industrial SCOs, the corresponding crushed concrete pile(s) were shipped off-Site for disposal.

At this time, no further Site-derived concrete is being crushed for use as backfill. Prior to using any further crushed concrete from on-Site sources or importing crushed concrete (or any other materials) from other off-Site sources, NYSDEC approval must first be received (see Section D-10 for further details). The NYSDEC has approved the use of crushed concrete as backfill from the off-Site Swift River facility at 1717 New Road in Niagara Falls, New York following the above approach.

Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Site will not be reused on-Site.

D-8 FLUIDS MANAGEMENT

All liquids to be removed from the Site, including excavation dewatering, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be avoided and will only be performed if determined necessary with the prior approval of the NYSDEC under a State Pollution Discharge Elimination System (SPDES) permit.

Historically, excavation water has been disposed off-Site through the Norampac Waste Water Treatment Plant (WWTP), which ultimately discharges to the Niagara Falls Water Board (NFWB) wastewater treatment facility. If a similar approach is desired, the Site owner will contact the NFWB to determine the proper protocols to follow to obtain permission to dispose of the staged water at the NFWB wastewater facility. The current contact of the Enforcement Division (Mr. Albert Zaepfel) should be contacted to provide the Owner's contractor with a list of parameters needed for approval of the disposal of water at the NFWB wastewater treatment facility.

D-9 COVER SYSTEM RESTORATION

There are no soil cover systems present at the Site.

D-10 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the Site for use as backfill will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the Site.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the Site.

All imported materials will meet NYSDEC-approved backfill requirements for this Site. Unless otherwise approved in advance by the NYSDEC, sampling must be conducted in accordance with Table D-1 below.

Table D-1 – Recommended Number of Soil Samples for Soil Imported To or Exported from a Site (Source: DER-10, Table 5.4(e)10)

Contaminant	VOCs	SVOCs, Inorganics & PCBs/Pesticides	
Soil Quantity (cubic yards)	Discrete Samples	Composite	Discrete Samples/Composite
0-50	1	1	3-5 discrete samples from different locations in the fill being provided will comprise a composite sample for analysis
50-100	2	1	
100-200	3	1	
200-300	4	1	
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1000	7	2	
➢ 1000	Add an additional 2 VOC and 1 composite for each additional 1000 Cubic yards or consult with DER		

These NYSDEC-approved backfill quality requirements are listed in DER-10 Appendix 5 Allowable Constituent Levels for Imported Fill or Soil Subdivision 5.4(e) Commercial or Industrial Use (NYSDEC, 2010) and are provided at the end of this section as Table D-2. Non-compliant soils will not be imported onto the Site without prior written approval of the NYSDEC. Solid waste will not be imported onto the Site.

Trucks entering the Site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

D-11 STORMWATER POLLUTION PREVENTION

The New York State Standards and Specifications for Soil Erosion and Sediment Controls require an Erosion & Sediment Control Plan (ESCP) for any construction activity that disturbs one or more acres. The disturbance area associated with the current Site redevelopment activities exceeds 5 acres. Therefore, as part of their required Storm Water Pollution Prevention Plan (SWPPP), Beardsley Design Associates of Dewitt, New York incorporated an ESCP for implementation by the excavation contractors in a manner consistent with the New York State Standards and Specifications for Soil Erosion and Sediment Control. A copy of the full SWPPP is presented as Attachment D-1 of this EWP.

As part of the Site redevelopment and as required by the SWPPP, soil erosion and sedimentation controls have been installed at the Site to minimize the potential for erosion and migration of excavated soil and to control precipitation and storm water runoff in work areas. During excavation activities, sedimentation controls should include silt fence and hay bales around

excavation, grading, soil staging areas and as needed near catch basins, surface waters and other discharge points. A silt fence will be installed along the perimeter of excavation work areas. The silt fence will be anchored a minimum of 6-inches into the ground and staked every 10-feet. Hay bales or equivalent will be used in conjunction with the silt fence in any low-lying areas or areas that could be expected to receive a greater amount of run-off. Inspections and proper maintenance of the controls will be performed during excavation activities in accordance with the SWPPP.

After completion of Site redevelopment activities, and termination of the SWPPP, all further earth moving activities will be performed in accordance with applicable federal, state, and local regulation, and all necessary permits will be obtained in advance of such activities.

Should barriers or hay bales need to be installed, they will be inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC. All necessary repairs shall be made as soon as practicable.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

D-12 CONTINGENCY PLAN

If underground tanks or other previously-unidentified potential contaminant sources are found during post-remedial subsurface excavations or development-related construction, the NYSDEC will be promptly notified (see below) and excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment, surrounding soils, etc., as necessary to determine the nature of the material and proper disposal method.

Chemical analysis shall be performed for a thorough list of analytes including (TAL metals (not including cyanide) plus mercury, TCL VOCs plus 10 TICs, TCL SVOCs plus 20 TICs, TCL pesticides, and PCBs, unless Site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Contaminated media identified by visual, olfactory, or field screening during invasive Site work will be promptly communicated by phone to the NYSDEC's Project Manager (see Section D-1). Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline (DEC hotline (800-457-7362; outside New York State: 518-457-7362) within two hours of discovery. These findings will be also included in the Periodic Progress Reports prepared pursuant to Section 5 of the SMP.

D-13 COMMUNITY AIR MONITORING PLAN

During any excavation activity, air monitoring should be conducted in accordance with the Community Air Monitoring Plan (CAMP) included as Attachment K of the HASP, which provided as Appendix D of this SMP. In summary, the CAMP calls for real-time monitoring for VOCs and particulates (i.e., dust) at the downwind perimeter of each designated work area when intrusive activities are in progress at the Site. Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas. Continuous monitoring is required for all ground intrusive activities to the extent practicable (e.g., air monitoring may not be conducted during precipitation events).

VOC Monitoring, Response Levels, and Actions

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations will be recorded at the start of each workday and periodically thereafter to establish background conditions. All VOC monitoring equipment will be calibrated daily. The equipment will be capable of calculating 15-minute running average concentrations.

- If the ambient air concentration of total VOC concentrations at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total

VOC levels readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.

- If total VOC levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of VOCs identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume if total VOC levels 200-feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20-feet, are below 5 ppm over background for the 15-minute average.
- If the total VOC concentration is greater than 25 ppm above background at the perimeter of the work area, intrusive work activities will be halted and the source of the VOCs will be identified. Work will resume when additional continuous monitoring demonstrates that VOC concentrations have dropped below 25 ppm for a minimum of one-half hour, and the total VOC concentration 200-feet downwind of the work area, or half the distance to the nearest potential receptor, whichever is less (but in no case less than 20-feet), is below 5 ppm above background for the 15-minute average..

All 15-minute VOC readings must be recorded and be available for NYSDEC and NYSDOH personnel to review if desired. Instantaneous readings, if any, used for decision purposes will also be recorded.

PARTICULATE MATTER RESPONSE LEVELS AND CORRECTIVE ACTIONS

Fugitive dust migration from the work area will be visually assessed during intrusive activities. Particulate concentrations will be monitored continuously at the downwind perimeter of the work area during intrusive activities. Particulate monitoring will be performed using real-time electronic aerosol monitoring equipment capable of measuring particulate matter less than 10-micrometers in size (PM-10) and capable of integrating over a period of 15 minutes for comparison to the airborne particulate action levels referenced below. The monitoring equipment will be equipped with an audible alarm to indicate an exceedance of a specified action level.

If the downwind PM-10 concentration is 100-micrograms per cubic meter ($\mu g/m^3$) greater than background for the 15-minute period, or if airborne dust is observed leaving the work area, dust suppression techniques will be employed (see Section D-15). Work may continue with dust suppression techniques

provided that downwind PM-10 concentration does not exceed 150-µg/m^3above background and provided that significant visible dust is not migrating from the work area.

If downwind PM-10 concentrations are greater than 150-µg/m^3 above background, intrusive activities will be stopped and a re-evaluation of the intrusive activities will be initiated. Work can resume provided that dust suppression measures and/or other engineering controls are successful in reducing the downwind PM-10 concentration to within 150-µg/m^3 of background and in preventing significant visible dust migration.

All 15-minute readings will be recorded and will be available for review by NYSDEC or NYSDOH personnel. Instantaneous readings (if any) used for decision purposes will also be recorded.

Exceedances of action levels listed in the CAMP will be reported to the NYSDEC and NYSDOH Project Managers.

D-14 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off-Site. If nuisance odors are identified at the Site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until nuisance odors have been satisfactorily abated. The NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the property owner's Remediation Engineer, and any measures that are implemented will be discussed in the applicable Periodic Review Report.

Necessary means will be employed to prevent on- and off-Site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-Site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-Site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

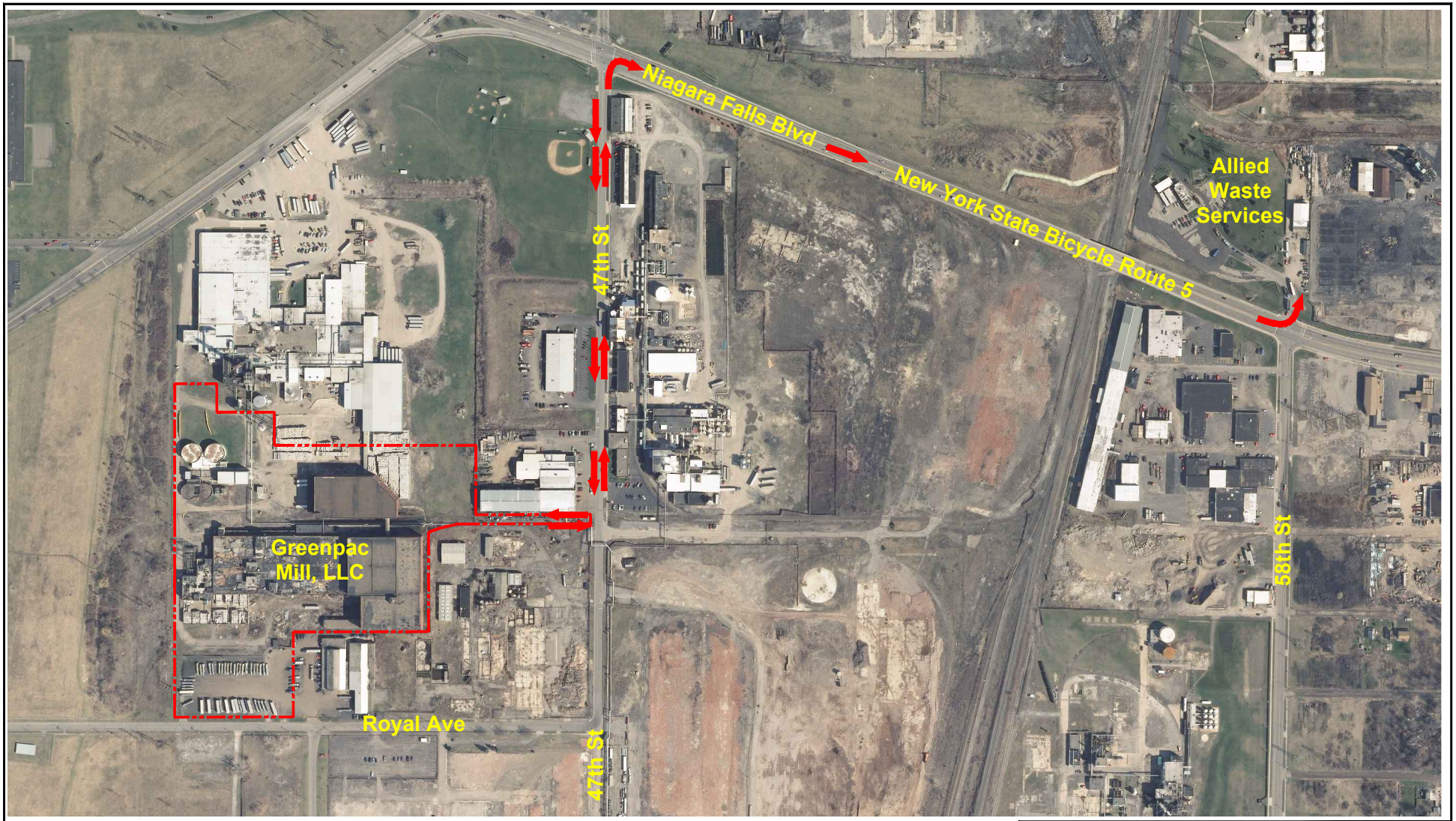
D-15 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive on-Site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved though the use of a dedicated on-Site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, un-vegetated soils vulnerable to dust production.
- Gravel will be used on roadways where practicable to provide a clean and dust-free road surface.
- On-Site roads will be limited in total area to minimize the area required for water truck sprinkling.

D-16 OTHER NUISANCES

If necessary, a plan will be developed and utilized by the Owner's contractors for remedial work to ensure compliance with local noise control ordinances.



Legend

BCP Site Boundary

Scale (1"=500')

250' 0 250' 500' 1000'

Graphic Scale in Feet

N

Source: NYSGIS Clearinhouse, http://gis.ny.gov

TITLE

ANTICIPATED TRUCK TRANSPORT ROUTE

PREPARED FOR

GREENPAC MILL, LLC

Environmental Resources Management

FIGURE D-1

DRAWN BY	SCALE	DATE	JOB NO.
EMF	AS SHOWN	06/05/2012	0128439.13

R:\Scout\Projects\Greenpac Mill LLC - Niagara Falls, NY\XREF\03-27-2012 - Greenpac - Truck Route.dwg (06/05/2012 - 9:12am Melville)

Appendix 5
Allowable Constituent Levels for Imported Fill or Soil
Subdivision 5.4(e)

Source: This table is derived from soil cleanup objective (SCO) tables in 6 NYCRR 375. Table 375-6.8(a) is the source for unrestricted use and Table 375-6.8(b) is the source for restricted use.

Note: For constituents not included in this table, refer to the contaminant for supplemental soil cleanup objectives (SSCOs) in the Commissioner Policy on *Soil Cleanup Guidance*. If an SSCO is not provided for a constituent, contact the DER PM to determine a site-specific level.

Constituent	Unrestricted Use	Residential Use	Restricted Residential Use	Commercial or Industrial Use	If Ecological Resources are Present
Metals					
Arsenic	13	16	16	16	13
Barium	350	350	400	400	433
Beryllium	7.2	14	47	47	10
Cadmium	2.5	2.5	4.3	7.5	4
Chromium, Hexavalent[1]	1 [3]	19	19	19	1 [3]
Chromium, Trivalent[1]	30	36	180	1500	41
Copper	50	270	270	270	50
Cyanide	27	27	27	27	NS
Lead	63	400	400	450	63
Manganese	1600	2000	2000	2000	1600
Mercury (total)	0.18	0.73	0.73	0.73	0.18
Nickel	30	130	130	130	30
Selenium	3.9	4	4	4	3.9
Silver	2	8.3	8.3	8.3	2
Zinc	109	2200	2480	2480	109
PCBs/Pesticides					
2,4,5-TP Acid (Silvex)	3.8	3.8	3.8	3.8	NS
4,4'-DDE	0.0033 [3]	1.8	8.9	17	0.0033 [3]
4,4'-DDT	0.0033 [3]	1.7	7.9	47	0.0033 [3]
4,4'-DDD	0.0033 [3]	2.6	13	14	0.0033 [3]
Aldrin	0.005	0.019	0.097	0.19	0.14
Alpha-BHC	0.02	0.02	0.02	0.02	0.04 [4]
Beta-BHC	0.036	0.072	0.09	0.09	0.6
Chlordane (alpha)	0.094	0.91	2.9	2.9	1.3
Delta-BHC	0.04	0.25	0.25	0.25	0.04 [4]
Dibenzofuran	7	14	59	210	NS
Dieldrin	0.005	0.039	0.1	0.1	0.006
Endosulfan I	2.4[2]	4.8	24	102	NS
Endosulfan II	2.4[2]	4.8	24	102	NS
Endosulfan sulfate	2.4[2]	4.8	24	200	NS
Endrin	0.014	0.06	0.06	0.06	0.014
Heptachlor	0.042	0.38	0.38	0.38	0.14
Lindane	0.1	0.1	0.1	0.1	6
Polychlorinated biphenyls	0.1	1	1	1	1

TABLE D-2 - Criteria for Imported Fill or Soil

Constituent	Unrestricted Use	Residential Use	Restricted Residential Use	Commercial or Industrial Use	If Ecological Resources are Present
Semi-volatile Organic Compounds					
Acenaphthene	20	98	98	98	20
Acenaphthylene	100	100	100	107	NS
Anthracene	100	100	100	500	NS
Benzo(a)anthracene	1	1	1	1	NS
Benzo(a)pyrene	1	1	1	1	2.6
Benzo(b)fluoranthene	1	1	1	1.7	NS
Benzo(g,h,i)perylene	100	100	100	500	NS
Benzo(k)fluoranthene	0.8	1	1.7	1.7	NS
Chrysene	1	1	1	1	NS
Dibenz(a,h)anthracene	0.33 [3]	0.33 [3]	0.33 [3]	0.56	NS
Fluoranthene	100	100	100	500	NS
Fluorene	30	100	100	386	30
Indeno(1,2,3-cd)pyrene	0.5	0.5	0.5	5.6	NS
m-Cresol(s)	0.33 [3]	0.33 [3]	0.33 [3]	0.33 [3]	NS
Naphthalene	12	12	12	12	NS
o-Cresol(s)	0.33 [3]	0.33 [3]	0.33 [3]	0.33 [3]	NS
p-Cresol(s)	0.33	0.33	0.33	0.33	NS
Pentachlorophenol	0.8 [3]	0.8 [3]	0.8 [3]	0.8 [3]	0.8 [3]
Phenanthrene	100	100	100	500	NS
Phenol	0.33 [3]	0.33 [3]	0.33 [3]	0.33 [3]	30
Pyrene	100	100	100	500	NS
Volatile Organic Compounds					
1,1,1-Trichloroethane	0.68	0.68	0.68	0.68	NS
1,1-Dichloroethane	0.27	0.27	0.27	0.27	NS
1,1-Dichloroethene	0.33	0.33	0.33	0.33	NS
1,2-Dichlorobenzene	1.1	1.1	1.1	1.1	NS
1,2-Dichloroethane	0.02	0.02	0.02	0.02	10
1,2-Dichloroethene(cis)	0.25	0.25	0.25	0.25	NS
1,2-Dichloroethene(trans)	0.19	0.19	0.19	0.19	NS
1,3-Dichlorobenzene	2.4	2.4	2.4	2.4	NS
1,4-Dichlorobenzene	1.8	1.8	1.8	1.8	20
1,4-Dioxane	0.1 [3]	0.1 [3]	0.1 [3]	0.1 [3]	0.1
Acetone	0.05	0.05	0.05	0.05	2.2
Benzene	0.06	0.06	0.06	0.06	70
Butylbenzene	12	12	12	12	NS
Carbon tetrachloride	0.76	0.76	0.76	0.76	NS
Chlorobenzene	1.1	1.1	1.1	1.1	40
Chloroform	0.37	0.37	0.37	0.37	12
Ethylbenzene	1	1	1	1	NS
Hexachlorobenzene	0.33 [3]	0.33 [3]	1.2	3.2	NS
Methyl ethyl ketone	0.12	0.12	0.12	0.12	100
Methyl tert-butyl ether	0.93	0.93	0.93	0.93	NS
Methylene chloride	0.05	0.05	0.05	0.05	12

Volatile Organic Compounds (continued)					
Propylbenzene-n	3.9	3.9	3.9	3.9	NS
Sec-Butylbenzene	11	11	11	11	NS
Tert-Butylbenzene	5.9	5.9	5.9	5.9	NS
Tetrachloroethene	1.3	1.3	1.3	1.3	2
Toluene	0.7	0.7	0.7	0.7	36
Trichloroethene	0.47	0.47	0.47	0.47	2
Trimethylbenzene-1,2,4	3.6	3.6	3.6	3.6	NS
Trimethylbenzene-1,3,5	8.4	8.4	8.4	8.4	NS
Vinyl chloride	0.02	0.02	0.02	0.02	NS
Xylene (mixed)	0.26	1.6	1.6	1.6	0.26

All concentrations are in parts per million (ppm)
NS = Not Specified

Footnotes:
[1] The SCO for Hexavalent or Trivalent Chromium is considered to be met if the analysis for the total species of this contaminant is below the specific SCO for Hexavalent Chromium.
[2] The SCO is the sum of endosulfan I, endosulfan II and endosulfan sulfate.
[3] For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the Track 1 SCO value.
[4] This SCO is derived from data on mixed isomers of BHC.

STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

For

Greenpac Partnership
New Paper Mill

4001 Packard Road
Niagara Falls, New York

May 20, 2011
Revised June 24, 2011

Prepared for:

Greenpac Partnership
4001 Packard Road
Niagara Falls, New York 14303

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REVISION SCHEDULE

This stormwater pollution prevention plan (SWPPP) should be revised and updated to address changes in site conditions, new or revised government regulations, and additional on-site stormwater pollution controls.

All revisions to the SWPPP must be documented on the SWPPP Revision Documentation Form, which should include the information shown below. By signing this form, the author attests that the SWPPP revision information is true and accurate. Previous authors are not responsible for the revisions.

SWPPP Revision Documentation Form

Number	Date	Author	Company Representative Signature
0	5/20/11	BDA	
1	6/24/11	BDA	
2			
3			
4			
5			
6			
7			
8			
9			
10			

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1.0 INTRODUCTION

1.1 Report Objectives

The purpose of this Stormwater Pollution Prevention Plan (SWPPP) is to summarize the proposed stormwater management system for the site development, the rationale for sizing the stormwater drainage system and water quality treatment systems, and the selection of erosion control methods employed for construction of the Greenpac Partnership New Paper Mill project. This SWPPP Report has been prepared by a professional engineer licensed in the State of New York and is in accordance with the New York State Department of Environmental Conservation (NYSDEC) "Standards and Specifications for Erosion and Sediment Control," the 2010 "Stormwater Management Design Manual," and the "SPDES General Permit for Stormwater Discharges from Construction Activities," GP-0-10-001. A copy of the NYSDEC SPDES General Permit GP-0-10-001 is provided as Appendix A of this Report.

Greenpac Partnership referred to herein as "the Owner," and selected Contractor(s) shall maintain a copy of this SWPPP Report on site for the duration of the construction process.

For additional information regarding this project, contact the following:

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Beardsley Design Associates:
Raymond N. Cudney, P.E.
Principal
5789 Widewaters Parkway
DeWitt, NY 13214
Phone: (315) 472-6980

1.2 General Project Description

The Owner proposes to construct a “mini-mill” linerboard manufacturing facility at 4001 Packard Road, Niagara Falls, NY. The facility will be utilized to recycle used corrugated cardboard into reusable raw material. Construction includes demolition of existing buildings and pavements, and reconstruction of new facilities. This project is considered a redevelopment project and the proposed stormwater treatment measures are prepared in accordance with Chapter 9 – Redevelopment Projects, of the NYSDEC’s Stormwater Design Manual.

In addition to the proposed building, a chip-seal tractor-trailer parking area, asphalt access drive and parking lot, concrete sidewalks, utility infrastructure, and grading and drainage improvements are planned.

A temporary contractor parking lot will be constructed on a parcel of land leased from National Grid located south of Royal Avenue. Construction of the temporary parking lot will include cutting vegetation, placement of geotextile fabrics, and installation of a stone base. Since ~~there~~ no soil disturbance associated with the temporary parking lot is planned, only temporary erosion and sediment control measures (stabilized construction entrance and silt fence) are proposed.

Due to the nature of grading associated with construction of the proposed building, tractor-

trailer parking area, and railway it is anticipated that soil disturbances greater than 5-acres will occur. As mandated by NYSDEC SPDES permit GP-0-10-001, the Contractor(s) shall not disturb greater than 5-acres of soil at any one time without prior written authorization from the NYSDEC. It will be the Contractor(s) responsibility to produce a construction phasing plan and to obtain the NYSDEC authorization.

2.0 EXISTING SITE CONDITIONS

2.1 Location

The project site is located at 4001 Packard Road, Niagara Falls, New York. The location of the site in relation to major roads and other points of reference is shown on Figure 1 - Site Location Plan.

2.2 Municipal Separate Storm Sewer System Jurisdiction

As shown in Figure 2 – Municipal Separate Storm Sewer System (MS4) Jurisdiction, the project site lies within the City of Niagara Falls' designated MS4 boundary. The City of Niagara Falls Engineering Department will review the SWPPP Report for conformance with the NYSDEC Stormwater Phase II regulations. A copy of the MS4 SWPPP Acceptance form will be included as part of the submission of the Notice of Intent (NOI) form to the NYSDEC. Refer to Appendix N for a copy of the MS4 SWPPP Acceptance form.

2.3 General Topography

The natural topography of the property is classified as "gently sloping," with slopes ranging from 1% to 10%. The project site topographically is broken down into four large areas. The northeast portion slopes southeasterly, the north portion slopes north towards Packard Avenue, the west portion slopes west, and the south portion slopes south towards Royal Road. Site surface elevation ranges from 569' to 579' (NAVD 1988).

2.4 Watershed

2.4.1 Soils

A large portion of the project site is identified on the Natural Resources Conservation Services' (NRCS) Web Soil Survey online soil data map as being an "unsurveyed area." Therefore, the predominant surrounding soils of hydrologic soil group "D" were assumed for the unsurveyed area. The remaining portion of the project site that was surveyed by NRCS identifies the Odesa soil group as being present. The Odesa soil group is also consistent with a "D" type hydrologic soil group rating.

Exhibits outlining the characteristics of the existing site soils are provided as Appendix B. The portion of the NRCS Web Soil Survey indicating the subject site is depicted on Figure 3 – Site Soil Survey. For more information on the subsurface site conditions, refer to the Subsurface Exploration and Geotechnical Report prepared by John P. Stopen Engineering Partnership, dated March 18, 2010.

2.4.2 Watershed Boundary

The watershed boundary analyzed for the pre-development site conditions was separated into eight drainage sub-areas. The eight watershed sub-areas total 50.50-acres and consist of the entire project site. These watershed sub-areas discharge to five separate outfalls. The watershed sub-areas are depicted on Figure 8 – Pre-Development Watershed Boundary Map.

2.4.3 Description

Under existing conditions, the 50.50-acre watershed is considered developed. The primary land cover includes buildings, impervious pavements, lawn areas, and brush & overgrown areas. A breakdown of land coverage for the watershed area is summarized in Section 3.1.

2.5 Existing Drainage Facilities

Under existing conditions, the developed project site has several combine sewer systems that collect and convey stormwater runoff and wastewater from the project site to the City of Niagara Falls' combined sewer systems located along Packard Road and Royal Avenue. A 21-inch pipe connects the site's drainage system to the City's combined sewer along Packard Road, while a 36-inch and 30-inch pipe connect to City's system along Royal Avenue. Locations of the existing sewer systems are shown on Drawings C-107 & C-108 (Utility Plan – South & North).

2.6 Wetlands and Receiving Waters

According to the U.S. Fish and Wildlife National Wetlands Inventory, there are no wetlands or riparian areas within or adjacent to the project site. Additionally, according to the New York Department of Environmental Conservations' (DEC) Environmental Resource Mapper website, there are no DEC wetlands located within or adjacent to the project site. The project site in relation to the federal wetlands is indicated on Figure 4 – U.S. Fish and Wildlife Service National Wetlands Inventory.

Stormwater runoff that discharges from the project site is conveyed by the City of Niagara Falls' combined sewer overflow (cso) system to a wastewater treatment plant.

2.7 Flood Potential

According to the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps, Panel #3602300020C for the City of Buffalo, the project site is located within Zone AE. This area becomes inundated by 100-year floods and has base flood elevations known (elevation = 570.00). The project site in relation to FEMA designated floodplains is indicated on Figure 5 – FEMA Floodplain Mapping.

2.8 Historical and Cultural Resources

According to the New York State Historic Preservation Office (SHPO) Geographic Information System (GIS) Archeology and National Register website, the project site is not located within any State or Federal archeological sensitive/listed areas. The project site in relation to SHPO designated areas is shown on Figure 6 – NYSOPRHP Archeology & National Register Map.

2.9 Site Biodiversity

According to the New York State Department of Environmental Conservations' Environmental Resource Mapper website, the project site could potentially contain rare plants and rare animals. Locations where rare plants and rare animals are identified on the mapper website are generalized areas near actual, confirmed observations and collections of rare animal or plant by the New York National Heritage Program. A letter request was submitted to the New York Heritage Program requesting further evaluation for the actual presence of rare plants and rare

animals at the project site. Included within Appendix L is a response letter which states that the NYSDEC does not "have records of rare or state-listed animals or plants, significant natural communities or other significant habitats, on or within the immediate vicinity" of the project site. The project site in relation to the NYSDEC Environmental Resource Mapper is identified on Figure 7 – Site Biodiversity Map.

3.0 PROPOSED SITE CONDITION

3.1 General Site Improvements

The Owner proposes to construct a "mini-mill" linerboard manufacturing facility, a chip-seal tractor-trailer parking area, asphalt access drive and parking lot, concrete sidewalks, utility infrastructure, and grading and drainage improvements.

A summary of the pre- and post-development site conditions for the watershed areas is presented below:

Surface Description	Pre- Conditions (ac)	Post-Development Conditions (ac)
Impervious Pavements	5.75	22.07
Buildings	13.92	12.59
Gravel Pavements	13.78	1.34
Lawn & Landscaped	13.69	14.50
Brush & Overgrown Land	3.36	0.00
Total	**50.50**	**50.50**

The land-surface cover description for the watershed areas is described as follows:

- Impervious Pavements – Asphalt Pavements, Concrete Pavements, etc.
- Building Coverage – Building Roofs
- Lawn & Landscaped (open green space, parks, etc.) – Good condition
- Brush & Overgrown Land – Unmaintained area consisting of brush and thicket

3.2 Drainage Improvements and Watershed Boundary

The drainage improvements for the site are intended to address three primary stormwater related issues. These issues are:

- Collection of stormwater runoff from the impervious pavements, buildings, and lawn areas and convey it to the stormwater treatment practices
- Limit peak off-site stormwater discharges to levels no greater than those which existed prior to development
- Mitigate the impacts of development on stormwater quality

The grading and drainage schemes for the proposed development are designed to mimic the existing drainage patterns and allow stormwater runoff from the impervious surfaces to sheet flow to the drainage system.

The watershed boundary analyzed for the post-development site condition is equal to the pre-development condition of 50.50-acres and is broken into 50 drainage sub-areas. By utilizing open drainage channels and storm sewer systems, stormwater runoff is conveyed to either a stormwater wet pond or hydrodynamic drainage structures for water quality and quantity treatment.

The overall watershed analyzed under both pre- and post-development site conditions is described in detail under Section 4.0, Stormwater Runoff Computations. The location of the watershed boundaries for the post-development site conditions is depicted on Figure 9 – Post-Development Watershed Boundary Map.

4.0 STORMWATER RUNOFF COMPUTATIONS

4.1 Analysis Method

USDA-SCS TR-55 Tabular Method was utilized for estimating runoff and peak discharges from the subject watershed and stormwater treatment systems. Beardsley Design Associates utilized "Haestad Methods" watershed modeling software (PondPack) for performing the runoff analysis to size the stormwater treatment practices.

4.1.1 Design Storms

Pre- and post-development calculations generated for 1-year, 10-year, and 100-year frequency, 24-hour storm events, were considered individually. Exhibits of the pertinent rainfall frequency maps taken from the "New York State Standards and Specifications for Erosion and Sediment Control" are presented as Appendix C. Type II synthetic rainfall distributions were used in the analysis and are models of intense, brief rainfall events for the portion of the State in which the subject site is situated.

4.2 Comparison of Pre- and Post-Development Runoff

4.2.1 Peak Runoff

The peak flow rates for the pre- and post-development watershed areas are summarized below:

Pre-Conditions Watershed vs. Post-Development Watersheds							
Drainage Outfall (I.D.)		1	2	3	4	5	Total
Watershed Sub-Area (I.D.)	Pre-Conditions	1	2a & 2b	3	4a & 4b	5a & 5b	-
	Post-Conditions	1-20, 22-24, 46	21, 25-36,38-47, 49	48	37	-	-
Area (ac)	Pre-Conditions	9.48	21.30	3.96	13.74	2.02	50.50
	Post-Conditions	19.98	26.49	3.50	0.53	-	50.50
1-Year Storm Peak Flow (cfs)	Pre-Conditions	11.52	49.25	6.24	7.03	1.28	75.32
	Post-Conditions	10.76	43.59	4.99	0.49	-	59.83
10-Year Storm Peak Flow (cfs)	Pre-Conditions	23.10	89.33	12.05	17.36	3.15	144.99
	Post-Conditions	21.46	81.50	11.04	1.28	-	115.28
100-Year Storm Peak Flow (cfs)	Pre-Conditions	33.90	126.02	17.42	27.75	5.03	210.12
	Post-Conditions	25.72	116.89	16.85	2.11	-	161.57

As shown above, for the north portion of the project site the wet pond is effective in mitigating peak flows from the post-development site to levels less than the pre-development conditions. The wet pond retains the peak runoff volumes generated from the watershed areas, treating the runoff through infiltration, evaporation, and evapotranspiration. For the south portion of the project site, the reduction in impervious pavement is sufficient to keep the total runoff from post-development conditions generated by the tributary areas to less than pre-development conditions.

4.2.2 Runoff Volume

The total volume of runoff anticipated to be discharged from the pre- and post-developed watershed areas of the project site is summarized below:

Pre-Conditions Watershed vs. Post-Development Watersheds							
Drainage Outfall (I.D.)		1	2	3	4	5	Total
Watershed Sub-Area (I.D.)	Pre-Conditions	1	2a & 2b	3	4a & 4b	5a & 5b	-
	Post-Conditions	1-20, 22-24, 46	21, 25-36,38-47, 49	48	37	-	-
Area (ac)	Pre-Conditions	9.48	21.30	3.96	13.74	2.02	50.50
	Post-Conditions	19.98	26.49	3.50	0.53	-	50.50
1-Year Storm Volume (ac-ft)	Pre-Conditions	0.99	2.77	0.44	0.94	0.14	5.28
	Post-Conditions	1.28	3.14	0.29	0.03	-	4.75
10-Year Storm Volume (ac-ft)	Pre-Conditions	2.01	5.18	0.87	2.23	0.33	10.61
	Post-Conditions	3.44	6.01	0.64	0.08	-	10.17
100-Year Storm Volume (ac-ft)	Pre-Conditions	2.99	7.46	1.29	3.55	0.52	15.80
	Post-Conditions	5.67	8.77	0.99	0.12	-	15.55

The peak flow conditions for the pre- and post-development watershed areas of the project site are presented in Appendices D and E, respectively.

4.3 Stormwater Drainage Facilities Peak Flows

Stormwater runoff from the proposed impervious pavements will be collected and conveyed to the stormwater treatment practices by drainage structures, storm drains and grass-lined drainage channels. The storm drains and grass-lined channels are capable of conveying the runoff produced by a 10-yr storm event.

Drainage Structure I.D.	Material	Diameter (inches)	Peak Flows (cfs)	Peak Flow Capacity (cfs)
Storm Drain #1	CPEP	12	0.39	5.48
Storm Drain #2	CPEP	18	3.38	8.68
Storm Drain #3	CPEP	12	1.89	5.74
Storm Drain #4	CPEP	18	10.66	12.28
Storm Drain #5	CPEP	12	1.85	6.46
Storm Drain #6	CPEP	30	16.63	33.90
Storm Drain #7	CPEP	12	1.85	7.51
Storm Drain #8	CPEP	30	22.18	33.90
Storm Drain #9	CPEP	12	0.26	4.52
Storm Drain #10	CPEP	12	0.68	5.20
Storm Drain #11	CPEP	12	3.28	7.21
Storm Drain #12	CPEP	12	6.56	9.40
Storm Drain #13	CPEP	12	2.94	4.16
Storm Drain #14	CPEP	12	0.49	2.94
Storm Drain #15	CPEP	12	4.15	8.68
Storm Drain #16	CPEP	24	7.74	16.72
Storm Drain #17	CPEP	30	16.63	30.32
Storm Drain #18	CPEP	12	3.94	4.35
Storm Drain #19	CPEP	24	4.52	16.72
Storm Drain #20	CPEP	24	5.53	16.72
Storm Drain #21	CPEP	12	1.51	2.94
Storm Drain #22	CPEP	18	5.20	8.68
Storm Drain #23	CPEP	12	1.82	2.94
Storm Drain #24	CPEP	24	8.07	18.70
Storm Drain #25	CPEP	18	9.08	10.27
Storm Drain #26	CPEP	12	5.57	7.21
Storm Drain #27	RCP	12	0.88	2.72
Storm Drain #28	CPEP	12	6.17	8.33
Storm Drain #29	CPEP	24	15.11	18.70
Storm Drain #30	CPEP	12	8.70	9.31
Storm Drain #31	CPEP	12	4.02	7.79
Storm Drain #32	CPEP	30	20.43	33.90
Storm Drain #33	CPEP	12	2.09	9.08
Storm Drain #34	CPEP	30	22.51	33.90
Storm Drain #35	CPEP	18	14.17	38.83

Drainage Structure I.D.	Material	Diameter (inches)	Peak Flows (cfs)	Peak Flow Capacity (cfs)
Storm Drain #36	CPEP	36	35.68	55.13
Storm Drain #37	CPEP	36	38.03	55.13
Storm Drain #38	CPEP	36	39.74	55.13
Storm Drain #39	CPEP	36	39.74	55.13
Storm Drain #40	CPEP	12	3.13	7.21
Storm Drain #41	CPEP	12	3.81	9.31
Storm Drain #42	CPEP	24	19.12	26.44
Storm Drain #43	CPEP	18	6.06	8.68
Storm Drain #44	CPEP	12	4.37	5.89
Storm Drain #45	CPEP	12	2.59	4.16
Storm Drain #46	CPEP	24	25.80	37.39
Storm Drain #47	CPEP	36	65.54	69.73
Storm Drain #48	CPEP	12	2.49	4.16
Storm Drain #49	CPEP	12	1.82	4.16
Storm Drain #50	CPEP	12	1.63	2.94
Drainage Channel #1	Grass-lined	-	2.69	6.48
Drainage Channel #2	Grass-lined	-	3.02	5.35
Drainage Channel #3	Grass-lined	-	2.60	6.55

*CPEP = corrugated polyethylene pipe; RCP = rigid concrete pipe

The drainage area boundaries for each of the proposed stormwater drainage structure described above are depicted on Figure 9 – Post-Development Watershed Boundary Map. The computer modeling results of the storm drainage peak flows, storm drain sizing, and energy grade line analysis are presented in Appendix F. A more detailed description of the stormwater facilities proposed as part of the site improvements is presented in Report Section 6.0 – Stormwater Control Structures.

5.0 STORMWATER QUALITY

5.1 Water Quality

The NYSDEC has developed unified approaches for sizing stormwater management practices for satisfying water quality goals for removal of pollutants, reduction of channel erosion, prevention of over-bank flooding, and help in controlling extreme floods. The "90% Rule," as referenced from the New York State Stormwater Management Design Manual, is a water quality practice designed to capture and treat 90% of the average annual stormwater runoff volume from impervious surfaces. This runoff volume known as the water quality volume (WQ_V) is directly related to the amount of impervious cover created at the site. The following equation is used to estimate water quality storage volume WQ_V in acre-feet of storage:

$$WQ_V = \frac{(P)(R_V)(A)}{12}$$

Where: WQ_V = water quality volume (in acre-feet)
P = 90% Rainfall Event Number (Figure 4.1 of New York State Stormwater Management Design Manual) (see Appendix G of this Report)
R_V = 0.05 + 0.009(I), where I is the percent of impervious cover
A = drainage area in acres

It is assumed that by meeting the water quality volume (WQ_V) requirements through the employment practices outlined in Table 3.3 of the NYS Stormwater Management Design Manual, a project will meet water quality objectives (see Appendix G of this Report).

Due to the amount of proposed impervious cover, and available green space and head, the project site utilizes two treatment methods to meet the WQv requirements:

5.1.1 North Portion

With the available green space in the northern portion of the project site, a standard NYSDEC approved wet pond (P-2) is proposed to retain the post-development water quantity rates to below pre-development conditions and to treat the tributary WQv. The wet pond was designed to treat 25% of the existing impervious area, plus 100% of the additional impervious area. The water quality volume (WQ_V) computed for the northern portion of the site is estimated at 0.527 acre-feet, and considers all contributing impervious areas. This WQv is will be retained below the wet pond's 15-inch drain pipe. Refer to Appendix G for a summary of the WQv calculations.

5.1.2 South Portion

The southern portion of the project site is denser with impervious pavements and does not have the green space to construct a standard detention basin or suitable permeable soils to utilize infiltration practices. Therefore, proprietary hydrodynamic systems are proposed to treat the WQv from the southern tributary impervious areas. The proprietary hydrodynamic systems are vortex separators that move the stormwater in a circular, centrifugal manner to accelerate the separation and deposition of primary sediment from the stormwater. These structures are sized on rate-based sizing approach.

A summary of the anticipated water quality flow rates for the proprietary structures is summarized below.

Proprietary Drainage Structure I.D.	Water Quality Storm Peak Flow (cfs)
Sediment Removal System #1 (SR-1)	5.62
Sediment Removal System #2 (SR-2)	4.11
Sediment Removal System #3 (SR-3)	0.47
Sediment Removal System #4 (SR-4)	2.03
Sediment Removal System #5 (SR-5)	2.15
Sediment Removal System #6 (SR-6)	2.10
Sediment Removal System #7 (SR-7)	0.44
Sediment Removal System #8 (SR-8)	0.52
Sediment Removal System #9 (SR-9)	0.71

Design calculations for estimating the water quality storm flow rates are provided in Append G – Stormwater Quality. Refer to Section 6.3 for a description of the proprietary hydrodynamic systems.

5.2 Green Infrastructure Techniques

As discuss above, the project site consists of developed land that is largely covered by impervious pavements and heavily compacted soils with a hydraulic group rating of "D." Therefore, green infrastructure techniques would not be a viable solution to treat the post-development water quality volumes. Stormwater treatment practices for the redevelopment project will consist of a NYSDEC approved traditional stormwater wet pond (P-2) and proprietary hydrodynamic structures to treat the required WQv.

5.3 Standard SMP's with RRv Capacity

In accordance with Section 3.2 of the NYSDEC Stormwater Management Design Manual, the Runoff Reduction Volume (RRV) criteria is not required for redevelopment projects that meet the "Application Criteria" in Section 9.3.1 of the Design Manual. A summary of the "Application Criteria" found in Section 9.3.1 of the Design Manual is provided below.

(1) *An existing impervious area is disturbed then reconstructed as either a pervious or impervious surface.*
   a. The project site's existing impervious area will be disturbed and reconstructed with either pervious or impervious surfaces.
(2) *There is inadequate space for controlling stormwater runoff from the reconstructed area*
   a. The proposed development spans the entire project site. Along the northern portion of the site, where there is an increase in impervious pavements, a traditional stormwater wet pond is proposed. On the south portion, there is a reduction in impervious cover, therefore; water quantity treatment is not required and NYSDEC approved proprietary hydrodynamic drainage structures are proposed for water quality treatment.
(3) *The physical constraints of the site do not allow meeting the required elements of the*

standard practices.

a. The project site is developed and consists of impervious pavements and heavily compacted soil with a hydraulic group rating of "D." Green infrastructure and standard SMP's with RRv capacity are not favorable in these conditions.

5.4 Stream Channel Protection

Stream channel protection volume requirements are designed to protect stream channels from erosion. In New York State, this goal is accomplished by providing 24-hour extended detention of a 1-year, 24-hour storm event. In accordance with Section 9.3.2 of the NYSDEC Stormwater Management Design Manual, in redevelopment cases where the hydrology and hydraulic study shows that the post-construction 1-year 24 hour discharge rate is less than the pre-construction rate, providing 24 hour detention of the 1-year storm to meet the channel protection criteria is not required. As shown in Section 4.2.1, the post-development peak runoff rates are less than pre-development conditions, therefore, the channel protection volumes were not analyzed.

6.0 STORMWATER CONTROL STRUCTURES

6.1 General

All stormwater control structures are classified as permanent structures, unless otherwise noted, for the site development. Permanent stormwater control structures are designed to accommodate peak stormwater discharge based on a 10-year, 24-hour design storm event, as determined by the SCS TR-55 design method.

6.2 Permanent Stormwater Control Structures

This subsection will describe the specific stormwater control structures to be implemented as part of this project.

6.2.1 Catch Basins and Drop Inlets

A total of 16 catch basins and 14 drop inlets collect stormwater runoff intercepted by drainage depressions located within lawn areas or pavement areas of the proposed site. The location for the drainage structures are shown on Drawings C-107 & C-108 (Utility Plan – South & North), accompanying this Report.

The catch basin consists of 5' diameter pre-cast concrete structure with inlet grate cover. The drop inlets consist of 3' x3' square pre-cast concrete structures with inlet grate covers. A sediment sump/trap with a minimum of 2' depth is provided in the catch basin and drop inlets. Typical details for a catch basin and drop inlet are provided within the attached detail sheets accompanying this Report.

6.2.2 Stormwater Manhole

Stormwater manholes are required at locations where storm drains turn direction in order to convey runoff to the next drainage structure in series. Ten 5' diameter pre-cast concrete structures with a manhole frames and covers are proposed for this site.

The location of the stormwater manholes are shown on Drawings C-107 & C-108 (Utility Plan – South & North), accompanying this Report. A typical detail for a stormwater manhole is provided within the attached detail sheets accompanying this Report.

6.2.3 Storm Drains

Storm drains are utilized to convey collected stormwater runoff from impervious areas to the stormwater treatment practices. The existing and proposed storm drains for the site range from 12" to 30" in diameter. Proposed storm drains are either smooth-interior corrugated polyethylene pipe (cpep) or rigid concrete pipe (rcp), while the existing storm drains consist of vitrified clay tile. At the open-end discharge locations, the storm drains are equipped with flared-end sections and riprap stone erosion protection aprons. The stone erosion protection apron is described in more detail in Section 7.3.

The locations and sizes for the storm drains are shown on Drawings C-107 & C-108 (Utility Plan – South & North). Typical utility trench details for installation of storm drains and storm drain

end sections are provided within the attached detail sheets accompanying this Report.

6.2.4 Drainage Channels

Three grass-lined open-channels were analyzed for the project site. The drainage channels are located around the northeastern tractor-trailer parking area to intercept stormwater runoff flowing via sheet and shallow concentrated flows from the tributary grassed areas, as shown on Drawing C-104 (Grading Plan - North).

The stormwater drainage channels are sized using the peak discharge from its respective upstream drainage area and 10-year storm event. The channels are designed with a minimum of 6" of freeboard, and have a maximum channel side slope of 4:1 (h:v). The peak flow analysis and design calculations for the proposed stormwater drainage channels are presented in Appendix F. A detail for the grass-lined channel is provided within the attached detail sheets.

6.3 Stormwater Treatment Practices

6.3.1 Stormwater Wet Pond

A stormwater wet pond (NYSDEC P-2) is proposed within the northern portion of the property site. The basin is proposed as an open-drainage basin designed to safely discharge storm events up to a 100-year frequency. The wet pond has a storage volume of 1.214 acre-feet with a top and bottom embankment elevation of 573.00 and 563.00 (NAVD 1988), respectively.

The wet pond is designed to store the required water quality volume for its tributary areas by retaining this volume within the basin and allowing it to infiltrate into the surrounding soils. The stormwater basin is equipped with a 15-inch drain pipe, **a ten to fifteen foot wide aquatic bench vegetated with aquatic plants (revised 6/24/11)**, an emergency overflow outlet structure consisting of a 4'x4' square catch basin, and a 21-inch outlet pipe to safely release flows approaching larger storm events. The 15-inch drain is set at elevation 564.60' to enable the discharge of 10-year and larger storm events. The overflow catch basin grate is set at elevation 566.75. The basin outlet structure discharges to a 21-inch cpep storm drain, where it will enter into the City of Niagara Falls' combined sewer overflow (cso) system. The embankment side slopes of the basin are approximately 4:1 (h:v), and the basin embankments will have a minimum top width of 10'. Since the side slopes are a maximum of 4:1, per NYSDEC regulations a safety bench is not required. A guide rail is proposed around the basin to prevent unwanted vehicle entry.

Design calculations for estimating the storage requirements and outlet structure discharge rates for the stormwater wet pond are presented in Appendix E. The location of the proposed stormwater wet pond is shown on Drawing C–104 (Grading Plan – North), accompanying this Report. A detail for the wet pond's outlet structure is provided within the attached detail sheets.

6.3.2 Hydrodynamic Structures

With an impervious cover reduction, the amount of runoff produced by the southern portion of the project site is reduced under post-development conditions and therefore, water quantity retention is not required. To treat the required peak rate of runoff from the water quality design storm, hydrodynamic proprietary drainage structures are proposed for the southern portion of the site. By swirling the stormwater runoff in a circular, centrifugal manner, the structures

accelerate the separation and deposition of sediment from the stormwater. The hydrodynamic structures for the project site are selected from the NYSDEC's approved list of proprietary practices. The storm drain system located along the southern portion of the project site discharges to a 36-inch cpep storm drain, where it will enter into the City of Niagara Falls' combined sewer overflow (cso) system along Royal Avenue.

Design calculations for estimating the water quality storm flow rates for each of the hydrodynamic structures is presented in Appendix G. The locations of the proposed hydrodynamic structures are shown on Drawings C–107 & C-108 (Utility Plan – South & North), accompanying this Report. A detail for the structure is provided on Drawing C-501 (Site Details).

7.0 EROSION CONTROL MEASURES

7.1 General

Structural erosion and sediment control measures are classified as either temporary or permanent, according to how they are used. Temporary structural measures shall be used during construction to prevent offsite sedimentation. Permanent structural measures shall be utilized following construction and shall be implemented to convey surface water safely to the existing drainage ways present in the pre-development condition. The permanent structural measures shall remain in place and continue to function after the completion of construction. General construction notes and maintenance plan for implementing the temporary and permanent stormwater and erosion control structures during and after construction have been developed for the site. The proposed temporary erosion control structures for the project site are depicted on Drawings C-105 & C-106 (Erosion and Sediment Control Plan – South & North). The proposed permanent structural measures are depicted on Drawings C-107 & C-108 (Utility Plan – South & North).

Erosion control measures shall be inspected weekly and after heavy rains by a qualified professional experienced in erosion and sedimentation control techniques until the site is completely stabilized. Inspections of erosion control structures are described under Section 9.0 - Site Assessment and Inspection, and shall be in accordance with the New York State Pollution Discharge Elimination System for Construction Activities GP-0-10-001 (SPDES) program. The Owner is responsible for filing a Notice of Intent (NOI) Form with NYSDEC prior to commencement of construction activities. A copy of a NOI form is provided as Appendix H.

7.2 Temporary Structural Measures

This subsection describes the specific temporary control measures to be implemented to reduce and/or eliminate erosion and sedimentation during the construction phase of this project. The Contractor shall install and maintain any additional temporary erosion control measures required beyond those identified on the construction drawings to keep the site in conformance with the NYSDEC "Standards and Specifications for Erosion and Sediment Control."

7.2.1 Silt Fence

A temporary barrier of geotextile fabric (filter cloth) shall be used to intercept sediment-laden runoff along the borders of disturbed site areas during construction. The silt fence requires periodic maintenance and should be checked for tears or clogging with silt or debris. Silt can be removed from the woven filter cloth with a stiff brush if clogging occurs. Standard details for silt fence installation are presented in Appendix I, as well as shown on Drawing C-501 (Site Details).

7.2.2 Stabilized Construction Entrance

A stabilized pad of aggregate underlain with separation fabric shall be positioned at points where traffic will be entering or leaving the construction site area onto public roads. This measure will reduce the tracking of soils onto public roads or streets. A standard detail for a stabilized construction entrance is presented in Appendix I, as well as shown on Drawing C-501 (Site Details).

7.2.3 Sediment Trap

A temporary stone outlet sediment trap shall be utilized during construction to intercept sediment-laden runoff and retain sediment prior to discharge into permanent drainage facilities. Temporary sediment traps shall be installed in the areas of construction prior to any earth disturbance. The sediment traps will be placed in temporary surface drainage ways prior to runoff leaving the site, and will consist of over excavating around selected drainage structures. Sediment traps will be limited to maximum drainage areas of 2 acres and provide sediment storage volume of 1,800 cubic feet (cf) for each acre of drainage area. Standard details for temporary sediment traps are provided in Appendix I, as well as shown on Drawing C-501 (Site Details).

7.3 Permanent Structural Measures

7.3.1 Storm Drain End Section

Storm drain end sections shall be placed at the storm drain outlets that discharge to/from the storm drains for reducing the depth, velocity, and energy of water movement. Materials used for construction of the stone outlet protection consist of riprap stone comprised of fieldstone or rough quarry stone. The stone shall be composed primarily of larger stone sizes but with a sufficient mixture of other sizes to fill the smaller voids between the stones. The larger stones shall have a maximum diameter of 9" and a minimum diameter of 4". The minimum thickness of the apron shall be 14". The stone shall be hard and angular, and of a quality that will not disintegrate on exposure to water or weathering. The maintenance needs of these structures are very low. They should be inspected after high flows to see if scour beneath the rock protection has occurred, or if any stones have been dislodged. A standard detail for a riprap end section is provided within the attached detail sheets accompanying this Report.

7.3.2 Stormwater Wet Pond

A stormwater wet pond is a man-made basin that is utilized to treat stormwater through retention and convey overflows to the storm drain system. Refer to Section 6.3.1 for further design information, sizing, and components of the proposed stormwater wet pond.

7.3.3 Hydrodynamic Drainage Structures

A hydrodynamic drainage structure is a drainage structure that uses proprietary design to swirl stormwater runoff in a centrifugal manner, thus separating sediment from the stormwater. Refer to Section 6.3.2 for further information on the design considerations, sizing, and components of the proposed hydrodynamic drainage structures.

7.4 Maintenance of Temporary and Permanent Control Structures

7.4.1 Stormwater Facilities during Construction

Temporary stormwater and erosion control structures must be constructed in accordance with their design intent and maintained to prevent sediment-laden runoff from leaving the site during construction. In general, the temporary structures during construction should be inspected by a qualified professional at least every seven calendar-days and maintained as follows:

- Stabilized construction entrance shall be inspected periodically and after each rainfall; and

the entrance cleaned, repaired, or replaced, as required. The temporary construction entrance shall be removed when construction is completed and all disturbed areas are stabilized.

- Temporary sediment traps shall be installed prior to earth disturbance. Sediment traps shall be inspected weekly, and the traps cleaned and restored to their original size when sediment has accumulated to one-half of the basin depth. Temporary sediment traps shall be removed and the area stabilized when their contributory drainage area is stabilized.

- Temporary silt fences and sediment interceptors shall be installed prior to earth disturbance to reduce runoff velocity and transportation of sediment. The stabilization structures shall be inspected weekly; and the structures cleaned, repaired, or replaced as required. Temporary stabilization structures shall be removed when their contributory drainage area is stabilized.

- Temporary grass-lined channels shall be installed to divert runoff to sediment traps. The channels shall be inspected weekly to insure their stability and to locate points of scour, rodent-holes, breaches, and deposition of sediment or other obstructions. The channels shall be cleaned, repaired, and re-seeded, as required. Temporary channels shall be removed and the area stabilized when their contributory drainage area is stabilized

- Temporary channel protection consisting of stone check dams along the channel invert shall be provided to prevent sediment-laden runoff from entering downstream drainage facilities. The check dams shall be inspected weekly; and the structures cleaned, repaired, or replaced, as required. The check dams shall be removed when all disturbed areas are stabilized.

- All permanent drainage structures, installed as part of the site improvements, shall be inspected weekly to insure structural integrity, detect vandalism and damage, and for cleaning. Permanent drainage structures shall be repaired or replaced, as required.

- Upon final grading of topsoil, all disturbed soil areas shall be seeded and mulched. All seeded areas shall be inspected monthly and after every rainfall and the areas repaired and re-seeded, as required.

7.4.2 Permanent Stormwater Facilities after Construction

Permanent stormwater control structures must be constructed in accordance with their design intent and maintained on a routine basis to remain effective. In accordance with Part V.A.4.c of the SPDES General Permit GP-0-10-001, the Owner is responsible for the maintenance of the permanent stormwater management practices. In general, the structures after construction should be inspected periodically and maintained as follows:

- Permanent stormwater drainage structures (catch basins, drop inlets, storm manholes, hydrodynamic structures, stormwater wet pond outlet structure, and storm drains) shall be inspected semi-annually and after every heavy rainfall to insure structural integrity, detect vandalism and damage, and for cleaning. The structures shall be repaired or replaced, as required.

- The stormwater wet pond shall be inspected semi-annually and after every heavy rainfall to insure structural integrity, detect vandalism and damage, and for cleaning. The outlet structure shall be repaired or replaced, as required.

- Stone erosion protection aprons located at the storm drain outlet and basin outlet structure shall be inspected semi-annually and after every heavy rainfall to insure structural integrity and that the stone has not been bypassed nor developed excessive scour at the stone base, or that sediment has built up. Sediment accumulated within the riprap stone erosion protection shall be removed, or stone replaced, as required, to allow the emergency-outlet to drain through the stone to reduce erosive velocities and prevent large flows from carrying sediment over their tops.

- Grass-lined drainage channels shall be inspected semi-annually and after every heavy rainfall to insure structural integrity and to detect erosion/scouring of the channel. Sediment accumulated within the channel shall be removed, as required, to allow the channel to convey stormwater properly.

- Permanent lawns and landscaped areas shall be inspected and maintained on a regular basis, consistent with favorable plant growth, soil, and climatic conditions to insure soil protection and structural integrity of the site's plant cover. Maintenance involves regular seasonal work for mowing, fertilizing, liming, watering, pruning, fire controls, weed and pest control, re-seeding, and timely repairs, as required. Maintenance of vegetative areas shall also include removal of debris and protection from unintended uses or traffic.

8.0 SITE WASTE MANAGEMENT AND SPILL PREVENTION

The following sections provide a description of pollution prevention measures utilized to control litter, construction chemicals, and construction debris from becoming a pollutant source to stormwater discharges. In addition, storage practices to minimize the exposure of materials to stormwater, as well as, spill prevention and response measures are described in this section.

8.1 General

The following information describes Spill Prevention, Containment, and Countermeasure Planning for the project.

Personnel responsible for the oversight of the petroleum products and hazardous or controlled substances include:

a. Construction Manager
b. Job-site Coordinators designated by the Construction Manager

8.2 Petroleum Products and Hazardous or Controlled Substances

Petroleum products and hazardous or controlled substances will be stored at the temporary storage and staging area. It is anticipated that the following hazardous or controlled substances and petroleum products will be stored on site, within regulatory approved containers.

a. Gasoline
b. Diesel Fuel
c. Equipment Oils and Lubricants
d. Commercial Fertilizer

8.3 Pollution Prevention

The following sections provide a description of pollution prevention measures that will be used to control litter, construction chemicals, and construction debris from becoming a pollutant source to the stormwater discharges. In addition, storage practices to minimize the exposure of materials to stormwater as well as spill prevention and response measures are detailed.

8.3.1 Material Delivery and Storage

a. Locate material storage and delivery areas at a minimum distance of 100 feet away from any drain inlet and surface water bodies.
b. Keep inventory low.
c. Store dry chemicals and bagged materials on pallets.
d. Store all flammable products away from any heat and/or ignition source.
e. Provide secondary containment for hazardous liquids.
f. Keep designated storage areas clean and well organized. Conduct weekly inspections to

check for damaged containers, leaks, etc.

g. Comply with State and Local requirements for storage of hazardous waste.

h. During the wet season, cover chemicals, drums, and bagged materials to prevent contact with rainwater (e.g. tarps, bins, structures).

i. During the wet season, cover secondary containment areas to prevent accumulation of water.

j. Keep chemicals labeled and in original containers.

k. Train all Construction Workers on the proper use of storage area.

8.3.2 Spill Prevention and Control

a. Notify all Construction Workers of the location of materials used to cleanup spills.

b. Store spill cleanup materials on site and near potential spill areas.

c. Keep commercially available spill kits for construction equipment on site.

d. Keep drums, barrels, temporary storage bags, or equivalent materials for containment and transportation on site.

e. Keep absorbent pads, oil booms, mat, or equivalent materials on site.

f. Keep washable, reusable rags for cleaning up small lubricant leaks on site.

g. Train employees and subcontractors on proper spill prevention and control methods.

h. Never hose down or bury dry material spills. Cleanup as much as possible and dispose of properly.

i. In the event of a spill occurrence, the following actions are to be taken:

- Document the spill and Report to the project Construction Manager and Job-site Coordinator.
- For spills less than 5 gallons on an impervious surface, attempt to confine and clean the spill.
- For spills greater than 5 gallons, attempt to confine the spill and call a remediation contractor if assistance is required with product recovery and containment.
- For spills greater than 5 gallons, Report to NYSDEC Region 9 Spill Prevention and Response (716-851-7220) within two hours of discovery.
- Provide written documentation of the spill.
- Disposal of recovered materials must be conducted in accordance with State and federal regulations.

8.3.3 Solid Waste Management

a. Provide as many waste bins as needed to keep site clean of litter and waste.

b. During the wet season, waste bins must be covered to prevent runoff from trash.

c. Collect trash on a daily basis.

d. Arrange for regular waste collection by a licensed trash hauler.

e. Segregate and recycle waste materials (e.g. paints, solvents, oil, etc.)

f. Provide covered waste bins for disposal of all empty products (e.g. Paints, solvents, glues, pesticides, etc.)

g. Locate waste container storage area(s) at a minimum distance of 100-feet away from any drain inlet and surface water bodies.

h. Provide secondary containment for hazardous waste containers.

i. Comply with all Local and State solid waste disposal and nuisance requirements.

j. Do not hose out waste containers on site.

k. Train employees and subcontractors to use proper solid waste management.

8.3.4 Vehicle & Equipment Maintenance

a. Do not discharge vehicle/machinery wash waters or solvents to storm drains or to surface water bodies.

b. Locate areas for fueling and maintenance at a minimum distance of 100-feet away from any drain inlet and surface water bodies.

c. Any equipment, which must be refueled in the field, will be refueled from tanks carried to the work site by truck.

d. Prevent spills and leaks during fueling and maintenance operations.

e. Inspect and maintain vehicles regularly to minimize leaks and drips; place drip pans or absorbent materials under leak-prone machinery when idle.

f. Comply with Federal, State, and Local requirements for fuel storage tanks.

8.3.5 Landscaping Operations

a. Carefully follow recommended usage instructions for the application of all fertilizer.

b. Disposal of trees, brush, or other debris in any stream corridor, wetland, or surface water is prohibited.

c. Avoid applications of fertilizers prior to storm events.

d. Apply fertilizers in multiple smaller applications, as opposed to on large application.

e. Train all construction workers in the proper use of landscaped materials and chemicals.

8.3.6 Concrete Management

a. Avoid mixing excess amounts of concrete or fresh cement on site.

b. Store concrete, grout, and mortar under cover and away from drainage areas.

c. Designate a wash out area on site and insure that material can not flow to storm drains, open ditches, streets, or surface water bodies by constructing a temporary pit or bermed area.

d. Concrete from washout area should be allowed to set. Upon completion of the concrete work, the Contractor shall break up, remove, and haul away solid concrete that has accumulated in the washout.

e. Train all construction workers in proper concrete waste management.

8.3.7 Sanitary/Septic Waste Management

a. Locate sanitary facilities for convenient access and at a minimum of 100-feet away from drain inlets and surface water bodies.

b. Untreated raw wastewater may not be discharged to land, the storm drain system, or to surface water bodies.

c. Sanitary/septic facilities should be maintained in good working order by a licensed service.

d. Arrange regular waste collection by a licensed hauler before facilities overflow.

e. If washing out of interior or portable toilets is needed, insure that wash water is discharged to land and does not flow into street, the storm drain system, or surface water bodies.

9.0 SITE ASSESSMENT AND INSPECTION

9.1 Initial Inspection

The Owner shall have a qualified inspector conduct an assessment of the site prior to the commencement of construction. The qualified inspector shall certify that the appropriate erosion and sediment control methods as described in this SWPPP and as required by the permit have been adequately installed or implemented to ensure overall preparedness of the site for commencement of construction. The qualified inspector shall meet the requirements of the SPDES General Permit for Stormwater Runoff from Construction Activity, GP-0-10-001.

9.2 Inspections and Records During Construction

9.2.1 Inspection Frequency

After construction commences, site inspections shall be conducted by the qualified inspector at least every seven (7) calendar days. During instances when construction disturbances are greater than 5 acres the qualified inspector shall conduct at least two (2) site inspections every seven (7) calendar days, for as long as greater than 5 acres of soil remain disturbed. When performing just two inspections every seven (7) calendar days, the inspections shall be separated by a minimum of two full calendar days. Prior to filing a Notice of Termination (NOT) Form with NYSDEC or at the end of the permit term, the Owner shall have a policy and procedures in place that ensure operation and maintenance of the practices in accordance with the operation and maintenance plan, and shall have the qualified inspector perform a final site inspection.

9.2.2 Records During Inspection

Subsequent of each site inspection, the qualified inspector shall prepare an inspection Report. The Report shall include and/or address the following items:

- Date and time of the inspection
- Name, title, and signature of person(s) performing the inspection
- A description of the weather and soil conditions at the time of the inspection
- A description of the condition of the runoff at all points of discharge from the construction site, including identification of any discharges of sediment from the construction site. (including conveyance systems and overland flow)
- Digital photographs with date stamp that show condition of all practices that have been identified as needing corrective actions. Hard color copies of the photographs shall be attached to the inspection Report.
- Digital photographs with date stamp that show condition of all practices after the correction action has been completed. Hard color copies of the photographs shall be attached to the inspection Report.
- Identification of all erosion and sediment control practices in need of repair or maintenance
- Identification of all erosion and sediment control practices that were not installed properly or are not functioning as designed and need to be reinstalled or replaced
- Description and sketch of areas that are disturbed at the time of the inspection and areas that have been stabilized since the last inspection

- Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards
- Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practice; and to correct deficiencies identified with the construction of the post-stormwater management practices

9.2.3 SWPPP Updates

The Owner and the selected Contractor(s) shall keep the SWPPP current so that at all times it accurately documents the erosion and sediment control practices that are being used or will be used during construction, and all post construction stormwater management practices that will be constructed on site. At a minimum, the SWPPP shall be amended:

- When current practices prove to be ineffective in minimizing pollutants in stormwater discharges
- When there is a change in design, construction, or operation at the construction site that has or could have an effect on the discharge of pollutants
- To address issues or deficiencies identified during an inspection by the qualified inspector, NYSDEC or other regulatory agency.

9.2.4 Inspection Log Book

The Owner and their selected Contractor(s) shall maintain an inspection logbook, which shall contain a record of all inspection Reports. The site logbook shall be maintained on site and shall be made available to the permitting authority upon request. The Owner and/or the selected Contractor shall post at the site, in a publicly accessible location, a summary of the site inspection activities on a monthly basis. Copies of the Site Inspection forms are provided in Appendix J.

9.2.5 Suspending Inspections

If soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and temporary stabilization measures have been applied to all disturbed activities, the Owner can stop conducting the maintenance inspections. The Owner shall begin conducting the maintenance inspections as soon as soil disturbances resume.

9.2.6 Certifications

At the final site inspection, the qualified inspector shall verify all disturbed areas have achieved final stabilization; and all temporary, structural erosion and sediment control measures have been removed, and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP. The Owner shall certify that the requirements of the permit have been satisfied, and submit a Notice of Termination (NOT) Form with NYSDEC. A copy of the NOT form is also provided as Appendix H.

10.0 SWPPP CERTIFICATION & SITE CONTACT INFORMATION

10.1 Qualified Personnel

Identified below are the descriptions of the qualified personnel, referenced from SPDES General Permit GP 0-10-001, along with the individual's contact and certification information.

10.1.1 Trained Contractor

A Trained Contractor is an employee from the contracting (construction) company that has received four (4) hours of NYSDEC endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other NYSDEC endorsed entity. After receiving the initial training, the Trained Contractor shall receive four (4) hours of training every three (3) years. A Trained Contractor can also be an employee from the contracting (construction) company that meets the qualified inspector qualifications.

A Trained Contractor will be responsible for the day-to-day implementation of the SWPPP. Refer to Section 10.2 for the Trained Contractor's certification and contact information.

10.1.2 Qualified Inspector

A Qualified Inspector (QI) is a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or other NYSDEC endorsed individual(s) such as someone working under the direct supervision of the licensed Professional Engineer, CPESC, or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual has received four (4) hours of NYSDEC endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other NYSDEC endorsed entity. After receiving the initial training, the trained individual shall receive four (4) hours of training every three (3) years.

Qualified Inspector: _____

Qualified Inspector's Employer: _____

Title: _____

Address: _____

_____

Phone: _____ Fax: _____

Certification: _____ Date Received: _____

Qualified Inspector: _____

Qualified Inspector's Employer: _____

Title: _____

Address: _____

_____

Phone: _____ Fax: _____

Certification: _____ Date Received: _____

Qualified Inspector: _____

Qualified Inspector's Employer: _____

Title: _____

Address: _____

_____

Phone: _____ Fax: _____

Certification: _____ Date Received: _____

10.2 Contractor's/Sub-Contractor's Certification & Contact Information

All Contractors and Sub-Contractors agree to the following certification statement referenced from SPDES General Permit GP 0-10-001:

Project: Greenpac Partnership – New Paper Mill
4001 Packard Road
Niagara Falls, NY 14304

Certification Statement

"I hereby certify that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector. I also understand that the *owner or operator* must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings."

Contractor: _____

Trained Contractor's Signature: _____ Date: _____

Title: _____

Address: _____

_____

Phone: _____ Fax: _____

Description of Work: _____

_____

Sub-Contractor: _____

Trained Contractor's Signature: _____ Date: _____

Title: _____

Address: _____

_____

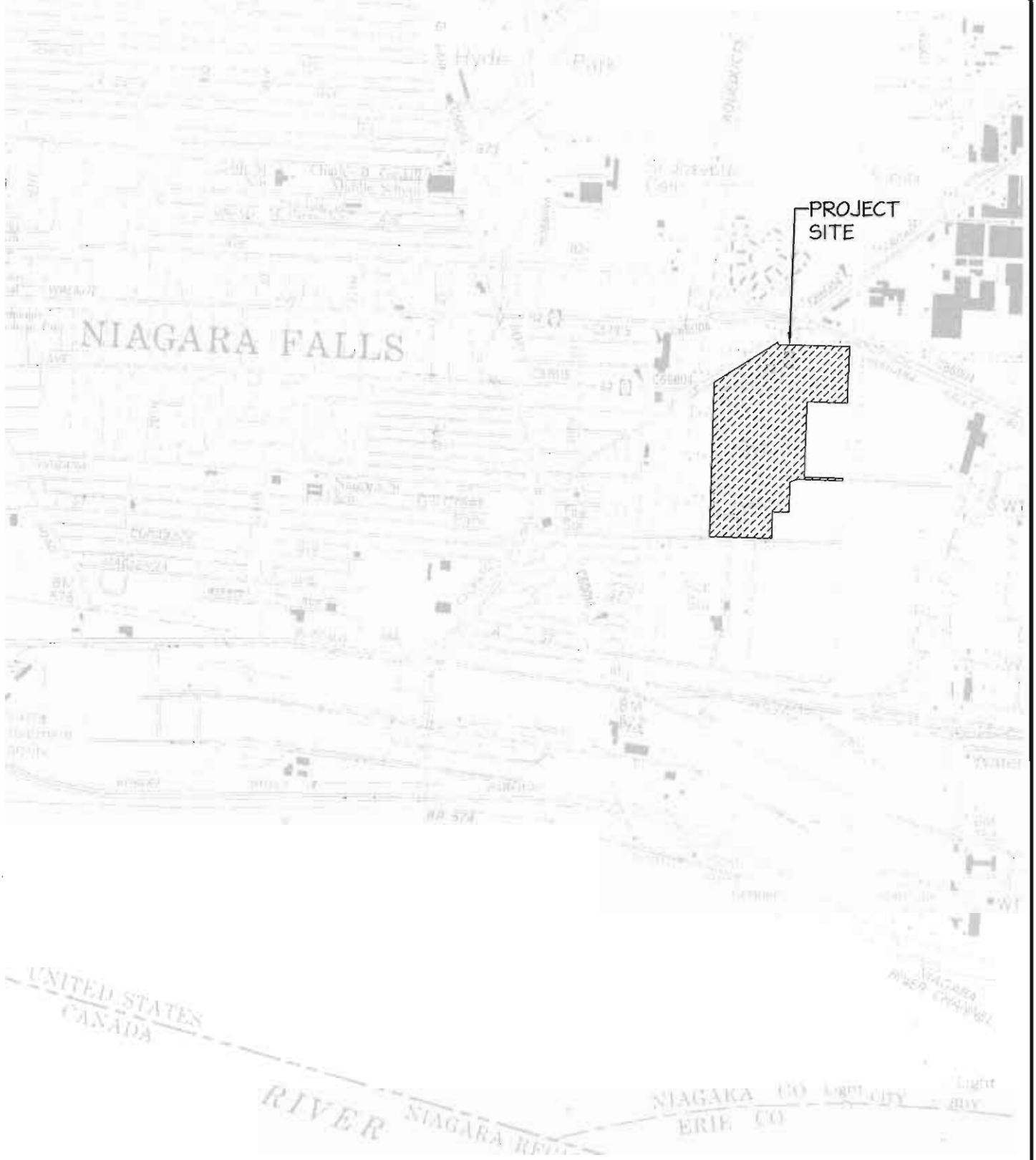
Phone: _____ Fax: _____

Description of Work: _____

_____

(For additional sub-contractors, copy this page)

FIGURES



PROJECT ADDRESS:
4001 PACKARD ROAD,
NIAGARA FALLS, NY 14304

WARNING
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NEW PAPER MILL
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TRADE

SITE LOCATION MAP

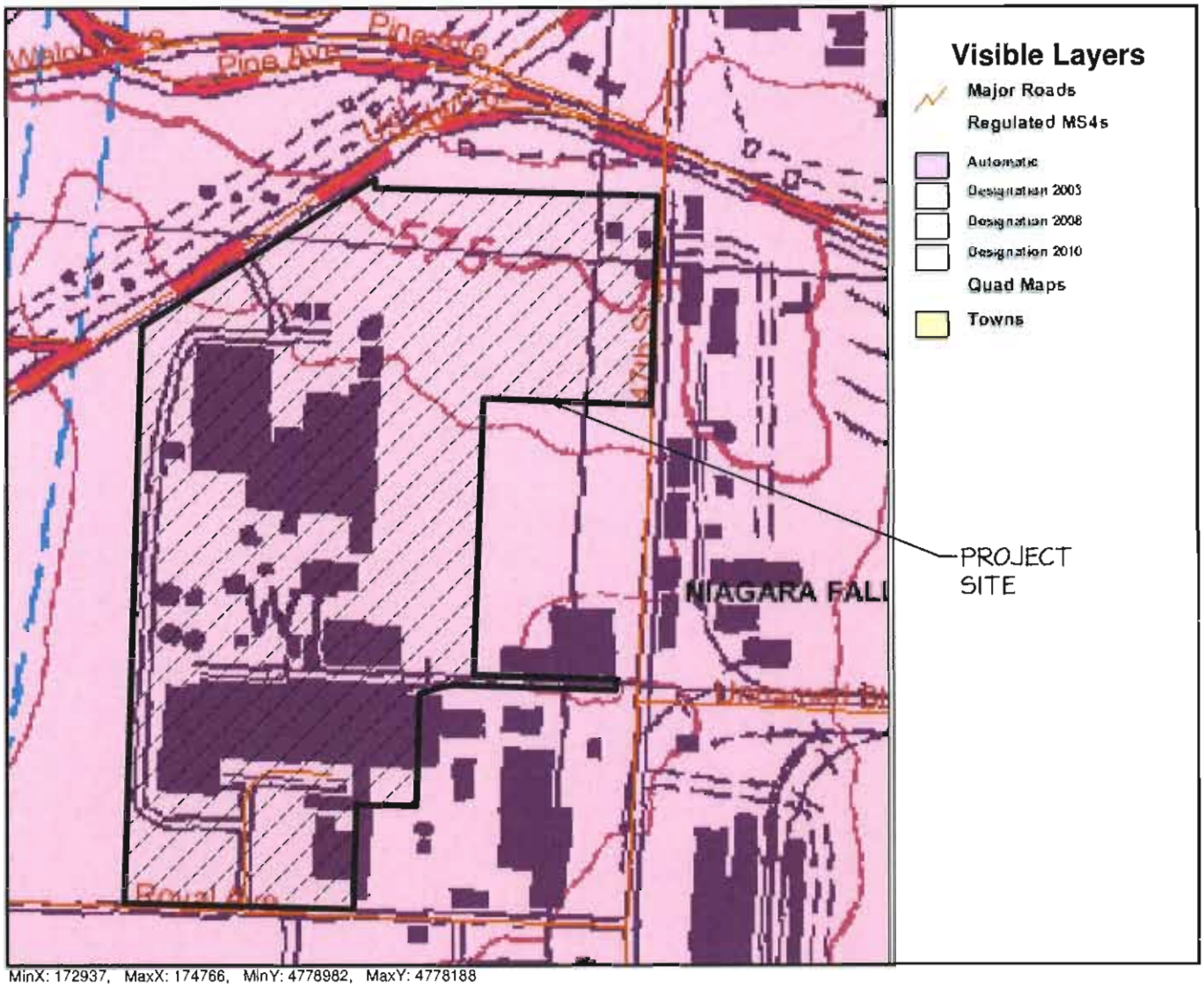
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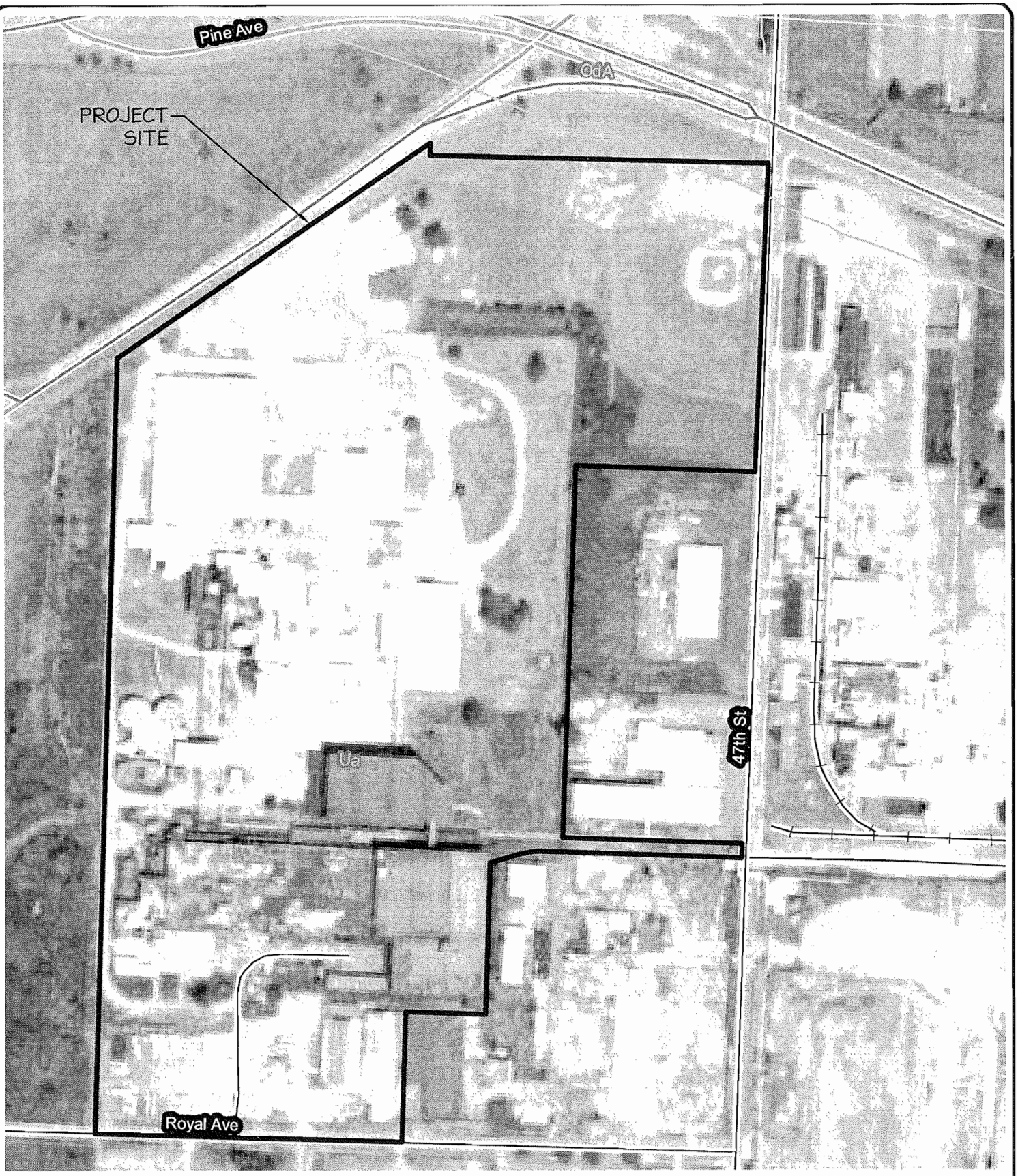
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Municipal Separate Storm Sewer System Jurisdiction

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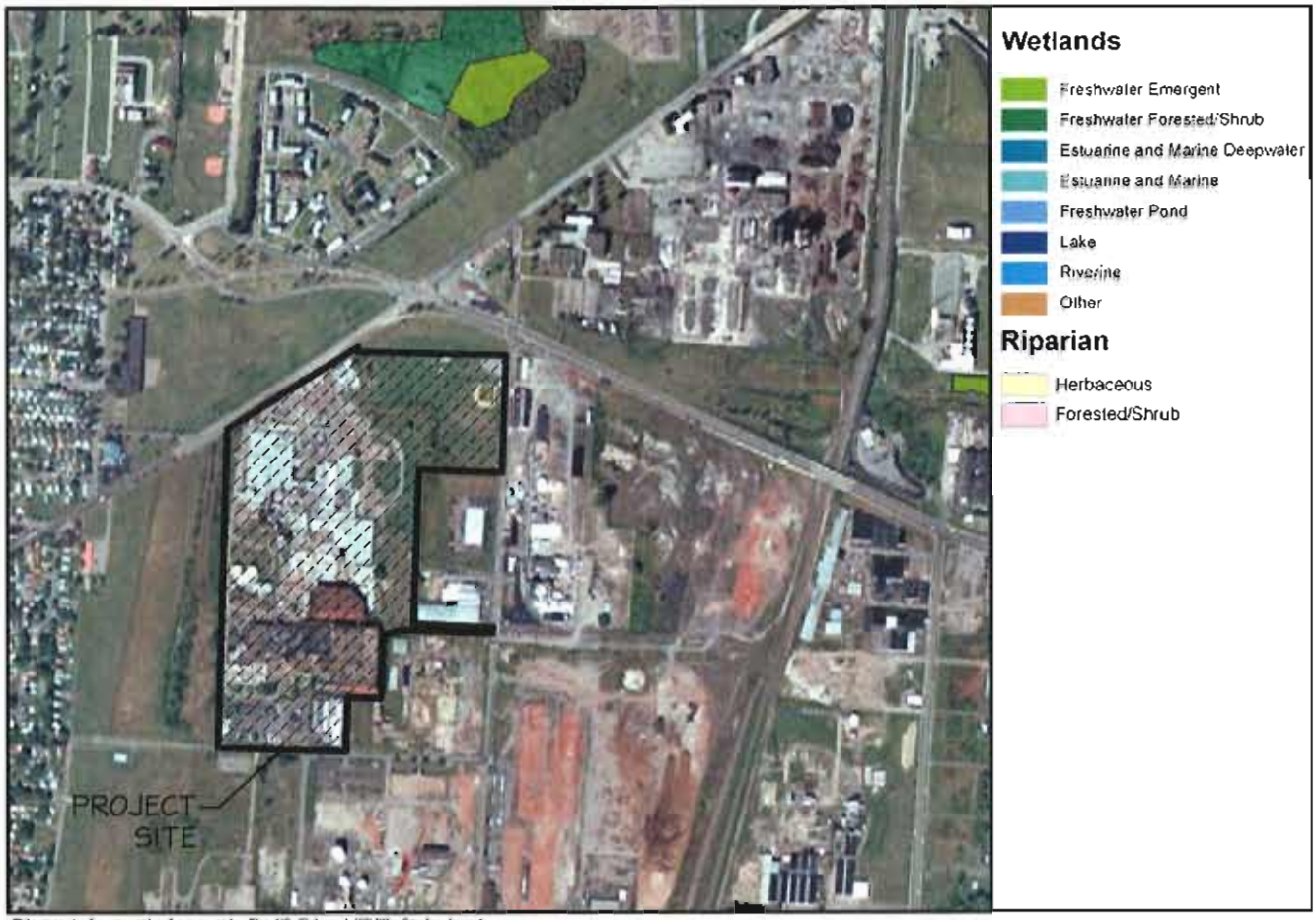
SITE SOILS MAP

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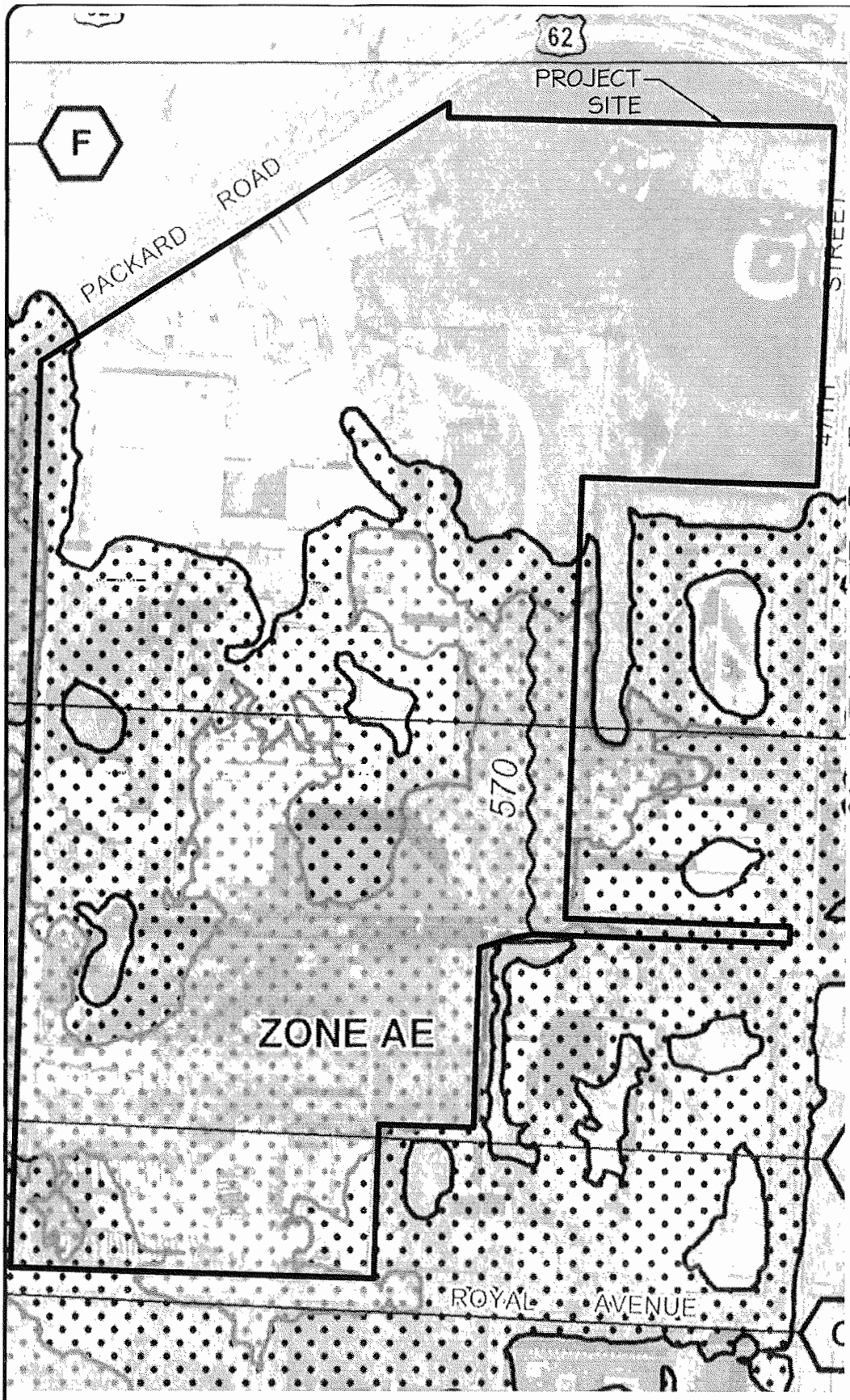
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TRADE
U.S. FISH AND WILDLIFE SERVICES NATIONAL WETLANDS INVENTORY

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LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A — Cross section line

23 — 23 — Transect line

87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

76 ° ' N — 1000-meter Universal Transverse Mercator grid values, zone 18

600000 FT — 5000-foot Tick: New York State Plane coordinate system, west zone (FIPSZONE 3103), Transverse Mercator

DX5510 x — Bench mark (see explanation in Notes to Users section of this FIRM panel)

• M1.5 — River Mile

NATIONAL FLOOD INSURANCE PROGRAM — NFIP

PANEL 0309E

FIRM

FLOOD INSURANCE RATE MAP

for NIAGARA COUNTY, NEW YORK (ALL JURISDICTIONS)

CONTAINS:

COMMUNITY	NUMBER
NIAGARA FALLS, CITY OF	360506

PANEL 309 OF 430

MAP SUFFIX: E

(SEE MAP INDEX FOR EFFECTIVE PANEL LAYOUT)

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER 36063C0309E

EFFECTIVE DATE SEPTEMBER 17, 2010

Federal Emergency Management Agency

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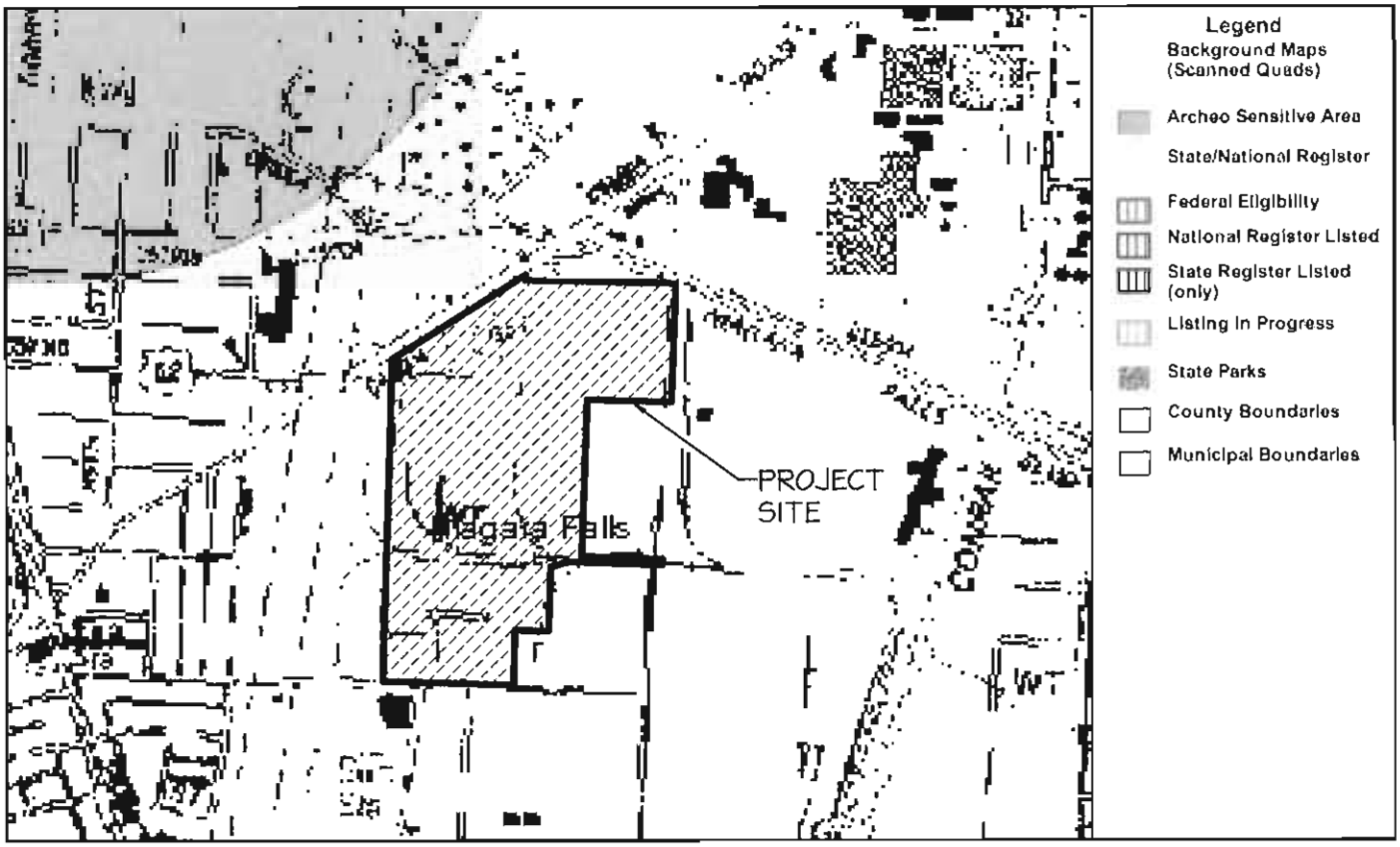
FEMA FLOODPLAIN MAP

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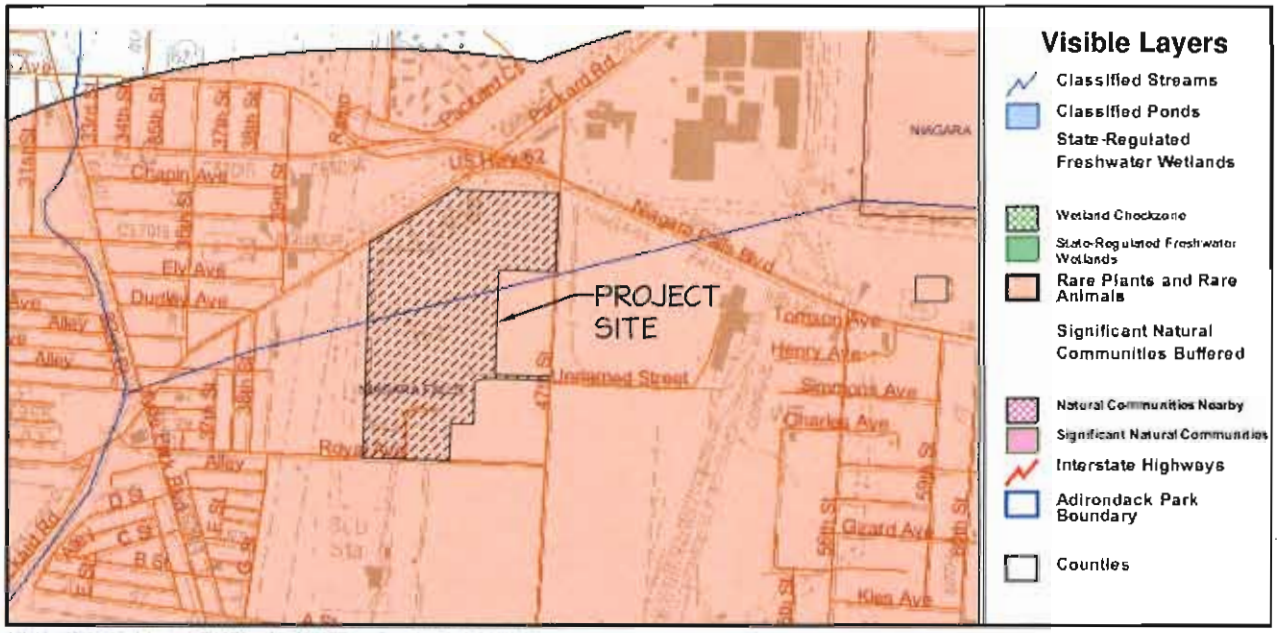
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NYS OPRHP
ARCHEOLOGY & NATIONAL
REGISTER MAP

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SITE BIODIVERSITY MAP

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PRE-DEVELOPMENT WATERSHED BOUNDARY MAP

SCALE: NONE

PACKARD ROAD
Variable Width
N 65°00'45" E
457.18'
50' EASEMENT TO NIAGARA FALLS POWER CO.
L 437 P. 138
10" CITY WATER
Edge of Pavement
Curb
Curb Cut
Fire Hose Shed
Light Pole
Fence
Edge of Sidewalk
Gas Line
Gas Enclosure
WELL
Tower
Pole
Fence Line
Centerline of Drive
Area of Power Substation
Monitoring Station Mill No. 1
EX FLUME HOUSE
PUMP HOUSE
TANK
Hyd. Bldg
Concrete Wall
Concrete Pad
Gazebo Pad
Die Tank
Dugout
Pile
Brush
Edge of Brush
Gravel Area
Existing 1-St Block Building
Overhead Utility Lines
Boring B-1
Boring B-2
Boring B-3
Boring B-4
Boring B-5
Monitoring Well
Area of Power Substation
Entering Well
SOUTH METER
Edge of Tarvia
Tarvia Drive
Ex. Building
Bldg
Gate
Street Line
Centerline per Deed
Centerline of Existing Pavement
2-Manholes
Manhole
Ex IP
8" CITY WATER
ROYAL AVENUE
47th STREET
Existing 1-St Block Building
Gas Valve
Pipe Bridge
Concrete
Fence Line
Street Line

N 04°14'45" E 606.09'
N/F NIAGARA MOHAWK POWER CORPORATION
S 04°14'45" W 603.84'
N/F VEROST PARTNERSHIP
N/F 5335 RIVER ROAD INC.
N/F NIAGARA MOHAWK POWER CORPORATION
S 04°14'45" W 344.20'
S 04°15'45" W 114.92'
S 04°15'45" W 98.89'
N 04°14'45" E 295.13'
S 04°14'45" W 240.66'
S 04°14'45" W 639.33'
N 04°14'45" E 1158.52'
S 85°44'15" E 700.33'
S 85°56'00" E 469.80'
N 85°56'00" W 412.64'
S 85°56'00" E 166.72'
N 85°56'00" W 345.54'
S 85°56'00" E 18.44'
S 82°12'30" W 38.35'
R=291.67'
753.56'
S 86°07'48" E
424.05'
351.47'
254.41'
399.95'
400.00'
460.21'
320.00'
146.58'
199.99'
106.13'
29.10'
Parcel X

DRAINAGE AREA I.D.	DRAINAGE AREA (AC.)
1a	0.39
1b	1.63
1c	12.30
1d	9.48
1e	1.44
2a	19.34
2b	1.96
3	3.96
TOTAL	50.50

KEY LEGEND

WATERSHED BOUNDARY

(1) DRAINAGE AREA I.D.

(1) DRAINAGE OUTFALL I.D.

TC ROUTE

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CIVIL
PRE-DEVELOPMENT WATERSHED BOUNDARY MAP

GREENPAC PARTNERSHIP NEW PAPER MILL

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A POST-DEVELOPMENT WATERSHED BOUNDARY MAP

SCALE: NONE

PACKARD ROAD

ROYAL AVENUE

47th STREET

N/F NIAGARA MOHAWK POWER CORPORATION

N/F VEROST PARTNERSHIP

N/F 5335 RIVER ROAD INC.

DRAINAGE CHANNEL #1

DRAINAGE CHANNEL #2

DRAINAGE CHANNEL #3

STORMWATER BASIN

DETENTION

FOREBAY

EX FLUME HOUSE

PROCESS WASTEWATER

KEY LEGEND

WATERSHED BOUNDARY

DRAINAGE AREA I.D.

DRAINAGE OUTFALL I.D.

TC ROUTE

DRAINAGE AREA I.D.	DRAINAGE AREA (Ac.)
1	0.93
2	0.09
3	0.70
4	0.44
5	1.31
6	0.43
7	1.13
8	0.43
9	1.01
10	0.06
11	0.76
12	0.10
13	1.10
14	0.36
15	0.31
16	0.12
17	0.71
18	1.32
19	1.60
20	4.23
21	0.92
22	0.88
23	0.35
24	1.22
25	0.34
26	0.41
27	0.85
28	1.17
29	4.34
30	1.10
31	0.74
32	0.37
33	1.89
34	1.92
35	0.60
36	0.22
37	0.53
38	0.68
39a	2.66
39b	2.66
40	0.71
41	0.64
42	0.56
43	0.50
44	1.08
45	1.14
46	0.39
47	0.58
48	3.50
49	0.41
TOTAL	50.50

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NEW PAPER MILL

CIVIL
POST-DEVELOPMENT WATERSHED BOUNDARY MAP

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APPENDIX A

SPDES GENERAL PERMIT, GP-0-10-001

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SPDES GENERAL PERMIT
FOR STORMWATER DISCHARGES

from

CONSTRUCTION ACTIVITY

Permit No. GP-0-10-001

Issued Pursuant to Article 17, Titles 7. 8 and Article 70
of the Environmental Conservation Law

Effective Date: January 29, 2010 Expiration Date: January 28, 2015

William R. Adriance
Chief Permit Administrator

William R. Adriance — January 28, 2010
Authorized Signature — Date

Address: NYS DEC
Div. Environmental Permits
625 Broadway, 4th Floor
Albany, N.Y. 12233-1750

PREFACE

Pursuant to Section 402 of the Clean Water Act ("CWA"), stormwater *discharges* from certain *construction activities* are unlawful unless they are authorized by a *National Pollutant Discharge Elimination System ("NPDES")* permit or by a state permit program. New York's *State Pollutant Discharge Elimination System ("SPDES")* is a NPDES-approved program with permits issued in accordance with the *Environmental Conservation Law ("ECL").*

This general permit ("permit") is issued pursuant to Article 17, Titles 7, 8 and Article 70 of the ECL. An *owner or operator* may obtain coverage under this permit by submitting a Notice of Intent ("NOI") to the Department. Copies of this permit and the NOI for New York are available by calling (518) 402-8109 or at any New York State Department of Environmental Conservation ("the Department") regional office (see Appendix G).They are also available on the Department's website at:

http://www.dec.ny.gov/

An *owner or operator* of a *construction activity* that is eligible for coverage under this permit must obtain coverage prior to the *commencement of construction activity*. Activities that fit the definition of "*construction activity*", as defined under 40 CFR 122.26(b)(14)(x), (15)(i), and (15)(ii), constitute construction of a point source and therefore, pursuant to Article 17-0505 of the ECL, the *owner or operator* must have coverage under a SPDES permit prior to *commencing construction activity*. They cannot wait until there is an actual *discharge* from the construction site to obtain permit coverage.

***Note: The italicized words/phrases within this permit are defined in Appendix A.**

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES

FROM CONSTRUCTION ACTIVITIES

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Part I. PERMIT COVERAGE AND LIMITATIONS

A. Permit Application - This permit authorizes stormwater *discharges* to *surface waters of the State* from the following *construction activities* identified within 40 CFR Parts 122.26(b)(14)(x), 122.26(b)(15)(i) and 122.26(b)(15)(ii), provided all of the eligibility provisions of this permit are met:

1. *Construction activities* involving soil disturbances of one (1) or more acres; including disturbances of less than one acre that are part of a *larger common plan of development or sale* that will ultimately disturb one or more acres of land; excluding *routine maintenance activity* that is performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility;

2. *Construction activities* involving soil disturbances of less than one (1) acre where the Department has determined that a *SPDES* permit is required for stormwater *discharges* based on the potential for contribution to a violation of a *water quality standard* or for significant contribution of *pollutants* to *surface waters of the State.*

3. *Construction activities* located in the watershed(s) identified in Appendix D that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land.

B. Maintaining Water Quality - It shall be a violation of this permit and the *ECL* for any *discharge* to either cause or contribute to a violation of *water quality standards* as contained in Parts 700 through 705 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York, such as:

1. There shall be no increase in turbidity that will cause a substantial visible contrast to natural conditions;

2. There shall be no increase in suspended, colloidal or settleable solids that will cause deposition or impair the waters for their best usages; and

3. There shall be no residue from oil and floating substances, nor visible oil film, nor globules of grease.

C. Eligibility Under This General Permit

1. This permit may authorize all *discharges* of stormwater from *construction activity* to *surface waters of the State* and *groundwaters* except for ineligible *discharges* identified under subparagraph D. of this Part.

2. Except for non-stormwater *discharges* explicitly listed in the next paragraph, this permit only authorizes stormwater discharges from *construction activities*.

(Part I. C)

3. Notwithstanding paragraphs C.1 and C.2 above, the following non-stormwater *discharges* may be authorized by this permit: discharges from fire fighting activities; fire hydrant flushings; waters to which cleansers or other components have not been added that are used to wash vehicles or control dust in accordance with the SWPPP, routine external building washdown which does not use detergents; pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used; air conditioning condensate; uncontaminated groundwater or spring water; uncontaminated discharges from construction site de-watering operations; and foundation or footing drains where flows are not contaminated with process materials such as solvents. For those entities required to obtain coverage under this permit, and who discharge as noted in this paragraph, and with the exception of flows from fire fighting activities, these discharges must be identified in the SWPPP. Under all circumstances, the *owner or operator* must still comply with water quality standards in Part I.B.

D. <u>Activities Which Are Ineligible for Coverage Under This General Permit</u> - All of the following are **<u>not</u>** authorized by this permit:

1. *Discharges* after *construction activities* have been completed and the site has undergone *final stabilization*;

2. *Discharges* that are mixed with sources of non-stormwater other than those expressly authorized under subsection C.3. of this Part and identified in the SWPPP required by this permit;

3. *Discharges* that are required to obtain an individual SPDES permit or another SPDES general permit pursuant to Part VII, subparagraph K of this permit;

4. *Discharges* from *construction activities* that adversely affect a listed, or proposed to be listed, endangered or threatened species, or its critical habitat;

5. *Discharges* which either cause or contribute to a violation of *water quality standards* adopted pursuant to the *ECL* and its accompanying regulations;

6. *Construction activities* for residential, commercial and institutional projects that:

    a. are tributary to waters of the state classified as AA or AA-s; and

(Part I. D. 6)

b. disturb one or more acres of land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey for the County in which the disturbance will occur.

7. *Construction activities* for linear transportation projects and linear utility projects that:
   a. are tributary to waters of the state classified as AA or AA-s; and

   b. disturb two or more acres of land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey for the County in which the disturbance will occur.

8. *Construction activities* that adversely affect a property that is listed or is eligible for listing on the State or National Register of Historic Places (Note: includes Archeological sites), unless there are written agreements in place with the NYS Office of Parks, Recreation and Historic Preservation (OPRHP) or other governmental agencies to mitigate the effects, or there are local land use approvals evidencing the same.

Part II. OBTAINING PERMIT COVERAGE

A. Notice of Intent (NOI) Submittal

1. An *owner or operator* of a *construction activity* that is not subject to the requirements of a *regulated, traditional land use control MS4* must first develop a SWPPP in accordance with all applicable requirements of this permit and then submit a completed NOI form to the address below in order to be authorized to *discharge* under this permit. The NOI form shall be one which is associated with this permit, signed in accordance with Part VII.H. of this permit.

   NOTICE OF INTENT
   NYS DEC, Bureau of Water Permits
   625 Broadway, 4th Floor
   Albany, New York 12233-3505

2. An *owner or operator* of a *construction activity* that is subject to the requirements of a *regulated, traditional land use control MS4* must first develop a SWPPP in accordance with all applicable requirements of this permit and then have its SWPPP reviewed and accepted by the *MS4* prior to submitting the NOI to the Department. The *owner or operator* shall have the "MS4 SWPPP Acceptance" form signed by the principal executive officer or ranking elected official from the *regulated, traditional land use control MS4*, or by a duly authorized representative of that person, and then submit that form along with the NOI to the address referenced under "Notice of Intent (NOI) Submittal".

(Part II. A.2)

This requirement does not apply to an *owner or operator* that is obtaining permit coverage in accordance with the requirements in Part II.E. (Change of Owner or Operator).

3. The *owner or operator* shall have the SWPPP preparer sign the "SWPPP Preparer Certification" statement on the NOI prior to submitting the form to the Department.

4. As of the date the NOI is submitted to the Department, the *owner or operator* shall make the NOI and SWPPP available for review and copying in accordance with the requirements in Part VII.F. of this permit.

B. <u>Permit Authorization</u>

1. An *owner or operator* shall not *commence construction activity* until their authorization to *discharge* under this permit goes into effect.

2. Authorization to *discharge* under this permit will be effective when the *owner or operator* has satisfied <u>all</u> of the following criteria:

    a. project review pursuant to the State Environmental Quality Review Act (SEQRA) have been satisfied, when SEQRA is applicable,

    b. where required, all necessary Department permits subject to the *Uniform Procedures Act (UPA)* (see 6 NYCRR Part 621) have been obtained, unless otherwise notified by the Department pursuant to 6 NYCRR 621.3(a)(4). *Owners or operators* of *construction activities* that are required to obtain *UPA* permits must submit a preliminary SWPPP to the appropriate DEC Regional Office in Appendix F at the time all other necessary *UPA* permit applications are submitted. The preliminary SWPPP must include sufficient information to demonstrate that the *construction activity* qualifies for authorization under this permit,

    c. the final SWPPP has been prepared, and

    d. an NOI has been submitted to the Department in accordance with the requirements of this permit.

3. An *owner or operator* that has satisfied the requirements of Part II.B.2 above will be authorized to *discharge* stormwater from their *construction activity* in accordance with the following schedule:

(Part II. B. 3)

a. For *construction activities* that are <u>not</u> subject to the requirements of a *regulated, traditional land use control MS4*:

i. Five (5) business days from the date the Department receives a complete NOI for *construction activities* with a SWPPP that has been prepared in conformance with the technical standards referenced in Parts III.B.1, 2 and/or 3, or

ii. Sixty (60) business days from the date the Department receives a complete NOI for *construction activities* with a SWPPP that has <u>not</u> been prepared in conformance with the technical standards referenced in Parts III.B.1, 2 or 3.

b. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*:

i. Five (5) business days from the date the Department receives a complete NOI and signed "MS4 SWPPP Acceptance" form,

4. The Department may suspend or deny an *owner's or operator's* coverage under this permit if the Department determines that the SWPPP does not meet the permit requirements.

5. Coverage under this permit authorizes stormwater *discharges* from only those areas of disturbance that are identified in the NOI. If an *owner or operator* wishes to have stormwater *discharges* from future or additional areas of disturbance authorized, they must submit a new NOI that addresses that phase of the development, unless otherwise notified by the Department.

C. <u>General Requirements For Owners or Operators With Permit Coverage</u>

1. The *owner or operator* shall ensure that the provisions of the SWPPP are implemented from the *commencement of construction activity* until all areas of disturbance have achieved *final stabilization* and the Notice of Termination (NOT) has been submitted to the Department in accordance with Part V. of this permit. This includes any changes made to the SWPPP pursuant to Part III.A.4.

2. The *owner or operator* shall maintain a copy of the General Permit (GP-0-10-001), NOI, *NOI Acknowledgment Letter*, SWPPP, MS4 SWPPP Acceptance form and inspection reports at the construction site until all disturbed areas have achieved *final stabilization* and the NOT has been submitted to the Department.

(Part II. C. 2)

The documents must be maintained in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.

3. The *owner or operator* of a *construction activity* shall not disturb greater than five (5) acres of soil at any one time without prior written authorization from the Department or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the MS4 (provided the MS4 is not the *owner or operator* of the construction activity). At a minimum, the *owner or operator* must comply with the following requirements in order to be authorized to disturb greater than five (5) acres of soil at any one time:

    a. The *owner or operator* shall have a *qualified inspector* conduct **at least** two (2) site inspections in accordance with Part IV.C. every seven (7) calendar days, for as long as greater than five (5) acres of soil remain disturbed. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

    b. In areas where soil disturbance activity has been temporarily or permanently ceased, temporary and/or permanent soil stabilization measures shall be installed and/or implemented within seven (7) days from the date the soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control.

    c. The *owner or operator* shall prepare a phasing plan that defines maximum disturbed area per phase and shows required cuts and fills.

    d. The *owner or operator* shall install any additional site specific practices needed to protect water quality.

    e. The *owner or operator* shall include the requirements above in their SWPPP.

4. The Department may suspend or revoke an *owner's or operator's* coverage under this permit at any time if the Department determines that the SWPPP does not meet the permit requirements.

(Part II. C)

5. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4,* the *owner or operator* shall notify the *MS4* in writing of any planned amendments or modifications to the post-construction stormwater management practice component of the SWPPP required by Part III.A. 4. and 5. of this permit. Unless otherwise notified by the *MS4,* the *owner or operator* shall have the SWPPP amendments or modifications reviewed and accepted by the *MS4* prior to commencing construction of the post-construction stormwater management practice.

D. Permit Coverage for Discharges Authorized Under GP-0-08-001

1. Upon renewal of SPDES General Permit for Stormwater Discharges from Construction Activity (Permit No. GP-0-08-001), a*n owner or operator* of *construction activity* with coverage under GP-0-08-001, as of the effective date of GP-0-10-001, shall be authorized to *discharge* in accordance with GP-0-10-001 unless otherwise notified by the Department.

E. Change of Owner or Operator

1. When property ownership changes or when there is a change in operational control over the construction plans and specifications, the original *owner or operator* must notify the new *owner or operator*, in writing, of the requirement to obtain permit coverage by submitting a NOI with the Department. Once the new *owner or operator* obtains permit coverage, the original *owner or operator* shall then submit a completed NOT with the name and permit identification number of the new *owner or operator* to the Department at the address in Part II.A.1.. If the original *owner or operator* maintains ownership of a portion of the *construction activity* and will disturb soil, they must maintain their coverage under the permit.

   Permit coverage for the new *owner or operator* will be effective as of the date the Department receives a complete NOI, provided the original *owner or operator* was not subject to a sixty (60) business day authorization period that has not expired as of the date the Department receives the NOI from the new *owner or operator*.

Part III. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A. General SWPPP Requirements

1. The SWPPP shall be prepared prior to the submittal of the NOI. The NOI shall be submitted to the Department prior to the *commencement of construction activity*.

(Part III. A)

2. The SWPPP shall describe the erosion and sediment control practices and where required, post-construction stormwater management practices that will be used and/or constructed to reduce the pollutants in stormwater discharges and to assure compliance with the terms and conditions of this permit. In addition, the SWPPP shall identify potential sources of pollution which may reasonably be expected to affect the quality of stormwater *discharges*.

3. All SWPPPs that require the post-construction stormwater management practice component shall be prepared by a *qualified professional* that is knowledgeable in the principles and practices of stormwater management and treatment.

4. The *owner or operator* must keep the SWPPP current so that it at all times accurately documents the erosion and sediment controls practices that are being used or will be used during construction, and all post-construction stormwater management practices that will be constructed on the site. At a minimum, the *owner or operator* shall amend the SWPPP:

    a. whenever the current provisions prove to be ineffective in minimizing pollutants in stormwater *discharges* from the site;

    b. whenever there is a change in design, construction, or operation at the construction site that has or could have an effect on the discharge of pollutants; and

    c. to address issues or deficiencies identified during an inspection by the *qualified inspector,* the Department or other regulatory authority.

5. The Department may notify the *owner or operator* at any time that the SWPPP does not meet one or more of the minimum requirements of this permit. The notification shall be in writing and identify the provisions of the SWPPP that require modification. Within fourteen (14) calendar days of such notification, or as otherwise indicated by the Department, the *owner or operator* shall make the required changes to the SWPPP and submit written notification to the Department that the changes have been made. If the *owner or operator* does not respond to the Department's comments in the specified time frame, the Department may suspend the *owner's or operator's* coverage under this permit.

6. Prior to the *commencement of construction activity*, the *owner or operator* must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP; and the contractor(s) and subcontractor(s) that will be responsible for constructing the post-construction stormwater management practices included in the SWPPP.

(Part III. A. 6)

The *owner or operator* shall have each of the contractors and subcontractors identify at least one person from their company that will be responsible for implementation of the SWPPP. This person shall be known as the *trained contractor.* The *owner or operator* shall ensure that at least one *trained contractor* is on site on a daily basis when soil disturbance activities are being performed.

The *owner or operator* shall have each of the contractors and subcontractors identified above sign a copy of the following certification statement below before they commence any *construction activity*:

> "I hereby certify that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the *qualified inspector* during a site inspection. I also understand that the *owner or operator* must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings. "

In addition to providing the certification statement above, the certification page must also identify the specific elements of the SWPPP that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the *trained contractor* responsible for SWPPP implementation; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification statement is signed. The *owner or operator* shall attach the certification statement(s) to the copy of the SWPPP that is maintained at the construction site. If new or additional contractors are hired to implement measures identified in the SWPPP after construction has commenced, they must also sign the certification statement and provide the information listed above.

7. For projects where the Department requests a copy of the SWPPP or inspection reports, the *owner or operator* shall submit the documents in both electronic (PDF only) and paper format within five (5) business days, unless otherwise notified by the Department.

8. The SWPPP must include documentation supporting the determination of permit eligibility with regard to Part I.D.8. (Historic Places or Archeological Resource). At a minimum, the supporting documentation shall include the following:

(Part III. A. 8)

a. Information on whether the stormwater discharge or *construction activities* would have an effect on a property (historic or archeological resource) that is listed or eligible for listing on the State or National Register of Historic Places;

b. Results of historic resources screening determinations conducted. Information regarding the location of historic places listed, or eligible for listing, on the State or National Registers of Historic Places and areas of archeological sensitivity that may indicate the need for a survey can be obtained online by viewing the New York State Office of Parks, Recreation and Historic Places (OPRHP) online resources located on their web site at: http://nysparks.state.ny.us/shpo/online-tools/ (using The Geographic Information System for Archeology and National Register). OPRHP can also be contacted at: NYS OPRHP, State Historic Preservation Office, Peebles Island Resources Center, P.O. Box 189, Waterford, NY 12188-0189, phone: 518-237-8643;

c. A description of measures necessary to avoid or minimize adverse impacts on places listed, or eligible for listing, on the State or National Register of Historic Places. If the *owner or operator* fails to describe and implement such measures, the stormwater *discharge* is ineligible for coverage under this permit; and

d. Where adverse effects may occur, any written agreements in place with OPRHP or other governmental agency to mitigate those effects, or local land use approvals evidencing the same.

B. Required SWPPP Contents

1. Erosion and sediment control component - All SWPPPs prepared pursuant to this permit shall include erosion and sediment control practices designed in conformance with the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control. Where erosion and sediment control practices are not designed in conformance with this technical standard, the *owner or operator* must demonstrate equivalence to the technical standard. At a minimum, the erosion and sediment control component of the SWPPP shall include the following:

    a. Background information about the scope of the project, including the location, type and size of project;

(Part III. B. 1)

b. A site map/construction drawing(s) for the project, including a general location map. At a minimum, the site map shall show the total site area; all improvements; areas of disturbance; areas that will not be disturbed; existing vegetation; on-site and adjacent off-site surface water(s), wetlands and drainage patterns that could be affected by the construction activity; existing and final slopes; locations of different soil types with boundaries; material, waste, borrow or equipment storage areas located on adjacent properties; and location(s) of the stormwater discharge(s);

c. A description of the soil(s) present at the site, including an identification of the Hydrologic Soil Group (HSG);

d. A construction phasing plan and sequence of operations describing the intended order of construction activities, including clearing and grubbing, excavation and grading, utility and infrastructure installation and any other activity at the site that results in soil disturbance;

e. A description of the minimum erosion and sediment control practices to be installed or implemented for each construction activity that will result in soil disturbance. Include a schedule that identifies the timing of initial placement or implementation of each erosion and sediment control practice and the minimum time frames that each practice should remain in place or be implemented;

f. A temporary and permanent soil stabilization plan that meets the requirements of the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, for each stage of the project, including initial land clearing and grubbing to project completion and achievement of final stabilization;

g. A site map/construction drawing(s) showing the specific location(s), size(s), and length(s) of each erosion and sediment control practice;

h. The dimensions, material specifications, installation details, and operation and maintenance requirements for all erosion and sediment control practices. Include the location and sizing of any temporary sediment basins and structural practices that will be used to divert flows from exposed soils;

(Part III. B. 1)

i. A maintenance inspection schedule for the contractor(s) identified in Part III.A.6., to ensure continuous and effective operation of the erosion and sediment control practices. The maintenance inspection schedule shall be in accordance with the requirements in the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control;

j. A description of the pollution prevention measures that will be used to control litter, construction chemicals and construction debris from becoming a pollutant source in the stormwater *discharges*;

k. A description and location of any stormwater *discharges* associated with industrial activity other than construction at the site, including, but not limited to, stormwater *discharges* from asphalt plants and concrete plants located on the construction site; and

l. Identification of any elements of the design that are not in conformance with the requirements in the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control. Include the reason for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is equivalent to the technical standards.

2. Post-construction stormwater management practice component - All construction projects identified in Table 2 of Appendix B as needing post-construction stormwater management practices shall prepare a SWPPP that includes practices designed in conformance with the most current version of the technical standard, New York State Stormwater Management Design Manual ("Design Manual"). If the Design Manual is revised during the term of this permit, an *owner or operator* must begin using the revised version of the Design Manual to prepare their SWPPP six (6) months from the final revision date of the Design Manual.

   Where post-construction stormwater management practices are not designed in conformance with this technical standard, the *owner or operator* must demonstrate equivalence to the technical standard.

   At a minimum, the post-construction stormwater management practice component of the SWPPP shall include the following:

   a. Identification of all post-construction stormwater management practices to be constructed as part of the project;

(Part III. B. 2)

b. A site map/construction drawing(s) showing the specific location and size of each post-construction stormwater management practice;

c. The dimensions, material specifications and installation details for each post-construction stormwater management practice;

d. Identification of any elements of the design that are not in conformance with the Design Manual. Include the reason for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is equivalent to the technical standards;

e. A hydrologic and hydraulic analysis for all structural components of the stormwater management control system;

f. A detailed summary (including calculations) of the sizing criteria that was used to design all post-construction stormwater management practices. At a minimum, the summary shall address the required design criteria from the applicable chapter of the Design Manual; including the identification of and justification for any deviations from the Design Manual, and identification of any design criteria that are not required based on the design criteria or waiver criteria included in the Design Manual; and

g. An operations and maintenance plan that includes inspection and maintenance schedules and actions to ensure continuous and effective operation of each post-construction stormwater management practice. The plan shall identify the entity that will be responsible for the long term operation and maintenance of each practice.

3. Enhanced Phosphorus Removal Standards - All construction projects identified in Table 2 of Appendix B that are located in the watersheds identified in Appendix C shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the Enhanced Phosphorus Removal Standards included in the Design Manual. At a minimum, the post-construction stormwater management practice component of the SWPPP shall include items 2.a - 2.g. above.

(Part III. C)

C. Required SWPPP Components by Project Type - Unless otherwise notified by the Department, *owners or operators* of *construction activities* identified in Table 1 of Appendix B are required to prepare a SWPPP that only includes erosion and sediment control practices designed in conformance with Part III.B.1. *Owners or operators* of the *construction activities* identified in Table 2 of Appendix B shall prepare a SWPPP that also includes post-construction stormwater management practices designed in conformance with Part III.B.2 or 3.

Part IV. INSPECTION AND MAINTENANCE REQUIREMENTS

A. General Construction Site Inspection and Maintenance Requirements

1. The *owner or operator* must ensure that all erosion and sediment control practices and all post-construction stormwater management practices identified in the SWPPP are maintained in effective operating condition at all times.

2. The terms of this permit shall not be construed to prohibit the State of New York from exercising any authority pursuant to the ECL, common law or federal law, or prohibit New York State from taking any measures, whether civil or criminal, to prevent violations of the laws of the State of New York, or protect the public health and safety and/or the environment.

B. Owner or Operator Maintenance Inspection Requirements

1. The *owner or operator* shall inspect, in accordance with the requirements in the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, the erosion and sediment controls identified in the SWPPP to ensure that they are being maintained in effective operating condition at all times.

2. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the *owner or operator* can stop conducting the maintenance inspections. The *owner or operator* shall begin conducting the maintenance inspections in accordance with Part IV.B.1. as soon as soil disturbance activities resume.

3. For construction sites where soil disturbance activities have been shut down with partial project completion, the *owner or operator* can stop conducting the maintenance inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational.

(Part IV. C)

C. <u>Qualified Inspector Inspection Requirements</u> - The *owner or operator* shall have a *qualified inspector* conduct site inspections in conformance with the following requirements:

[Note: The *trained contractor* identified in Part III.A.6. **cannot** conduct the *qualified inspector* site inspections unless they meet the *qualified inspector* qualifications included in Appendix A. In order to perform these inspections, the *trained contractor* would have to be a:

- Licensed Professional Engineer,
- Certified Professional in Erosion and Sediment Control (CPESC),
- Registered Landscape Architect, or
- Someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity].

1. A *qualified inspector* shall conduct site inspections for all *construction activities* identified in Tables 1 and 2 of Appendix B, <u>with the exception of</u>:

    a. the construction of a single family residential subdivision with 25% or less impervious cover at total site build-out that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is <u>not</u> located in one of the watersheds listed in Appendix C and <u>not</u> directly discharging to one of the 303(d) segments listed in Appendix E;

    b. the construction of a single family home that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is <u>not</u> located in one of the watersheds listed in Appendix C and <u>not</u> directly discharging to one of the 303(d) segments listed in Appendix E;

    c. construction on agricultural property that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres; and

    d. construction activities located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land.

2. Unless otherwise notified by the Department, the *qualified inspector* shall conduct site inspections in accordance with the following timetable:

    a. For construction sites where soil disturbance activities are on-going, the *qualified inspector* shall conduct a site inspection at least once every seven (7) calendar days.

(Part IV. C. 2)

b. For construction sites where soil disturbance activities are on-going and the *owner or operator* has received authorization in accordance with Part II.C.3 to disturb greater than five (5) acres of soil at any one time, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

c. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the *qualified inspector* shall conduct a site inspection at least once every thirty (30) calendar days. The *owner or operator* shall notify the Regional Office stormwater contact person (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the MS4 (provided the MS4 is not the *owner or operator* of the construction activity) in writing prior to reducing the frequency of inspections.

d. For construction sites where soil disturbance activities have been shut down with partial project completion, the *qualified inspector* can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational. The *owner or operator* shall notify the Regional Office stormwater contact person (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the MS4 (provided the MS4 is not the *owner or operator* of the construction activity). in writing prior to the shutdown. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the *owner or operator* shall have the *qualified inspector* perform a final inspection and certify that all disturbed areas have achieved *final stabilization,* and all temporary, structural erosion and sediment control measures have been removed*;* and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP by signing the "Final Stabilization" and "Post-Construction Stormwater Management Practice" certification statements on the NOT. The *owner or operator* shall then submit the completed NOT form to the address in Part II.A.1..

(Part IV. C. 3)

3. At a minimum, the *qualified inspector* shall inspect all erosion and sediment control practices to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved *final stabilization,* all points of discharge to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site, and all points of discharge from the construction site.

4. The *qualified inspector* shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

    a. Date and time of inspection;

    b. Name and title of person(s) performing inspection;

    c. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;

    d. A description of the condition of the runoff at all points of discharge from the construction site. This shall include identification of any *discharges* of sediment from the construction site. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

    e. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site which receive runoff from disturbed areas. This shall include identification of any *discharges* of sediment to the surface waterbody;

    f. Identification of all erosion and sediment control practices that need repair or maintenance;

    g. Identification of all erosion and sediment control practices that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

    h. Description and sketch of areas that are disturbed at the time of the inspection and areas that have been stabilized (temporary and/or final) since the last inspection;

i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;

j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s); and

k. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

5. Within one business day of the completion of an inspection, the *qualified inspector* shall notify the *owner or operator* and appropriate contractor or subcontractor identified in Part III.A.6. of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

6. All inspection reports shall be signed by the *qualified inspector.* Pursuant to Part II.C.2., the inspection reports shall be maintained on site with the SWPPP.

Part V. TERMINATION OF PERMIT COVERAGE

A. Termination of Permit Coverage

1. An *owner or operator* that is eligible to terminate coverage under this permit must submit a completed NOT form to the address in Part II.A.1. The NOT form shall be one which is associated with this general permit, signed in accordance with Part VII.H.

2. An *owner or operator* may terminate coverage when one or more the following conditions have been met:

(Part V. A. 2)

a. Total project completion - All construction activity identified in the SWPPP has been completed; and all areas of disturbance have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices have been constructed in conformance with the SWPPP and are operational;

b. Planned shutdown with partial project completion - All soil disturbance activities have ceased; and all areas disturbed as of the project shutdown date have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational;

c. A new *owner or operator* has obtained coverage under this permit in accordance with Part II.E.

3. For *construction activities* meeting subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *qualified inspector* perform a final site inspection prior to submitting the NOT. The *qualified inspector* shall, by signing the "Final Stabilization" and "Post-Construction Stormwater Management Practice" certification statements on the NOT, certify that all disturbed areas have achieved *final stabilization;* and all temporary, structural erosion and sediment control measures have been removed; and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP.

4. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4* and meet subdivision 2a. or 2b. of this Part, the *owner or operator* shall also have the MS4 sign the "MS4 Acceptance" statement on the NOT. The *owner or operator* shall have the principal executive officer, ranking elected official, or duly authorized representative from the *regulated, traditional land use control MS4*, sign the "MS4 Acceptance" statement. The MS4 official, by signing this statement, has determined that it is acceptable for the *owner or operator* to submit the NOT in accordance with the requirements of this Part. The MS4 can make this determination by performing a final site inspection themselves or by accepting the *qualified inspector's* final site inspection certification(s) required in Part V.3.

5. For *construction activities* that require post-construction stormwater management practices and meet subdivision 2a. of this Part, the *owner or operator* must, prior to submitting the NOT, ensure one of the following:

(Part V. A. 5)

a. the post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain such practice(s) have been deeded to the municipality in which the practice(s) is located,

b. an executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s),

c. for post-construction stormwater management practices that are privately owned, the *owner or operator* has modified their deed of record to include a deed covenant that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan,

d. for post-construction stormwater management practices that are owned by a public or private institution (e.g. school, college, university), or government agency or authority, the *owner or operator* has policy and procedures in place that ensures operation and maintenance of the practices in accordance with the operation and maintenance plan.

Part VI. REPORTING AND RETENTION OF RECORDS

A. Record Retention - The *owner or operator* shall retain a copy of the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form and any inspection reports that were prepared in conjunction with this permit for a period of at least five (5) years from the date that the site achieves *final stabilization*. This period may be extended by the Department, in its sole discretion, at any time upon written notification.

B. Addresses - With the exception of the NOI, NOT, and MS4 SWPPP Acceptance form (which must be submitted to the address referenced in Part II.A.1), all written correspondence requested by the Department, including individual permit applications, shall be sent to the address of the appropriate Department Regional Office listed in Appendix F.

Part VII. STANDARD PERMIT CONDITIONS

A. Duty to Comply - The *owner or operator* must comply with all conditions of this permit. All contractors and subcontractors associated with the project must comply with the terms of the SWPPP. Any non-compliance with this permit constitutes a violation of the Clean Water Act (CWA) and the ECL and is grounds for an enforcement action against the *owner or operator* and/or the contractor/subcontractor; permit revocation, suspension or modification; or denial of a permit renewal application. Upon a finding of significant non-compliance with this permit or the applicable SWPPP, the Department may order an immediate stop to all *construction activity* at the site until the non-compliance is remedied.

(Part VII. A)

The stop work order shall be in writing, shall describe the non-compliance in detail, and shall be sent to the *owner or operator*.

B. Continuation of the Expired General Permit - This permit expires five (5) years from the effective date. However, coverage may be obtained under the expired general permit, which will continue in force and effect, until a new general permit is issued. Unless otherwise notified by the Department in writing, an *owner or operator* seeking authorization under the new general permit must submit a new NOI in accordance with the terms of such new general permit.

C. Enforcement - Failure of the *owner or operator,* its contractors, subcontractors, agents and/or assigns to strictly adhere to any of the permit requirements contained herein shall constitute a violation of this permit. There are substantial criminal, civil, and administrative penalties associated with violating the provisions of this permit. Fines of up to $37,500 per day for each violation and imprisonment for up to fifteen (15) years may be assessed depending upon the nature and degree of the offense.

D. Need to Halt or Reduce Activity Not a Defense - It shall not be a defense for an *owner or operator* in an enforcement action that it would have been necessary to halt or reduce the *construction activity* in order to maintain compliance with the conditions of this permit.

E. Duty to Mitigate - The *owner or operator* and its contractors and subcontractors shall take all reasonable steps to minimize or prevent any *discharge* in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

F. Duty to Provide Information - The *owner or operator* shall make available to the Department for review and copying or furnish to the Department within five (5) business days of receipt of a Department request for such information, any information requested for the purpose of determining compliance with this permit. This can include, but is not limited to, the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form, executed maintenance agreement, and inspection reports. Failure to provide information requested by the Department within the request timeframe shall be a violation of this permit.

The NOI, SWPPP and inspection reports required by this permit are public documents that the *owner or operator* must make available for review and copying by any person within five (5) business days of the *owner or operator* receiving a written request by any such person to review the NOI, SWPPP or inspection reports. Copying of documents will be done at the requester's expense.

G. Other Information - When the *owner or operator* becomes aware that they failed to submit any relevant facts, or submitted incorrect information in the NOI or in any other report, or have made substantive revisions to the SWPPP (e.g. the scope of the project changes significantly, the type of post-construction stormwater management practice(s)

changes, there is a reduction in the sizing of the post-construction stormwater management practice, or there is an increase in the disturbance area or impervious area), which were not reflected in the original NOI submitted to the Department, they shall promptly submit such facts or information to the Department. Failure of the *owner or operator* to correct or supplement any relevant facts within five (5) business days of becoming aware of the deficiency shall constitute a violation of this permit.

H. <u>Signatory Requirements</u>

1. All NOIs and NOTs shall be signed as follows:

    a. For a corporation these forms shall be signed by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

        i. a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

        ii. the manager of one or more manufacturing, production or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

    b. For a partnership or sole proprietorship these forms shall be signed by a general partner or the proprietor, respectively; or

    c. For a municipality, State, Federal, or other public agency these forms shall be signed by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

        i. the chief executive officer of the agency, or

(Part VII. H. 1. c)

ii. a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. The SWPPP and other information requested by the Department shall be signed by a person described in Part VII.H.1. or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described in Part VII.H.1.;

   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position) and,

   c. The written authorization shall include the name, title and signature of the authorized representative and be attached to the SWPPP.

3. All inspection reports shall be signed by the *qualified inspector* that performs the inspection.

4. The MS4 SWPPP Acceptance form shall be signed by the principal executive officer or ranking elected official from the *regulated, traditional land use control MS4,* or by a duly authorized representative of that person.

   It shall constitute a permit violation if an incorrect and/or improper signatory authorizes any required forms, SWPPP and/or inspection reports.

I. <u>Property Rights</u> - The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations. *Owners or operators* must obtain any applicable conveyances, easements, licenses and/or access to real property prior to *commencing construction activity*.

J. <u>Severability</u> - The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

(Part VII. K)
K. <u>Denial of Coverage Under This Permit</u>

1. At its sole discretion, the Department may require any *owner or operator* authorized by this permit to apply for and/or obtain either an individual SPDES permit or another SPDES general permit. When the Department requires any discharger authorized by a general permit to apply for an individual SPDES permit, it shall notify the discharger in writing that a permit application is required. This notice shall include a brief statement of the reasons for this decision, an application form, a statement setting a time frame for the *owner or operator* to file the application for an individual SPDES permit, and a deadline, not sooner than 180 days from *owner or operator* receipt of the notification letter, whereby the authorization to discharge under this general permit shall be terminated. Applications must be submitted to the appropriate Regional Office. The Department may grant additional time upon demonstration, to the satisfaction of the Regional Water Engineer, that additional time to apply for an alternative authorization is necessary or where the Department has not provided a permit determination in accordance with Part 621 of this Title.

2. Any *owner or operator* authorized by this permit may request to be excluded from the coverage under this permit by applying for an individual permit or another general permit. In such cases, the *owner or operator* shall submit an individual application or an alternative general permit application in accordance with the requirements of this general permit, 40 CFR 122.26(c)(1)(ii) and 6 NYCRR Part 621, with reasons supporting the request, to the Department at the address for the appropriate Department Office (see addresses in Appendix F).The request may be granted by issuance of an individual permit or another general permit at the discretion of the Department.

3. When an individual SPDES permit is issued to a discharger authorized to discharge under a general SPDES permit for the same discharge(s), the general permit authorization for outfalls authorized under the individual SPDES permit is automatically terminated on the effective date of the individual permit unless termination is earlier in accordance with 6 NYCRR Part 750.

L. <u>Proper Operation and Maintenance</u> - The *owner or operator* shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the *owner or operator* to achieve compliance with the conditions of this permit and with the requirements of the SWPPP.

M. <u>Inspection and Entry</u> - The *owner or operator* shall allow the Department or an authorized representative of EPA, the State, or, in the case of a construction site which discharges through an *MS4*, an authorized representative of the *MS4* receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

(Part VII. M)

1. Enter upon the *owner's or operator's* premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment).

N. Permit Actions - At the Department's sole discretion, this permit may, at any time, be modified, suspended, revoked, or renewed. The filing of a request by the *owner or operator* for a permit modification, revocation and reissuance, termination, a notification of planned changes or anticipated noncompliance does not limit, diminish and/or stay compliance with any terms of this permit.

O. Definitions - Definitions of key terms are included in Appendix A of this permit.

P. Re-Opener Clause

1. If there is evidence indicating potential or realized impacts on water quality due to any stormwater discharge associated with *construction activity* covered by this permit, the *owner or operator* of such discharge may be required to obtain an individual permit or alternative general permit in accordance with Part VII.K. of this permit or the permit may be modified to include different limitations and/or requirements.

2. Permit modification, suspension or revocation will be conducted in accordance with 6 NYCRR Part 621, 6 NYCRR 750-1.18, and 6 NYCRR 750-1.20.

Q. Penalties for Falsification of Forms and Reports – Article 17 of the ECL provides for a civil penalty of $37,500 per day per violation of this permit. Articles 175 and 210 of the New York State Penal Law provide for a criminal penalty of a fine and/or imprisonment for falsifying forms and reports required by this permit.

R. Other Permits – Nothing in this permit relieves the *owner or operator* from a requirement to obtain any other permits required by law.

APPENDIX A

Definitions

Alter Hydrology from Pre to Post-Development Conditions - means the post-development peak flow rate(s) has increased by more than 5% of the pre-developed condition for the design storm of interest (e.g. 10 yr and 100 yr).

Combined Sewer - means a sewer that is designed to collect and convey both "sewage" and "stormwater".

Commence (Commencement of) Construction Activities - means the initial disturbance of soils associated with clearing, grading or excavation activities; or other construction related activities that disturb or expose soils such as demolition, stockpiling of fill material, and the initial installation of erosion and sediment control practices required in the SWPPP. See definition for "Construction Activity(ies)" also.

Construction Activity(ies) - means any clearing, grading, excavation, filling, demolition or stockpiling activities that result in soil disturbance. Clearing activities can include, but are not limited to, logging equipment operation, the cutting and skidding of trees, stump removal and/or brush root removal. Construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

Direct Discharge (to a specific surface waterbody) - means that runoff flows from a construction site by overland flow and the first point of discharge is the specific surface waterbody, or runoff flows from a construction site to a separate storm sewer system and the first point of discharge from the separate storm sewer system is the specific surface waterbody.

Discharge(s) - means any addition of any pollutant to waters of the State through an outlet or point source.

Environmental Conservation Law (ECL) - means chapter 43-B of the Consolidated Laws of the State of New York, entitled the Environmental Conservation Law.

Final Stabilization - means that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

General SPDES permit - means a SPDES permit issued pursuant to 6 NYCRR Part 750-1.21 authorizing a category of discharges.

Groundwater - means waters in the saturated zone. The saturated zone is a subsurface zone in

which all the interstices are filled with water under pressure greater than that of the atmosphere. Although the zone may contain gas-filled interstices or interstices filled with fluids other than water, it is still considered saturated.

Impervious Area (Cover) - means all impermeable surfaces that cannot effectively infiltrate rainfall. This includes paved, concrete and gravel surfaces (i.e. parking lots, driveways, roads, runways and sidewalks); building rooftops and miscellaneous impermeable structures such as patios, pools, and sheds.

Larger Common Plan of Development or Sale - means a contiguous area where multiple separate and distinct construction activities are occurring, or will occur, under one plan. The term "plan" in "larger common plan of development or sale" is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, marketing plan, advertisement, drawing, permit application, State Environmental Quality Review Act (SEQRA) application, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating that construction activities may occur on a specific plot.

For discrete construction projects that are located within a larger common plan of development or sale that are at least 1/4 mile apart, each project can be treated as a separate plan of development or sale provided any interconnecting road, pipeline or utility project that is part of the same "common plan" is not concurrently being disturbed.

Municipal Separate Storm Sewer (MS4) - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

i. Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to surface waters of the State*;*
ii. Designed or used for collecting or conveying stormwater;
iii. Which is not a *combined sewer*; and
iv. Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

National Pollutant Discharge Elimination System (NPDES) - means the national system for the issuance of wastewater and stormwater permits under the Federal Water Pollution Control Act (Clean Water Act).

NOI Acknowledgment Letter - means the letter that the Department sends to an owner or operator to acknowledge the Department's receipt and acceptance of a complete Notice of Intent. This letter documents the owner's or operator's authorization to discharge in accordance with the general permit for stormwater discharges from construction activity.

Owner or Operator - means the person, persons or legal entity which owns or leases the property on which the construction activity is occurring; and/or an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications.

Pollutant - means dredged spoil, filter backwash, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, agricultural waste and ballast discharged into water; which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards or guidance values adopted as provided in Parts 700 et seq of this Title.

Qualified Inspector - means a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or other Department endorsed individual(s).

It can also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every three (3) years.

It can also mean a person that meets the *Qualified Professional* qualifications in addition to the *Qualified Inspector* qualifications.

Note: Inspections of any post-construction stormwater management practices that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

Qualified Professional - means a person that is knowledgeable in the principles and practices of stormwater management and treatment, such as a licensed Professional Engineer, Registered Landscape Architect or other Department endorsed individual(s). Individuals preparing SWPPPs that require the post-construction stormwater management practice component must have an understanding of the principles of hydrology, water quality management practice design, water quantity control design, and, in many cases, the principles of hydraulics in order to prepare a SWPPP that conforms to the Department's technical standard. All components of the SWPPP that involve the practice of engineering, as defined by the NYS Education Law (see Article 145), shall be prepared by, or under the direct supervision of, a professional engineer licensed to practice in the State of New York.

Regulated, Traditional Land Use Control MS4 - means a city, town or village with land use control authority that is required to gain coverage under New York State DEC's SPDES General Permit For Stormwater Discharges from Municipal Separate Stormwater Sewer Systems (MS4s).

Routine Maintenance Activity - means construction activity that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility, including, but not limited to:

- Re-grading of gravel roads or parking lots,
- Stream bank restoration projects (does not include the placement of spoil material),
- Cleaning and shaping of existing roadside ditches and culverts that maintains the approximate original line and grade, and hydraulic capacity of the ditch,
- Cleaning and shaping of existing roadside ditches that does not maintain the approximate original grade, hydraulic capacity and purpose of the ditch if the changes to the line and grade, hydraulic capacity or purpose of the ditch are installed to improve water quality and quantity controls (e.g. installing grass lined ditch),
- Placement of aggregate shoulder backing that makes the transition between the road shoulder and the ditch or embankment,
- Full depth milling and filling of existing asphalt pavements, replacement of concrete pavement slabs, and similar work that does not expose soil or disturb the bottom six (6) inches of subbase material,
- Long-term use of equipment storage areas at or near highway maintenance facilities,
- Removal of sediment from the edge of the highway to restore a previously existing sheet-flow drainage connection from the highway surface to the highway ditch or embankment,
- Existing use of Canal Corp owned upland disposal sites for the canal, and
- Replacement of curbs, gutters, sidewalks and guide rail posts.

State Pollutant Discharge Elimination System (SPDES) - means the system established pursuant to Article 17 of the ECL and 6 NYCRR Part 750 for issuance of permits authorizing discharges to the waters of the state.

Surface Waters of the State - shall be construed to include lakes, bays, sounds, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic ocean within the territorial seas of the state of New York and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface or underground waters), which are wholly or partially within or bordering the state or within its jurisdiction. Waters of the state are further defined in 6 NYCRR Parts 800 to 941.

Temporary Stabilization - means that exposed soil has been covered with material(s) as set forth in the technical standard, New York Standards and Specifications for Erosion and Sediment Control, to prevent the exposed soil from eroding. The materials can include, but are not limited to, mulch, seed and mulch, and erosion control mats (e.g. jute twisted yarn, excelsior wood fiber mats).

Total Maximum Daily Loads (TMDLs) - A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. It is a calculation of the maximum amount of a pollutant that a waterbody can receive on a daily basis and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL stipulates wasteload allocations (WLAs) for point source discharges, load allocations (LAs) for nonpoint sources, and a margin of safety (MOS).

Trained Contractor - means an employee from the contracting (construction) company, identified in Part III.A.6., that has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the *trained contractor* shall receive four (4) hours of training every three (3) years.

It can also mean an employee from the contracting (construction) company, identified in Part III.A.6., that meets the *qualified inspector* qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity).

The *trained contractor* will be responsible for the day to day implementation of the SWPPP.

Uniform Procedures Act (UPA) Permit - means a permit required under 6 NYCRR Part 621 of the Environmental Conservation Law (ECL), Article 70.

Water Quality Standard - means such measures of purity or quality for any waters in relation to their reasonable and necessary use as promulgated in 6 NYCRR Part 700 et seq.

APPENDIX B

Required SWPPP Components by Project Type

Table 1
CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT ONLY INCLUDES EROSION AND SEDIMENT CONTROLS

The following construction activities that involve soil disturbances of one (1) or more acres of land, but less than five (5) acres:

- Single family home not located in one of the watersheds listed in Appendix C and not *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions with 25% or less impervious cover at total site build-out and not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E
- Construction of a barn or other agricultural building, silo, stock yard or pen.

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Installation of underground, linear utilities; such as gas lines, fiber-optic cable, cable TV, electric, telephone, sewer mains, and water mains
- Environmental enhancement projects, such as wetland mitigation projects, stormwater retrofits and stream restoration projects
- Bike paths and trails
- Sidewalk construction projects that are not part of a road/ highway construction or reconstruction project
- Slope stabilization projects
- Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics
- Spoil areas that will be covered with vegetation
- Land clearing and grading for the purposes of creating vegetated open space (i.e. recreational parks, lawns, meadows, fields), excluding projects that *alter hydrology from pre to post development* conditions
- Athletic fields (natural grass) that do not include the construction or reconstruction of *impervious area* and do not *alter hydrology from pre to post development* conditions
- Demolition project where vegetation will be established and no redevelopment is planned
- Overhead electric transmission line project that does not include the construction of permanent access roads or parking areas surfaced with *impervious cover*
- Structural practices as identified in Table II in the "Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State", excluding projects that involve soil disturbances of less than five acres and construction activities that include the construction or reconstruction of impervious area

The following construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land:

- All construction activities located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land.

Table 2
CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Single family home located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions that involve soil disturbances of between one (1) and five (5) acres of land with greater than 25% impervious cover at total site build-out
- Single family residential subdivisions that involve soil disturbances of five (5) or more acres of land, and single family residential subdivisions that involve soil disturbances of less than five (5) acres that are part of a larger common plan of development or sale that will ultimately disturb five or more acres of land
- Multi-family residential developments; includes townhomes, condominiums, senior housing complexes, apartment complexes, and mobile home parks
- Airports
- Amusement parks
- Campgrounds
- Cemeteries that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Commercial developments
- Churches and other places of worship
- Construction of a barn or other agricultural building(e.g. silo) and structural practices as identified in Table II in the "Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State" that include the construction or reconstruction of *impervious area*, excluding projects that involve soil disturbances of less than five acres.
- Golf courses
- Institutional, includes hospitals, prisons, schools and colleges
- Industrial facilities, includes industrial parks
- Landfills
- Municipal facilities; includes highway garages, transfer stations, office buildings, POTW's and water treatment plants
- Office complexes
- Sports complexes
- Racetracks, includes racetracks with earthen (dirt) surface
- Road construction or reconstruction
- Parking lot construction or reconstruction
- Athletic fields (natural grass) that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Athletic fields with artificial turf
- Permanent access roads, parking areas, substations, compressor stations and well drilling pads, surfaced with *impervious cover,* and constructed as part of an over-head electric transmission line project , wind-power project, cell tower project, oil or gas well drilling project or other linear utility project
- All other construction activities that include the construction or reconstruction of *impervious area* and *alter the hydrology from pre to post development* conditions, and are not listed in Table 1

APPENDIX C

Watersheds Where Enhanced Phosphorus Removal Standards Are Required

Watersheds where *owners or operators* of construction activities identified in Table 2 of Appendix B must prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the Enhanced Phosphorus Removal Standards included in the technical standard, New York State Stormwater Management Design Manual ("Design Manual").

- Entire New York City Watershed located east of the Hudson River - Figure 1
- Onondaga Lake Watershed - Figure 2
- Greenwood Lake Watershed -Figure 3
- Oscawana Lake Watershed – Figure 4

Figure 1 - New York City Watershed East of the Hudson

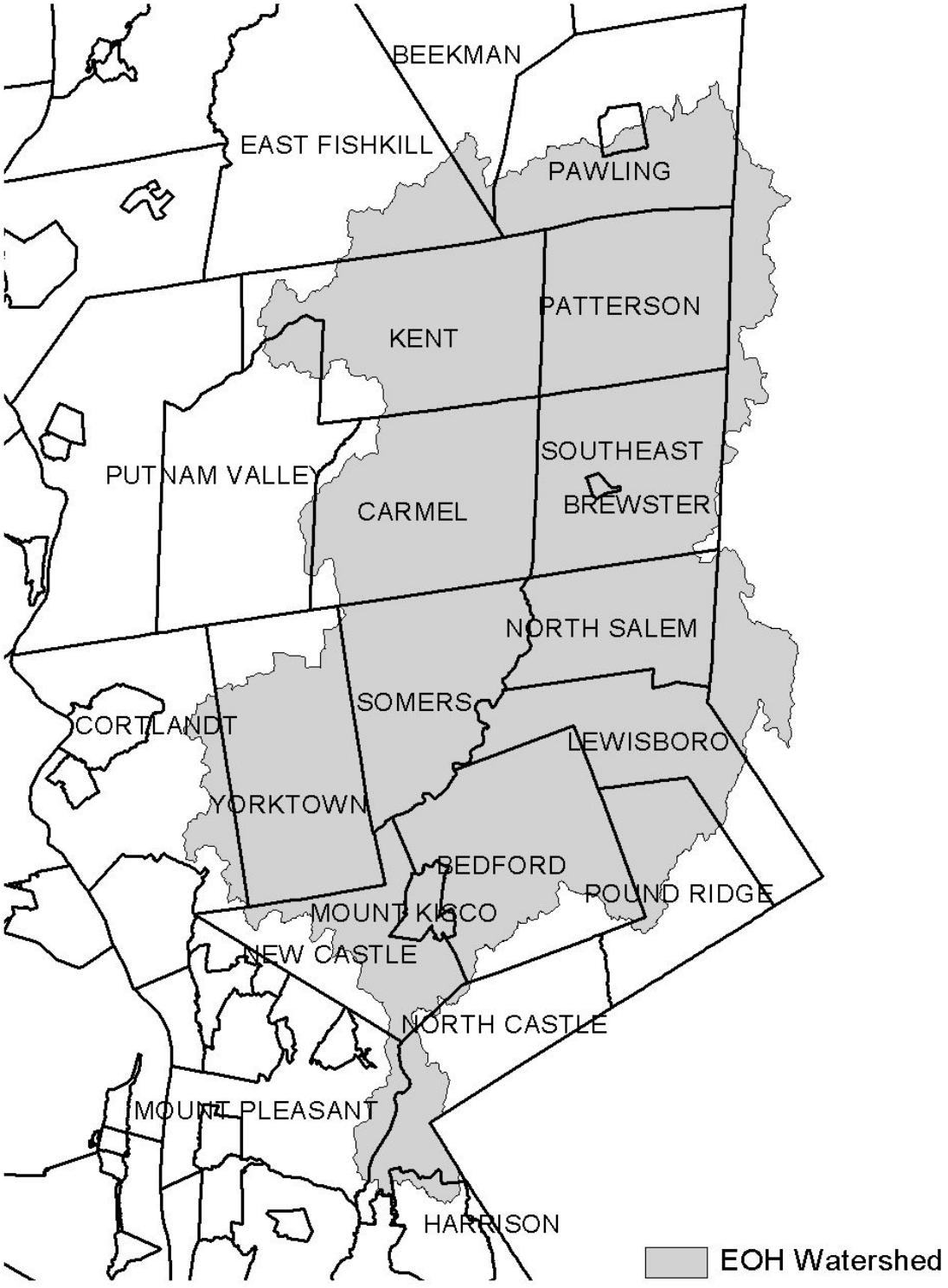


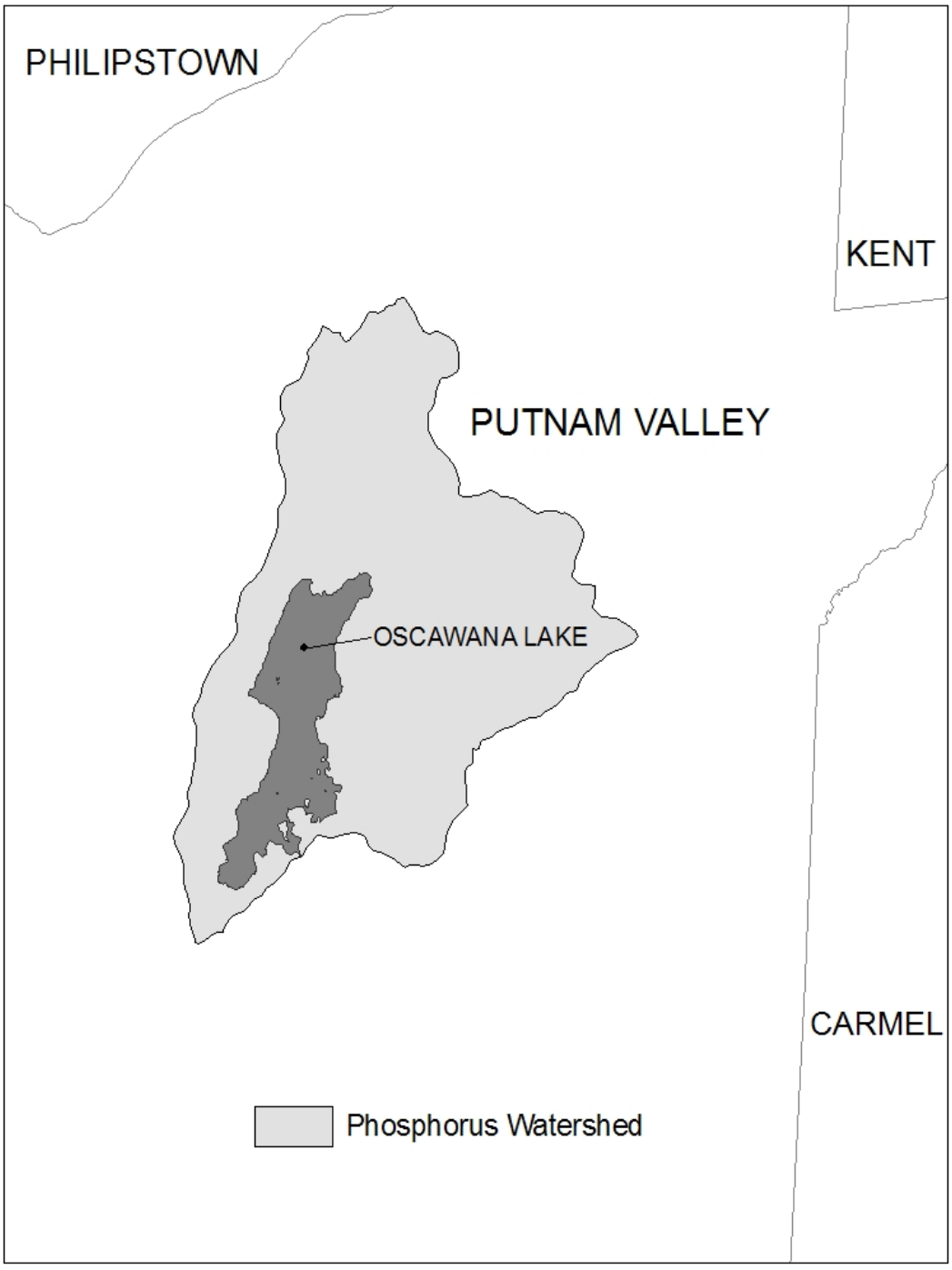
Figure 2 - Onondaga Lake Watershed



Figure 3 - Greenwood Lake Watershed



Figure 4 - Oscawana Lake Watershed



APPENDIX D

Watersheds where *owners or operators* of construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land must obtain coverage under this permit.

Entire New York City Watershed that is located east of the Hudson River - See Figure 1 in Appendix C

APPENDIX E

List of 303(d) segments impaired by pollutants related to construction activity (e.g. silt, sediment or nutrients). *Owners or operators* of single family home and single family residential subdivision construction activities that involve soil disturbances of one or more acres of land, but less than 5 acres, and *directly discharge* to one of the listed segments below shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the most current version of the technical standard, New York State Stormwater Management Design Manual ("Design Manual").

COUNTY	WATERBODY
Albany	Ann Lee (Shakers) Pond, Stump Pond
Albany	Basic Creek Reservoir
Bronx	Van Cortlandt Lake
Broome	Whitney Point Lake/Reservoir
Broome	Beaver Lake
Broome	White Birch Lake
Chautauqua	Chautauqua Lake, North
Chautauqua	Chautauqua Lake, South
Chautauqua	Bear Lake
Chautauqua	Chadakoin River and tribs
Chautauqua	Lower Cassadaga Lake
Chautauqua	Middle Cassadaga Lake
Chautauqua	Findley Lake
Clinton	Great Chazy River, Lower, Main Stem
Columbia	Kinderhook Lake
Columbia	Robinson Pond
Dutchess	Hillside Lake
Dutchess	Wappinger Lakes
Dutchess	Fall Kill and tribs
Dutchess	Rudd Pond
Erie	Rush Creek and tribs
Erie	Ellicott Creek, Lower, and tribs
Erie	Beeman Creek and tribs
Erie	Murder Creek, Lower, and tribs
Erie	South Branch Smoke Cr, Lower, and tribs
Erie	Little Sister Creek, Lower, and tribs
Essex	Lake George (primary county listed as Warren)
Genesee	Black Creek, Upper, and minor tribs
Genesee	Tonawanda Creek, Middle, Main Stem
Genesee	Tonawanda Creek, Upper, and minor tribs
Genesee	Little Tonawanda Creek, Lower, and tribs
Genesee	Oak Orchard Creek, Upper, and tribs
Genesee	Bowen Brook and tribs
Genesee	Bigelow Creek and tribs
Greene	Schoharie Reservoir
Greene	Sleepy Hollow Lake
Herkimer	Steele Creek tribs
Kings	Hendrix Creek
Lewis	Mill Creek/South Branch and tribs
Livingston	Conesus Lake
Livingston	Jaycox Creek and tribs
Livingston	Mill Creek and minor tribs
Monroe	Genesee River, Lower, Main Stem
Monroe	Genesee River, Middle, Main Stem
Monroe	Black Creek, Lower, and minor tribs
Monroe	Buck Pond
Monroe	Long Pond
Monroe	Cranberry Pond
Monroe	Mill Creek and tribs
Monroe	Shipbuilders Creek and tribs
Monroe	Minor tribs to Irondequoit Bay
Monroe	Thomas Creek/White Brook and tribs
Nassau	Glen Cove Creek, Lower, and tribs
Nassau	LI Tribs (fresh) to East Bay
Nassau	East Meadow Brook, Upper, and tribs
Nassau	Hempstead Bay
Nassau	Hempstead Lake
Nassau	Grant Park Pond
Niagara	Bergholtz Creek and tribs
Oneida	Ballou, Nail Creeks
Onondaga	Ley Creek and tribs
Onondaga	Onondaga Creek, Lower and tribs
Onondaga	Onondaga creek, Middle and tribs
Onondaga	Onondaga Creek, Upper, and minor tribs
Onondaga	Harbor Brook, Lower, and tribs
Onondaga	Ninemile Creek, Lower, and tribs
Onondaga	Minor tribs to Onondaga Lake
Ontario	Honeoye Lake
Ontario	Hemlock Lake Outlet and minor tribs
Ontario	Great Brook and minor tribs
Oswego	Lake Neatahwanta
Putnam	Oscawana Lake
Putnam	Lake Carmel
Queens	Jamaica Bay, Eastern, and tribs (Queens)
Queens	Bergen Basin
Queens	Shellbank Basin
Rensselaer	Snyders Lake
Richmond	Grasmere, Arbutus and Wolfes Lakes
Saratoga	Dwaas Kill and tribs
Saratoga	Tribs to Lake Lonely
Saratoga	Lake Lonely
Saratoga	Schuyler Creek and tribs
Schenectady	Collins Lake

APPENDIX E

List of 303(d) segments impaired by pollutants related to construction activity, cont'd.

COUNTY	WATERBODY	COUNTY	WATERBODY
Schoharie	Engleville Pond		
Schoharie	Summit Lake		
St. Lawrence	Black Lake Outlet/Black Lake		
Steuben	Lake Salubria		
Steuben	Smith Pond		
Suffolk	Millers Pond		
Suffolk	Mattituck (Marratooka) Pond		
Suffolk	Tidal tribs to West Moriches Bay		
Suffolk	Canaan Lake		
Suffolk	Lake Ronkonkoma		
Tompkins	Cayuga Lake, Southern End		
Tompkins	Owasco Inlet, Upper, and tribs		
Ulster	Ashokan Reservoir		
Ulster	Esopus Creek, Upper, and minor tribs		
Warren	Lake George		
Warren	Tribs to L.George, Village of L George		
Warren	Huddle/Finkle Brooks and tribs		
Warren	Indian Brook and tribs		
Warren	Hague Brook and tribs		
Washington	Tribs to L.George, East Shore of Lake George		
Washington	Cossayuna Lake		
Wayne	Port Bay		
Wayne	Marbletown Creek and tribs		
Westchester	Peach Lake		
Westchester	Mamaroneck River, Lower		
Westchester	Mamaroneck River, Upper, and minor tribs		
Westchester	Sheldrake River and tribs		
Westchester	Blind Brook, Lower		
Westchester	Blind Brook, Upper, and tribs		
Westchester	Lake Lincolndale		
Westchester	Lake Meahaugh		
Wyoming	Java Lake		
Wyoming	Silver Lake		

Note: The list above identifies those waters from the final New York State "2008 Section 303(d) List of Impaired Waters Requiring a TMDL/Other Strategy", dated May 26, 2008, that are impaired by silt, sediment or nutrients.

APPENDIX F

LIST OF NYS DEC REGIONAL OFFICES

Region	COVERING THE FOLLOWING COUNTIES:	DIVISION OF ENVIRONMENTAL PERMITS (DEP) PERMIT ADMINISTRATORS	DIVISION OF WATER (DOW) WATER (SPDES) PROGRAM
1	NASSAU AND SUFFOLK	50 CIRCLE ROAD STONY BROOK, NY 11790 TEL. (631) 444-0365	50 CIRCLE ROAD STONY BROOK, NY 11790-3409 TEL. (631) 444-0405
2	BRONX, KINGS, NEW YORK, QUEENS AND RICHMOND	1 HUNTERS POINT PLAZA, 47-40 21ST ST. LONG ISLAND CITY, NY 11101-5407 TEL. (718) 482-4997	1 HUNTERS POINT PLAZA, 47-40 21ST ST. LONG ISLAND CITY, NY 11101-5407 TEL. (718) 482-4933
3	DUTCHESS, ORANGE, PUTNAM, ROCKLAND, SULLIVAN, ULSTER AND WESTCHESTER	21 SOUTH PUTT CORNERS ROAD NEW PALTZ, NY 12561-1696 TEL. (845) 256-3059	100 HILLSIDE AVENUE, SUITE 1W WHITE PLAINS, NY 10603 TEL. (914) 428 - 2505
4	ALBANY, COLUMBIA, DELAWARE, GREENE, MONTGOMERY, OTSEGO, RENSSELAER, SCHENECTADY AND SCHOHARIE	1150 NORTH WESTCOTT ROAD SCHENECTADY, NY 12306-2014 TEL. (518) 357-2069	1130 NORTH WESTCOTT ROAD SCHENECTADY, NY 12306-2014 TEL. (518) 357-2045
5	CLINTON, ESSEX, FRANKLIN, FULTON, HAMILTON, SARATOGA, WARREN AND WASHINGTON	1115 STATE ROUTE 86, PO BOX 296 RAY BROOK, NY 12977-0296 TEL. (518) 897-1234	232 GOLF COURSE ROAD, PO BOX 220 WARRENSBURG, NY 12885-0220 TEL. (518) 623-1200
6	HERKIMER, JEFFERSON, LEWIS, ONEIDA AND ST. LAWRENCE	STATE OFFICE BUILDING 317 WASHINGTON STREET WATERTOWN, NY 13601-3787 TEL. (315) 785-2245	STATE OFFICE BUILDING 207 GENESEE STREET UTICA, NY 13501-2885 TEL. (315) 793-2554
7	BROOME, CAYUGA, CHENANGO, CORTLAND, MADISON, ONONDAGA, OSWEGO, TIOGA AND TOMPKINS	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7438	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7500
8	CHEMUNG, GENESEE, LIVINGSTON, MONROE, ONTARIO, ORLEANS, SCHUYLER, SENECA, STEUBEN, WAYNE AND YATES	6274 EAST AVON-LIMA ROAD AVON, NY 14414-9519 TEL. (585) 226-2466	6274 EAST AVON-LIMA RD. AVON, NY 14414-9519 TEL. (585) 226-2466
9	ALLEGANY, CATTARAUGUS, CHAUTAUQUA, ERIE, NIAGARA AND WYOMING	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7165	270 MICHIGAN AVE. BUFFALO, NY 14203-2999 TEL. (716) 851-7070

APPENDIX B

SITE SOIL CHARACTERISTICS

Exhibit 4.2
SCS Hydrologic Soil Groups—New York

Soils are classified into hydrologic soil groups (HSG's) to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSG's; which are A,B, C, and D; are one element used in determining runoff curve numbers.

The infiltration rate is the rate at which water enters the soil at the soil surface. It is controlled by surface conditions. HSG also indicated the transmission rate—the rate at which the water moves within the soil. This rate is controlled by the soil profile. Approximate numerical ranges for transmission rates shown in the HSG definitions were first published by Musgrave. SCS soil scientists define the four groups as follows:

Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission (greater than 0.30 in/hr).

Group B soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (0.15-0.30 in/hr).

Group C soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (0.05-0.15 in/hr).

Group D soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0-0.05 in/hr).

Disturbed Soil Profiles

As a result of urbanization, the soil profile may be considerably altered and the listed group classification may no longer apply. In these circumstances, use the following to determine HSG according to the texture of the new surface soil, provided that significant compaction has not occurred:

HSG	Soil textures
A	Sand, loamy sand, or sandy loam
B	Silt loam or loam
C	Sandy clay loam
D	Clay loam, silty clay loam, sandy clay, silty clay, or clay

Drainage and Group D Soils

Some soils in the list are in group D because of a high water table that creates a drainage problem. Once these soils are effectively drained, they are placed in a different group. For example, Adrian soil is classified as A/D. This indicates that the drained Adrian soil is in group A and the un-drained soil is in group D.

Table 8. Soil hydrologic groups for New York soils. Last updated [illegible]

Soil Type	HG
Leon	C
Lewbath	C
Lewbeach	C
Leyden	C
Lima	B
Limerick	C
Linden	B
Linlithgo	B
Livingston	D
Lobdell	B
Lockport	D
Lorain	D
Lordstown	C
Lovewell	B
Lowville	B
Loxley	A
Lucas	C
Ludlow	C
Lupton	A
Lyman	C
Lyman-Becket-Berkshire	C
Lyme	C
Lyons	D
Machias	B
Macomber	C
Macomber-Taconic	C
Madalin	D
Madawaska	B
Madrid	B
Malone	C
Manahawkin	D
Mandy	C
Manheim	C
Manhoning	D
Manlius	C
Mansfield	D
Maplecrest	B
Marcy	D
Mardin	C

Soil Type	HG
Marilla	C
Markey	A/D
Marlow	C
Martisco	B
Massena	C
Matoon	D
Matunuck	D
Medihemists	A/D
Medina	B
Medomak	D
Melrose	C
Menlo	D
Mentor	B
Merrimac	A
Middlebrook	C
Middlebrook-Mongaup	C
Middlebury	B
Millis	C
Millsite	C
Mineola	A
Miner	D
Mino	C
Minoa	C
Mohawk	B
Moira	C
Monadnock	B
Monarda	D
Mongaup	C
Montauk	C
Mooers	B
Morocco	C
Morris	C
Mosherville	C
Muck	D
Muck-Peat	D
Mundal	C
Mundalite	C
Mundalite-Rawsonville	C
Munson	D
Munuscong	B

Soil Type	HG
Muskego	A/C
Muskellunge	D
Napoleon	A
Napoli	C
Nassau	C
Naumburg	C
Nehasne	B
Nellis	B
Neversink	D
Newfane	B
Newstead	C
Newton	A/D
Niagara	C
Nicholville	C
Ninigret	B
Norchip	D
Norwell	C
Norwich	D
Nunda	C
Oakville	A
Occum	B
Odessa	D
Ogdensburg	C
Olean	B
Ondawa	B
Oneida	C
Onoville	C
Ontario	B
Onteora	C
Ontusia	C
Oquaga	C
Oramel	C
Organic	A/D
Orpark	C
Orwell	D
Ossipee	D
Otego	B
Otisville	A
Ottawa	A
Ovid	C
Palatine	B
Palms	A/D

Soil Type	HG
Palmyra	B
Panton	D
Papakating	D
Parishville	C
Parsippany	D
Patchin	D
Pawcatuck	D
Pawling	B
Paxton	C
Peacham	D
Peat	A/D
Peat-Muck	A/D
Peru	C
Petoskey	A
Phelps	B
Philo	B
Pillsbury	C
Pinckney	C
Pipestone	B
Pittsfield	B
Pittstown	C
Plainbo	A
Plainfield	A
Plessis	D
Plymouth	A
Podunk	B
Poland	B
Pompton	B
Pootatuck	B
Pope	B
Potsdam	C
Poygan	D
Punsit	C
Pyrities	B
Quetico	D
Quetico-Rock Outcrop	D
Raquette	B
Rawsonville	C
Rawsonville-Beseman-	C
Rayne	B

surface layer. Reaction ranges from strongly acid to neutral in the surface layer and from medium acid to mildly alkaline in the subsoil.

Seasonal wetness, slow permeability in the substratum, and instability of cut banks limit many uses of this soil. This soil is used for various purposes, including residential and commercial development, farming, and woodland. Many areas are idle.

This Niagara soil is not well suited to farming, unless drained. Erosion is not a problem on this nearly level soil, but it tends to puddle and compact if tilled when wet. In some areas drainage is difficult to install because of the nearly level slopes, instability of cut banks, and lack of suitable outlets. With adequate drainage and maintenance of tilth and fertility, this soil is suitable for most crops grown in the county except early-market and long-season varieties. Keeping tillage to a minimum, using cover crops, including grasses and legumes in the cropping system, and plowing at the proper soil moisture level help maintain good tilth.

Without adequate drainage, this soil is best suited to hay and pasture plants that can withstand seasonal wetness. Grazing when the soil is wet is the major concern of pasture management. It causes soil compaction, restricts plant growth, and can lead to the loss of the pasture grasses. Restricting grazing in wet periods, rotational grazing, and yearly mowing are desirable practices.

The potential of this soil for wood crops is fair. Seasonal wetness limits the use of planting and harvesting equipment and increases seedling mortality. Trees rooted in this soil are generally able to withstand all but excessive windstorms. Trees that can withstand seasonal wetness are best suited to this soil.

The seasonal high water table, poor soil compaction, and slow permeability in the loamy substratum are serious limitations for most urban uses of this Niagara soil. If storm sewers or other outlets are available, drains can be installed around foundations to minimize the seasonal wetness. This soil has much greater stability and strength than the other Niagara soils because the substratum is loamy glacial till. Because this soil has a high silt content, frost may damage roads and dwellings without basements.

This Niagara soil is in capability subclass IIIw.

Od—Odessa silt loam. This nearly level soil is deep and somewhat poorly drained. This soil is high in clay content and is on broad, flat plains in the northern part of the county. These plains were formerly the bottoms of glacial lakes. This soil generally is on interfluves between streams and intermittent drainageways. Slope is 0 to 3 percent. Areas of this soil are large and irregular in shape and roughly parallel the streams. Areas range from 5 to 200 acres or more.

Typically, this soil has a surface layer of very dark grayish brown silt loam about 9 inches thick. The subsoil extends to a depth of 22 inches. It is mottled, pinkish gray silty clay in the upper part and mottled, reddish brown silty clay in the lower part. The substratum to a depth of 60 inches is varved, reddish brown, gray, reddish gray, and weak red silty clay.

Included with this soil in mapping are small areas of the Lakemont, Schoharie, Niagara, Churchville, and Cosad soils. The Lakemont soils are wetter than this Odessa soil; the Schoharie soils are on small rises on the landscape; the Niagara soils are more silty than this Odessa soil; the Churchville soils are underlain by stony glacial till at a depth of 20 to 40 inches; and the Cosad soils have a 20- to 40-inch sandy overburden underlain by clayey lake sediments. Areas of included soils range up to 3 acres.

From December through May the Odessa soils have a perched water table in the upper part of the subsoil. Permeability is slow or very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is slow. There is usually no gravel in the soil. Bedrock is at a depth of 5 feet or more. In unlimed areas, reaction ranges from medium acid to neutral in the surface layer and from medium acid to mildly alkaline in the subsoil.

This soil has limited suitability for farm and urban uses. Current land use includes urban and suburban residential and commercial development and farming. Some areas are idle.

Seasonal wetness limits the suitability of this Odessa soil for cultivated crops. Erosion does not present a problem, but puddling and soil compaction are likely in wet seasons. Keeping tillage to a minimum, using cover crops, and including grasses and legumes in the cropping system improve tilth and maintain or improve crop yields. Artificial drainage is difficult to install because the soil is nearly level, and drains must be closely spaced because percolation is slow. With adequate drainage and maintenance of tilth and fertility, this soil is suitable for crops grown in the county except early-market and long-season varieties.

Without adequate drainage this soil is best suited to hay and pasture. Grazing when the soil is wet is the major concern of pasture management. It causes soil compaction, restricted plant growth, and the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing during wet periods are the chief management needs.

The potential of this soil for wood crops is fair to good. Seasonal wetness is a limitation to equipment use. Trees rooted in this soil are able to withstand all but excessively strong winds. Without intensive site preparation and maintenance, plant competition will prevent regeneration of conifers.

The seasonally perched water table, low soil strength, poor soil compaction, clayey textures, and slow or very slow permeability are serious limitations for many urban uses of this soil (fig. 7). Septic tank absorption fields

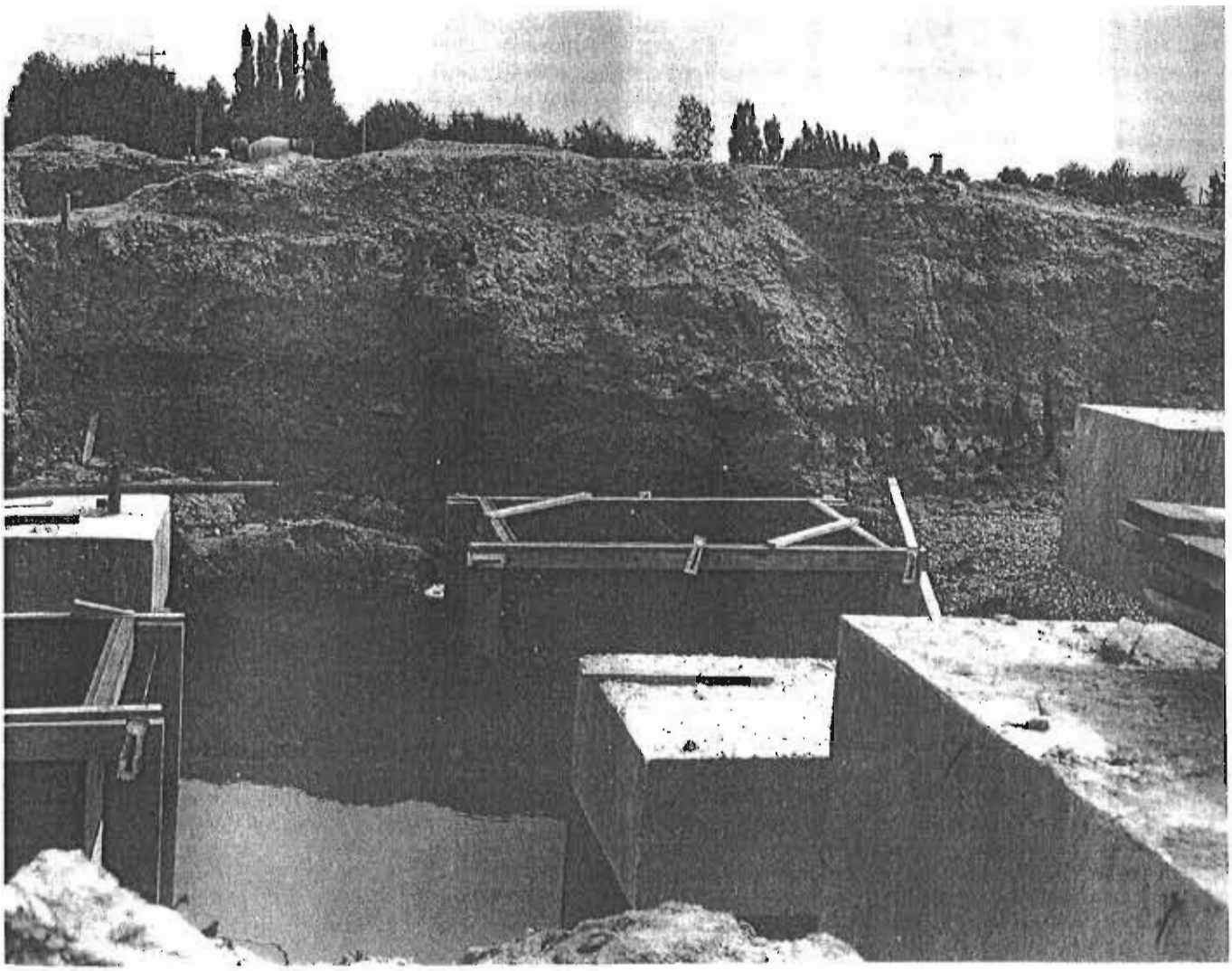


Figure 7.—The seasonal high water table in these Odessa silt loam soils is a limitation for basements. Excavated material in the background is on the original soil surface.

need to be specially designed and installed because of the seasonal wetness and slow permeability of the soil. Basements are difficult to keep dry. Where the clayey subsoil is disturbed during construction, the soil is difficult to vegetate. This soil is a poor source of roadfill because of its low strength and high clay content. Some areas provide good sites for dugout ponds; but if the ponds are used for irrigation, they tend to refill slowly.

This Odessa soil is in capability subclass IIIw.

Oe—Odessa-Lakemont silt loams. This complex consists of the nearly level, somewhat poorly drained Odessa soil and poorly drained Lakemont soil in broad, flat areas that were the bottoms of glacial lakes. The two soils differ only slightly in elevation; the Odessa soil is about a foot or so above the Lakemont soil. This complex generally is on broad interfluves between major and intermittent drainageways. Areas of this complex are mainly irregular in shape, but they are roughly elongated when parallel to drainageways. Slope ranges from 0 to 3 percent. Individual areas range from 5 to 200 acres or more.

This complex is about 65 percent Odessa silt loam, 30 percent Lakemont silt loam, and 5 percent other soils. The Odessa and Lakemont soils form such an intricate

APPENDIX C

RAINFALL FREQUENCY AND DISTRIBUTION MAPS

Exhibit 4.1 (cont'd)
New York Rainfall Maps for Different Rainfall Frequencies

RAINFALL LIST BY COUNTY

The frequency values listed below are average values for the County. Please check these against the maps on pages 4.29 through 4.31 for your county. In certain areas of the county, jobs may require higher or lower rainfall values.

Amended July 30, 2002

COUNTY	RAINFALL FOR EACH FREQUENCY							Average Annual Rainfall
	1YR	2YR	5YR	10YR	25 YR	50YR	100YR	
ALBANY	2.4	2.9	3.7	4.5	4.9	5.5	7.0	37.9
ALLEGANY	2.2	2.6	3.2	3.8	4.3	4.8	5.3	37.0
BRONX	2.7	3.5	4.5	5.0	6.0	7.0	7.5	46.2
BROOME	2.4	2.8	3.5	4.2	4.8	5.3	6.2	38.8
CATTARAUGUS	2.2	2.5	3.2	3.7	4.2	4.7	5.2	43.3
CAYUGA	2.2	2.5	3.2	3.8	4.4	4.8	5.3	37.1
CHAUTAUQUA	2.1	2.5	3.1	3.6	4.1	4.6	4.9	45.3
CHEMUNG	2.3	2.7	3.4	3.9	4.6	5.0	5.6	34.9
CHENANGO	2.3	2.8	3.4	4.0	4.8	5.0	6.0	40.0
CLINTON	2.0	2.5	3.1	3.5	4.0	4.5	4.9	34.2
COLUMBIA	2.5	3.0	4.0	4.7	5.5	6.0	7.8	42.3
CORTLAND	2.3	2.7	3.4	3.9	4.6	4.9	5.6	40.5
DELAWARE	2.5	2.9	4.0	4.5	5.0	5.5	7.9	42.1
DUTCHESS	2.8	3.5	4.5	5.0	6.0	7.0	8.0	43.3
ERIE	2.1	2.5	3.1	3.6	4.0	4.5	4.9	40.4
ESSEX	2.1	2.5	3.2	3.6	4.2	4.6	5.1	39.5
FRANKLIN	2.0	2.5	3.0	3.5	4.0	4.5	4.8	39.8
FULTON	2.3	2.6	3.4	3.9	4.6	4.9	5.5	46.3
GENESEE	2.1	2.5	3.1	3.6	4.1	4.6	4.9	34.8
GREENE	3.0	3.0	4.5	5.0	6.0	7.0	8.0	41.5
HAMILTON	2.2	2.5	3.2	3.7	4.3	4.7	5.4	49.7
HERKIMER	2.2	2.5	3.2	3.7	4.4	4.7	5.5	47.9
JEFFERSON	2.1	2.5	3.0	3.5	4.0	4.5	4.7	39.0
KINGS	2.7	3.5	4.5	5.0	6.0	7.0	7.5	44.3
LEWIS	2.3	2.5	3.1	3.6	4.2	4.5	4.8	48.1
LIVINGSTON	2.2	2.5	3.2	3.7	4.2	4.7	5.0	32.6
MADISON	2.3	2.6	3.3	3.8	4.6	4.9	5.5	40.9
MANHATTAN	2.7	3.5	4.5	5.0	6.0	6.5	7.5	46.1
MONROE	2.2	2.5	3.1	3.6	4.1	4.6	4.9	31.9
MONTGOMERY	2.4	2.7	3.4	3.9	4.7	5.0	5.7	40.9
NASSAU	2.7	3.5	4.5	5.0	6.0	7.0	7.5	44.5
NIAGARA	2.1	2.5	3.0	3.5	4.0	4.5	4.8	34.9
ONEIDA	2.3	2.5	3.2	3.8	4.5	4.8	5.4	47.8

APPENDIX D

PRE-DEVELOPMENT PEAK FLOW ANALYSIS

==========
JOB TITLE
==========

Project Date: 5/10/2011
Project Engineer: SAL
Project Title: Norampac Industries, Inc.
Project Comments:
Pre-Development Conditions

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MASTER DESIGN STORM SUMMARY

Network Storm Collection: Niagara

Return Event	Total Depth in	Rainfall Type	RNF ID
1	2.1000	Synthetic Curve	TypeII 24hr
10	3.5000	Synthetic Curve	TypeII 24hr
100	4.8000	Synthetic Curve	TypeII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
*OUT 1	JCT	1	.989		12.1000	11.52		
*OUT 1	JCT	10	2.009		12.1000	23.10		
*OUT 1	JCT	100	2.995		12.1000	33.90		
*OUT 2	JCT	1	2.773		11.9000	49.25		
*OUT 2	JCT	10	5.183		11.9000	89.33		
*OUT 2	JCT	100	7.457		11.9000	126.02		
*OUT 3	JCT	1	.438		12.0500	6.24		
*OUT 3	JCT	10	.870		12.0500	12.05		
*OUT 3	JCT	100	1.285		12.0500	17.42		
*OUT 4	JCT	1	.940		12.3500	7.03		
*OUT 4	JCT	10	2.227		12.3000	17.36		
*OUT 4	JCT	100	3.547		12.3000	27.75		
*OUT 5	JCT	1	.137		12.1500	1.28		
*OUT 5	JCT	10	.326		12.1500	3.15		
*OUT 5	JCT	100	.520		12.1500	5.03		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
SUBAREA 1	AREA	1	.989		12.1000	11.52		
SUBAREA 1	AREA	10	2.009		12.1000	23.10		
SUBAREA 1	AREA	100	2.995		12.1000	33.90		
SUBAREA 2A	AREA	1	2.544		11.9000	45.11		
SUBAREA 2A	AREA	10	4.737		11.9000	81.47		
SUBAREA 2A	AREA	100	6.803		11.9000	114.75		
SUBAREA 2B	AREA	1	.230		11.9000	4.14		
SUBAREA 2B	AREA	10	.447		11.9000	7.85		
SUBAREA 2B	AREA	100	.654		11.9000	11.27		
SUBAREA 3	AREA	1	.438		12.0500	6.24		
SUBAREA 3	AREA	10	.870		12.0500	12.05		
SUBAREA 3	AREA	100	1.285		12.0500	17.42		
SUBAREA 4A	AREA	1	.104		12.2500	.95		
SUBAREA 4A	AREA	10	.242		12.2000	2.28		
SUBAREA 4A	AREA	100	.382		12.2000	3.59		
SUBAREA 4B	AREA	1	.836		12.3500	6.18		
SUBAREA 4B	AREA	10	1.985		12.3500	15.29		
SUBAREA 4B	AREA	100	3.165		12.3500	24.42		
SUBAREA 5A	AREA	1	.026		12.0500	.36		
SUBAREA 5A	AREA	10	.063		12.0500	.88		
SUBAREA 5A	AREA	100	.100		12.0500	1.40		
SUBAREA 5B	AREA	1	.111		12.2500	1.03		
SUBAREA 5B	AREA	10	.263		12.2000	2.53		
SUBAREA 5B	AREA	100	.419		12.2000	4.03		

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

DEFAULT Design Storm File,ID = Niagara

Storm Tag Name = 1

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 1 yr
Total Rainfall Depth= 2.1000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak hrs	Qpeak cfs	Max WSEL ft
Outfall OUT 1	JCT	.989		12.1000	11.52	
Outfall OUT 2	JCT	2.773		11.9000	49.25	
Outfall OUT 3	JCT	.438		12.0500	6.24	
Outfall OUT 4	JCT	.940		12.3500	7.03	
Outfall OUT 5	JCT	.137		12.1500	1.28	
SUBAREA 1	AREA	.989		12.1000	11.52	
SUBAREA 2A	AREA	2.544		11.9000	45.11	
SUBAREA 2B	AREA	.230		11.9000	4.14	
SUBAREA 3	AREA	.438		12.0500	6.24	
SUBAREA 4A	AREA	.104		12.2500	.95	
SUBAREA 4B	AREA	.836		12.3500	6.18	
SUBAREA 5A	AREA	.026		12.0500	.36	
SUBAREA 5B	AREA	.111		12.2500	1.03	

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

DEFAULT Design Storm File,ID = Niagara

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 3.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak hrs	Qpeak cfs	Max WSEL ft
Outfall OUT 1	JCT	2.009		12.1000	23.10	
Outfall OUT 2	JCT	5.183		11.9000	89.33	
Outfall OUT 3	JCT	.870		12.0500	12.05	
Outfall OUT 4	JCT	2.227		12.3000	17.36	
Outfall OUT 5	JCT	.326		12.1500	3.15	
SUBAREA 1	AREA	2.009		12.1000	23.10	
SUBAREA 2A	AREA	4.737		11.9000	81.47	
SUBAREA 2B	AREA	.447		11.9000	7.85	
SUBAREA 3	AREA	.870		12.0500	12.05	
SUBAREA 4A	AREA	.242		12.2000	2.28	
SUBAREA 4B	AREA	1.985		12.3500	15.29	
SUBAREA 5A	AREA	.063		12.0500	.88	
SUBAREA 5B	AREA	.263		12.2000	2.53	

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

DEFAULT Design Storm File,ID = Niagara

Storm Tag Name = 100

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 4.8000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak hrs	Qpeak cfs	Max WSEL ft
Outfall OUT 1	JCT	2.995		12.1000	33.90	
Outfall OUT 2	JCT	7.457		11.9000	126.02	
Outfall OUT 3	JCT	1.285		12.0500	17.42	
Outfall OUT 4	JCT	3.547		12.3000	27.75	
Outfall OUT 5	JCT	.520		12.1500	5.03	
SUBAREA 1	AREA	2.995		12.1000	33.90	
SUBAREA 2A	AREA	6.803		11.9000	114.75	
SUBAREA 2B	AREA	.654		11.9000	11.27	
SUBAREA 3	AREA	1.285		12.0500	17.42	
SUBAREA 4A	AREA	.382		12.2000	3.59	
SUBAREA 4B	AREA	3.165		12.3500	24.42	
SUBAREA 5A	AREA	.100		12.0500	1.40	
SUBAREA 5B	AREA	.419		12.2000	4.03	

Title... Project Date: 5/10/2011
Project Engineer: SAL
Project Title: Norampac Industries, Inc.
Project Comments:
Pre-Development Conditions

DESIGN STORMS SUMMARY

Design Storm File,ID = Niagara

Storm Tag Name = 1

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 1 yr
Total Rainfall Depth= 2.1000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 3.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 4.8000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.2000	
Hydraulic Length	150.00	ft
2yr, 24hr P	2.5000	in
Slope	.019000	ft/ft
Avg.Velocity	.13	ft/sec

Segment #1 Time: .3283 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	446.50	ft
Slope	.012500	ft/ft
Paved		
Avg.Velocity	2.27	ft/sec

Segment #2 Time: .0546 hrs

Segment #3: Tc: TR-55 Channel

Flow Area	2.3500	sq.ft
Wetted Perimeter	4.63	ft
Hydraulic Radius	.51	ft
Slope	.004000	ft/ft
Mannings n	.0120	
Hydraulic Length	175.50	ft
Avg.Velocity	5.00	ft/sec

Segment #3 Time: .0098 hrs

==========
Total Tc: .3927 hrs
==========

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

==== SCS Channel Flow ==

R = Aq / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

Tc = (Lf / V) / (3600sec/hr)

Where: R = Hydraulic radius
Aq = Flow area, sq.ft.
Wp = Wetted perimeter, ft
V = Velocity, ft/sec
Sf = Slope, ft/ft
n = Mannings n
Tc = Time of concentration, hrs
Lf = Flow length, ft

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: Length & Vel.

Hydraulic Length 310.00 ft
Avg.Velocity 5.00 ft/sec

Segment #1 Time: .0172 hrs

Segment #2: Tc: TR-55 Channel

Flow Area 4.7900 sq.ft
Wetted Perimeter 6.62 ft
Hydraulic Radius .72 ft
Slope .003500 ft/ft
Mannings n .0140
Hydraulic Length 970.00 ft

Avg.Velocity 5.07 ft/sec

Segment #2 Time: .0531 hrs

==========
Total Tc: .0703 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs
==========

Tc Equations used...

==== SCS Channel Flow ==

R = Aq / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

Tc = (Lf / V) / (3600sec/hr)

Where: R = Hydraulic radius
Aq = Flow area, sq.ft.
Wp = Wetted perimeter, ft
V = Velocity, ft/sec
Sf = Slope, ft/ft
n = Mannings n
Tc = Time of concentration, hrs
Lf = Flow length, ft

==== User Defined Length & Velocity ==================================

Tc = (Lf / V) / (3600sec/hr)

Where: Tc = Time of concentration, hrs
Lf = Flow length, ft
V = Velocity, ft/sec

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.0110	
Hydraulic Length	150.00	ft
2yr, 24hr P	2.5000	in
Slope	.010000	ft/ft
Avg.Velocity	1.00	ft/sec

Segment #1 Time: .0417 hrs

Total Tc: .0417 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.1000
Hydraulic Length	120.00 ft
2yr, 24hr P	2.5000 in
Slope	.010000 ft/ft

Avg.Velocity .16 ft/sec

Segment #1 Time: .2039 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	190.00 ft
Slope	.005000 ft/ft

Unpaved

Avg.Velocity 1.14 ft/sec

Segment #2 Time: .0463 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	28.00 ft
Slope	.005000 ft/ft

Paved

Avg.Velocity 1.44 ft/sec

Segment #3 Time: .0054 hrs

==========
Total Tc: .2556 hrs
==========

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.3000
Hydraulic Length	150.00 ft
2yr, 24hr P	2.5000 in
Slope	.013000 ft/ft

Avg.Velocity .08 ft/sec

Segment #1 Time: .5286 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	48.00 ft
Slope	.003000 ft/ft

Unpaved

Avg.Velocity .88 ft/sec

Segment #2 Time: .0151 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	75.00 ft
Slope	.003000 ft/ft

Paved

Avg.Velocity 1.11 ft/sec

Segment #3 Time: .0187 hrs

==========
Total Tc: .5624 hrs
==========

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.0200
Hydraulic Length	85.00 ft
2yr, 24hr P	2.5000 in
Slope	.006000 ft/ft

Avg.Velocity .45 ft/sec

Segment #1 Time: .0524 hrs

Segment #2: Tc: TR-55 Sheet

Mannings n	.2500
Hydraulic Length	65.00 ft
2yr, 24hr P	2.5000 in
Slope	.006000 ft/ft

Avg.Velocity .06 ft/sec

Segment #2 Time: .3188 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	770.00 ft
Slope	.007800 ft/ft
Unpaved	

Avg.Velocity 1.42 ft/sec

Segment #3 Time: .1501 hrs

Segment #4: Tc: TR-55 Shallow

Hydraulic Length 751.00 ft
Slope .003000 ft/ft
Unpaved

Avg.Velocity .88 ft/sec

Segment #4 Time: .2361 hrs

Total Tc: .7574 hrs

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.2500
Hydraulic Length	33.00 ft
2yr, 24hr P	2.5000 in
Slope	.006000 ft/ft

Avg.Velocity .05 ft/sec

Segment #1 Time: .1854 hrs

Segment #2: Tc: TR-55 Sheet

Mannings n	.0200
Hydraulic Length	87.00 ft
2yr, 24hr P	2.5000 in
Slope	.006000 ft/ft

Avg.Velocity .45 ft/sec

Segment #2 Time: .0534 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	126.50 ft
Slope	.005000 ft/ft
Unpaved	

Avg.Velocity 1.14 ft/sec

Segment #3 Time: .0308 hrs

Total Tc: .2695 hrs

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.2500	
Hydraulic Length	150.00	ft
2yr, 24hr P	2.5000	in
Slope	.011700	ft/ft
Avg.Velocity	.09	ft/sec

Segment #1 Time: .4765 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	350.00	ft
Slope	.009000	ft/ft
Unpaved		
Avg.Velocity	1.53	ft/sec

Segment #2 Time: .0635 hrs

Total Tc: .5400 hrs

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervious Pavements	98	.420			98.00
Buildings	98	2.730			98.00
Gravel & Compacted Earth - D	91	4.730			91.00
Lawns good - D	80	1.600			80.00
COMPOSITE AREA & WEIGHTED CN --->		9.480			91.47 (91)

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervious Pavements	98	4.390			98.00
Buildings	98	9.970			98.00
Gravel & Compacted Earth - D	91	3.000			91.00
Lawns - good - D	80	.980			80.00
Brush, weed, grass mix - fair - D	77	1.000			77.00
COMPOSITE AREA & WEIGHTED CN --->		19.340			94.92 (95)

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervoius Pavements	98	.100			98.00
Buildings	98	.550			98.00
Gravel & Compacted Earth	91	1.260			91.00
Lawns - good - D	80	.050			80.00
COMPOSITE AREA & WEIGHTED CN --->		1.960			93.04 (93)

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervious Pavements	98	.240			98.00
Buildings	98	.620			98.00
Gravel & Compacted Earth - D	91	3.000			91.00
Brush, weed, grass mix - fair - D	77	.100			77.00
COMPOSITE AREA & WEIGHTED CN --->		3.960			92.17 (92)

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervoius Pavements	98	.100			98.00
Gravel & Compacted Earth - D	91	.560			91.00
Lawns - good - D	80	.680			80.00
Brush, weed, grass mix - fair - D	77	.100			77.00
COMPOSITE AREA & WEIGHTED CN --->		1.440			85.32 (85)

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervoius Pavements	98	.500			98.00
Buildings	98	.030			98.00
Gravel & Compacted Earth - D	91	1.100			91.00
Lawns - fair - D	84	8.510			84.00
Brush, weed, grass mix - fair - D	77	2.160			77.00
COMPOSITE AREA & WEIGHTED CN --->		12.300			84.00 (84)

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Buildings	98	.010			98.00
Gravel & Compacted Earth - D	91	.130			91.00
Lawns - good - D	80	.250			80.00
COMPOSITE AREA & WEIGHTED CN --->		.390			84.13 (84)

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Buildings	98	.010			98.00
Lawns - fair - D	84	1.620			84.00
COMPOSITE AREA & WEIGHTED CN --->		1.630			84.09 (84)

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 1 1
Tc = .3927 hrs
Drainage Area = 9.480 acres Runoff CN= 91

==========
Computational Time Increment = .05236 hrs
Computed Peak Time = 12.0942 hrs
Computed Peak Flow = 11.52 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 11.52 cfs
==========

DRAINAGE AREA

ID:SUBAREA 1
CN = 91
Area = 9.480 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

1.2515 in
.989 ac-ft

HYG Volume... .989 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .39267 hrs (ID: SUBAREA 1)
Computational Incr, Tm = .05236 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 27.35 cfs
Unit peak time Tp = .26178 hrs
Unit receding limb, Tr = 1.04711 hrs
Total unit time, Tb = 1.30889 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 1 10
Tc = .3927 hrs
Drainage Area = 9.480 acres Runoff CN= 91

==========
Computational Time Increment = .05236 hrs
Computed Peak Time = 12.0942 hrs
Computed Peak Flow = 23.14 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 23.10 cfs
==========

DRAINAGE AREA

ID:SUBAREA 1
CN = 91
Area = 9.480 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

2.5411 in
2.007 ac-ft

HYG Volume... 2.009 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .39267 hrs (ID: SUBAREA 1)
Computational Incr, Tm = .05236 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 27.35 cfs
Unit peak time Tp = .26178 hrs
Unit receding limb, Tr = 1.04711 hrs
Total unit time, Tb = 1.30889 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 1 100
Tc = .3927 hrs
Drainage Area = 9.480 acres Runoff CN= 91

==========
Computational Time Increment = .05236 hrs
Computed Peak Time = 12.0942 hrs
Computed Peak Flow = 33.96 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 33.90 cfs
==========

DRAINAGE AREA

ID:SUBAREA 1
CN = 91
Area = 9.480 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

3.7881 in
2.993 ac-ft

HYG Volume... 2.995 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .39267 hrs (ID: SUBAREA 1)
Computational Incr, Tm = .05236 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 27.35 cfs
Unit peak time Tp = .26178 hrs
Unit receding limb, Tr = 1.04711 hrs
Total unit time, Tb = 1.30889 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 2A 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = 19.340 acres Runoff CN= 95

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 46.35 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 45.11 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 2A
CN = 95
Area = 19.340 acres
S = .5263 in
0.2S = .1053 in

Cumulative Runoff

1.5783 in
2.544 ac-ft

HYG Volume... 2.544 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 2A)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 263.06 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 2A 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = 19.340 acres Runoff CN= 95

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 83.34 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 81.47 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 2A
CN = 95
Area = 19.340 acres
S = .5263 in
0.2S = .1053 in

Cumulative Runoff

2.9391 in
4.737 ac-ft

HYG Volume... 4.737 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 2A)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 263.06 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 2A 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = 19.340 acres Runoff CN= 95

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 117.18 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 114.75 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 2A
CN = 95
Area = 19.340 acres
S = .5263 in
0.2S = .1053 in

Cumulative Runoff

4.2215 in
6.804 ac-ft

HYG Volume... 6.803 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 2A)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 263.06 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 2B 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.960 acres Runoff CN= 93

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 4.27 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 4.14 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 2B
CN = 93
Area = 1.960 acres
S = .7527 in
0.2S = .1505 in

Cumulative Runoff

1.4064 in
.230 ac-ft

HYG Volume... .230 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 2B)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 26.66 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 2B 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.960 acres Runoff CN= 93

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 8.06 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 7.85 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 2B
CN = 93
Area = 1.960 acres
S = .7527 in
0.2S = .1505 in

Cumulative Runoff

2.7349 in
.447 ac-ft

HYG Volume... .447 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 2B)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 26.66 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 2B 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.960 acres Runoff CN= 93

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 11.53 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 11.27 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 2B
CN = 93
Area = 1.960 acres
S = .7527 in
0.2S = .1505 in

Cumulative Runoff

4.0016 in
.654 ac-ft

HYG Volume... .654 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 2B)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 26.66 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 3 1
Tc = .2556 hrs
Drainage Area = 3.960 acres Runoff CN= 92

==========
Computational Time Increment = .03408 hrs
Computed Peak Time = 12.0301 hrs
Computed Peak Flow = 6.27 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = 6.24 cfs
==========

DRAINAGE AREA

ID:SUBAREA 3
CN = 92
Area = 3.960 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff

1.3270 in
.438 ac-ft

HYG Volume... .438 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .25560 hrs (ID: SUBAREA 3)
Computational Incr, Tm = .03408 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 17.55 cfs
Unit peak time Tp = .17040 hrs
Unit receding limb, Tr = .68159 hrs
Total unit time, Tb = .85199 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 3 10
Tc = .2556 hrs
Drainage Area = 3.960 acres Runoff CN= 92

==========
Computational Time Increment = .03408 hrs
Computed Peak Time = 12.0301 hrs
Computed Peak Flow = 12.17 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = 12.05 cfs
==========

DRAINAGE AREA

ID:SUBAREA 3
CN = 92
Area = 3.960 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff

2.6367 in
.870 ac-ft

HYG Volume... .870 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .25560 hrs (ID: SUBAREA 3)
Computational Incr, Tm = .03408 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 17.55 cfs
Unit peak time Tp = .17040 hrs
Unit receding limb, Tr = .68159 hrs
Total unit time, Tb = .85199 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 3 100
Tc = .2556 hrs
Drainage Area = 3.960 acres Runoff CN= 92

==========
Computational Time Increment = .03408 hrs
Computed Peak Time = 12.0301 hrs
Computed Peak Flow = 17.62 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = 17.42 cfs
==========

DRAINAGE AREA

ID:SUBAREA 3
CN = 92
Area = 3.960 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff

3.8941 in
1.285 ac-ft

HYG Volume... 1.285 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .25560 hrs (ID: SUBAREA 3)
Computational Incr, Tm = .03408 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 17.55 cfs
Unit peak time Tp = .17040 hrs
Unit receding limb, Tr = .68159 hrs
Total unit time, Tb = .85199 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 4A 1
Tc = .5624 hrs
Drainage Area = 1.440 acres Runoff CN= 85

==========
Computational Time Increment = .07499 hrs
Computed Peak Time = 12.2226 hrs
Computed Peak Flow = .97 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.2500 hrs
Peak Flow, Interpolated Output = .95 cfs
==========

DRAINAGE AREA

ID:SUBAREA 4A
CN = 85
Area = 1.440 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

.8691 in
.104 ac-ft

HYG Volume... .104 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .56239 hrs (ID: SUBAREA 4A)
Computational Incr, Tm = .07499 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 2.90 cfs
Unit peak time Tp = .37493 hrs
Unit receding limb, Tr = 1.49971 hrs
Total unit time, Tb = 1.87464 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 4A 10
Tc = .5624 hrs
Drainage Area = 1.440 acres Runoff CN= 85

==========
Computational Time Increment = .07499 hrs
Computed Peak Time = 12.2226 hrs
Computed Peak Flow = 2.31 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.2000 hrs
Peak Flow, Interpolated Output = 2.28 cfs
==========

DRAINAGE AREA

ID:SUBAREA 4A
CN = 85
Area = 1.440 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

2.0164 in
.242 ac-ft

HYG Volume... .242 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .56239 hrs (ID: SUBAREA 4A)
Computational Incr, Tm = .07499 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 2.90 cfs
Unit peak time Tp = .37493 hrs
Unit receding limb, Tr = 1.49971 hrs
Total unit time, Tb = 1.87464 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 4A 100
Tc = .5624 hrs
Drainage Area = 1.440 acres Runoff CN= 85

==========
Computational Time Increment = .07499 hrs
Computed Peak Time = 12.2226 hrs
Computed Peak Flow = 3.63 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.2000 hrs
Peak Flow, Interpolated Output = 3.59 cfs
==========

DRAINAGE AREA

ID:SUBAREA 4A
CN = 85
Area = 1.440 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

3.1837 in
.382 ac-ft

HYG Volume... .382 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .56239 hrs (ID: SUBAREA 4A)
Computational Incr, Tm = .07499 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 2.90 cfs
Unit peak time Tp = .37493 hrs
Unit receding limb, Tr = 1.49971 hrs
Total unit time, Tb = 1.87464 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 4B 1
Tc = .7574 hrs
Drainage Area = 12.300 acres Runoff CN= 84

==========
Computational Time Increment = .10098 hrs
Computed Peak Time = 12.3199 hrs
Computed Peak Flow = 6.19 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3500 hrs
Peak Flow, Interpolated Output = 6.18 cfs
==========

DRAINAGE AREA

ID:SUBAREA 4B
CN = 84
Area = 12.300 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

.8155 in
.836 ac-ft

HYG Volume... .836 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .75737 hrs (ID: SUBAREA 4B)
Computational Incr, Tm = .10098 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 18.40 cfs
Unit peak time Tp = .50491 hrs
Unit receding limb, Tr = 2.01966 hrs
Total unit time, Tb = 2.52457 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 4B 10
Tc = .7574 hrs
Drainage Area = 12.300 acres Runoff CN= 84

==========
Computational Time Increment = .10098 hrs
Computed Peak Time = 12.3199 hrs
Computed Peak Flow = 15.43 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3500 hrs
Peak Flow, Interpolated Output = 15.29 cfs
==========

DRAINAGE AREA

ID:SUBAREA 4B
CN = 84
Area = 12.300 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

1.9365 in
1.985 ac-ft

HYG Volume... 1.985 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .75737 hrs (ID: SUBAREA 4B)
Computational Incr, Tm = .10098 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 18.40 cfs
Unit peak time Tp = .50491 hrs
Unit receding limb, Tr = 2.01966 hrs
Total unit time, Tb = 2.52457 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 4B 100
Tc = .7574 hrs
Drainage Area = 12.300 acres Runoff CN= 84

==========
Computational Time Increment = .10098 hrs
Computed Peak Time = 12.3199 hrs
Computed Peak Flow = 24.70 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3500 hrs
Peak Flow, Interpolated Output = 24.42 cfs
==========

DRAINAGE AREA

ID:SUBAREA 4B
CN = 84
Area = 12.300 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

3.0880 in
3.165 ac-ft

HYG Volume... 3.165 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .75737 hrs (ID: SUBAREA 4B)
Computational Incr, Tm = .10098 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 18.40 cfs
Unit peak time Tp = .50491 hrs
Unit receding limb, Tr = 2.01966 hrs
Total unit time, Tb = 2.52457 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 5A 1
Tc = .2695 hrs
Drainage Area = .390 acres Runoff CN= 84

==========
Computational Time Increment = .03594 hrs
Computed Peak Time = 12.0753 hrs
Computed Peak Flow = .37 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = .36 cfs
==========

DRAINAGE AREA

ID:SUBAREA 5A
CN = 84
Area = .390 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

.8155 in
.027 ac-ft

HYG Volume... .026 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .26954 hrs (ID: SUBAREA 5A)
Computational Incr, Tm = .03594 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.64 cfs
Unit peak time Tp = .17969 hrs
Unit receding limb, Tr = .71877 hrs
Total unit time, Tb = .89846 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 5A 10
Tc = .2695 hrs
Drainage Area = .390 acres Runoff CN= 84

==========
Computational Time Increment = .03594 hrs
Computed Peak Time = 12.0393 hrs
Computed Peak Flow = .89 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = .88 cfs
==========

DRAINAGE AREA

ID:SUBAREA 5A
CN = 84
Area = .390 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

1.9365 in
.063 ac-ft

HYG Volume... .063 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .26954 hrs (ID: SUBAREA 5A)
Computational Incr, Tm = .03594 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.64 cfs
Unit peak time Tp = .17969 hrs
Unit receding limb, Tr = .71877 hrs
Total unit time, Tb = .89846 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 5A 100
Tc = .2695 hrs
Drainage Area = .390 acres Runoff CN= 84

==========
Computational Time Increment = .03594 hrs
Computed Peak Time = 12.0393 hrs
Computed Peak Flow = 1.41 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = 1.40 cfs
==========

DRAINAGE AREA

ID:SUBAREA 5A
CN = 84
Area = .390 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

3.0880 in
.100 ac-ft

HYG Volume... .100 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .26954 hrs (ID: SUBAREA 5A)
Computational Incr, Tm = .03594 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.64 cfs
Unit peak time Tp = .17969 hrs
Unit receding limb, Tr = .71877 hrs
Total unit time, Tb = .89846 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 5B 1
Tc = .5400 hrs
Drainage Area = 1.630 acres Runoff CN= 84

==========
Computational Time Increment = .07200 hrs
Computed Peak Time = 12.2408 hrs
Computed Peak Flow = 1.04 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.2500 hrs
Peak Flow, Interpolated Output = 1.03 cfs
==========

DRAINAGE AREA

ID:SUBAREA 5B
CN = 84
Area = 1.630 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

.8155 in
.111 ac-ft

HYG Volume... .111 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .54003 hrs (ID: SUBAREA 5B)
Computational Incr, Tm = .07200 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.42 cfs
Unit peak time Tp = .36002 hrs
Unit receding limb, Tr = 1.44009 hrs
Total unit time, Tb = 1.80011 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 5B 10
Tc = .5400 hrs
Drainage Area = 1.630 acres Runoff CN= 84

==========
Computational Time Increment = .07200 hrs
Computed Peak Time = 12.2408 hrs
Computed Peak Flow = 2.53 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.2000 hrs
Peak Flow, Interpolated Output = 2.53 cfs
==========

DRAINAGE AREA

ID:SUBAREA 5B
CN = 84
Area = 1.630 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

1.9365 in
.263 ac-ft

HYG Volume... .263 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .54003 hrs (ID: SUBAREA 5B)
Computational Incr, Tm = .07200 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.42 cfs
Unit peak time Tp = .36002 hrs
Unit receding limb, Tr = 1.44009 hrs
Total unit time, Tb = 1.80011 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 5B 100
Tc = .5400 hrs
Drainage Area = 1.630 acres Runoff CN= 84

==========
Computational Time Increment = .07200 hrs
Computed Peak Time = 12.1688 hrs
Computed Peak Flow = 4.04 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.2000 hrs
Peak Flow, Interpolated Output = 4.03 cfs
==========

DRAINAGE AREA

ID:SUBAREA 5B
CN = 84
Area = 1.630 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

3.0880 in
.419 ac-ft

HYG Volume... .419 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .54003 hrs (ID: SUBAREA 5B)
Computational Incr, Tm = .07200 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.42 cfs
Unit peak time Tp = .36002 hrs
Unit receding limb, Tr = 1.44009 hrs
Total unit time, Tb = 1.80011 hrs

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APPENDIX E

POST-DEVELOPMENT PEAK FLOW ANALYSIS

==========
JOB TITLE
==========

Project Date: 5/20/2011
Project Engineer: SAL
Project Title: Norampac Industries, Inc.
Project Comments:
Post-Development Conditions

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********** OUTLET STRUCTURES **********

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MASTER DESIGN STORM SUMMARY

Network Storm Collection: Niagara

Return Event	Total Depth in	Rainfall Type	RNF ID
1	2.1000	Synthetic Curve	TypeII 24hr
10	3.5000	Synthetic Curve	TypeII 24hr
100	4.8000	Synthetic Curve	TypeII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
BASIN	IN POND	1	1.902		12.0000	28.13		
BASIN	IN POND	10	3.730		11.9500	55.30		
BASIN	IN POND	100	5.580		11.9500	81.47		
BASIN	OUT POND	1	.726		12.6500	2.13	565.62	.000
BASIN	OUT POND	10	2.377		12.2500	11.74	567.14	.000
BASIN	OUT POND	100	4.118		12.3500	15.82	568.51	.000
CB-1	JCT	1	.155		11.9500	2.76		
CB-1	JCT	10	.344		11.9500	6.06		
CB-1	JCT	100	.532		11.9500	9.24		
CB-10	JCT	1	.640		11.9500	10.16		
CB-10	JCT	10	1.116		11.9500	17.22		
CB-10	JCT	100	1.620		11.9000	27.84		
CB-11	JCT	1	.396		11.9500	6.33		
CB-11	JCT	10	.691		11.9500	10.73		
CB-11	JCT	100	.966		11.9500	14.79		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
CB-12	JCT	1	.123		11.9000	2.04		
CB-12	JCT	10	.215		11.9000	3.46		
CB-12	JCT	100	.300		11.9000	4.77		
CB-13	JCT	1	.025		11.9000	.40		
CB-13	JCT	10	.043		11.9000	.68		
CB-13	JCT	100	.061		11.9000	.94		
CB-14	JCT	1	.162		11.9500	2.90		
CB-14	JCT	10	.330		11.9500	5.75		
CB-14	JCT	100	.493		11.9500	8.41		
CB-15	JCT	1	.231		12.0000	2.68		
CB-15	JCT	10	.496		12.0000	5.52		
CB-15	JCT	100	.772		11.9500	10.57		
CB-16	JCT	1	.100		12.1500	.91		
CB-16	JCT	10	.222		12.1500	2.08		
CB-16	JCT	100	.343		12.1500	3.22		
CB-2	JCT	1	.626		11.9000	10.28		
CB-2	JCT	10	1.177		11.9000	19.12		
CB-2	JCT	100	1.706		11.9000	27.44		
CB-3	JCT	1	.175		11.9000	3.08		
CB-3	JCT	10	.326		11.9000	5.57		
CB-3	JCT	100	.468		11.9000	7.86		
CB-4	JCT	1	.283		11.9000	4.28		
CB-4	JCT	10	.551		11.9000	8.07		
CB-4	JCT	100	.811		11.9000	11.64		
CB-5	JCT	1	.161		11.9000	2.83		
CB-5	JCT	10	.302		11.9000	5.20		
CB-5	JCT	100	.436		11.9000	7.37		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
CB-6	JCT	1	.115		11.9500	2.03		
CB-6	JCT	10	.249		11.9500	4.37		
CB-6	JCT	100	.384		11.9500	6.62		
CB-7	JCT	1	.505		11.9500	7.88		
CB-7	JCT	10	.984		12.0000	16.34		
CB-7	JCT	100	1.404		11.9000	19.76		
CB-8	JCT	1	.161		12.0000	2.58		
CB-8	JCT	10	.347		11.9500	6.66		
CB-8	JCT	100	.520		11.9000	8.00		
CB-9	JCT	1	.865		11.9500	13.37		
CB-9	JCT	10	1.508		11.9500	22.69		
CB-9	JCT	100	2.282	R	11.9000	42.23		
DI-1	JCT	1	.074		11.9500	1.31		
DI-1	JCT	10	.150		11.9500	2.59		
DI-1	JCT	100	.224		11.9500	3.77		
DI-10	JCT	1	.069		11.9000	1.15		
DI-10	JCT	10	.120		11.9000	1.95		
DI-10	JCT	100	.167		11.9000	2.69		
DI-11	JCT	1	.014		11.9000	.24		
DI-11	JCT	10	.024		11.9000	.40		
DI-11	JCT	100	.034		11.9000	.55		
DI-12	JCT	1	.009		11.9000	.16		
DI-12	JCT	10	.016		11.9000	.27		
DI-12	JCT	100	.023		11.9000	.37		
DI-13	JCT	1	.127		11.9000	2.30		
DI-13	JCT	10	.258		11.9000	4.61		
DI-13	JCT	100	.385		11.9000	6.76		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
DI-14	JCT	1	.016		11.9000	.28		
DI-14	JCT	10	.029		11.9000	.51		
DI-14	JCT	100	.042		11.9000	.71		
DI-15	JCT	1	.083		12.0000	1.35		
DI-15	JCT	10	.192		12.0000	3.13		
DI-15	JCT	100	.302		12.0000	4.87		
DI-2	JCT	1	.119		11.9500	1.96		
DI-2	JCT	10	.237		11.9500	3.81		
DI-2	JCT	100	.350		11.9500	5.52		
DI-3	JCT	1	.252		12.2500	2.22		
DI-3	JCT	10	.470		12.2500	4.02		
DI-3	JCT	100	.675		12.2500	5.68		
DI-4	JCT	1	.026		11.9000	.46		
DI-4	JCT	10	.050		11.9000	.88		
DI-4	JCT	100	.073		11.9000	1.27		
DI-5	JCT	1	.053		11.9000	.89		
DI-5	JCT	10	.093		11.9000	1.51		
DI-5	JCT	100	.129		11.9000	2.08		
DI-6	JCT	1	.091		12.0000	1.50		
DI-6	JCT	10	.190		12.0000	3.02		
DI-6	JCT	100	.286		12.0000	4.44		
DI-7	JCT	1	.137		11.9000	2.30		
DI-7	JCT	10	.240		11.9000	3.91		
DI-7	JCT	100	.335		11.9000	5.39		
DI-8	JCT	1	.067		11.9000	1.12		
DI-8	JCT	10	.117		11.9000	1.91		
DI-8	JCT	100	.164		11.9000	2.63		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
DI-9	JCT	1	.067		11.9000	1.12		
DI-9	JCT	10	.117		11.9000	1.91		
DI-9	JCT	100	.164		11.9000	2.63		
ES-4	JCT	1	.095		11.9500	1.66		
ES-4	JCT	10	.193		11.9000	3.29		
ES-4	JCT	100	.288		11.9000	4.85		
ES-5	JCT	1	.025		11.9500	.40		
ES-5	JCT	10	.043		11.9500	.68		
ES-5	JCT	100	.061		11.9500	.93		
JUNC 10	JCT	1	1.283		12.0000	10.76		
JUNC 10	JCT	10	3.438		12.2000	21.46		
JUNC 10	JCT	100	5.668		12.3000	25.72		
*OUT 1	JCT	1	1.283		12.0000	10.76		
*OUT 1	JCT	10	3.438		12.2000	21.46		
*OUT 1	JCT	100	5.668		12.3000	25.72		
*OUT 2	JCT	1	3.142		11.9500	43.59		
*OUT 2	JCT	10	6.013		11.9500	81.50		
*OUT 2	JCT	100	8.767		11.9500	116.89		
*OUT 3	JCT	1	.287		11.9500	4.99		
*OUT 3	JCT	10	.637		11.9500	11.04		
*OUT 3	JCT	100	.986		11.9500	16.85		
*OUT 4	JCT	1	.030		12.0000	.49		
*OUT 4	JCT	10	.075		11.9500	1.28		
*OUT 4	JCT	100	.124		11.9500	2.11		
SR-1	JCT	1	.828		11.9500	13.47		
SR-1	JCT	10	1.606		11.9500	25.80		
SR-1	JCT	100	2.359		11.9500	37.43		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
SR-2	JCT	1	.486		11.9000	8.13		
SR-2	JCT	10	.868		11.9000	14.17		
SR-2	JCT	100	1.226		11.9000	19.75		
SR-3	JCT	1	.074		12.0000	1.13		
SR-3	JCT	10	.142		12.0000	2.09		
SR-3	JCT	100	.205		12.0000	2.96		
SR-4	JCT	1	.516		12.1500	4.85		
SR-4	JCT	10	.950		12.1500	8.70		
SR-4	JCT	100	1.358		12.1500	12.22		
SR-5	JCT	1	.277		11.9000	3.32		
SR-5	JCT	10	.542		11.9000	6.17		
SR-5	JCT	100	.796		11.9000	8.80		
SR-6	JCT	1	.348		11.9500	4.58		
SR-6	JCT	10	.718		11.9500	9.08		
SR-6	JCT	100	1.085		11.9500	13.42		
SR-7	JCT	1	.054		11.9000	.95		
SR-7	JCT	10	.099		11.9000	1.68		
SR-7	JCT	100	.141		11.9000	2.34		
SR-8	JCT	1	.064		11.9000	1.07		
SR-8	JCT	10	.112		11.9000	1.82		
SR-8	JCT	100	.156		11.9000	2.51		
SR-9	JCT	1	.081		11.9000	1.41		
SR-9	JCT	10	.147		11.9000	2.49		
SR-9	JCT	100	.209		11.9000	3.49		
STMH-10	JCT	1	.626		11.9000	10.28		
STMH-10	JCT	10	1.177		11.9000	19.12		
STMH-10	JCT	100	1.706		11.9000	27.44		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
STMH-2	JCT	1	2.674		11.9500	35.28		
STMH-2	JCT	10	5.084		11.9500	65.54		
STMH-2	JCT	100	7.395		11.9500	93.90		
STMH-3	JCT	1	1.846		11.9500	21.81		
STMH-3	JCT	10	3.478		11.9500	39.74		
STMH-3	JCT	100	5.036		11.9500	56.47		
STMH-4	JCT	1	1.846		11.9500	21.81		
STMH-4	JCT	10	3.478		11.9500	39.74		
STMH-4	JCT	100	5.036		11.9500	56.47		
STMH-5	JCT	1	1.782		11.9500	20.80		
STMH-5	JCT	10	3.366		11.9500	38.03		
STMH-5	JCT	100	4.880		11.9500	54.12		
STMH-6	JCT	1	1.701		11.9500	19.45		
STMH-6	JCT	10	3.219		11.9500	35.68		
STMH-6	JCT	100	4.670		11.9500	50.84		
STMH-7	JCT	1	1.215		12.0000	11.84		
STMH-7	JCT	10	2.351		12.0000	22.51		
STMH-7	JCT	100	3.444		12.0000	32.56		
STMH-8	JCT	1	1.141		12.0000	10.71		
STMH-8	JCT	10	2.209		12.0000	20.43		
STMH-8	JCT	100	3.238		12.0000	29.60		
STMH-9	JCT	1	.625		11.9500	7.85		
STMH-9	JCT	10	1.259		11.9500	15.11		
STMH-9	JCT	100	1.880		11.9500	22.01		
SUBAREA 1	AREA	1	.091		12.0000	1.50		
SUBAREA 1	AREA	10	.190		12.0000	3.02		
SUBAREA 1	AREA	100	.286		12.0000	4.44		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
SUBAREA 10	AREA	1	.009		11.9000	.16		
SUBAREA 10	AREA	10	.016		11.9000	.27		
SUBAREA 10	AREA	100	.023		11.9000	.37		
SUBAREA 11	AREA	1	.070		11.9000	1.27		
SUBAREA 11	AREA	10	.149		11.9000	2.69		
SUBAREA 11	AREA	100	.227		11.9000	4.03		
SUBAREA 12	AREA	1	.016		11.9000	.26		
SUBAREA 12	AREA	10	.027		11.9000	.44		
SUBAREA 12	AREA	100	.038		11.9000	.61		
SUBAREA 13	AREA	1	.085		12.2000	.86		
SUBAREA 13	AREA	10	.192		12.2000	1.98		
SUBAREA 13	AREA	100	.301		12.1500	3.08		
SUBAREA 14	AREA	1	.035		12.1000	.43		
SUBAREA 14	AREA	10	.073		12.1000	.89		
SUBAREA 14	AREA	100	.110		12.1000	1.32		
SUBAREA 15	AREA	1	.032		12.1500	.34		
SUBAREA 15	AREA	10	.074		12.1500	.81		
SUBAREA 15	AREA	100	.117		12.1500	1.27		
SUBAREA 16	AREA	1	.016		11.9000	.28		
SUBAREA 16	AREA	10	.029		11.9000	.51		
SUBAREA 16	AREA	100	.042		11.9000	.71		
SUBAREA 17	AREA	1	.070		11.9000	1.26		
SUBAREA 17	AREA	10	.145		11.9000	2.60		
SUBAREA 17	AREA	100	.218		11.9000	3.85		
SUBAREA 18	AREA	1	.206		11.9000	3.45		
SUBAREA 18	AREA	10	.359		11.9000	5.86		
SUBAREA 18	AREA	100	.502		11.9000	8.08		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
SUBAREA 19	AREA	1	.109		11.9500	1.96		
SUBAREA 19	AREA	10	.258		11.9000	4.67		
SUBAREA 19	AREA	100	.412		11.9000	7.44		
SUBAREA 2	AREA	1	.014		11.9000	.24		
SUBAREA 2	AREA	10	.024		11.9000	.40		
SUBAREA 2	AREA	100	.034		11.9000	.55		
SUBAREA 20	AREA	1	.468		11.9000	8.45		
SUBAREA 20	AREA	10	.929		11.9000	16.48		
SUBAREA 20	AREA	100	1.373		11.9000	23.89		
SUBAREA 21	AREA	1	.108		11.9000	1.94		
SUBAREA 21	AREA	10	.210		11.9000	3.69		
SUBAREA 21	AREA	100	.307		11.9000	5.29		
SUBAREA 22	AREA	1	.137		11.9000	2.30		
SUBAREA 22	AREA	10	.240		11.9000	3.91		
SUBAREA 22	AREA	100	.335		11.9000	5.39		
SUBAREA 23	AREA	1	.034		11.9000	.62		
SUBAREA 23	AREA	10	.071		11.9000	1.28		
SUBAREA 23	AREA	100	.107		11.9000	1.90		
SUBAREA 24	AREA	1	.127		11.9000	2.30		
SUBAREA 24	AREA	10	.258		11.9000	4.61		
SUBAREA 24	AREA	100	.385		11.9000	6.76		
SUBAREA 25	AREA	1	.053		11.9000	.89		
SUBAREA 25	AREA	10	.093		11.9000	1.51		
SUBAREA 25	AREA	100	.129		11.9000	2.08		
SUBAREA 26	AREA	1	.064		11.9000	1.07		
SUBAREA 26	AREA	10	.112		11.9000	1.82		
SUBAREA 26	AREA	100	.156		11.9000	2.51		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
SUBAREA 27	AREA	1	.058		12.0500	.77		
SUBAREA 27	AREA	10	.137		12.0500	1.87		
SUBAREA 27	AREA	100	.219		12.0500	2.97		
SUBAREA 28	AREA	1	.065		12.1500	.68		
SUBAREA 28	AREA	10	.167		12.1500	1.86		
SUBAREA 28	AREA	100	.274		12.1500	3.07		
SUBAREA 29	AREA	1	.468		11.9500	8.31		
SUBAREA 29	AREA	10	.929		11.9500	15.95		
SUBAREA 29	AREA	100	1.373		11.9500	22.99		
SUBAREA 3	AREA	1	.109		11.9000	1.83		
SUBAREA 3	AREA	10	.191		11.9000	3.11		
SUBAREA 3	AREA	100	.266		11.9000	4.28		
SUBAREA 30	AREA	1	.102		12.3000	.84		
SUBAREA 30	AREA	10	.216		12.3000	1.77		
SUBAREA 30	AREA	100	.328		12.3000	2.67		
SUBAREA 31	AREA	1	.092		11.9000	1.64		
SUBAREA 31	AREA	10	.175		11.9000	3.04		
SUBAREA 31	AREA	100	.253		11.9000	4.33		
SUBAREA 32	AREA	1	.058		11.9000	.97		
SUBAREA 32	AREA	10	.101		11.9000	1.64		
SUBAREA 32	AREA	100	.141		11.9000	2.26		
SUBAREA 33	AREA	1	.263		12.1500	2.73		
SUBAREA 33	AREA	10	.480		12.1500	4.82		
SUBAREA 33	AREA	100	.683		12.1500	6.74		
SUBAREA 34	AREA	1	.252		12.2500	2.22		
SUBAREA 34	AREA	10	.470		12.2500	4.02		
SUBAREA 34	AREA	100	.675		12.2500	5.68		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
SUBAREA 35	AREA	1	.074		12.0000	1.13		
SUBAREA 35	AREA	10	.142		12.0000	2.09		
SUBAREA 35	AREA	100	.205		12.0000	2.96		
SUBAREA 36	AREA	1	.026		11.9000	.46		
SUBAREA 36	AREA	10	.050		11.9000	.88		
SUBAREA 36	AREA	100	.073		11.9000	1.27		
SUBAREA 37	AREA	1	.030		12.0000	.49		
SUBAREA 37	AREA	10	.075		11.9500	1.28		
SUBAREA 37	AREA	100	.124		11.9500	2.11		
SUBAREA 38	AREA	1	.071		11.9500	1.26		
SUBAREA 38	AREA	10	.144		11.9500	2.49		
SUBAREA 38	AREA	100	.215		11.9500	3.63		
SUBAREA 39A	AREA	1	.415		11.9000	6.95		
SUBAREA 39A	AREA	10	.724		11.9000	11.81		
SUBAREA 39A	AREA	100	1.012		11.9000	16.28		
SUBAREA 39B	AREA	1	.415		11.9000	6.95		
SUBAREA 39B	AREA	10	.724		11.9000	11.81		
SUBAREA 39B	AREA	100	1.012		11.9000	16.28		
SUBAREA 4	AREA	1	.069		11.9000	1.15		
SUBAREA 4	AREA	10	.120		11.9000	1.95		
SUBAREA 4	AREA	100	.167		11.9000	2.69		
SUBAREA 40	AREA	1	.074		11.9500	1.31		
SUBAREA 40	AREA	10	.150		11.9500	2.59		
SUBAREA 40	AREA	100	.224		11.9500	3.77		
SUBAREA 41	AREA	1	.041		11.9500	.72		
SUBAREA 41	AREA	10	.099		11.9500	1.79		
SUBAREA 41	AREA	100	.160		11.9500	2.84		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
SUBAREA 42	AREA	1	.041		11.9500	.73		
SUBAREA 42	AREA	10	.094		11.9500	1.69		
SUBAREA 42	AREA	100	.149		11.9500	2.62		
SUBAREA 43	AREA	1	.055		11.9500	.96		
SUBAREA 43	AREA	10	.110		11.9500	1.86		
SUBAREA 43	AREA	100	.162		11.9500	2.68		
SUBAREA 44	AREA	1	.119		11.9500	1.96		
SUBAREA 44	AREA	10	.237		11.9500	3.81		
SUBAREA 44	AREA	100	.350		11.9500	5.52		
SUBAREA 45	AREA	1	.083		12.0000	1.35		
SUBAREA 45	AREA	10	.192		12.0000	3.13		
SUBAREA 45	AREA	100	.302		12.0000	4.87		
SUBAREA 46	AREA	1	.054		11.9000	.95		
SUBAREA 46	AREA	10	.099		11.9000	1.68		
SUBAREA 46	AREA	100	.141		11.9000	2.34		
SUBAREA 47	AREA	1	.081		11.9000	1.41		
SUBAREA 47	AREA	10	.147		11.9000	2.49		
SUBAREA 47	AREA	100	.209		11.9000	3.49		
SUBAREA 48	AREA	1	.287		11.9500	4.99		
SUBAREA 48	AREA	10	.637		11.9500	11.04		
SUBAREA 48	AREA	100	.986		11.9500	16.85		
SUBAREA 49	AREA	1	.064		11.9000	1.07		
SUBAREA 49	AREA	10	.112		11.9000	1.82		
SUBAREA 49	AREA	100	.156		11.9000	2.51		
SUBAREA 5	AREA	1	.205		11.9000	3.42		
SUBAREA 5	AREA	10	.357		11.9000	5.81		
SUBAREA 5	AREA	100	.498		11.9000	8.02		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
SUBAREA 6	AREA	1	.067		11.9000	1.12		
SUBAREA 6	AREA	10	.117		11.9000	1.91		
SUBAREA 6	AREA	100	.164		11.9000	2.63		
SUBAREA 7	AREA	1	.176		11.9000	2.95		
SUBAREA 7	AREA	10	.308		11.9000	5.02		
SUBAREA 7	AREA	100	.430		11.9000	6.92		
SUBAREA 8	AREA	1	.067		11.9000	1.12		
SUBAREA 8	AREA	10	.117		11.9000	1.91		
SUBAREA 8	AREA	100	.164		11.9000	2.63		
SUBAREA 9	AREA	1	.158		11.9000	2.64		
SUBAREA 9	AREA	10	.275		11.9000	4.48		
SUBAREA 9	AREA	100	.384		11.9000	6.18		
TD-1	JCT	1	.064		11.9000	1.07		
TD-1	JCT	10	.112		11.9000	1.82		
TD-1	JCT	100	.156		11.9000	2.51		

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

DEFAULT Design Storm File,ID = Niagara

Storm Tag Name = 1

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 1 yr
Total Rainfall Depth= 2.1000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Node ID		Type	HYG Vol ac-ft	Trun.	Qpeak hrs	Qpeak cfs	Max WSEL ft
BASIN	IN	POND	1.902		12.0000	28.13	
BASIN	OUT	POND	.726		12.6500	2.13	565.62
CB-1		JCT	.155		11.9500	2.76	
CB-10		JCT	.640		11.9500	10.16	
CB-11		JCT	.396		11.9500	6.33	
CB-12		JCT	.123		11.9000	2.04	
CB-13		JCT	.025		11.9000	.40	
CB-14		JCT	.162		11.9500	2.90	
CB-15		JCT	.231		12.0000	2.68	
CB-16		JCT	.100		12.1500	.91	
CB-2		JCT	.626		11.9000	10.28	
CB-3		JCT	.175		11.9000	3.08	
CB-4		JCT	.283		11.9000	4.28	
CB-5		JCT	.161		11.9000	2.83	
CB-6		JCT	.115		11.9500	2.03	
CB-7		JCT	.505		11.9500	7.88	
CB-8		JCT	.161		12.0000	2.58	
CB-9		JCT	.865		11.9500	13.37	
DI-1		JCT	.074		11.9500	1.31	
DI-10		JCT	.069		11.9000	1.15	
DI-11		JCT	.014		11.9000	.24	
DI-12		JCT	.009		11.9000	.16	
DI-13		JCT	.127		11.9000	2.30	
DI-14		JCT	.016		11.9000	.28	
DI-15		JCT	.083		12.0000	1.35	
DI-2		JCT	.119		11.9500	1.96	
DI-3		JCT	.252		12.2500	2.22	
DI-4		JCT	.026		11.9000	.46	
DI-5		JCT	.053		11.9000	.89	
DI-6		JCT	.091		12.0000	1.50	
DI-7		JCT	.137		11.9000	2.30	
DI-8		JCT	.067		11.9000	1.12	

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak hrs	Qpeak cfs	Max WSEL ft
DI-9	JCT	.067		11.9000	1.12	
ES-4	JCT	.095		11.9500	1.66	
ES-5	JCT	.025		11.9500	.40	
JUNC 10	JCT	1.283		12.0000	10.76	
Outfall OUT 1	JCT	1.283		12.0000	10.76	
Outfall OUT 2	JCT	3.142		11.9500	43.59	
Outfall OUT 3	JCT	.287		11.9500	4.99	
Outfall OUT 4	JCT	.030		12.0000	.49	
SR-1	JCT	.828		11.9500	13.47	
SR-2	JCT	.486		11.9000	8.13	
SR-3	JCT	.074		12.0000	1.13	
SR-4	JCT	.516		12.1500	4.85	
SR-5	JCT	.277		11.9000	3.32	
SR-6	JCT	.348		11.9500	4.58	
SR-7	JCT	.054		11.9000	.95	
SR-8	JCT	.064		11.9000	1.07	
SR-9	JCT	.081		11.9000	1.41	
STMH-10	JCT	.626		11.9000	10.28	
STMH-2	JCT	2.674		11.9500	35.28	
STMH-3	JCT	1.846		11.9500	21.81	
STMH-4	JCT	1.846		11.9500	21.81	
STMH-5	JCT	1.782		11.9500	20.80	
STMH-6	JCT	1.701		11.9500	19.45	
STMH-7	JCT	1.215		12.0000	11.84	
STMH-8	JCT	1.141		12.0000	10.71	
STMH-9	JCT	.625		11.9500	7.85	
SUBAREA 1	AREA	.091		12.0000	1.50	
SUBAREA 10	AREA	.009		11.9000	.16	
SUBAREA 11	AREA	.070		11.9000	1.27	
SUBAREA 12	AREA	.016		11.9000	.26	
SUBAREA 13	AREA	.085		12.2000	.86	
SUBAREA 14	AREA	.035		12.1000	.43	
SUBAREA 15	AREA	.032		12.1500	.34	
SUBAREA 16	AREA	.016		11.9000	.28	
SUBAREA 17	AREA	.070		11.9000	1.26	
SUBAREA 18	AREA	.206		11.9000	3.45	
SUBAREA 19	AREA	.109		11.9500	1.96	
SUBAREA 2	AREA	.014		11.9000	.24	
SUBAREA 20	AREA	.468		11.9000	8.45	
SUBAREA 21	AREA	.108		11.9000	1.94	
SUBAREA 22	AREA	.137		11.9000	2.30	
SUBAREA 23	AREA	.034		11.9000	.62	
SUBAREA 24	AREA	.127		11.9000	2.30	

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak hrs	Qpeak cfs	Max WSEL ft
SUBAREA 25	AREA	.053		11.9000	.89	
SUBAREA 26	AREA	.064		11.9000	1.07	
SUBAREA 27	AREA	.058		12.0500	.77	
SUBAREA 28	AREA	.065		12.1500	.68	
SUBAREA 29	AREA	.468		11.9500	8.31	
SUBAREA 3	AREA	.109		11.9000	1.83	
SUBAREA 30	AREA	.102		12.3000	.84	
SUBAREA 31	AREA	.092		11.9000	1.64	
SUBAREA 32	AREA	.058		11.9000	.97	
SUBAREA 33	AREA	.263		12.1500	2.73	
SUBAREA 34	AREA	.252		12.2500	2.22	
SUBAREA 35	AREA	.074		12.0000	1.13	
SUBAREA 36	AREA	.026		11.9000	.46	
SUBAREA 37	AREA	.030		12.0000	.49	
SUBAREA 38	AREA	.071		11.9500	1.26	
SUBAREA 39A	AREA	.415		11.9000	6.95	
SUBAREA 39B	AREA	.415		11.9000	6.95	
SUBAREA 4	AREA	.069		11.9000	1.15	
SUBAREA 40	AREA	.074		11.9500	1.31	
SUBAREA 41	AREA	.041		11.9500	.72	
SUBAREA 42	AREA	.041		11.9500	.73	
SUBAREA 43	AREA	.055		11.9500	.96	
SUBAREA 44	AREA	.119		11.9500	1.96	
SUBAREA 45	AREA	.083		12.0000	1.35	
SUBAREA 46	AREA	.054		11.9000	.95	
SUBAREA 47	AREA	.081		11.9000	1.41	
SUBAREA 48	AREA	.287		11.9500	4.99	
SUBAREA 49	AREA	.064		11.9000	1.07	
SUBAREA 5	AREA	.205		11.9000	3.42	
SUBAREA 6	AREA	.067		11.9000	1.12	
SUBAREA 7	AREA	.176		11.9000	2.95	
SUBAREA 8	AREA	.067		11.9000	1.12	
SUBAREA 9	AREA	.158		11.9000	2.64	
TD-1	JCT	.064		11.9000	1.07	

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

DEFAULT Design Storm File,ID = Niagara

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 3.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Node ID		Type	HYG Vol ac-ft	Trun.	Qpeak hrs	Qpeak cfs	Max WSEL ft
BASIN	IN	POND	3.730		11.9500	55.30	
BASIN	OUT	POND	2.377		12.2500	11.74	567.14
CB-1		JCT	.344		11.9500	6.06	
CB-10		JCT	1.116		11.9500	17.22	
CB-11		JCT	.691		11.9500	10.73	
CB-12		JCT	.215		11.9000	3.46	
CB-13		JCT	.043		11.9000	.68	
CB-14		JCT	.330		11.9500	5.75	
CB-15		JCT	.496		12.0000	5.52	
CB-16		JCT	.222		12.1500	2.08	
CB-2		JCT	1.177		11.9000	19.12	
CB-3		JCT	.326		11.9000	5.57	
CB-4		JCT	.551		11.9000	8.07	
CB-5		JCT	.302		11.9000	5.20	
CB-6		JCT	.249		11.9500	4.37	
CB-7		JCT	.984		12.0000	16.34	
CB-8		JCT	.347		11.9500	6.66	
CB-9		JCT	1.508		11.9500	22.69	
DI-1		JCT	.150		11.9500	2.59	
DI-10		JCT	.120		11.9000	1.95	
DI-11		JCT	.024		11.9000	.40	
DI-12		JCT	.016		11.9000	.27	
DI-13		JCT	.258		11.9000	4.61	
DI-14		JCT	.029		11.9000	.51	
DI-15		JCT	.192		12.0000	3.13	
DI-2		JCT	.237		11.9500	3.81	
DI-3		JCT	.470		12.2500	4.02	
DI-4		JCT	.050		11.9000	.88	
DI-5		JCT	.093		11.9000	1.51	
DI-6		JCT	.190		12.0000	3.02	
DI-7		JCT	.240		11.9000	3.91	
DI-8		JCT	.117		11.9000	1.91	

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak hrs	Qpeak cfs	Max WSEL ft
DI-9	JCT	.117		11.9000	1.91	
ES-4	JCT	.193		11.9000	3.29	
ES-5	JCT	.043		11.9500	.68	
JUNC 10	JCT	3.438		12.2000	21.46	
Outfall OUT 1	JCT	3.438		12.2000	21.46	
Outfall OUT 2	JCT	6.013		11.9500	81.50	
Outfall OUT 3	JCT	.637		11.9500	11.04	
Outfall OUT 4	JCT	.075		11.9500	1.28	
SR-1	JCT	1.606		11.9500	25.80	
SR-2	JCT	.868		11.9000	14.17	
SR-3	JCT	.142		12.0000	2.09	
SR-4	JCT	.950		12.1500	8.70	
SR-5	JCT	.542		11.9000	6.17	
SR-6	JCT	.718		11.9500	9.08	
SR-7	JCT	.099		11.9000	1.68	
SR-8	JCT	.112		11.9000	1.82	
SR-9	JCT	.147		11.9000	2.49	
STMH-10	JCT	1.177		11.9000	19.12	
STMH-2	JCT	5.084		11.9500	65.54	
STMH-3	JCT	3.478		11.9500	39.74	
STMH-4	JCT	3.478		11.9500	39.74	
STMH-5	JCT	3.366		11.9500	38.03	
STMH-6	JCT	3.219		11.9500	35.68	
STMH-7	JCT	2.351		12.0000	22.51	
STMH-8	JCT	2.209		12.0000	20.43	
STMH-9	JCT	1.259		11.9500	15.11	
SUBAREA 1	AREA	.190		12.0000	3.02	
SUBAREA 10	AREA	.016		11.9000	.27	
SUBAREA 11	AREA	.149		11.9000	2.69	
SUBAREA 12	AREA	.027		11.9000	.44	
SUBAREA 13	AREA	.192		12.2000	1.98	
SUBAREA 14	AREA	.073		12.1000	.89	
SUBAREA 15	AREA	.074		12.1500	.81	
SUBAREA 16	AREA	.029		11.9000	.51	
SUBAREA 17	AREA	.145		11.9000	2.60	
SUBAREA 18	AREA	.359		11.9000	5.86	
SUBAREA 19	AREA	.258		11.9000	4.67	
SUBAREA 2	AREA	.024		11.9000	.40	
SUBAREA 20	AREA	.929		11.9000	16.48	
SUBAREA 21	AREA	.210		11.9000	3.69	
SUBAREA 22	AREA	.240		11.9000	3.91	
SUBAREA 23	AREA	.071		11.9000	1.28	
SUBAREA 24	AREA	.258		11.9000	4.61	

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak hrs	Qpeak cfs	Max WSEL ft
SUBAREA 25	AREA	.093		11.9000	1.51	
SUBAREA 26	AREA	.112		11.9000	1.82	
SUBAREA 27	AREA	.137		12.0500	1.87	
SUBAREA 28	AREA	.167		12.1500	1.86	
SUBAREA 29	AREA	.929		11.9500	15.95	
SUBAREA 3	AREA	.191		11.9000	3.11	
SUBAREA 30	AREA	.216		12.3000	1.77	
SUBAREA 31	AREA	.175		11.9000	3.04	
SUBAREA 32	AREA	.101		11.9000	1.64	
SUBAREA 33	AREA	.480		12.1500	4.82	
SUBAREA 34	AREA	.470		12.2500	4.02	
SUBAREA 35	AREA	.142		12.0000	2.09	
SUBAREA 36	AREA	.050		11.9000	.88	
SUBAREA 37	AREA	.075		11.9500	1.28	
SUBAREA 38	AREA	.144		11.9500	2.49	
SUBAREA 39A	AREA	.724		11.9000	11.81	
SUBAREA 39B	AREA	.724		11.9000	11.81	
SUBAREA 4	AREA	.120		11.9000	1.95	
SUBAREA 40	AREA	.150		11.9500	2.59	
SUBAREA 41	AREA	.099		11.9500	1.79	
SUBAREA 42	AREA	.094		11.9500	1.69	
SUBAREA 43	AREA	.110		11.9500	1.86	
SUBAREA 44	AREA	.237		11.9500	3.81	
SUBAREA 45	AREA	.192		12.0000	3.13	
SUBAREA 46	AREA	.099		11.9000	1.68	
SUBAREA 47	AREA	.147		11.9000	2.49	
SUBAREA 48	AREA	.637		11.9500	11.04	
SUBAREA 49	AREA	.112		11.9000	1.82	
SUBAREA 5	AREA	.357		11.9000	5.81	
SUBAREA 6	AREA	.117		11.9000	1.91	
SUBAREA 7	AREA	.308		11.9000	5.02	
SUBAREA 8	AREA	.117		11.9000	1.91	
SUBAREA 9	AREA	.275		11.9000	4.48	
TD-1	JCT	.112		11.9000	1.82	

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

DEFAULT Design Storm File,ID = Niagara

Storm Tag Name = 100

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 4.8000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Node ID		Type	HYG Vol ac-ft	Trun.	Qpeak hrs	Qpeak cfs	Max WSEL ft
BASIN	IN	POND	5.580		11.9500	81.47	
BASIN	OUT	POND	4.118		12.3500	15.82	568.51
CB-1		JCT	.532		11.9500	9.24	
CB-10		JCT	1.620		11.9000	27.84	
CB-11		JCT	.966		11.9500	14.79	
CB-12		JCT	.300		11.9000	4.77	
CB-13		JCT	.061		11.9000	.94	
CB-14		JCT	.493		11.9500	8.41	
CB-15		JCT	.772		11.9500	10.57	
CB-16		JCT	.343		12.1500	3.22	
CB-2		JCT	1.706		11.9000	27.44	
CB-3		JCT	.468		11.9000	7.86	
CB-4		JCT	.811		11.9000	11.64	
CB-5		JCT	.436		11.9000	7.37	
CB-6		JCT	.384		11.9500	6.62	
CB-7		JCT	1.404		11.9000	19.76	
CB-8		JCT	.520		11.9000	8.00	
CB-9		JCT	2.282	R	11.9000	42.23	
DI-1		JCT	.224		11.9500	3.77	
DI-10		JCT	.167		11.9000	2.69	
DI-11		JCT	.034		11.9000	.55	
DI-12		JCT	.023		11.9000	.37	
DI-13		JCT	.385		11.9000	6.76	
DI-14		JCT	.042		11.9000	.71	
DI-15		JCT	.302		12.0000	4.87	
DI-2		JCT	.350		11.9500	5.52	
DI-3		JCT	.675		12.2500	5.68	
DI-4		JCT	.073		11.9000	1.27	
DI-5		JCT	.129		11.9000	2.08	
DI-6		JCT	.286		12.0000	4.44	
DI-7		JCT	.335		11.9000	5.39	
DI-8		JCT	.164		11.9000	2.63	

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak hrs	Qpeak cfs	Max WSEL ft
DI-9	JCT	.164		11.9000	2.63	
ES-4	JCT	.288		11.9000	4.85	
ES-5	JCT	.061		11.9500	.93	
JUNC 10	JCT	5.668		12.3000	25.72	
Outfall OUT 1	JCT	5.668		12.3000	25.72	
Outfall OUT 2	JCT	8.767		11.9500	116.89	
Outfall OUT 3	JCT	.986		11.9500	16.85	
Outfall OUT 4	JCT	.124		11.9500	2.11	
SR-1	JCT	2.359		11.9500	37.43	
SR-2	JCT	1.226		11.9000	19.75	
SR-3	JCT	.205		12.0000	2.96	
SR-4	JCT	1.358		12.1500	12.22	
SR-5	JCT	.796		11.9000	8.80	
SR-6	JCT	1.085		11.9500	13.42	
SR-7	JCT	.141		11.9000	2.34	
SR-8	JCT	.156		11.9000	2.51	
SR-9	JCT	.209		11.9000	3.49	
STMH-10	JCT	1.706		11.9000	27.44	
STMH-2	JCT	7.395		11.9500	93.90	
STMH-3	JCT	5.036		11.9500	56.47	
STMH-4	JCT	5.036		11.9500	56.47	
STMH-5	JCT	4.880		11.9500	54.12	
STMH-6	JCT	4.670		11.9500	50.84	
STMH-7	JCT	3.444		12.0000	32.56	
STMH-8	JCT	3.238		12.0000	29.60	
STMH-9	JCT	1.880		11.9500	22.01	
SUBAREA 1	AREA	.286		12.0000	4.44	
SUBAREA 10	AREA	.023		11.9000	.37	
SUBAREA 11	AREA	.227		11.9000	4.03	
SUBAREA 12	AREA	.038		11.9000	.61	
SUBAREA 13	AREA	.301		12.1500	3.08	
SUBAREA 14	AREA	.110		12.1000	1.32	
SUBAREA 15	AREA	.117		12.1500	1.27	
SUBAREA 16	AREA	.042		11.9000	.71	
SUBAREA 17	AREA	.218		11.9000	3.85	
SUBAREA 18	AREA	.502		11.9000	8.08	
SUBAREA 19	AREA	.412		11.9000	7.44	
SUBAREA 2	AREA	.034		11.9000	.55	
SUBAREA 20	AREA	1.373		11.9000	23.89	
SUBAREA 21	AREA	.307		11.9000	5.29	
SUBAREA 22	AREA	.335		11.9000	5.39	
SUBAREA 23	AREA	.107		11.9000	1.90	
SUBAREA 24	AREA	.385		11.9000	6.76	

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak hrs	Qpeak cfs	Max WSEL ft
SUBAREA 25	AREA	.129		11.9000	2.08	
SUBAREA 26	AREA	.156		11.9000	2.51	
SUBAREA 27	AREA	.219		12.0500	2.97	
SUBAREA 28	AREA	.274		12.1500	3.07	
SUBAREA 29	AREA	1.373		11.9500	22.99	
SUBAREA 3	AREA	.266		11.9000	4.28	
SUBAREA 30	AREA	.328		12.3000	2.67	
SUBAREA 31	AREA	.253		11.9000	4.33	
SUBAREA 32	AREA	.141		11.9000	2.26	
SUBAREA 33	AREA	.683		12.1500	6.74	
SUBAREA 34	AREA	.675		12.2500	5.68	
SUBAREA 35	AREA	.205		12.0000	2.96	
SUBAREA 36	AREA	.073		11.9000	1.27	
SUBAREA 37	AREA	.124		11.9500	2.11	
SUBAREA 38	AREA	.215		11.9500	3.63	
SUBAREA 39A	AREA	1.012		11.9000	16.28	
SUBAREA 39B	AREA	1.012		11.9000	16.28	
SUBAREA 4	AREA	.167		11.9000	2.69	
SUBAREA 40	AREA	.224		11.9500	3.77	
SUBAREA 41	AREA	.160		11.9500	2.84	
SUBAREA 42	AREA	.149		11.9500	2.62	
SUBAREA 43	AREA	.162		11.9500	2.68	
SUBAREA 44	AREA	.350		11.9500	5.52	
SUBAREA 45	AREA	.302		12.0000	4.87	
SUBAREA 46	AREA	.141		11.9000	2.34	
SUBAREA 47	AREA	.209		11.9000	3.49	
SUBAREA 48	AREA	.986		11.9500	16.85	
SUBAREA 49	AREA	.156		11.9000	2.51	
SUBAREA 5	AREA	.498		11.9000	8.02	
SUBAREA 6	AREA	.164		11.9000	2.63	
SUBAREA 7	AREA	.430		11.9000	6.92	
SUBAREA 8	AREA	.164		11.9000	2.63	
SUBAREA 9	AREA	.384		11.9000	6.18	
TD-1	JCT	.156		11.9000	2.51	

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 1 1
Tc = .1623 hrs
Drainage Area = .930 acres Runoff CN= 90

==========
Computational Time Increment = .02163 hrs
Computed Peak Time = 11.9851 hrs
Computed Peak Flow = 1.51 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 1.50 cfs
==========

DRAINAGE AREA

ID:SUBAREA 1
CN = 90
Area = .930 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

1.1797 in
.091 ac-ft

HYG Volume... .091 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .16225 hrs (ID: SUBAREA 1)
Computational Incr, Tm = .02163 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 6.49 cfs
Unit peak time Tp = .10817 hrs
Unit receding limb, Tr = .43268 hrs
Total unit time, Tb = .54084 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 1 10
Tc = .1623 hrs
Drainage Area = .930 acres Runoff CN= 90

==========
Computational Time Increment = .02163 hrs
Computed Peak Time = 11.9851 hrs
Computed Peak Flow = 3.06 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 3.02 cfs
==========

DRAINAGE AREA

ID:SUBAREA 1
CN = 90
Area = .930 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

2.4480 in
.190 ac-ft

HYG Volume... .190 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .16225 hrs (ID: SUBAREA 1)
Computational Incr, Tm = .02163 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 6.49 cfs
Unit peak time Tp = .10817 hrs
Unit receding limb, Tr = .43268 hrs
Total unit time, Tb = .54084 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 1 100
Tc = .1623 hrs
Drainage Area = .930 acres Runoff CN= 90

==========
Computational Time Increment = .02163 hrs
Computed Peak Time = 11.9635 hrs
Computed Peak Flow = 4.52 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 4.44 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 1
CN = 90
Area = .930 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

3.6837 in
.285 ac-ft

HYG Volume... .286 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .16225 hrs (ID: SUBAREA 1)
Computational Incr, Tm = .02163 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 6.49 cfs
Unit peak time Tp = .10817 hrs
Unit receding limb, Tr = .43268 hrs
Total unit time, Tb = .54084 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 10 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .060 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .16 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .16 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 10
CN = 98
Area = .060 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.009 ac-ft

HYG Volume... .009 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 10)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = .82 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 10 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .060 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .27 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .27 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 10
CN = 98
Area = .060 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.016 ac-ft

HYG Volume... .016 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 10)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = .82 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 10 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .060 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .37 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .37 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 10
CN = 98
Area = .060 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
.023 ac-ft

HYG Volume... .023 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 10)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = .82 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 11 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .760 acres Runoff CN= 89

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9286 hrs
Computed Peak Flow = 1.33 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.27 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 11
CN = 89
Area = .760 acres
S = 1.2360 in
0.2S = .2472 in

Cumulative Runoff

1.1114 in
.070 ac-ft

HYG Volume... .070 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 11)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 10.34 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 11 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .760 acres Runoff CN= 89

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 2.77 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 2.69 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 11
CN = 89
Area = .760 acres
S = 1.2360 in
0.2S = .2472 in

Cumulative Runoff

2.3572 in
.149 ac-ft

HYG Volume... .149 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 11)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 10.34 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 11 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .760 acres Runoff CN= 89

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 4.14 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 4.03 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 11
CN = 89
Area = .760 acres
S = 1.2360 in
0.2S = .2472 in

Cumulative Runoff

3.5807 in
.227 ac-ft

HYG Volume... .227 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 11)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 10.34 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 12 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .100 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .27 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .26 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 12
CN = 98
Area = .100 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.016 ac-ft

HYG Volume... .016 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 12)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.36 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 12 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .100 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .45 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .44 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 12
CN = 98
Area = .100 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.027 ac-ft

HYG Volume... .027 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 12)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.36 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 12 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .100 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .62 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .61 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 12
CN = 98
Area = .100 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
.038 ac-ft

HYG Volume... .038 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 12)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.36 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 13 1
Tc = .4863 hrs
Drainage Area = 1.100 acres Runoff CN= 86

==========
Computational Time Increment = .06485 hrs
Computed Peak Time = 12.1910 hrs
Computed Peak Flow = .87 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.2000 hrs
Peak Flow, Interpolated Output = .86 cfs
==========

DRAINAGE AREA

ID:SUBAREA 13
CN = 86
Area = 1.100 acres
S = 1.6279 in
0.2S = .3256 in

Cumulative Runoff

.9254 in
.085 ac-ft

HYG Volume... .085 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .48634 hrs (ID: SUBAREA 13)
Computational Incr, Tm = .06485 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 2.56 cfs
Unit peak time Tp = .32423 hrs
Unit receding limb, Tr = 1.29691 hrs
Total unit time, Tb = 1.62114 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 13 10
Tc = .4863 hrs
Drainage Area = 1.100 acres Runoff CN= 86

==========
Computational Time Increment = .06485 hrs
Computed Peak Time = 12.1910 hrs
Computed Peak Flow = 2.00 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.2000 hrs
Peak Flow, Interpolated Output = 1.98 cfs
==========

DRAINAGE AREA

ID:SUBAREA 13
CN = 86
Area = 1.100 acres
S = 1.6279 in
0.2S = .3256 in

Cumulative Runoff

2.0983 in
.192 ac-ft

HYG Volume... .192 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .48634 hrs (ID: SUBAREA 13)
Computational Incr, Tm = .06485 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 2.56 cfs
Unit peak time Tp = .32423 hrs
Unit receding limb, Tr = 1.29691 hrs
Total unit time, Tb = 1.62114 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 13 100
Tc = .4863 hrs
Drainage Area = 1.100 acres Runoff CN= 86

==========
Computational Time Increment = .06485 hrs
Computed Peak Time = 12.1910 hrs
Computed Peak Flow = 3.10 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = 3.08 cfs
==========

DRAINAGE AREA

ID:SUBAREA 13
CN = 86
Area = 1.100 acres
S = 1.6279 in
0.2S = .3256 in

Cumulative Runoff

3.2808 in
.301 ac-ft

HYG Volume... .301 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .48634 hrs (ID: SUBAREA 13)
Computational Incr, Tm = .06485 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 2.56 cfs
Unit peak time Tp = .32423 hrs
Unit receding limb, Tr = 1.29691 hrs
Total unit time, Tb = 1.62114 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 14 1
Tc = .3590 hrs
Drainage Area = .360 acres Runoff CN= 90

==========
Computational Time Increment = .04786 hrs
Computed Peak Time = 12.1097 hrs
Computed Peak Flow = .44 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = .43 cfs
==========

DRAINAGE AREA

ID:SUBAREA 14
CN = 90
Area = .360 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

1.1797 in
.035 ac-ft

HYG Volume... .035 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .35898 hrs (ID: SUBAREA 14)
Computational Incr, Tm = .04786 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.14 cfs
Unit peak time Tp = .23932 hrs
Unit receding limb, Tr = .95729 hrs
Total unit time, Tb = 1.19662 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 14 10
Tc = .3590 hrs
Drainage Area = .360 acres Runoff CN= 90

==========
Computational Time Increment = .04786 hrs
Computed Peak Time = 12.1097 hrs
Computed Peak Flow = .89 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = .89 cfs
==========

DRAINAGE AREA

ID:SUBAREA 14
CN = 90
Area = .360 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

2.4480 in
.073 ac-ft

HYG Volume... .073 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .35898 hrs (ID: SUBAREA 14)
Computational Incr, Tm = .04786 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.14 cfs
Unit peak time Tp = .23932 hrs
Unit receding limb, Tr = .95729 hrs
Total unit time, Tb = 1.19662 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 14 100
Tc = .3590 hrs
Drainage Area = .360 acres Runoff CN= 90

==========
Computational Time Increment = .04786 hrs
Computed Peak Time = 12.1097 hrs
Computed Peak Flow = 1.32 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 1.32 cfs
==========

DRAINAGE AREA

ID:SUBAREA 14
CN = 90
Area = .360 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

3.6837 in
.111 ac-ft

HYG Volume... .110 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .35898 hrs (ID: SUBAREA 14)
Computational Incr, Tm = .04786 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.14 cfs
Unit peak time Tp = .23932 hrs
Unit receding limb, Tr = .95729 hrs
Total unit time, Tb = 1.19662 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 15 1
Tc = .4375 hrs
Drainage Area = .440 acres Runoff CN= 85

==========
Computational Time Increment = .05834 hrs
Computed Peak Time = 12.1339 hrs
Computed Peak Flow = .34 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = .34 cfs
==========

DRAINAGE AREA

ID:SUBAREA 15
CN = 85
Area = .440 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

.8691 in
.032 ac-ft

HYG Volume... .032 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .43752 hrs (ID: SUBAREA 15)
Computational Incr, Tm = .05834 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.14 cfs
Unit peak time Tp = .29168 hrs
Unit receding limb, Tr = 1.16672 hrs
Total unit time, Tb = 1.45840 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 15 10
Tc = .4375 hrs
Drainage Area = .440 acres Runoff CN= 85

==========
Computational Time Increment = .05834 hrs
Computed Peak Time = 12.1339 hrs
Computed Peak Flow = .82 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = .81 cfs
==========

DRAINAGE AREA

ID:SUBAREA 15
CN = 85
Area = .440 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

2.0164 in
.074 ac-ft

HYG Volume... .074 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .43752 hrs (ID: SUBAREA 15)
Computational Incr, Tm = .05834 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.14 cfs
Unit peak time Tp = .29168 hrs
Unit receding limb, Tr = 1.16672 hrs
Total unit time, Tb = 1.45840 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 15 100
Tc = .4375 hrs
Drainage Area = .440 acres Runoff CN= 85

==========
Computational Time Increment = .05834 hrs
Computed Peak Time = 12.1339 hrs
Computed Peak Flow = 1.29 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = 1.27 cfs
==========

DRAINAGE AREA

ID:SUBAREA 15
CN = 85
Area = .440 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

3.1837 in
.117 ac-ft

HYG Volume... .117 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .43752 hrs (ID: SUBAREA 15)
Computational Incr, Tm = .05834 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.14 cfs
Unit peak time Tp = .29168 hrs
Unit receding limb, Tr = 1.16672 hrs
Total unit time, Tb = 1.45840 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 16 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .120 acres Runoff CN= 95

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .29 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .28 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 16
CN = 95
Area = .120 acres
S = .5263 in
0.2S = .1053 in

Cumulative Runoff

1.5783 in
.016 ac-ft

HYG Volume... .016 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 16)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.63 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 16 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .120 acres Runoff CN= 95

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .52 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .51 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 16
CN = 95
Area = .120 acres
S = .5263 in
0.2S = .1053 in

Cumulative Runoff

2.9391 in
.029 ac-ft

HYG Volume... .029 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 16)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.63 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 16 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .120 acres Runoff CN= 95

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .73 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .71 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 16
CN = 95
Area = .120 acres
S = .5263 in
0.2S = .1053 in

Cumulative Runoff

4.2215 in
.042 ac-ft

HYG Volume... .042 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 16)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.63 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 17 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .710 acres Runoff CN= 90

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9286 hrs
Computed Peak Flow = 1.31 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.26 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 17
CN = 90
Area = .710 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

1.1797 in
.070 ac-ft

HYG Volume... .070 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 17)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 9.66 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 17 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .710 acres Runoff CN= 90

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 2.68 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 2.60 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 17
CN = 90
Area = .710 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

2.4480 in
.145 ac-ft

HYG Volume... .145 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 17)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 9.66 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 17 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .710 acres Runoff CN= 90

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 3.95 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 3.85 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 17
CN = 90
Area = .710 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

3.6837 in
.218 ac-ft

HYG Volume... .218 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 17)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 9.66 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 18 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.320 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 3.52 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 3.45 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 18
CN = 98
Area = 1.320 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.206 ac-ft

HYG Volume... .206 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 18)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 17.95 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 18 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.320 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 5.97 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 5.86 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 18
CN = 98
Area = 1.320 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.359 ac-ft

HYG Volume... .359 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 18)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 17.95 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 18 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.320 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 8.23 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 8.08 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 18
CN = 98
Area = 1.320 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
.502 ac-ft

HYG Volume... .502 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 18)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 17.95 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 19 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.600 acres Runoff CN= 84

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9286 hrs
Computed Peak Flow = 2.02 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 1.96 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 19
CN = 84
Area = 1.600 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

.8155 in
.109 ac-ft

HYG Volume... .109 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 19)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 21.76 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 19 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.600 acres Runoff CN= 84

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9286 hrs
Computed Peak Flow = 4.86 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 4.67 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 19
CN = 84
Area = 1.600 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

1.9365 in
.258 ac-ft

HYG Volume... .258 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 19)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 21.76 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 19 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.600 acres Runoff CN= 84

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 7.69 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 7.44 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 19
CN = 84
Area = 1.600 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

3.0880 in
.412 ac-ft

HYG Volume... .412 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 19)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 21.76 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 2 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .090 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .24 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .24 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 2
CN = 98
Area = .090 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.014 ac-ft

HYG Volume... .014 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 2)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.22 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 2 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .090 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .41 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .40 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 2
CN = 98
Area = .090 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.024 ac-ft

HYG Volume... .024 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 2)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.22 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 2 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .090 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .56 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .55 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 2
CN = 98
Area = .090 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
.034 ac-ft

HYG Volume... .034 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 2)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.22 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 20 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = 4.230 acres Runoff CN= 92

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 8.75 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 8.45 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 20
CN = 92
Area = 4.230 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff

1.3270 in
.468 ac-ft

HYG Volume... .468 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 20)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 57.54 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 20 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = 4.230 acres Runoff CN= 92

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 16.93 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 16.48 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 20
CN = 92
Area = 4.230 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff

2.6367 in
.929 ac-ft

HYG Volume... .929 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 20)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 57.54 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 20 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = 4.230 acres Runoff CN= 92

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 24.47 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 23.89 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 20
CN = 92
Area = 4.230 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff

3.8941 in
1.373 ac-ft

HYG Volume... 1.373 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 20)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 57.54 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

Type.... Unit Hyd. Summary Page 3.40
Name.... SUBAREA 21 Tag: 1 Event: 1 yr
File.... S:\Projects\BDA\10088\CALCS\SITE\PondPack\POST-DEVELOPMENT.PPW
Storm... TypeII 24hr Tag: 1

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 21 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .920 acres Runoff CN= 93

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 2.01 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.94 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 21
CN = 93
Area = .920 acres
S = .7527 in
0.2S = .1505 in

Cumulative Runoff

1.4064 in
.108 ac-ft

HYG Volume... .108 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 21)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 12.51 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 21 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .920 acres Runoff CN= 93

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 3.78 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 3.69 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 21
CN = 93
Area = .920 acres
S = .7527 in
0.2S = .1505 in

Cumulative Runoff

2.7349 in
.210 ac-ft

HYG Volume... .210 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 21)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 12.51 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 21 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .920 acres Runoff CN= 93

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 5.41 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 5.29 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 21
CN = 93
Area = .920 acres
S = .7527 in
0.2S = .1505 in

Cumulative Runoff

4.0016 in
.307 ac-ft

HYG Volume... .307 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 21)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 12.51 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 22 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .880 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 2.35 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 2.30 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 22
CN = 98
Area = .880 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.137 ac-ft

HYG Volume... .137 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 22)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 11.97 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 22 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .880 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 3.98 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 3.91 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 22
CN = 98
Area = .880 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.240 ac-ft

HYG Volume... .240 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 22)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 11.97 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 22 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .880 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 5.49 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 5.39 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 22
CN = 98
Area = .880 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
.335 ac-ft

HYG Volume... .335 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 22)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 11.97 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 23 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .350 acres Runoff CN= 90

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9286 hrs
Computed Peak Flow = .65 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .62 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 23
CN = 90
Area = .350 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

1.1797 in
.034 ac-ft

HYG Volume... .034 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 23)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 4.76 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 23 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .350 acres Runoff CN= 90

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.32 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.28 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 23
CN = 90
Area = .350 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

2.4480 in
.071 ac-ft

HYG Volume... .071 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 23)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 4.76 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 23 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .350 acres Runoff CN= 90

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.95 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.90 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 23
CN = 90
Area = .350 acres
S = 1.1111 in
0.2S = .2222 in

Cumulative Runoff

3.6837 in
.107 ac-ft

HYG Volume... .107 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 23)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 4.76 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 24 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.220 acres Runoff CN= 91

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 2.39 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 2.30 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 24
CN = 91
Area = 1.220 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

1.2515 in
.127 ac-ft

HYG Volume... .127 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 24)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 16.59 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 24 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.220 acres Runoff CN= 91

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 4.74 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 4.61 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 24
CN = 91
Area = 1.220 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

2.5411 in
.258 ac-ft

HYG Volume... .258 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 24)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 16.59 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 24 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.220 acres Runoff CN= 91

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 6.93 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 6.76 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 24
CN = 91
Area = 1.220 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

3.7881 in
.385 ac-ft

HYG Volume... .385 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 24)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 16.59 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 25 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .340 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .91 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .89 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 25
CN = 98
Area = .340 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.053 ac-ft

HYG Volume... .053 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 25)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 4.62 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 25 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .340 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.54 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.51 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 25
CN = 98
Area = .340 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.093 ac-ft

HYG Volume... .093 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 25)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 4.62 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 25 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .340 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 2.12 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 2.08 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 25
CN = 98
Area = .340 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
.129 ac-ft

HYG Volume... .129 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 25)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 4.62 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 26 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .410 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.09 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.07 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 26
CN = 98
Area = .410 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.064 ac-ft

HYG Volume... .064 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 26)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.58 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 26 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .410 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.86 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.82 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 26
CN = 98
Area = .410 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.112 ac-ft

HYG Volume... .112 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 26)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.58 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 26 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .410 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 2.56 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 2.51 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 26
CN = 98
Area = .410 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
.156 ac-ft

HYG Volume... .156 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 26)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.58 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 27 1
Tc = .2856 hrs
Drainage Area = .850 acres Runoff CN= 84

==========
Computational Time Increment = .03808 hrs
Computed Peak Time = 12.0720 hrs
Computed Peak Flow = .79 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = .77 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 27
CN = 84
Area = .850 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

.8155 in
.058 ac-ft

HYG Volume... .058 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .28562 hrs (ID: SUBAREA 27)
Computational Incr, Tm = .03808 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.37 cfs
Unit peak time Tp = .19041 hrs
Unit receding limb, Tr = .76164 hrs
Total unit time, Tb = .95205 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 27 10
Tc = .2856 hrs
Drainage Area = .850 acres Runoff CN= 84

==========
Computational Time Increment = .03808 hrs
Computed Peak Time = 12.0720 hrs
Computed Peak Flow = 1.90 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = 1.87 cfs
==========

DRAINAGE AREA

ID:SUBAREA 27
CN = 84
Area = .850 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

1.9365 in
.137 ac-ft

HYG Volume... .137 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .28562 hrs (ID: SUBAREA 27)
Computational Incr, Tm = .03808 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.37 cfs
Unit peak time Tp = .19041 hrs
Unit receding limb, Tr = .76164 hrs
Total unit time, Tb = .95205 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 27 100
Tc = .2856 hrs
Drainage Area = .850 acres Runoff CN= 84

==========
Computational Time Increment = .03808 hrs
Computed Peak Time = 12.0720 hrs
Computed Peak Flow = 2.99 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = 2.97 cfs
==========

DRAINAGE AREA

ID:SUBAREA 27
CN = 84
Area = .850 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

3.0880 in
.219 ac-ft

HYG Volume... .219 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .28562 hrs (ID: SUBAREA 27)
Computational Incr, Tm = .03808 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.37 cfs
Unit peak time Tp = .19041 hrs
Unit receding limb, Tr = .76164 hrs
Total unit time, Tb = .95205 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 28 1
Tc = .4258 hrs
Drainage Area = 1.170 acres Runoff CN= 81

==========
Computational Time Increment = .05677 hrs
Computed Peak Time = 12.1486 hrs
Computed Peak Flow = .69 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = .68 cfs
==========

DRAINAGE AREA

ID:SUBAREA 28
CN = 81
Area = 1.170 acres
S = 2.3457 in
0.2S = .4691 in

Cumulative Runoff

.6689 in
.065 ac-ft

HYG Volume... .065 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .42577 hrs (ID: SUBAREA 28)
Computational Incr, Tm = .05677 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.11 cfs
Unit peak time Tp = .28385 hrs
Unit receding limb, Tr = 1.13538 hrs
Total unit time, Tb = 1.41923 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 28 10
Tc = .4258 hrs
Drainage Area = 1.170 acres Runoff CN= 81

==========
Computational Time Increment = .05677 hrs
Computed Peak Time = 12.1486 hrs
Computed Peak Flow = 1.86 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = 1.86 cfs
==========

DRAINAGE AREA

ID:SUBAREA 28
CN = 81
Area = 1.170 acres
S = 2.3457 in
0.2S = .4691 in

Cumulative Runoff

1.7086 in
.167 ac-ft

HYG Volume... .167 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .42577 hrs (ID: SUBAREA 28)
Computational Incr, Tm = .05677 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.11 cfs
Unit peak time Tp = .28385 hrs
Unit receding limb, Tr = 1.13538 hrs
Total unit time, Tb = 1.41923 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 28 100
Tc = .4258 hrs
Drainage Area = 1.170 acres Runoff CN= 81

==========
Computational Time Increment = .05677 hrs
Computed Peak Time = 12.1486 hrs
Computed Peak Flow = 3.07 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = 3.07 cfs
==========

DRAINAGE AREA

ID:SUBAREA 28
CN = 81
Area = 1.170 acres
S = 2.3457 in
0.2S = .4691 in

Cumulative Runoff

2.8093 in
.274 ac-ft

HYG Volume... .274 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .42577 hrs (ID: SUBAREA 28)
Computational Incr, Tm = .05677 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.11 cfs
Unit peak time Tp = .28385 hrs
Unit receding limb, Tr = 1.13538 hrs
Total unit time, Tb = 1.41923 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 29 1
Tc = .0985 hrs
Drainage Area = 4.230 acres Runoff CN= 92

==========
Computational Time Increment = .01314 hrs
Computed Peak Time = 11.9277 hrs
Computed Peak Flow = 8.53 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 8.31 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 29
CN = 92
Area = 4.230 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff

1.3270 in
.468 ac-ft

HYG Volume... .468 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .09852 hrs (ID: SUBAREA 29)
Computational Incr, Tm = .01314 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 48.65 cfs
Unit peak time Tp = .06568 hrs
Unit receding limb, Tr = .26273 hrs
Total unit time, Tb = .32841 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 29 10
Tc = .0985 hrs
Drainage Area = 4.230 acres Runoff CN= 92

==========
Computational Time Increment = .01314 hrs
Computed Peak Time = 11.9277 hrs
Computed Peak Flow = 16.49 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 15.95 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 29
CN = 92
Area = 4.230 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff

2.6367 in
.929 ac-ft

HYG Volume... .929 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .09852 hrs (ID: SUBAREA 29)
Computational Incr, Tm = .01314 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 48.65 cfs
Unit peak time Tp = .06568 hrs
Unit receding limb, Tr = .26273 hrs
Total unit time, Tb = .32841 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 29 100
Tc = .0985 hrs
Drainage Area = 4.230 acres Runoff CN= 92

==========
Computational Time Increment = .01314 hrs
Computed Peak Time = 11.9277 hrs
Computed Peak Flow = 23.85 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 22.99 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 29
CN = 92
Area = 4.230 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff

3.8941 in
1.373 ac-ft

HYG Volume... 1.373 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .09852 hrs (ID: SUBAREA 29)
Computational Incr, Tm = .01314 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 48.65 cfs
Unit peak time Tp = .06568 hrs
Unit receding limb, Tr = .26273 hrs
Total unit time, Tb = .32841 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 3 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .700 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.87 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.83 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 3
CN = 98
Area = .700 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.109 ac-ft

HYG Volume... .109 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 3)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 9.52 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 3 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .700 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 3.17 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 3.11 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 3
CN = 98
Area = .700 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.191 ac-ft

HYG Volume... .191 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 3)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 9.52 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 3 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .700 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 4.37 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 4.28 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 3
CN = 98
Area = .700 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
.266 ac-ft

HYG Volume... .266 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 3)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 9.52 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 30 1
Tc = .6847 hrs
Drainage Area = 1.100 acres Runoff CN= 89

==========
Computational Time Increment = .09129 hrs
Computed Peak Time = 12.3238 hrs
Computed Peak Flow = .84 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = .84 cfs
==========

DRAINAGE AREA

ID:SUBAREA 30
CN = 89
Area = 1.100 acres
S = 1.2360 in
0.2S = .2472 in

Cumulative Runoff

1.1114 in
.102 ac-ft

HYG Volume... .102 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .68466 hrs (ID: SUBAREA 30)
Computational Incr, Tm = .09129 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.82 cfs
Unit peak time Tp = .45644 hrs
Unit receding limb, Tr = 1.82575 hrs
Total unit time, Tb = 2.28219 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 30 10
Tc = .6847 hrs
Drainage Area = 1.100 acres Runoff CN= 89

==========
Computational Time Increment = .09129 hrs
Computed Peak Time = 12.3238 hrs
Computed Peak Flow = 1.78 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = 1.77 cfs
==========

DRAINAGE AREA

ID:SUBAREA 30
CN = 89
Area = 1.100 acres
S = 1.2360 in
0.2S = .2472 in

Cumulative Runoff

2.3572 in
.216 ac-ft

HYG Volume... .216 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .68466 hrs (ID: SUBAREA 30)
Computational Incr, Tm = .09129 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.82 cfs
Unit peak time Tp = .45644 hrs
Unit receding limb, Tr = 1.82575 hrs
Total unit time, Tb = 2.28219 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 30 100
Tc = .6847 hrs
Drainage Area = 1.100 acres Runoff CN= 89

==========
Computational Time Increment = .09129 hrs
Computed Peak Time = 12.3238 hrs
Computed Peak Flow = 2.67 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = 2.67 cfs
==========

DRAINAGE AREA

ID:SUBAREA 30
CN = 89
Area = 1.100 acres
S = 1.2360 in
0.2S = .2472 in

Cumulative Runoff

3.5807 in
.328 ac-ft

HYG Volume... .328 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .68466 hrs (ID: SUBAREA 30)
Computational Incr, Tm = .09129 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.82 cfs
Unit peak time Tp = .45644 hrs
Unit receding limb, Tr = 1.82575 hrs
Total unit time, Tb = 2.28219 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 31 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .740 acres Runoff CN= 94

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.69 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.64 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 31
CN = 94
Area = .740 acres
S = .6383 in
0.2S = .1277 in

Cumulative Runoff

1.4901 in
.092 ac-ft

HYG Volume... .092 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 31)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 10.07 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 31 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .740 acres Runoff CN= 94

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 3.12 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 3.04 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 31
CN = 94
Area = .740 acres
S = .6383 in
0.2S = .1277 in

Cumulative Runoff

2.8356 in
.175 ac-ft

HYG Volume... .175 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 31)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 10.07 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 31 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .740 acres Runoff CN= 94

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 4.42 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 4.33 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 31
CN = 94
Area = .740 acres
S = .6383 in
0.2S = .1277 in

Cumulative Runoff

4.1108 in
.253 ac-ft

HYG Volume... .253 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 31)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 10.07 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 32 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .370 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .99 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .97 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 32
CN = 98
Area = .370 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.058 ac-ft

HYG Volume... .058 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 32)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.03 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 32 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .370 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.67 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.64 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 32
CN = 98
Area = .370 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.101 ac-ft

HYG Volume... .101 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 32)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.03 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 32 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .370 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 2.31 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 2.26 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 32
CN = 98
Area = .370 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
.141 ac-ft

HYG Volume... .141 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 32)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.03 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 33 1
Tc = .4627 hrs
Drainage Area = 1.890 acres Runoff CN= 96

==========
Computational Time Increment = .06169 hrs
Computed Peak Time = 12.1525 hrs
Computed Peak Flow = 2.73 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = 2.73 cfs
==========

DRAINAGE AREA

ID:SUBAREA 33
CN = 96
Area = 1.890 acres
S = .4167 in
0.2S = .0833 in

Cumulative Runoff

1.6713 in
.263 ac-ft

HYG Volume... .263 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .46266 hrs (ID: SUBAREA 33)
Computational Incr, Tm = .06169 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 4.63 cfs
Unit peak time Tp = .30844 hrs
Unit receding limb, Tr = 1.23376 hrs
Total unit time, Tb = 1.54219 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 33 10
Tc = .4627 hrs
Drainage Area = 1.890 acres Runoff CN= 96

==========
Computational Time Increment = .06169 hrs
Computed Peak Time = 12.1525 hrs
Computed Peak Flow = 4.83 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = 4.82 cfs
==========

DRAINAGE AREA

ID:SUBAREA 33
CN = 96
Area = 1.890 acres
S = .4167 in
0.2S = .0833 in

Cumulative Runoff

3.0453 in
.480 ac-ft

HYG Volume... .480 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .46266 hrs (ID: SUBAREA 33)
Computational Incr, Tm = .06169 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 4.63 cfs
Unit peak time Tp = .30844 hrs
Unit receding limb, Tr = 1.23376 hrs
Total unit time, Tb = 1.54219 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 33 100
Tc = .4627 hrs
Drainage Area = 1.890 acres Runoff CN= 96

==========
Computational Time Increment = .06169 hrs
Computed Peak Time = 12.1525 hrs
Computed Peak Flow = 6.75 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = 6.74 cfs
==========

DRAINAGE AREA

ID:SUBAREA 33
CN = 96
Area = 1.890 acres
S = .4167 in
0.2S = .0833 in

Cumulative Runoff

4.3338 in
.683 ac-ft

HYG Volume... .683 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .46266 hrs (ID: SUBAREA 33)
Computational Incr, Tm = .06169 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 4.63 cfs
Unit peak time Tp = .30844 hrs
Unit receding limb, Tr = 1.23376 hrs
Total unit time, Tb = 1.54219 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 34 1
Tc = .6073 hrs
Drainage Area = 1.920 acres Runoff CN= 95

==========
Computational Time Increment = .08098 hrs
Computed Peak Time = 12.2275 hrs
Computed Peak Flow = 2.25 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.2500 hrs
Peak Flow, Interpolated Output = 2.22 cfs
==========

DRAINAGE AREA

ID:SUBAREA 34
CN = 95
Area = 1.920 acres
S = .5263 in
0.2S = .1053 in

Cumulative Runoff

1.5783 in
.253 ac-ft

HYG Volume... .252 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .60733 hrs (ID: SUBAREA 34)
Computational Incr, Tm = .08098 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.58 cfs
Unit peak time Tp = .40488 hrs
Unit receding limb, Tr = 1.61954 hrs
Total unit time, Tb = 2.02442 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 34 10
Tc = .6073 hrs
Drainage Area = 1.920 acres Runoff CN= 95

==========
Computational Time Increment = .08098 hrs
Computed Peak Time = 12.2275 hrs
Computed Peak Flow = 4.08 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.2500 hrs
Peak Flow, Interpolated Output = 4.02 cfs
==========

DRAINAGE AREA

ID:SUBAREA 34
CN = 95
Area = 1.920 acres
S = .5263 in
0.2S = .1053 in

Cumulative Runoff

2.9391 in
.470 ac-ft

HYG Volume... .470 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .60733 hrs (ID: SUBAREA 34)
Computational Incr, Tm = .08098 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.58 cfs
Unit peak time Tp = .40488 hrs
Unit receding limb, Tr = 1.61954 hrs
Total unit time, Tb = 2.02442 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 34 100
Tc = .6073 hrs
Drainage Area = 1.920 acres Runoff CN= 95

==========
Computational Time Increment = .08098 hrs
Computed Peak Time = 12.2275 hrs
Computed Peak Flow = 5.76 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.2500 hrs
Peak Flow, Interpolated Output = 5.68 cfs
==========

DRAINAGE AREA

ID:SUBAREA 34
CN = 95
Area = 1.920 acres
S = .5263 in
0.2S = .1053 in

Cumulative Runoff

4.2215 in
.675 ac-ft

HYG Volume... .675 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .60733 hrs (ID: SUBAREA 34)
Computational Incr, Tm = .08098 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.58 cfs
Unit peak time Tp = .40488 hrs
Unit receding limb, Tr = 1.61954 hrs
Total unit time, Tb = 2.02442 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 35 1
Tc = .2030 hrs
Drainage Area = .600 acres Runoff CN= 94

==========
Computational Time Increment = .02706 hrs
Computed Peak Time = 12.0168 hrs
Computed Peak Flow = 1.14 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 1.13 cfs
==========

DRAINAGE AREA

ID:SUBAREA 35
CN = 94
Area = .600 acres
S = .6383 in
0.2S = .1277 in

Cumulative Runoff

1.4901 in
.075 ac-ft

HYG Volume... .074 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .20299 hrs (ID: SUBAREA 35)
Computational Incr, Tm = .02706 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.35 cfs
Unit peak time Tp = .13532 hrs
Unit receding limb, Tr = .54130 hrs
Total unit time, Tb = .67662 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 35 10
Tc = .2030 hrs
Drainage Area = .600 acres Runoff CN= 94

==========
Computational Time Increment = .02706 hrs
Computed Peak Time = 11.9898 hrs
Computed Peak Flow = 2.09 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 2.09 cfs
==========

DRAINAGE AREA

ID:SUBAREA 35
CN = 94
Area = .600 acres
S = .6383 in
0.2S = .1277 in

Cumulative Runoff

2.8356 in
.142 ac-ft

HYG Volume... .142 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .20299 hrs (ID: SUBAREA 35)
Computational Incr, Tm = .02706 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.35 cfs
Unit peak time Tp = .13532 hrs
Unit receding limb, Tr = .54130 hrs
Total unit time, Tb = .67662 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 35 100
Tc = .2030 hrs
Drainage Area = .600 acres Runoff CN= 94

==========
Computational Time Increment = .02706 hrs
Computed Peak Time = 11.9898 hrs
Computed Peak Flow = 2.96 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 2.96 cfs
==========

DRAINAGE AREA

ID:SUBAREA 35
CN = 94
Area = .600 acres
S = .6383 in
0.2S = .1277 in

Cumulative Runoff

4.1108 in
.206 ac-ft

HYG Volume... .205 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .20299 hrs (ID: SUBAREA 35)
Computational Incr, Tm = .02706 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.35 cfs
Unit peak time Tp = .13532 hrs
Unit receding limb, Tr = .54130 hrs
Total unit time, Tb = .67662 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 36 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .220 acres Runoff CN= 93

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .48 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .46 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 36
CN = 93
Area = .220 acres
S = .7527 in
0.2S = .1505 in

Cumulative Runoff

1.4064 in
.026 ac-ft

HYG Volume... .026 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 36)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 2.99 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 36 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .220 acres Runoff CN= 93

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .90 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .88 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 36
CN = 93
Area = .220 acres
S = .7527 in
0.2S = .1505 in

Cumulative Runoff

2.7349 in
.050 ac-ft

HYG Volume... .050 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 36)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 2.99 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 36 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .220 acres Runoff CN= 93

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.29 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.27 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 36
CN = 93
Area = .220 acres
S = .7527 in
0.2S = .1505 in

Cumulative Runoff

4.0016 in
.073 ac-ft

HYG Volume... .073 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 36)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 2.99 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 37 1
Tc = .1370 hrs
Drainage Area = .530 acres Runoff CN= 81

==========
Computational Time Increment = .01827 hrs
Computed Peak Time = 11.9850 hrs
Computed Peak Flow = .49 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = .49 cfs
==========

DRAINAGE AREA

ID:SUBAREA 37
CN = 81
Area = .530 acres
S = 2.3457 in
0.2S = .4691 in

Cumulative Runoff

.6689 in
.030 ac-ft

HYG Volume... .030 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .13702 hrs (ID: SUBAREA 37)
Computational Incr, Tm = .01827 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 4.38 cfs
Unit peak time Tp = .09135 hrs
Unit receding limb, Tr = .36540 hrs
Total unit time, Tb = .45674 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 37 10
Tc = .1370 hrs
Drainage Area = .530 acres Runoff CN= 81

==========
Computational Time Increment = .01827 hrs
Computed Peak Time = 11.9667 hrs
Computed Peak Flow = 1.29 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 1.28 cfs
==========

DRAINAGE AREA

ID:SUBAREA 37
CN = 81
Area = .530 acres
S = 2.3457 in
0.2S = .4691 in

Cumulative Runoff

1.7086 in
.075 ac-ft

HYG Volume... .075 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .13702 hrs (ID: SUBAREA 37)
Computational Incr, Tm = .01827 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 4.38 cfs
Unit peak time Tp = .09135 hrs
Unit receding limb, Tr = .36540 hrs
Total unit time, Tb = .45674 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 37 100
Tc = .1370 hrs
Drainage Area = .530 acres Runoff CN= 81

==========
Computational Time Increment = .01827 hrs
Computed Peak Time = 11.9667 hrs
Computed Peak Flow = 2.12 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 2.11 cfs
==========

DRAINAGE AREA

ID:SUBAREA 37
CN = 81
Area = .530 acres
S = 2.3457 in
0.2S = .4691 in

Cumulative Runoff

2.8093 in
.124 ac-ft

HYG Volume... .124 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .13702 hrs (ID: SUBAREA 37)
Computational Incr, Tm = .01827 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 4.38 cfs
Unit peak time Tp = .09135 hrs
Unit receding limb, Tr = .36540 hrs
Total unit time, Tb = .45674 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 38 1
Tc = .1061 hrs
Drainage Area = .680 acres Runoff CN= 91

==========
Computational Time Increment = .01414 hrs
Computed Peak Time = 11.9350 hrs
Computed Peak Flow = 1.28 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 1.26 cfs
==========

DRAINAGE AREA

ID:SUBAREA 38
CN = 91
Area = .680 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

1.2515 in
.071 ac-ft

HYG Volume... .071 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .10606 hrs (ID: SUBAREA 38)
Computational Incr, Tm = .01414 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.26 cfs
Unit peak time Tp = .07070 hrs
Unit receding limb, Tr = .28282 hrs
Total unit time, Tb = .35352 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 38 10
Tc = .1061 hrs
Drainage Area = .680 acres Runoff CN= 91

==========
Computational Time Increment = .01414 hrs
Computed Peak Time = 11.9350 hrs
Computed Peak Flow = 2.54 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 2.49 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 38
CN = 91
Area = .680 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

2.5411 in
.144 ac-ft

HYG Volume... .144 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .10606 hrs (ID: SUBAREA 38)
Computational Incr, Tm = .01414 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.26 cfs
Unit peak time Tp = .07070 hrs
Unit receding limb, Tr = .28282 hrs
Total unit time, Tb = .35352 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 38 100
Tc = .1061 hrs
Drainage Area = .680 acres Runoff CN= 91

==========
Computational Time Increment = .01414 hrs
Computed Peak Time = 11.9350 hrs
Computed Peak Flow = 3.70 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 3.63 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 38
CN = 91
Area = .680 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

3.7881 in
.215 ac-ft

HYG Volume... .215 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .10606 hrs (ID: SUBAREA 38)
Computational Incr, Tm = .01414 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.26 cfs
Unit peak time Tp = .07070 hrs
Unit receding limb, Tr = .28282 hrs
Total unit time, Tb = .35352 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 39A 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = 2.660 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 7.10 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 6.95 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 39A
CN = 98
Area = 2.660 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.415 ac-ft

HYG Volume... .415 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 39A)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 36.18 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 39A 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = 2.660 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 12.04 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 11.81 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 39A
CN = 98
Area = 2.660 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.724 ac-ft

HYG Volume... .724 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 39A)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 36.18 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 39A 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = 2.660 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 16.59 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 16.28 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 39A
CN = 98
Area = 2.660 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
1.012 ac-ft

HYG Volume... 1.012 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 39A)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 36.18 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 39B 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = 2.660 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 7.10 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 6.95 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 39B
CN = 98
Area = 2.660 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.415 ac-ft

HYG Volume... .415 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 39B)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 36.18 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 39B 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = 2.660 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 12.04 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 11.81 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 39B
CN = 98
Area = 2.660 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.724 ac-ft

HYG Volume... .724 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 39B)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 36.18 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 39B 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = 2.660 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 16.59 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 16.28 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 39B
CN = 98
Area = 2.660 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
1.012 ac-ft

HYG Volume... 1.012 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 39B)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 36.18 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 4 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .440 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.17 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.15 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 4
CN = 98
Area = .440 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.069 ac-ft

HYG Volume... .069 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 4)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.98 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 4 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .440 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.99 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.95 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 4
CN = 98
Area = .440 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.120 ac-ft

HYG Volume... .120 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 4)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.98 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 4 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .440 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 2.74 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 2.69 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 4
CN = 98
Area = .440 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
.167 ac-ft

HYG Volume... .167 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 4)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.98 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 40 1
Tc = .1134 hrs
Drainage Area = .710 acres Runoff CN= 91

==========
Computational Time Increment = .01512 hrs
Computed Peak Time = 11.9434 hrs
Computed Peak Flow = 1.32 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 1.31 cfs
==========

DRAINAGE AREA

ID:SUBAREA 40
CN = 91
Area = .710 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

1.2515 in
.074 ac-ft

HYG Volume... .074 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .11339 hrs (ID: SUBAREA 40)
Computational Incr, Tm = .01512 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.09 cfs
Unit peak time Tp = .07559 hrs
Unit receding limb, Tr = .30236 hrs
Total unit time, Tb = .37795 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 40 10
Tc = .1134 hrs
Drainage Area = .710 acres Runoff CN= 91

==========
Computational Time Increment = .01512 hrs
Computed Peak Time = 11.9434 hrs
Computed Peak Flow = 2.61 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 2.59 cfs
==========

DRAINAGE AREA

ID:SUBAREA 40
CN = 91
Area = .710 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

2.5411 in
.150 ac-ft

HYG Volume... .150 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .11339 hrs (ID: SUBAREA 40)
Computational Incr, Tm = .01512 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.09 cfs
Unit peak time Tp = .07559 hrs
Unit receding limb, Tr = .30236 hrs
Total unit time, Tb = .37795 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 40 100
Tc = .1134 hrs
Drainage Area = .710 acres Runoff CN= 91

==========
Computational Time Increment = .01512 hrs
Computed Peak Time = 11.9282 hrs
Computed Peak Flow = 3.81 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 3.77 cfs
==========

DRAINAGE AREA

ID:SUBAREA 40
CN = 91
Area = .710 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

3.7881 in
.224 ac-ft

HYG Volume... .224 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .11339 hrs (ID: SUBAREA 40)
Computational Incr, Tm = .01512 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.09 cfs
Unit peak time Tp = .07559 hrs
Unit receding limb, Tr = .30236 hrs
Total unit time, Tb = .37795 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 41 1
Tc = .1015 hrs
Drainage Area = .640 acres Runoff CN= 83

==========
Computational Time Increment = .01353 hrs
Computed Peak Time = 11.9496 hrs
Computed Peak Flow = .72 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = .72 cfs
==========

DRAINAGE AREA

ID:SUBAREA 41
CN = 83
Area = .640 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.7643 in
.041 ac-ft

HYG Volume... .041 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .10150 hrs (ID: SUBAREA 41)
Computational Incr, Tm = .01353 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.14 cfs
Unit peak time Tp = .06766 hrs
Unit receding limb, Tr = .27066 hrs
Total unit time, Tb = .33832 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 41 10
Tc = .1015 hrs
Drainage Area = .640 acres Runoff CN= 83

==========
Computational Time Increment = .01353 hrs
Computed Peak Time = 11.9361 hrs
Computed Peak Flow = 1.81 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 1.79 cfs
==========

DRAINAGE AREA

ID:SUBAREA 41
CN = 83
Area = .640 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

1.8586 in
.099 ac-ft

HYG Volume... .099 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .10150 hrs (ID: SUBAREA 41)
Computational Incr, Tm = .01353 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.14 cfs
Unit peak time Tp = .06766 hrs
Unit receding limb, Tr = .27066 hrs
Total unit time, Tb = .33832 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 41 100
Tc = .1015 hrs
Drainage Area = .640 acres Runoff CN= 83

==========
Computational Time Increment = .01353 hrs
Computed Peak Time = 11.9361 hrs
Computed Peak Flow = 2.89 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 2.84 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 41
CN = 83
Area = .640 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

2.9937 in
.160 ac-ft

HYG Volume... .160 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .10150 hrs (ID: SUBAREA 41)
Computational Incr, Tm = .01353 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.14 cfs
Unit peak time Tp = .06766 hrs
Unit receding limb, Tr = .27066 hrs
Total unit time, Tb = .33832 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 42 1
Tc = .1015 hrs
Drainage Area = .560 acres Runoff CN= 85

==========
Computational Time Increment = .01353 hrs
Computed Peak Time = 11.9361 hrs
Computed Peak Flow = .73 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = .73 cfs
==========

DRAINAGE AREA

ID:SUBAREA 42
CN = 85
Area = .560 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

.8691 in
.041 ac-ft

HYG Volume... .041 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .10150 hrs (ID: SUBAREA 42)
Computational Incr, Tm = .01353 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 6.25 cfs
Unit peak time Tp = .06766 hrs
Unit receding limb, Tr = .27066 hrs
Total unit time, Tb = .33832 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 42 10
Tc = .1015 hrs
Drainage Area = .560 acres Runoff CN= 85

==========
Computational Time Increment = .01353 hrs
Computed Peak Time = 11.9361 hrs
Computed Peak Flow = 1.71 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 1.69 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 42
CN = 85
Area = .560 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

2.0164 in
.094 ac-ft

HYG Volume... .094 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .10150 hrs (ID: SUBAREA 42)
Computational Incr, Tm = .01353 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 6.25 cfs
Unit peak time Tp = .06766 hrs
Unit receding limb, Tr = .27066 hrs
Total unit time, Tb = .33832 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 42 100
Tc = .1015 hrs
Drainage Area = .560 acres Runoff CN= 85

==========
Computational Time Increment = .01353 hrs
Computed Peak Time = 11.9361 hrs
Computed Peak Flow = 2.67 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 2.62 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 42
CN = 85
Area = .560 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

3.1837 in
.149 ac-ft

HYG Volume... .149 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .10150 hrs (ID: SUBAREA 42)
Computational Incr, Tm = .01353 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 6.25 cfs
Unit peak time Tp = .06766 hrs
Unit receding limb, Tr = .27066 hrs
Total unit time, Tb = .33832 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 43 1
Tc = .1233 hrs
Drainage Area = .500 acres Runoff CN= 92

==========
Computational Time Increment = .01644 hrs
Computed Peak Time = 11.9525 hrs
Computed Peak Flow = .96 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = .96 cfs
==========

DRAINAGE AREA

ID:SUBAREA 43
CN = 92
Area = .500 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff

1.3270 in
.055 ac-ft

HYG Volume... .055 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .12331 hrs (ID: SUBAREA 43)
Computational Incr, Tm = .01644 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 4.59 cfs
Unit peak time Tp = .08220 hrs
Unit receding limb, Tr = .32882 hrs
Total unit time, Tb = .41102 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 43 10
Tc = .1233 hrs
Drainage Area = .500 acres Runoff CN= 92

==========
Computational Time Increment = .01644 hrs
Computed Peak Time = 11.9361 hrs
Computed Peak Flow = 1.86 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 1.86 cfs
==========

DRAINAGE AREA

ID:SUBAREA 43
CN = 92
Area = .500 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff

2.6367 in
.110 ac-ft

HYG Volume... .110 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .12331 hrs (ID: SUBAREA 43)
Computational Incr, Tm = .01644 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 4.59 cfs
Unit peak time Tp = .08220 hrs
Unit receding limb, Tr = .32882 hrs
Total unit time, Tb = .41102 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 43 100
Tc = .1233 hrs
Drainage Area = .500 acres Runoff CN= 92

==========
Computational Time Increment = .01644 hrs
Computed Peak Time = 11.9361 hrs
Computed Peak Flow = 2.69 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 2.68 cfs
==========

DRAINAGE AREA

ID:SUBAREA 43
CN = 92
Area = .500 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff

3.8941 in
.162 ac-ft

HYG Volume... .162 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .12331 hrs (ID: SUBAREA 43)
Computational Incr, Tm = .01644 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 4.59 cfs
Unit peak time Tp = .08220 hrs
Unit receding limb, Tr = .32882 hrs
Total unit time, Tb = .41102 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 44 1
Tc = .1511 hrs
Drainage Area = 1.080 acres Runoff CN= 92

==========
Computational Time Increment = .02015 hrs
Computed Peak Time = 11.9707 hrs
Computed Peak Flow = 1.99 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 1.96 cfs
==========

DRAINAGE AREA

ID:SUBAREA 44
CN = 92
Area = 1.080 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff

1.3270 in
.119 ac-ft

HYG Volume... .119 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .15114 hrs (ID: SUBAREA 44)
Computational Incr, Tm = .02015 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 8.10 cfs
Unit peak time Tp = .10076 hrs
Unit receding limb, Tr = .40305 hrs
Total unit time, Tb = .50382 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 44 10
Tc = .1511 hrs
Drainage Area = 1.080 acres Runoff CN= 92

==========
Computational Time Increment = .02015 hrs
Computed Peak Time = 11.9707 hrs
Computed Peak Flow = 3.84 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 3.81 cfs
==========

DRAINAGE AREA

ID:SUBAREA 44
CN = 92
Area = 1.080 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff

2.6367 in
.237 ac-ft

HYG Volume... .237 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .15114 hrs (ID: SUBAREA 44)
Computational Incr, Tm = .02015 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 8.10 cfs
Unit peak time Tp = .10076 hrs
Unit receding limb, Tr = .40305 hrs
Total unit time, Tb = .50382 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 44 100
Tc = .1511 hrs
Drainage Area = 1.080 acres Runoff CN= 92

==========
Computational Time Increment = .02015 hrs
Computed Peak Time = 11.9707 hrs
Computed Peak Flow = 5.55 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 5.52 cfs
==========

DRAINAGE AREA

ID:SUBAREA 44
CN = 92
Area = 1.080 acres
S = .8696 in
0.2S = .1739 in

Cumulative Runoff

3.8941 in
.350 ac-ft

HYG Volume... .350 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .15114 hrs (ID: SUBAREA 44)
Computational Incr, Tm = .02015 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 8.10 cfs
Unit peak time Tp = .10076 hrs
Unit receding limb, Tr = .40305 hrs
Total unit time, Tb = .50382 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 45 1
Tc = .1673 hrs
Drainage Area = 1.140 acres Runoff CN= 85

==========
Computational Time Increment = .02230 hrs
Computed Peak Time = 11.9991 hrs
Computed Peak Flow = 1.35 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 1.35 cfs
==========

DRAINAGE AREA

ID:SUBAREA 45
CN = 85
Area = 1.140 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

.8691 in
.083 ac-ft

HYG Volume... .083 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .16727 hrs (ID: SUBAREA 45)
Computational Incr, Tm = .02230 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.72 cfs
Unit peak time Tp = .11152 hrs
Unit receding limb, Tr = .44606 hrs
Total unit time, Tb = .55758 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 45 10
Tc = .1673 hrs
Drainage Area = 1.140 acres Runoff CN= 85

==========
Computational Time Increment = .02230 hrs
Computed Peak Time = 11.9991 hrs
Computed Peak Flow = 3.13 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 3.13 cfs
==========

DRAINAGE AREA

ID:SUBAREA 45
CN = 85
Area = 1.140 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

2.0164 in
.192 ac-ft

HYG Volume... .192 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .16727 hrs (ID: SUBAREA 45)
Computational Incr, Tm = .02230 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.72 cfs
Unit peak time Tp = .11152 hrs
Unit receding limb, Tr = .44606 hrs
Total unit time, Tb = .55758 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 45 100
Tc = .1673 hrs
Drainage Area = 1.140 acres Runoff CN= 85

==========
Computational Time Increment = .02230 hrs
Computed Peak Time = 11.9768 hrs
Computed Peak Flow = 4.89 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 4.87 cfs
==========

DRAINAGE AREA

ID:SUBAREA 45
CN = 85
Area = 1.140 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

3.1837 in
.302 ac-ft

HYG Volume... .302 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .16727 hrs (ID: SUBAREA 45)
Computational Incr, Tm = .02230 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.72 cfs
Unit peak time Tp = .11152 hrs
Unit receding limb, Tr = .44606 hrs
Total unit time, Tb = .55758 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 46 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .390 acres Runoff CN= 96

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = .97 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = .95 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 46
CN = 96
Area = .390 acres
S = .4167 in
0.2S = .0833 in

Cumulative Runoff

1.6713 in
.054 ac-ft

HYG Volume... .054 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 46)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.30 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 46 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .390 acres Runoff CN= 96

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.71 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.68 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 46
CN = 96
Area = .390 acres
S = .4167 in
0.2S = .0833 in

Cumulative Runoff

3.0453 in
.099 ac-ft

HYG Volume... .099 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 46)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.30 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 46 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .390 acres Runoff CN= 96

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 2.39 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 2.34 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 46
CN = 96
Area = .390 acres
S = .4167 in
0.2S = .0833 in

Cumulative Runoff

4.3338 in
.141 ac-ft

HYG Volume... .141 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 46)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.30 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 47 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .580 acres Runoff CN= 96

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.45 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.41 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 47
CN = 96
Area = .580 acres
S = .4167 in
0.2S = .0833 in

Cumulative Runoff

1.6713 in
.081 ac-ft

HYG Volume... .081 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 47)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.89 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 47 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .580 acres Runoff CN= 96

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 2.55 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 2.49 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 47
CN = 96
Area = .580 acres
S = .4167 in
0.2S = .0833 in

Cumulative Runoff

3.0453 in
.147 ac-ft

HYG Volume... .147 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 47)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.89 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 47 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .580 acres Runoff CN= 96

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 3.56 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 3.49 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 47
CN = 96
Area = .580 acres
S = .4167 in
0.2S = .0833 in

Cumulative Runoff

4.3338 in
.209 ac-ft

HYG Volume... .209 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 47)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 7.89 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 48 1
Tc = .1251 hrs
Drainage Area = 3.500 acres Runoff CN= 87

==========
Computational Time Increment = .01669 hrs
Computed Peak Time = 11.9635 hrs
Computed Peak Flow = 5.00 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 4.99 cfs
==========

DRAINAGE AREA

ID:SUBAREA 48
CN = 87
Area = 3.500 acres
S = 1.4943 in
0.2S = .2989 in

Cumulative Runoff

.9844 in
.287 ac-ft

HYG Volume... .287 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .12514 hrs (ID: SUBAREA 48)
Computational Incr, Tm = .01669 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 31.69 cfs
Unit peak time Tp = .08343 hrs
Unit receding limb, Tr = .33371 hrs
Total unit time, Tb = .41714 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 48 10
Tc = .1251 hrs
Drainage Area = 3.500 acres Runoff CN= 87

==========
Computational Time Increment = .01669 hrs
Computed Peak Time = 11.9468 hrs
Computed Peak Flow = 11.06 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 11.04 cfs
==========

DRAINAGE AREA

ID:SUBAREA 48
CN = 87
Area = 3.500 acres
S = 1.4943 in
0.2S = .2989 in

Cumulative Runoff

2.1824 in
.637 ac-ft

HYG Volume... .637 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .12514 hrs (ID: SUBAREA 48)
Computational Incr, Tm = .01669 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 31.69 cfs
Unit peak time Tp = .08343 hrs
Unit receding limb, Tr = .33371 hrs
Total unit time, Tb = .41714 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 48 100
Tc = .1251 hrs
Drainage Area = 3.500 acres Runoff CN= 87

==========
Computational Time Increment = .01669 hrs
Computed Peak Time = 11.9468 hrs
Computed Peak Flow = 16.89 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 16.85 cfs
==========

DRAINAGE AREA

ID:SUBAREA 48
CN = 87
Area = 3.500 acres
S = 1.4943 in
0.2S = .2989 in

Cumulative Runoff

3.3793 in
.986 ac-ft

HYG Volume... .986 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .12514 hrs (ID: SUBAREA 48)
Computational Incr, Tm = .01669 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 31.69 cfs
Unit peak time Tp = .08343 hrs
Unit receding limb, Tr = .33371 hrs
Total unit time, Tb = .41714 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 49 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .410 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.09 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.07 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 49
CN = 98
Area = .410 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.064 ac-ft

HYG Volume... .064 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 49)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.58 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 49 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .410 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.86 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.82 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 49
CN = 98
Area = .410 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.112 ac-ft

HYG Volume... .112 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 49)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.58 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 49 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .410 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 2.56 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 2.51 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 49
CN = 98
Area = .410 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
.156 ac-ft

HYG Volume... .156 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 49)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.58 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 5 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.310 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 3.50 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 3.42 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 5
CN = 98
Area = 1.310 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.205 ac-ft

HYG Volume... .205 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 5)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 17.82 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 5 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.310 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 5.93 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 5.81 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 5
CN = 98
Area = 1.310 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.357 ac-ft

HYG Volume... .357 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 5)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 17.82 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 5 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.310 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 8.17 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 8.02 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 5
CN = 98
Area = 1.310 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
.498 ac-ft

HYG Volume... .498 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 5)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 17.82 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 6 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .430 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.15 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.12 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 6
CN = 98
Area = .430 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.067 ac-ft

HYG Volume... .067 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 6)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.85 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 6 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .430 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.95 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.91 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 6
CN = 98
Area = .430 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.117 ac-ft

HYG Volume... .117 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 6)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.85 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 6 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .430 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 2.68 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 2.63 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 6
CN = 98
Area = .430 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
.164 ac-ft

HYG Volume... .164 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 6)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.85 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 7 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.130 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 3.02 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 2.95 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 7
CN = 98
Area = 1.130 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.176 ac-ft

HYG Volume... .176 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 7)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 15.37 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 7 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.130 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 5.11 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 5.02 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 7
CN = 98
Area = 1.130 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.308 ac-ft

HYG Volume... .308 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 7)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 15.37 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 7 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.130 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 7.05 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 6.92 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 7
CN = 98
Area = 1.130 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
.430 ac-ft

HYG Volume... .430 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 7)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 15.37 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 8 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .430 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.15 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.12 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 8
CN = 98
Area = .430 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.067 ac-ft

HYG Volume... .067 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 8)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.85 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 8 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .430 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 1.95 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 1.91 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 8
CN = 98
Area = .430 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.117 ac-ft

HYG Volume... .117 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 8)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.85 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 8 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .430 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 2.68 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 2.63 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 8
CN = 98
Area = .430 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
.164 ac-ft

HYG Volume... .164 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 8)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.85 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.1000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 9 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.010 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 2.70 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 2.64 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 9
CN = 98
Area = 1.010 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.8735 in
.158 ac-ft

HYG Volume... .158 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 9)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 13.74 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 9 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.010 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 4.57 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 4.48 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 9
CN = 98
Area = 1.010 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.2665 in
.275 ac-ft

HYG Volume... .275 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 9)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 13.74 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 4.8000 in
Rain Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = S:\Projects\BDA\10088\CALCS\SITE\PondPack\
HYG File - ID = - SUBAREA 9 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = 1.010 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 11.9175 hrs
Computed Peak Flow = 6.30 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9000 hrs
Peak Flow, Interpolated Output = 6.18 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:SUBAREA 9
CN = 98
Area = 1.010 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.5635 in
.384 ac-ft

HYG Volume... .384 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: SUBAREA 9)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 13.74 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
563.00	-----	.2700	.0000	.000	.000
564.00	-----	.3500	.9274	.309	.309
565.00	-----	.4700	1.2256	.409	.718
566.00	-----	.5500	1.5284	.509	1.227
567.00	-----	.6200	1.7540	.585	1.812
568.00	-----	.7000	1.9788	.660	2.471
569.00	-----	.7800	2.2189	.740	3.211
570.00	-----	.8800	2.4885	.829	4.041
571.00	-----	.9500	2.7443	.915	4.955
572.00	-----	1.0500	2.9987	1.000	5.955

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 563.00 ft
Increment = .25 ft
Max. Elev.= 572.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Inlet Box	R0	--->	C2	566.750	572.000
Orifice-Circular	O0	--->	C2	564.600	572.000
Culvert-Circular	C2	--->	TW	564.500	572.000

TW SETUP, DS Channel

OUTLET STRUCTURE INPUT DATA

Structure ID = R0
Structure Type = Inlet Box

# of Openings	=	1
Invert Elev.	=	566.75 ft
Orifice Area	=	8.0000 sq.ft
Orifice Coeff.	=	.600
Weir Length	=	16.00 ft
Weir Coeff.	=	3.330
K, Reverse	=	1.000
Mannings n	=	.0000
Kev,Charged Riser	=	.000
Weir Submergence	=	No

Structure ID = O0
Structure Type = Orifice-Circular

# of Openings	=	1
Invert Elev.	=	564.60 ft
Diameter	=	1.2500 ft
Orifice Coeff.	=	.600

OUTLET STRUCTURE INPUT DATA

Structure ID = C2
Structure Type = Culvert-Circular

No. Barrels	=	1
Barrel Diameter	=	1.7500 ft
Upstream Invert	=	564.50 ft
Dnstream Invert	=	563.61 ft
Horiz. Length	=	237.60 ft
Barrel Length	=	237.60 ft
Barrel Slope	=	.00375 ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0120	
Ke	=	.9000	(forward entrance loss)
Kb	=	.012636	(per ft of full flow)
Kr	=	.9000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1
Inlet Control K	=	.0340
Inlet Control M	=	1.5000
Inlet Control c	=	.05530
Inlet Control Y	=	.5400
T1 ratio (HW/D)	=	1.261
T2 ratio (HW/D)	=	1.423
Slope Factor	=	-.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev = 566.71 ft ---> Flow = 11.14 cfs
At T2 Elev = 566.99 ft ---> Flow = 12.73 cfs

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...

Maximum Iterations	=	40
Min. TW tolerance	=	.01 ft
Max. TW tolerance	=	.01 ft
Min. HW tolerance	=	.01 ft
Max. HW tolerance	=	.01 ft
Min. Q tolerance	=	.00 cfs
Max. Q tolerance	=	.00 cfs

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APPENDIX F

STORMWATER DRAINAGE

SYSTEM DESIGN ANALYSIS

NETWORK SUMMARY -- LINKS
(UN=Upstream Node; DL=DNstream End of Link; DN=DNstream Node)
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Link ID	Type		HYG Vol ac-ft	Trun.	Peak Time hrs	Peak Q cfs	End Points	
ADDLINK 930	ADD	UN	.110		11.9500	1.86	SUBAREA 43	
		DL	.110		11.9500	1.86		
		DN	1.177		11.9000	19.12	CB-2	
ADDLINK 940	ADD	UN	.724		11.9000	11.81	SUBAREA 39B	
		DL	.724		11.9000	11.81		
		DN	1.177		11.9000	19.12	CB-2	
CHANNEL #1	ADD	UN	.149		11.9000	2.69	SUBAREA 11	
		DL	.149		11.9000	2.69		
		DN	.193		11.9000	3.29	ES-4	
CHANNEL #2	ADD	UN	.190		12.0000	3.02	SUBAREA 1	
		DL	.190		12.0000	3.02		
		DN	.190		12.0000	3.02	DI-6	
CHANNEL #3	ADD	UN	.145		11.9000	2.60	SUBAREA 17	
		DL	.145		11.9000	2.60		
		DN	.347		11.9500	6.66	CB-8	
REACH 10	REACH	UN	.929		11.9000	16.48	SUBAREA 20	
		DL	.962		11.7500	9.63		
		DN	3.438		12.2000	21.46	JUNC 10	
ROUTE 20	PONDrt	UN	3.730		11.9500	55.30	BASIN	IN
ROUTE 20			2.377		12.2500	11.74	BASIN	OUT
		DL	2.377		12.2500	11.74		
		DN	3.438		12.2000	21.46	JUNC 10	
SD-1	REACH	UN	.024		11.9000	.40	DI-11	
		DL	.024		11.9500	.39		
		DN	.215		11.9000	3.46	CB-12	
SD-10	REACH	UN	.043		11.9000	.68	CB-13	
		DL	.043		11.9500	.68		
		DN	.043		11.9500	.68	ES-5	
SD-11	REACH	UN	.193		11.9000	3.29	ES-4	
		DL	.193		11.9500	3.28		
		DN	.496		12.0000	5.52	CB-15	

NETWORK SUMMARY -- LINKS
(UN=Upstream Node; DL=DNstream End of Link; DN=DNstream Node)
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Link ID	Type		HYG Vol ac-ft	Trun.	Peak Time hrs	Peak Q cfs	End Points	
SD-12	REACH	UN	.496		12.0000	5.52	CB-15	
		DL	.516		11.9000	6.56		
		DN	3.730		11.9500	55.30	BASIN	IN
SD-13	REACH	UN	.222		12.1500	2.08	CB-16	
		DL	.230		12.1500	2.94		
		DN	.496		12.0000	5.52	CB-15	
SD-14	REACH	UN	.029		11.9000	.51	DI-14	
		DL	.029		11.9500	.49		
		DN	.222		12.1500	2.08	CB-16	
SD-15	REACH	UN	.190		12.0000	3.02	DI-6	
		DL	.202		11.9500	4.15		
		DN	.347		11.9500	6.66	CB-8	
SD-16	REACH	UN	.347		11.9500	6.66	CB-8	
		DL	.370		12.0000	7.74		
		DN	.984		12.0000	16.34	CB-7	
SD-17	REACH	UN	.984		12.0000	16.34	CB-7	
		DL	1.044		11.9000	16.63		
		DN	3.730		11.9500	55.30	BASIN	IN
SD-18	REACH	UN	.240		11.9000	3.91	DI-7	
		DL	.255		11.9000	3.94		
		DN	.984		12.0000	16.34	CB-7	
SD-19	REACH	UN	.258		11.9000	4.61	DI-13	
		DL	.258		11.9500	4.52		
		DN	.330		11.9500	5.75	CB-14	
SD-2	REACH	UN	.215		11.9000	3.46	CB-12	
		DL	.215		11.9500	3.38		
		DN	.691		11.9500	10.73	CB-11	
SD-20	REACH	UN	.330		11.9500	5.75	CB-14	
		DL	.330		11.9500	5.53		
		DN	3.730		11.9500	55.30	BASIN	IN

NETWORK SUMMARY -- LINKS
(UN=Upstream Node; DL=DNstream End of Link; DN=DNstream Node)
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Link ID	Type		HYG Vol ac-ft	Trun.	Peak Time hrs	Peak Q cfs	End Points
SD-21	ADD	UN	.093		11.9000	1.51	DI-5
		DL	.093		11.9000	1.51	
		DN	.302		11.9000	5.20	CB-5
SD-22	ADD	UN	.302		11.9000	5.20	CB-5
		DL	.302		11.9000	5.20	
		DN	.551		11.9000	8.07	CB-4
SD-23	ADD	UN	.112		11.9000	1.82	TD-1
		DL	.112		11.9000	1.82	
		DN	.551		11.9000	8.07	CB-4
SD-24	ADD	UN	.551		11.9000	8.07	CB-4
		DL	.551		11.9000	8.07	
		DN	.718		11.9500	9.08	SR-6
SD-25	ADD	UN	.718		11.9500	9.08	SR-6
		DL	.718		11.9500	9.08	
		DN	1.259		11.9500	15.11	STMH-9
SD-26	ADD	UN	.326		11.9000	5.57	CB-3
		DL	.326		11.9000	5.57	
		DN	.542		11.9000	6.17	SR-5
SD-27	ADD	UN	.050		11.9000	.88	DI-4
		DL	.050		11.9000	.88	
		DN	.326		11.9000	5.57	CB-3
SD-28	ADD	UN	.542		11.9000	6.17	SR-5
		DL	.542		11.9000	6.17	
		DN	1.259		11.9500	15.11	STMH-9
SD-29	ADD	UN	1.259		11.9500	15.11	STMH-9
		DL	1.259		11.9500	15.11	
		DN	2.209		12.0000	20.43	STMH-8
SD-3	REACH	UN	.120		11.9000	1.95	DI-10
		DL	.120		11.9500	1.89	
		DN	.691		11.9500	10.73	CB-11

NETWORK SUMMARY -- LINKS
(UN=Upstream Node; DL=DNstream End of Link; DN=DNstream Node)
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Link ID	Type		HYG Vol ac-ft	Trun.	Peak Time hrs	Peak Q cfs	End Points
SD-30	ADD	UN	.950		12.1500	8.70	SR-4
		DL	.950		12.1500	8.70	
		DN	2.209		12.0000	20.43	STMH-8
SD-31	ADD	UN	.470		12.2500	4.02	DI-3
		DL	.470		12.2500	4.02	
		DN	.950		12.1500	8.70	SR-4
SD-32	ADD	UN	2.209		12.0000	20.43	STMH-8
		DL	2.209		12.0000	20.43	
		DN	2.351		12.0000	22.51	STMH-7
SD-33	ADD	UN	.142		12.0000	2.09	SR-3
		DL	.142		12.0000	2.09	
		DN	2.351		12.0000	22.51	STMH-7
SD-34	ADD	UN	2.351		12.0000	22.51	STMH-7
		DL	2.351		12.0000	22.51	
		DN	3.219		11.9500	35.68	STMH-6
SD-35	ADD	UN	.868		11.9000	14.17	SR-2
		DL	.868		11.9000	14.17	
		DN	3.219		11.9500	35.68	STMH-6
SD-36	ADD	UN	3.219		11.9500	35.68	STMH-6
		DL	3.219		11.9500	35.68	
		DN	3.366		11.9500	38.03	STMH-5
SD-37	ADD	UN	3.366		11.9500	38.03	STMH-5
		DL	3.366		11.9500	38.03	
		DN	3.478		11.9500	39.74	STMH-4
SD-38	ADD	UN	3.478		11.9500	39.74	STMH-4
		DL	3.478		11.9500	39.74	
		DN	3.478		11.9500	39.74	STMH-3
SD-39	ADD	UN	3.478		11.9500	39.74	STMH-3
		DL	3.478		11.9500	39.74	
		DN	5.084		11.9500	65.54	STMH-2

NETWORK SUMMARY -- LINKS

(UN=Upstream Node; DL=DNstream End of Link; DN=DNstream Node)
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Link ID	Type		HYG Vol ac-ft	Trun.	Peak Time hrs	Peak Q cfs	End Points
SD-4	REACH	UN	.691		11.9500	10.73	CB-11
		DL	.691		11.9500	10.66	
		DN	1.116		11.9500	17.22	CB-10
SD-40	ADD	UN	.192		12.0000	3.13	DI-15
		DL	.192		12.0000	3.13	
		DN	1.606		11.9500	25.80	SR-1
SD-41	ADD	UN	.237		11.9500	3.81	DI-2
		DL	.237		11.9500	3.81	
		DN	1.606		11.9500	25.80	SR-1
SD-42	ADD	UN	1.177		11.9000	19.12	STMH-10
		DL	1.177		11.9000	19.12	
		DN	1.606		11.9500	25.80	SR-1
SD-43	ADD	UN	.344		11.9500	6.06	CB-1
		DL	.344		11.9500	6.06	
		DN	1.177		11.9000	19.12	CB-2
SD-44	ADD	UN	.249		11.9500	4.37	CB-6
		DL	.249		11.9500	4.37	
		DN	.344		11.9500	6.06	CB-1
SD-45	ADD	UN	.150		11.9500	2.59	DI-1
		DL	.150		11.9500	2.59	
		DN	.249		11.9500	4.37	CB-6
SD-46	ADD	UN	1.606		11.9500	25.80	SR-1
		DL	1.606		11.9500	25.80	
		DN	5.084		11.9500	65.54	STMH-2
SD-47	ADD	UN	5.084		11.9500	65.54	STMH-2
		DL	5.084		11.9500	65.54	
		DN	6.013		11.9500	81.50	OUT 2
SD-48	ADD	UN	.147		11.9000	2.49	SR-9
		DL	.147		11.9000	2.49	
		DN	3.366		11.9500	38.03	STMH-5

NETWORK SUMMARY -- LINKS
(UN=Upstream Node; DL=DNstream End of Link; DN=DNstream Node)
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Link ID	Type		HYG Vol ac-ft	Trun.	Peak Time hrs	Peak Q cfs	End Points	
SD-49	ADD	UN	.112		11.9000	1.82	SR-8	
		DL	.112		11.9000	1.82		
		DN	3.478		11.9500	39.74	STMH-4	
SD-5	REACH	UN	.117		11.9000	1.91	DI-9	
		DL	.117		11.9500	1.85		
		DN	1.116		11.9500	17.22	CB-10	
SD-50	REACH	UN	.099		11.9000	1.68	SR-7	
		DL	.099		11.9500	1.63		
		DN	3.438		12.2000	21.46	JUNC 10	
SD-6	REACH	UN	1.116		11.9500	17.22	CB-10	
		DL	1.116		11.9500	16.63		
		DN	1.508		11.9500	22.69	CB-9	
SD-7	REACH	UN	.117		11.9000	1.91	DI-8	
		DL	.117		11.9500	1.85		
		DN	1.508		11.9500	22.69	CB-9	
SD-8	REACH	UN	1.508		11.9500	22.69	CB-9	
		DL	1.508		12.0000	22.18		
		DN	3.730		11.9500	55.30	BASIN	IN
SD-9	REACH	UN	.016		11.9000	.27	DI-12	
		DL	.016		11.9500	.26		
		DN	.043		11.9000	.68	CB-13	

PROJECT: Norampac NO.: 10088

DATE: 5/20/11 BY: SAL SUBJECT: Storm Drain Analysis

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #1 (SD-1)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	0.39	ft³/s
D =	1.00	ft
S =	0.017	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 5.48 ft³/s > Q_{ACT}= 0.39 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #2 (SD-2)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	3.38	ft³/s
D =	1.50	ft
S =	0.005	ft/ft
η =	0.012	
*A =	1.72	ft²
P =	3.97	ft
R =	0.43	ft

Q_{PROV}= 8.68 ft³/s > Q_{ACT}= 3.38 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #3 (SD-3)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	1.89	ft³/s
D =	1.00	ft
S =	0.019	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 5.74 ft³/s > Q_{ACT}= 1.89 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #4 (SD-4)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	10.66	ft³/s
D =	1.50	ft
S =	0.010	ft/ft
η =	0.012	
*A =	1.72	ft²
P =	3.97	ft
R =	0.43	ft

Q_{PROV}= 12.28 ft³/s > Q_{ACT}= 10.66 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #5 (SD-5)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	1.85	ft³/s
D =	1.00	ft
S =	0.024	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 6.46 ft³/s > Q_{ACT}= 1.85 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #6 (SD-6)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	16.63	ft³/s
D =	2.50	ft
S =	0.005	ft/ft
η =	0.012	
*A =	4.79	ft²
P =	6.62	ft
R =	0.72	ft

Q_{PROV}= 33.90 ft³/s > Q_{ACT}= 16.63 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #7 (SD-7)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	1.85	ft³/s
D =	1.00	ft
S =	0.033	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 7.51 ft³/s > Q_{ACT}= 1.85 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #8 (SD-8)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	22.18	ft³/s
D =	2.50	ft
S =	0.005	ft/ft
η =	0.012	
*A =	4.79	ft²
P =	6.62	ft
R =	0.72	ft

Q_{PROV}= 33.90 ft³/s > Q_{ACT}= 22.18 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #9 (SD-9)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	0.26	ft³/s
D =	1.00	ft
S =	0.012	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 4.52 ft³/s > Q_{ACT}= 0.26 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #10 (SD-10)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	0.68	ft³/s
D =	1.00	ft
S =	0.016	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 5.20 ft³/s > Q_{ACT}= 0.68 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

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- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #11 (SD-11)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft^3/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft^2)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	3.28	ft^3/s
D =	1.00	ft
S =	0.030	ft/ft
η =	0.012	
*A =	0.77	ft^2
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 7.21 ft^3/s > Q_{ACT}= 3.28 ft^3/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #12 (SD-12)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	6.56	ft³/s
D =	1.00	ft
S =	0.051	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 9.40 ft³/s > Q_{ACT}= 6.56 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #13 (SD-13)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	2.94	ft³/s
D =	1.00	ft
S =	0.010	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 4.16 ft³/s > Q_{ACT}= 2.94 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #14 (SD-14)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	0.49	ft³/s
D =	1.00	ft
S =	0.005	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 2.94 ft³/s > Q_{ACT}= 0.49 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #15 (SD-15)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	4.15	ft³/s
D =	1.50	ft
S =	0.005	ft/ft
η =	0.012	
*A =	1.72	ft²
P =	3.97	ft
R =	0.43	ft

Q_{PROV}= 8.68 ft³/s > Q_{ACT}= 4.15 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #16 (SD-16)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	7.74	ft³/s
D =	2.00	ft
S =	0.004	ft/ft
η =	0.012	
*A =	3.06	ft²
P =	5.29	ft
R =	0.58	ft

Q_{PROV}= 16.72 ft³/s > Q_{ACT}= 7.74 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #17 (SD-17)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	16.63	ft³/s
D =	2.50	ft
S =	0.004	ft/ft
η =	0.012	
*A =	4.79	ft²
P =	6.62	ft
R =	0.72	ft

Q_{PROV}= 30.32 ft³/s > Q_{ACT}= 16.63 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #18 (SD-18)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	3.94	ft³/s
D =	1.00	ft
S =	0.010	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 4.35 ft³/s > Q_{ACT}= 3.94 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #19 (SD-19)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	4.52	ft³/s
D =	2.00	ft
S =	0.004	ft/ft
η =	0.012	
*A =	3.06	ft²
P =	5.29	ft
R =	0.58	ft

Q_{PROV}= 16.72 ft³/s > Q_{ACT}= 4.52 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #20 (SD-20)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	5.53	ft³/s
D =	2.00	ft
S =	0.004	ft/ft
η =	0.012	
*A =	3.06	ft²
P =	5.29	ft
R =	0.58	ft

Q_{PROV}= 16.72 ft³/s > Q_{ACT}= 5.53 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #21 (SD-21)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	1.51	ft³/s
D =	1.00	ft
S =	0.005	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 2.94 ft³/s > Q_{ACT}= 1.51 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #22 (SD-22)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	5.20	ft³/s
D =	1.50	ft
S =	0.005	ft/ft
η =	0.012	
*A =	1.72	ft²
P =	3.97	ft
R =	0.43	ft

Q_{PROV}= 8.68 ft³/s > Q_{ACT}= 5.20 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #23 (SD-23)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	1.82	ft³/s
D =	1.00	ft
S =	0.005	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 2.94 ft³/s > Q_{ACT}= 1.82 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #24 (SD-24)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	8.07	ft³/s
D =	2.00	ft
S =	0.005	ft/ft
η =	0.012	
*A =	3.06	ft²
P =	5.29	ft
R =	0.58	ft

Q_{PROV}= 18.70 ft³/s > Q_{ACT}= 8.07 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #25 (SD-25)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft^3/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft^2)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	9.08	ft^3/s
D =	1.50	ft
S =	0.007	ft/ft
η =	0.012	
*A =	1.72	ft^2
P =	3.97	ft
R =	0.43	ft

Q_{PROV}= 10.27 ft^3/s > Q_{ACT}= 9.08 ft^3/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #26 (SD-26)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	5.57	ft³/s
D =	1.00	ft
S =	0.030	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 7.21 ft³/s > Q_{ACT}= 5.57 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #27 (SD-27)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	0.88	ft³/s
D =	1.00	ft
S =	0.005	ft/ft
η =	0.013	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 2.72 ft³/s > Q_{ACT}= 0.88 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #28 (SD-28)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	6.17	ft³/s
D =	1.00	ft
S =	0.040	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 8.33 ft³/s > Q_{ACT}= 6.17 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #29 (SD-29)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	15.11	ft³/s
D =	2.00	ft
S =	0.005	ft/ft
η =	0.012	
*A =	3.06	ft²
P =	5.29	ft
R =	0.58	ft

Q_{PROV}= 18.70 ft³/s > Q_{ACT}= 15.11 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #30 (SD-30)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	8.70	ft³/s
D =	1.00	ft
S =	0.050	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 9.31 ft³/s > Q_{ACT}= 8.70 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

PROJECT: Norampac NO.: 10088

DATE: 5/20/11 BY: SAL SUBJECT: Storm Drain Analysis

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #31 (SD-31)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	4.02	ft³/s
D =	1.00	ft
S =	0.035	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 7.79 ft³/s > Q_{ACT}= 4.02 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #32 (SD-32)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	20.43	ft³/s
D =	2.50	ft
S =	0.005	ft/ft
η =	0.012	
*A =	4.79	ft²
P =	6.62	ft
R =	0.72	ft

Q_{PROV}= 33.90 ft³/s > Q_{ACT}= 20.43 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #33 (SD-33)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft^3/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft^2)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	2.09	ft^3/s
D =	1.00	ft
S =	0.048	ft/ft
η =	0.012	
*A =	0.77	ft^2
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 9.08 ft^3/s > Q_{ACT}= 2.09 ft^3/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #34 (SD-34)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft^3/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft^2)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	22.51	ft^3/s
D =	2.50	ft
S =	0.005	ft/ft
η =	0.012	
*A =	4.79	ft^2
P =	6.62	ft
R =	0.72	ft

Q_{PROV}= 33.90 ft^3/s > Q_{ACT}= 22.51 ft^3/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #35 (SD-35)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	14.17	ft³/s
D =	1.50	ft
S =	0.100	ft/ft
η =	0.012	
*A =	1.72	ft²
P =	3.97	ft
R =	0.43	ft

Q_{PROV}= 38.83 ft³/s > Q_{ACT}= 14.17 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

PROJECT: Norampac NO.: 10088

DATE: 5/20/11 BY: SAL SUBJECT: Storm Drain Analysis

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #36 (SD-36)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	35.68	ft³/s
D =	3.00	ft
S =	0.005	ft/ft
η =	0.012	
*A =	6.90	ft²
P =	7.94	ft
R =	0.87	ft

Q_{PROV}= 55.13 ft³/s > Q_{ACT}= 35.68 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #37 (SD-37)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	38.03	ft³/s
D =	3.00	ft
S =	0.005	ft/ft
η =	0.012	
*A =	6.90	ft²
P =	7.94	ft
R =	0.87	ft

Q_{PROV}= 55.13 ft³/s > Q_{ACT}= 38.03 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #38 (SD-38)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	39.74	ft³/s
D =	3.00	ft
S =	0.005	ft/ft
η =	0.012	
*A =	6.90	ft²
P =	7.94	ft
R =	0.87	ft

Q_{PROV}= 55.13 ft³/s > Q_{ACT}= 39.74 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

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- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #39 (SD-39)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft^3/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft^2)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	39.74	ft^3/s
D =	3.00	ft
S =	0.005	ft/ft
η =	0.012	
*A =	6.90	ft^2
P =	7.94	ft
R =	0.87	ft

Q_{PROV}= 55.13 ft^3/s > Q_{ACT}= 39.74 ft^3/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #40 (SD-40)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	3.13	ft³/s
D =	1.00	ft
S =	0.030	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 7.21 ft³/s > Q_{ACT}= 3.13 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #41 (SD-41)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	3.81	ft³/s
D =	1.00	ft
S =	0.050	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 9.31 ft³/s > Q_{ACT}= 3.81 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #42 (SD-42)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	19.12	ft³/s
D =	2.00	ft
S =	0.010	ft/ft
η =	0.012	
*A =	3.06	ft²
P =	5.29	ft
R =	0.58	ft

Q_{PROV}= 26.44 ft³/s > Q_{ACT}= 19.12 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #43 (SD-43)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	6.06	ft³/s
D =	1.50	ft
S =	0.005	ft/ft
η =	0.012	
*A =	1.72	ft²
P =	3.97	ft
R =	0.43	ft

Q_{PROV}= 8.68 ft³/s > Q_{ACT}= 6.06 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #44 (SD-44)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	4.37	ft³/s
D =	1.00	ft
S =	0.020	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 5.89 ft³/s > Q_{ACT}= 4.37 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #45 (SD-45)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	2.59	ft³/s
D =	1.00	ft
S =	0.010	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 4.16 ft³/s > Q_{ACT}= 2.59 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #46 (SD-46)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	25.80	ft³/s
D =	2.00	ft
S =	0.020	ft/ft
η =	0.012	
*A =	3.06	ft²
P =	5.29	ft
R =	0.58	ft

Q_{PROV}= 37.39 ft³/s > Q_{ACT}= 25.80 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #47 (SD-47)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	65.54	ft³/s
D =	3.00	ft
S =	0.008	ft/ft
η =	0.012	
*A =	6.90	ft²
P =	7.94	ft
R =	0.87	ft

Q_{PROV}= 69.73 ft³/s > Q_{ACT}= 65.54 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #48 (SD-48)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	2.49	ft³/s
D =	1.00	ft
S =	0.010	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 4.16 ft³/s > Q_{ACT}= 2.49 ft³/s

Note:

* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #49 (SD-49)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	1.82	ft³/s
D =	1.00	ft
S =	0.010	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 4.16 ft³/s > Q_{ACT}= 1.82 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Storm Drain #50 (SD-50)

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft³/s)
D = Storm Drain Pipe Diameter (ft)
S = Channel Slope (ft/ft)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft²)
P = Wetted Perimeter (ft)
R = Hydraulic Radius (A/P)

Known Variables for the channel

Q_{ACT} =	1.63	ft³/s
D =	1.00	ft
S =	0.005	ft/ft
η =	0.012	
*A =	0.77	ft²
P =	2.65	ft
R =	0.29	ft

Q_{PROV}= 2.94 ft³/s > Q_{ACT}= 1.63 ft³/s

Note:
* Pipe assumed to be flowing at a depth equal to 94% of pipe diameter
Q_{ACT} = Calculated flowrate for the storm drains under future developed conditions
Q_{PROV} = Flowrate the channel can safely handle

PROJECT: Norampac NO.: 10088

DATE: 5/20/11 BY: SAL SUBJECT: Storm Drain Analysis

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Channel #1

$$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft^3/s)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft^2)
R = Hydraulic Radius (A/P)
S = Channel Slope (ft/ft)

Known Variables for the channel

Q_{ACT} = 2.69 ft^3/s
η = 0.150
A = 9.00 ft^2
side slope = 4 :1 ft
base width = 5 ft
depth = 1 ft
P = 13.25 ft
R = 0.68 ft
S = 0.0088 ft/ft

Q_{PROV}= 6.48 ft^3/s > Q_{ACT} = 2.69 ft^3/s

Note:
Q_{ACT} = Calculated flowrate for the channel under post-developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Channel #2

$$Q = \frac{1.49}{\eta} A R^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft^3/s)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft^2)
R = Hydraulic Radius (A/P)
S = Channel Slope (ft/ft)

Known Variables for the channel

Q_{ACT} = 3.02 ft^3/s
η = 0.150
A = 9.00 ft^2
side slope = 4 :1 ft
base width = 5 ft
depth = 1 ft
P = 13.25 ft
R = 0.68 ft
S = 0.0060 ft/ft

Q_{PROV}= 5.35 ft^3/s > Q_{ACT} = 3.02 ft^3/s

Note:
Q_{ACT} = Calculated flowrate for the channel under post-developed conditions
Q_{PROV} = Flowrate the channel can safely handle

- See Appendix F Stormwater Drainage System Design Analysis for peak flowrate discharges

Channel #3

$$Q = \frac{1.49}{\eta} A R^{2/3} S^{1/2}$$

Where:

Q = Discharge Flowrate (ft^3/s)
η = Manning Coefficient for Open Channels
A = Area of Channel Section (ft^2)
R = Hydraulic Radius (A/P)
S = Channel Slope (ft/ft)

Known Variables for the channel

Q_{ACT} = 2.60 ft^3/s
η = 0.150
A = 9.00 ft^2
side slope = 4 :1 ft
base width = 5 ft
depth = 1 ft
P = 13.25 ft
R = 0.68 ft
S = 0.0090 ft/ft

Q_{PROV}= 6.55 ft^3/s > Q_{ACT} = 2.60 ft^3/s

Note:
Q_{ACT} = Calculated flowrate for the channel under post-developed conditions
Q_{PROV} = Flowrate the channel can safely handle

HYDRAULIC GRADE LINE COMPUTATION FORM

PROJECT: Greenpac Partnership - New Paper Mill BY: SAL

DESIGN STORM: 10-year Storm Sewer System: ES-2 to DI-11 DATE: 5/20/2011

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
				Friction Loss In Pipe						Terminal Structure Losses		Junction Losses									
Struct. No.	D/S EGL	h_v out	D/S HGL	D in	Q cfs	V fps	L ft	S_f ft/ft	H_f ft	H_{ex} ft	H_{entr} ft	H_o ft	H_i ft	H_b ft	H_T ft	1.3 H_T ft	0.5 H_T ft	U/S EGL	h_v in	U/S HGL	Rim Elev.
ES-2	568.51	0.00	568.51							0.75								569.26	0.75	568.51	
				30	22.69	6.97	176	0.006	1.06												
CB-9	570.32	0.75	569.57									0.19	0.23	0.23	0.65	0.85	0.42	570.74	0.66	570.08	573.75
				30	17.22	6.52	171	0.005	0.86												
CB-10	571.60	0.66	570.94									0.17	0.18	0.00	0.35	0.46	0.23	571.83	0.522	571.30	573.75
				24	10.73	5.80	171	0.006	1.03												
CB-11	572.85	0.52	572.33									0.13	0.1	0.00	0.23	0.30	0.15	573.00	0.298	572.70	573.75
				18	3.46	4.38	169.5	0.005	0.85												
CB-12	573.85	0.30	573.55									0.07	0.08	0.15	0.3	0.39	0.20	574.04	0.218	573.83	573.75
				12	0.39	3.75	150	0.006	0.90												
DI-11	574.94	0.22	574.73								0.11				0.109			574.94		574.94	576.50

Column

1 Structure identification label

2 EGL elevation at downstream side of structure = preceding column 19 + preceding column 10

3 Velocity head at the discharge side of the structure = $V^2/2g$

4 HGL elevation = column 2 - column 3

5 Pipe diameter (D)

6 Discharge (Q)

7 Discharge velocity (V = Q/A)

8 Pipe length between structures (L)

9 Friction slope = $(Vn/1.49\ R^{2/3})^2$

10 Friction head loss = column 8 x column 9 (fig. 14.20-f)

11 Exit head loss at terminal structure on D/S end of run (fig. 14.20-a)

12 Entrance head loss at terminal structure on U/S end of run (fig. 14.20-b)

Column

13 Contraction head loss for outflow from a nonterminal structure = $k_{ex}(V^2_{out}/2g)$

14 Expansion head loss for inflow into nonterminal structure = $k_{entr}(V_{in}^2/2g)$

15 Bend head loss due to deflection of flow through structure (fig. 14.20-e)

16 Total head loss through the junction = column 13 + column 14 + column 15

17 Head loss for contributing flow from surface inlet = column 16 x 1.3, if surface discharge is greater than 10% of the mainline flow

18 Reduction in head loss of column 16 for inlet shaping = column 16 or column 17 x 0.5

19 EGL on the upstream side of the manhole structure = column 2 + column 11 or column 16, 17, or 18

20 Velocity head of the incoming pipe = $V_{in}^2/2g$

21 HGL on the upstream side of the manhole structure = column 19 - column 20

22 Elevation of top of manhole or inlet structure

D/S - downstream

U/S - upstream

BDA#: 10088

HYDRAULIC GRADE LINE COMPUTATION FORM

PROJECT: Greenpac Partnership - New Paper Mill BY: SAL

DESIGN STORM: 10-year Storm Sewer System: ES-6 to DI-13 DATE: 5/20/2011

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
										Terminal Structure Losses											
				Friction Loss In Pipe								Junction Losses									
Struct. No.	D/S EGL	h_v out	D/S HGL	D in	Q cfs	V fps	L ft	S_f ft/ft	H_f ft	H_{ex} ft	H_{entr} ft	H_o ft	H_i ft	H_b ft	H_T ft	1.3 H_T ft	0.5 H_T ft	U/S EGL	h_v in	U/S HGL	Rim Elev.
ES-6	568.51	0.00	568.51							0.28								568.79	0.28	568.51	
				24	4.52	4.28	124	0.003	0.37												
CB-14	569.17	0.28	568.88									0.07	0.13	0.24	0.44	0.57	0.29	569.45	0.38	569.08	571.50
				24	4.56	4.93	206	0.004	0.82												
DI-13	570.28	0.38	569.90								0.19				0.19			570.28		570.28	570.50

Column

1 Structure identification label

2 EGL elevation at downstream side of structure = preceding column 19 + preceding column 10

3 Velocity head at the discharge side of the structure = $V^2/2g$

4 HGL elevation = column 2 - column 3

5 Pipe diameter (D)

6 Discharge (Q)

7 Discharge velocity (V = Q/A)

8 Pipe length between structures (L)

9 Friction slope = $(Vn/1.49\ R^{2/3})^2$

10 Friction head loss = column 8 x column 9 (fig. 14.20-f)

11 Exit head loss at terminal structure on D/S end of run (fig. 14.20-a)

12 Entrance head loss at terminal structure on U/S end of run (fig. 14.20-b)

Column

13 Contraction head loss for outflow from a nonterminal structure = $k_{ex}(V^2_{out}/2g)$

14 Expansion head loss for inflow into nonterminal structure = $k_{entr}(V_{in}^2/2g)$

15 Bend head loss due to deflection of flow through structure (fig. 14.20-e)

16 Total head loss through the junction = column 13 + column 14 + column 15

17 Head loss for contributing flow from surface inlet = column 16 x 1.3, if surface discharge is greater than 10% of the mainline flow

18 Reduction in head loss of column 16 for inlet shaping = column 16 or column 17 x 0.5

19 EGL on the upstream side of the manhole structure = column 2 + column 11 or column 16, 17, or 18

20 Velocity head of the incoming pipe = $V_{in}^2/2g$

21 HGL on the upstream side of the manhole structure = column 19 - column 20

22 Elevation of top of manhole or inlet structure

D/S - downstream

U/S - upstream

BDA#: 10088

HYDRAULIC GRADE LINE COMPUTATION FORM

PROJECT: Greenpac Partnership - New Paper Mill BY: SAL

DESIGN STORM: 10-year Storm Sewer System: ES-1 to DI-6 DATE: 5/20/2011

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
										Terminal Structure Losses											
				Friction Loss In Pipe								Junction Losses									
Struct. No.	D/S EGL	h_v out	D/S HGL	D in	Q cfs	V fps	L ft	S_f ft/ft	H_f ft	H_{ex} ft	H_{entr} ft	H_o ft	H_i ft	H_b ft	H_T ft	1.3 H_T ft	0.5 H_T ft	U/S EGL	h_v in	U/S HGL	Rim Elev.
ES-1	568.51	0.00	568.51							0.25								568.76	0.25	568.51	
				24	16.63	4.01	145	0.003	0.44												
CB-7	569.19	0.25	568.95									0.06	0.11	0.17	0.34	0.44	0.22	569.42	0.30	569.11	572.50
				18	5.2	4.43	210	0.005	1.05												
CB-8	570.47	0.30	570.16									0.08	0.10	0.20	0.38	0.49	0.25	570.71	0.28	570.43	571.50
				18	3	4.26	98	0.004	0.39												
DI-6	571.10	0.28	570.82								0.14				0.141			571.10		571.10	572.00

Column

1 Structure identification label

2 EGL elevation at downstream side of structure = preceding column 19 + preceding column 10

3 Velocity head at the discharge side of the structure = $V^2/2g$

4 HGL elevation = column 2 - column 3

5 Pipe diameter (D)

6 Discharge (Q)

7 Discharge velocity (V = Q/A)

8 Pipe length between structures (L)

9 Friction slope = $(Vn/1.49\ R^{2/3})^2$

10 Friction head loss = column 8 x column 9 (fig. 14.20-f)

11 Exit head loss at terminal structure on D/S end of run (fig. 14.20-a)

12 Entrance head loss at terminal structure on U/S end of run (fig. 14.20-b)

Column

13 Contraction head loss for outflow from a nonterminal structure = $k_{ex}(V^2_{out}/2g)$

14 Expansion head loss for inflow into nonterminal structure = $k_{entr}(V_{in}^2/2g)$

15 Bend head loss due to deflection of flow through structure (fig. 14.20-e)

16 Total head loss through the junction = column 13 + column 14 + column 15

17 Head loss for contributing flow from surface inlet = column 16 x 1.3, if surface discharge is greater than 10% of the mainline flow

18 Reduction in head loss of column 16 for inlet shaping = column 16 or column 17 x 0.5

19 EGL on the upstream side of the manhole structure = column 2 + column 11 or column 16, 17, or 18

20 Velocity head of the incoming pipe = $V_{in}^2/2g$

21 HGL on the upstream side of the manhole structure = column 19 - column 20

22 Elevation of top of manhole or inlet structure

D/S - downstream

U/S - upstream

BDA#: 10088

HYDRAULIC GRADE LINE COMPUTATION FORM

PROJECT: Greenpac Partnership - New Paper Mill BY: SAL

DESIGN STORM: 10-year Storm Sewer System: EXMH-1 to DI-5 DATE: 5/20/2011

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
										Terminal Structure Losses											
				Friction Loss In Pipe								Junction Losses									
Struct. No.	D/S EGL	h_v out	D/S HGL	D in	Q cfs	V fps	L ft	S_f ft/ft	H_f ft	H_{ex} ft	H_{entr} ft	H_o ft	H_i ft	H_b ft	H_T ft	1.3 H_T ft	0.5 H_T ft	U/S EGL	h_v in	U/S HGL	Rim Elev.
EXMH-1	547.90	0.00	547.90							1.70								549.60	1.70	547.90	570.60
				36	65.54	10.45	15	0.010	0.16												
STMH-11	549.75	1.70	548.06									0.42	0.59	0.80	1.81		0.91	550.66	1.70	548.96	569.50
				36	65.54	10.45	147	0.010	1.53												
STMH-2	552.19	1.70	550.49									0.42	0.35		0.77		0.39	552.57	1.00	551.57	569.50
				36	39.74	8.03	223	0.006	1.37												
STMH-3	553.94	1.00	552.94									0.25	0.35	0.47	1.07		0.54	554.48	1.00	553.48	569.50
				36	39.74	8.03	281	0.006	1.73												
STMH-4	556.21	1.00	555.21									0.25	0.34		0.59		0.30	556.50	0.98	555.52	571.15
				36	38.03	7.96	114	0.006	0.69												
STMH-5	557.19	0.98	556.21									0.25	0.34	0.68	1.27		0.64	557.83	0.97	556.86	571.00
				36	35.68	7.90	275	0.006	1.64												
STMH-6	559.46	0.97	558.49									0.24	0.26	0.52	1.02		0.51	559.97	0.74	559.23	570.50
				30	22.51	6.91	184	0.006	1.07												
STMH-7	561.04	0.74	560.30									0.19	0.25	0.50	0.94		0.47	561.51	0.71	560.80	570.50
				30	20.43	6.78	242	0.006	1.35												
STMH-8	562.87	0.71	562.15									0.18	0.21		0.39		0.20	563.06	0.60	562.46	570.25
				24	15.11	6.24	243	0.006	1.55												
STMH-9	564.62	0.60	564.01									0.15	0.20	0.20	0.55		0.28	564.89	0.59	564.31	570.75
				18	9.08	6.14	182	0.009	1.66												
SR-6	566.55	0.59	565.96									0.15	0.15		0.30	0.39	0.20	566.74	0.42	566.32	569.50
				18	8.07	5.20	202	0.007	1.32												
CB-4	568.06	0.42	567.64									0.10	0.13	0.17	0.40	0.52	0.26	568.32	0.37	567.95	569.50
				18	5.20	4.89	149	0.006	0.86												
CB-5	569.18	0.37	568.81									0.09	0.07	0.07	0.23	0.30	0.15	569.33	0.20	569.13	570.50
				12	1.51	3.57	145	0.005	0.77												
DI-5	570.10	0.20	569.90								0.10				0.10			570.10		570.10	571.25

BDA#: 10088

Column		Column	
1	Structure identification label	13	Contraction head loss for outflow from a nonterminal structure = $k_{ex}(V^2_{out}/2g)$
2	EGL elevation at downstream side of structure = preceding column 19 + preceding column 10	14	Expansion head loss for inflow into nonterminal structure = $k_{entr}(V_{in}^2/2g)$
3	Velocity head at the discharge side of the structure = $V^2/2g$	15	Bend head loss due to deflection of flow through structure (fig. 14.20-e)
4	HGL elevation = column 2 - column 3	16	Total head loss through the junction = column 13 + column 14 + column 15
5	Pipe diameter (D)	17	Head loss for contributing flow from surface inlet = column 16 x 1.3, if surface discharge is greater than 10% of the mainline flow
6	Discharge (Q)	18	Reduction in head loss of column 16 for inlet shaping = column 16 or column 17 x 0.5
7	Discharge velocity (V = Q/A)	19	EGL on the upstream side of the manhole structure = column 2 + column 11 or column 16, 17, or 18
8	Pipe length between structures (L)	20	Velocity head of the incoming pipe = $V_{in}^2/2g$
9	Friction slope = $(Vn/1.49\ R^{2/3})^2$	21	HGL on the upstream side of the manhole structure = column 19 - column 20
10	Friction head loss = column 8 x column 9 (fig. 14.20-f)	22	Elevation of top of manhole or inlet structure
11	Exit head loss at terminal structure on D/S end of run (fig. 14.20-a)	D/S -	downstream
12	Entrance head loss at terminal structure on U/S end of run (fig. 14.20-b)	U/S -	upstream

APPENDIX G

STORMWATER QUALITY

Chapter 4: Unified Stormwater Sizing Criteria

Section 4.1 Introduction

This chapter presents a unified approach for sizing green infrastructure for runoff reduction and SMPs to meet pollutant removal goals, reduce channel erosion, prevent overbank flooding, and help control extreme floods. For a summary, please consult Table 4.1 below. The remaining sections describe the sizing criteria in detail and present guidance on how to properly compute and apply the required reduction and storage volumes.

Table 4.1 New York Stormwater Sizing Criteria[1]

Water Quality Volume (WQv)	**90% Rule:** WQ_v(acre-feet) = [(P)(Rv)(A)] /12 Rv = 0.05+0.009(I) I = Impervious Cover (Percent) Minimum Rv = 0.2 if WQv > RRv P(inch) = 90% Rainfall Event Number (See Figure 4.1)[2] A = site area in acres
Runoff Reduction Volume(RRv)	RRv (acre-feet)= Reduction of the total WQv by application of green infrastructure techniques and SMPs to replicate pre-development hydrology. The minimum required RRv is defined as the Specified Reduction Factor (S), provided objective technical justification is documented.
Channel Protection Volume(Cpv)	**Default Criterion:** Cp_v(acre-feet)= 24 hour extended detention of post-developed 1-year, 24-hour storm event; remaining after runoff reduction. Where site conditions allow, Runoff reduction of total CPv , is encouraged **Option for Sites Larger than 50 Acres:** Distributed Runoff Control - geomorphic assessment to determine the bankfull channel characteristics and thresholds for channel stability and bedload movement.
Overbank Flood (Q_p)	Q_p(cfs)=Control the peak discharge from the 10-year storm to 10-year predevelopment rates.
Extreme Storm (Q_f)	Q_f(cfs)=Control the peak discharge from the 100-year storm to 100-year predevelopment rates. Safely pass the 100-year storm event.
Alternative method (WQv):	Design, construct, and maintain systems sized to capture, reduce, reuse, treat, and manage rainfall on-site, and prevent the off-site discharge of the precipitation from all rainfall events less than or equal to the 95th percentile rainfall event, computed by an acceptable continuous simulation model.

[1] *Channel protection, overbank flood, and extreme storm requirements may be waived in some instances if the conditions specified in this chapter are met. For SMPs involving dams, follow Appendix A, Guidelines for Design of Dams for safe passage of the design flood.*

[2] *For required sizing criteria in redevelopment projects and phosphorus limited watersheds refer to Chapters 9 and 10, respectively.*

The Water Quality Volume (denoted as the WQ_v) is designed to improve water quality sizing to capture and treat 90% of the average annual stormwater runoff volume. The WQ_v is directly related to the amount of impervious cover created at a site. Contour lines of the 90% rainfall event are presented in Figure 4.1.

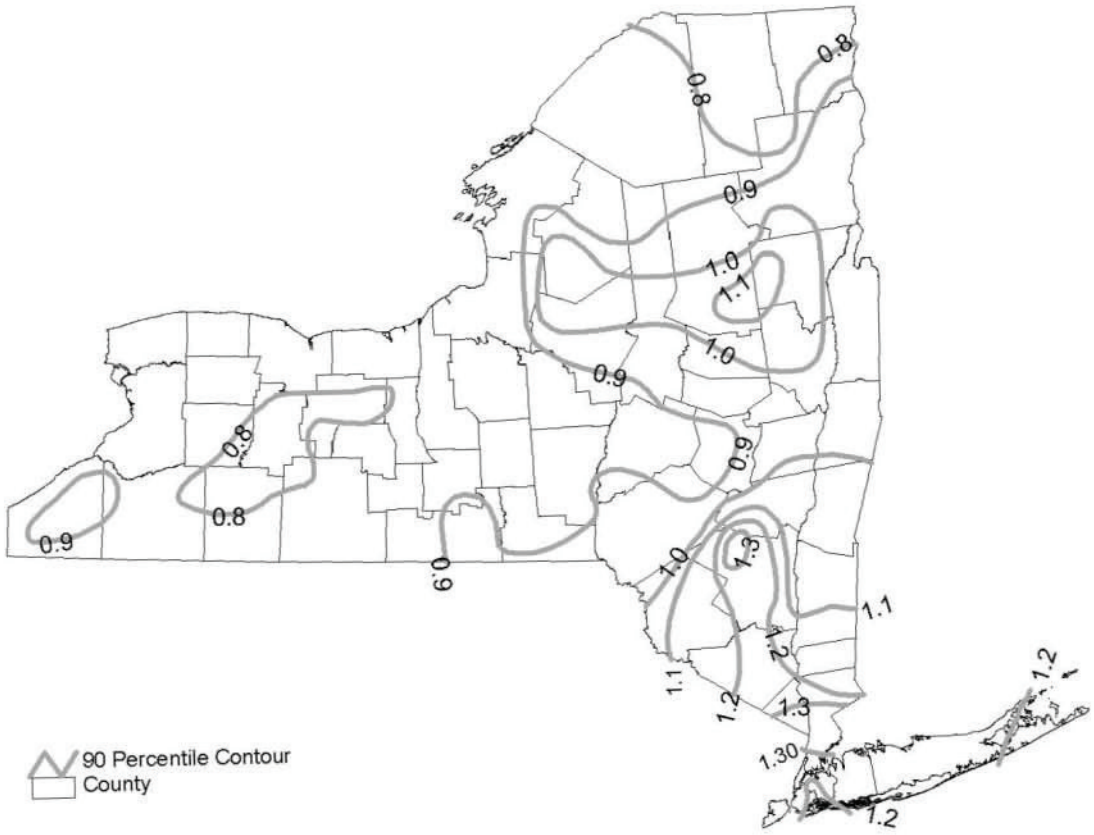
The following equation can be used to determine the water quality storage volume WQ_v (in acre-feet of storage):

$$WQ_v = \frac{(P)\,(R_v)(A)}{12}$$

where:
WQ_v = water quality volume (in acre-feet)
P = 90% Rainfall Event Number (see Figure 4.1)
R_v = 0.05 + 0.009(I), where I is percent impervious cover
A = site area in acres (Contributing area)

A minimum Rv of 0.2 will be applied to regulated sites.

Figure 4.1 90% Rainfall in New York State (NYSDEC, 2000)



PROJECT: Norampac Industries NO.: 10088

DATE: 5/10/11 BY: SAL SUBJECT: Water Quality Analysis

North Portion - Stormwater Wet Pond

$$WQ_v = \frac{(P \times R_v \times A)}{12}$$

Where:

WQ_v = Water Quality Volume in Acre-Feet

P = 90% Rainfall Event Number

R_v = 0.05 + 0.009(I), where I = percent of Impervious Cover

A = Drainage Area in Acres

Water Quality Volume for Site

P = 0.85

I = 21% Impervious Area 4.17 Acres

R_v = 0.24

A = 19.98 Acres

$WQ_{v25\%}$ = **0.187 Acre-Feet** ← WQv for 25% of the existing impervious area

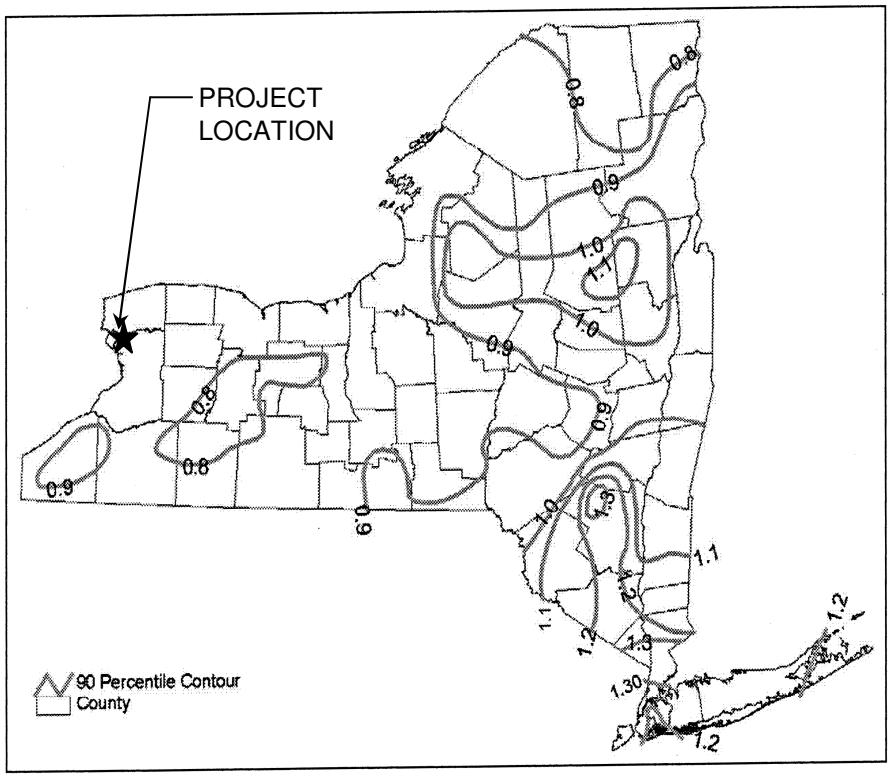
$WQ_{v100\%}$ = **0.340 Acre-Feet** ← WQv for 100% of the additional impervious area

WQ_v = **0.527 Acre-Feet** ← Total required WQv

$WQ_{provided}$ = 0.554 acre-feet at elev 564.60 (invert of 15-inch high flow weir)

Entire WQv is stored within the Perm. Pool

Figure 4.1 90% Rainfall in New York State



PROJECT: Greenpac - New Paper Mill NO.: SR-1

DATE: 5/19/11 BY: SAL SUBJECT: WQv sizing

WQv STORM PEAK FLOW WORKSHEET

1. COMPUTE WATER QUALITY VOLUME (WQv):

	Area	Impervious	% Impervious	P	Rv	WQv (acre-ft)	WQv (ft^3)
Total	7.29	4.82	66	0.85	0.65	0.333	14,510

2. CONVERTWQv TO WATERSHED INCHES OF RUNOFF:

$$\text{WQv (inches)} = \frac{\text{WQv (acre-ft)} \times 12 \text{ (in/ft)}}{\text{DA (acres)}} = 0.55 \text{ inches}$$

3. COMPUTE RCN FOR WQv STORM USING P AND WQv (inches):

$$\text{RCN} = \frac{1000}{0 + 5P + 10\text{WQv (inches)} - 10[(\text{WQv(inches)})^2 + 1.25P(\text{WQv(inches)})]^{1}} = \frac{1000}{10} = 97$$

4. COMPUTE Tc (TR-55 METHOD):

Tc = 0.08 hrs

5. DETERMINE INITIAL ABSTRACTION (Ia) FOR RCN OF: 97

Ia = 0.062 inches

6. COMPUTE Ia/P:

$\frac{Ia}{P}$ = 0.07 hrs

7. DETERMINE qu (UNIT PEAK DISCHARGE) IN CFS/MI^2/INCH USING Tc AND Ia/P:

(from TR-55 Exhibit 4-II or 4-III)

qu = 900 cfs/mi^2/inc

8. CALCULATE PEAK RUNOFF (Qp) IN CFS:

(using qu, DA, and WQv (inches))

Qp = qu x DA x WQv (inches)

Qp = 5.62 cfs

PROJECT: Greenpac - New Paper Mill NO.: SR-2

DATE: 5/19/11 BY: SAL SUBJECT: WQv sizing

WQv STORM PEAK FLOW WORKSHEET

1. COMPUTE WATER QUALITY VOLUME (WQv):

	Area	Impervious	% Impervious	P	Rv	WQv (acre-ft)	WQv (ft^3)
Total	3.34	3.34	100	0.85	0.95	0.225	9,790

2. CONVERTWQv TO WATERSHED INCHES OF RUNOFF:

$$\text{WQv (inches)} = \frac{\text{WQv (acre-ft)} \times 12 \text{ (in/ft)}}{\text{DA (acres)}} = 0.81 \text{ inches}$$

3. COMPUTE RCN FOR WQv STORM USING P AND WQv (inches):

$$\text{RCN} = \frac{1000}{0 + 5P + 10\text{WQv (inches)} - 10[(\text{WQv(inches)})^2 + 1.25P(\text{WQv(inches)})]^{1}} = \frac{1000}{10} = 100$$

4. COMPUTE Tc (TR-55 METHOD):

Tc = 0.11 hrs

5. DETERMINE INITIAL ABSTRACTION (Ia) FOR RCN OF: 100

Ia = 0.041 inches

6. COMPUTE Ia/P:

$\frac{Ia}{P}$ = 0.05 hrs

7. DETERMINE qu (UNIT PEAK DISCHARGE) IN CFS/MI^2/INCH USING Tc AND Ia/P:

(from TR-55 Exhibit 4-II or 4-III)

qu = 975 cfs/mi^2/inc

8. CALCULATE PEAK RUNOFF (Qp) IN CFS:

(using qu, DA, and WQv (inches))

Qp = qu x DA x WQv (inches)

Qp = 4.11 cfs

PROJECT: Greenpac - New Paper Mill NO.: SR-3

DATE: 5/19/11 BY: SAL SUBJECT: WQv sizing

WQv STORM PEAK FLOW WORKSHEET

1. COMPUTE WATER QUALITY VOLUME (WQv):

	Area	Impervious	% Impervious	P	Rv	WQv (acre-ft)	WQv (ft^3)
Total	0.60	0.46	77	0.85	0.74	0.031	1,370

2. CONVERTWQv TO WATERSHED INCHES OF RUNOFF:

$$\text{WQv (inches)} = \frac{\text{WQv (acre-ft)} \times 12 \text{ (in/ft)}}{\text{DA (acres)}} = 0.63 \text{ inches}$$

3. COMPUTE RCN FOR WQv STORM USING P AND WQv (inches):

$$\text{RCN} = \frac{1000}{0 + 5P + 10\text{WQv (inches)} - 10[(\text{WQv(inches)})^2 + 1.25P(\text{WQv(inches)})]^{1}} = \frac{1000}{10} = 98$$

4. COMPUTE Tc (TR-55 METHOD):

Tc = 0.20 hrs

5. DETERMINE INITIAL ABSTRACTION (Ia) FOR RCN OF: 98

Ia = 0.041 inches

6. COMPUTE Ia/P:

$\frac{Ia}{P}$ = 0.05 hrs

7. DETERMINE qu (UNIT PEAK DISCHARGE) IN CFS/MI^2/INCH USING Tc AND Ia/P:

(from TR-55 Exhibit 4-II or 4-III)

qu = 800 cfs/mi^2/inc

8. CALCULATE PEAK RUNOFF (Qp) IN CFS:

(using qu, DA, and WQv (inches))

Qp = qu x DA x WQv (inches)

Qp = 0.47 cfs

PROJECT: Greenpac - New Paper Mill NO.: SR-4

DATE: 5/19/11 BY: SAL SUBJECT: WQv sizing

WQv STORM PEAK FLOW WORKSHEET

1. COMPUTE WATER QUALITY VOLUME (WQv):

	Area	Impervious	% Impervious	P	Rv	WQv (acre-ft)	WQv (ft^3)
Total	3.81	3.37	88	0.85	0.85	0.228	9,946

2. CONVERTWQv TO WATERSHED INCHES OF RUNOFF:

$$\text{WQv (inches)} = \frac{\text{WQv (acre-ft)} \times 12 \text{ (in/ft)}}{\text{DA (acres)}} = 0.72 \text{ inches}$$

3. COMPUTE RCN FOR WQv STORM USING P AND WQv (inches):

$$\text{RCN} = \frac{1000}{0 + 5P + 10\text{WQv (inches)} - 10[(\text{WQv(inches)})^2 + 1.25P(\text{WQv(inches)})]^{1}} = \frac{1000}{10} = 99$$

4. COMPUTE Tc (TR-55 METHOD):

Tc = 0.61 hrs

5. DETERMINE INITIAL ABSTRACTION (Ia) FOR RCN OF: 99

Ia = 0.041 inches

6. COMPUTE Ia/P:

$\frac{Ia}{P}$ = 0.05 hrs

7. DETERMINE qu (UNIT PEAK DISCHARGE) IN CFS/MI^2/INCH USING Tc AND Ia/P:

(from TR-55 Exhibit 4-II or 4-III)

qu = 475 cfs/mi^2/inc

8. CALCULATE PEAK RUNOFF (Qp) IN CFS:

(using qu, DA, and WQv (inches))

Qp = qu x DA x WQv (inches)

Qp = 2.03 cfs

PROJECT: Greenpac - New Paper Mill NO.: SR-5

DATE: 5/19/11 BY: SAL SUBJECT: WQv sizing

WQv STORM PEAK FLOW WORKSHEET

1. COMPUTE WATER QUALITY VOLUME (WQv):

	Area	Impervious	% Impervious	P	Rv	WQv (acre-ft)	WQv (ft^3)
Total	2.43	1.66	68	0.85	0.66	0.114	4,985

2. CONVERTWQv TO WATERSHED INCHES OF RUNOFF:

$$\text{WQv (inches)} = \frac{\text{WQv (acre-ft)} \times 12 \text{ (in/ft)}}{\text{DA (acres)}} = 0.57 \text{ inches}$$

3. COMPUTE RCN FOR WQv STORM USING P AND WQv (inches):

$$\text{RCN} = \frac{1000}{0 + 5P + 10\text{WQv (inches)} - 10[(\text{WQv(inches)})^2 + 1.25P(\text{WQv(inches)})]^{1}} = \frac{1000}{10} = 97$$

4. COMPUTE Tc (TR-55 METHOD):

Tc = 0.10 hrs

5. DETERMINE INITIAL ABSTRACTION (Ia) FOR RCN OF: 97

Ia = 0.062 inches

6. COMPUTE Ia/P:

$\frac{Ia}{P}$ = 0.07 hrs

7. DETERMINE qu (UNIT PEAK DISCHARGE) IN CFS/MI^2/INCH USING Tc AND Ia/P:

(from TR-55 Exhibit 4-II or 4-III)

qu = 1000 cfs/mi^2/inc

8. CALCULATE PEAK RUNOFF (Qp) IN CFS:

(using qu, DA, and WQv (inches))

Qp = qu x DA x WQv (inches)

Qp = 2.15 cfs

PROJECT: Greenpac - New Paper Mill NO.: SR-6

DATE: 5/19/11 BY: SAL SUBJECT: WQv sizing

WQv STORM PEAK FLOW WORKSHEET

1. COMPUTE WATER QUALITY VOLUME (WQv):

	Area	Impervious	% Impervious	P	Rv	WQv (acre-ft)	WQv (ft^3)
Total	3.69	1.69	46	0.85	0.46	0.121	5,262

2. CONVERTWQv TO WATERSHED INCHES OF RUNOFF:

$$\text{WQv (inches)} = \frac{\text{WQv (acre-ft)} \times 12 \text{ (in/ft)}}{\text{DA (acres)}} = 0.39 \text{ inches}$$

3. COMPUTE RCN FOR WQv STORM USING P AND WQv (inches):

$$\text{RCN} = \frac{1000}{0 + 5P + 10\text{WQv (inches)} - 10[(\text{WQv(inches)})^2 + 1.25P(\text{WQv(inches)})]^{1}} = \frac{1000}{11} = 94$$

4. COMPUTE Tc (TR-55 METHOD):

Tc = 0.11 hrs

5. DETERMINE INITIAL ABSTRACTION (Ia) FOR RCN OF: 94

Ia = 0.128 inches

6. COMPUTE Ia/P:

$\frac{Ia}{P}$ = 0.15 hrs

7. DETERMINE qu (UNIT PEAK DISCHARGE) IN CFS/MI^2/INCH USING Tc AND Ia/P:

(from TR-55 Exhibit 4-II or 4-III)

qu = 925 cfs/mi^2/inc

8. CALCULATE PEAK RUNOFF (Qp) IN CFS:

(using qu, DA, and WQv (inches))

Qp = qu x DA x WQv (inches)

Qp = 2.10 cfs

PROJECT: Greenpac - New Paper Mill NO.: SR-7

DATE: 5/19/11 BY: SAL SUBJECT: WQv sizing

WQv STORM PEAK FLOW WORKSHEET

1. COMPUTE WATER QUALITY VOLUME (WQv):

	Area	Impervious	% Impervious	P	Rv	WQv (acre-ft)	WQv (ft^3)
Total	0.39	0.35	90	0.85	0.86	0.024	1,032

2. CONVERTWQv TO WATERSHED INCHES OF RUNOFF:

$$\text{WQv (inches)} = \frac{\text{WQv (acre-ft)} \times 12 \text{ (in/ft)}}{\text{DA (acres)}} = 0.73 \text{ inches}$$

3. COMPUTE RCN FOR WQv STORM USING P AND WQv (inches):

$$\text{RCN} = \frac{1000}{0 + 5P + 10\text{WQv (inches)} - 10[(\text{WQv(inches)})^2 + 1.25P(\text{WQv(inches)})]^{1}} = \frac{1000}{10} = 99$$

4. COMPUTE Tc (TR-55 METHOD):

Tc = 0.08 hrs

5. DETERMINE INITIAL ABSTRACTION (Ia) FOR RCN OF: 99

Ia = 0.041 inches

6. COMPUTE Ia/P:

$\frac{Ia}{P}$ = 0.05 hrs

7. DETERMINE qu (UNIT PEAK DISCHARGE) IN CFS/MI^2/INCH USING Tc AND Ia/P:

(from TR-55 Exhibit 4-II or 4-III)

qu = 1000 cfs/mi^2/inc

8. CALCULATE PEAK RUNOFF (Qp) IN CFS:

(using qu, DA, and WQv (inches))

Qp = qu x DA x WQv (inches)

Qp = 0.44 cfs

PROJECT: Greenpac - New Paper Mill NO.: SR-8

DATE: 5/19/11 BY: SAL SUBJECT: WQv sizing

WQv STORM PEAK FLOW WORKSHEET

1. COMPUTE WATER QUALITY VOLUME (WQv):

	Area	Impervious	% Impervious	P	Rv	WQv (acre-ft)	WQv (ft^3)
Total	0.41	0.41	100	0.85	0.95	0.028	1,202

2. CONVERTWQv TO WATERSHED INCHES OF RUNOFF:

$$\text{WQv (inches)} = \frac{\text{WQv (acre-ft)} \times 12 \text{ (in/ft)}}{\text{DA (acres)}} = 0.81 \text{ inches}$$

3. COMPUTE RCN FOR WQv STORM USING P AND WQv (inches):

$$\text{RCN} = \frac{1000}{0 + 5P + 10\text{WQv (inches)} - 10[(\text{WQv(inches)})^2 + 1.25P(\text{WQv(inches)})]^{1}} = \frac{1000}{10} = 100$$

4. COMPUTE Tc (TR-55 METHOD):

Tc = 0.08 hrs

5. DETERMINE INITIAL ABSTRACTION (Ia) FOR RCN OF: 100

Ia = 0.041 inches

6. COMPUTE Ia/P:

$\frac{Ia}{P}$ = 0.05 hrs

7. DETERMINE qu (UNIT PEAK DISCHARGE) IN CFS/MI^2/INCH USING Tc AND Ia/P:

(from TR-55 Exhibit 4-II or 4-III)

qu = 1000 cfs/mi^2/inc

8. CALCULATE PEAK RUNOFF (Qp) IN CFS:

(using qu, DA, and WQv (inches))

Qp = qu x DA x WQv (inches)

Qp = 0.52 cfs

PROJECT: Greenpac - New Paper Mill NO.: SR-9

DATE: 5/19/11 BY: SAL SUBJECT: WQv sizing

WQv STORM PEAK FLOW WORKSHEET

1. COMPUTE WATER QUALITY VOLUME (WQv):

	Area	Impervious	% Impervious	P	Rv	WQv (acre-ft)	WQv (ft^3)
Total	0.58	0.56	97	0.85	0.92	0.038	1,645

2. CONVERTWQv TO WATERSHED INCHES OF RUNOFF:

$$\text{WQv (inches)} = \frac{\text{WQv (acre-ft)} \times 12 \text{ (in/ft)}}{\text{DA (acres)}} = 0.78 \text{ inches}$$

3. COMPUTE RCN FOR WQv STORM USING P AND WQv (inches):

$$\text{RCN} = \frac{1000}{0 + 5P + 10\text{WQv (inches)} - 10[(\text{WQv(inches)})^2 + 1.25P(\text{WQv(inches)})]^{\frac{1}{2}}} = \frac{1000}{10} = 99$$

4. COMPUTE Tc (TR-55 METHOD):

Tc = 0.08 hrs

5. DETERMINE INITIAL ABSTRACTION (Ia) FOR RCN OF: 99

Ia = 0.041 inches

6. COMPUTE Ia/P:

$\frac{Ia}{P}$ = 0.05 hrs

7. DETERMINE qu (UNIT PEAK DISCHARGE) IN CFS/MI^2/INCH USING Tc AND Ia/P:

(from TR-55 Exhibit 4-II or 4-III)

qu = 1000 cfs/mi^2/inc

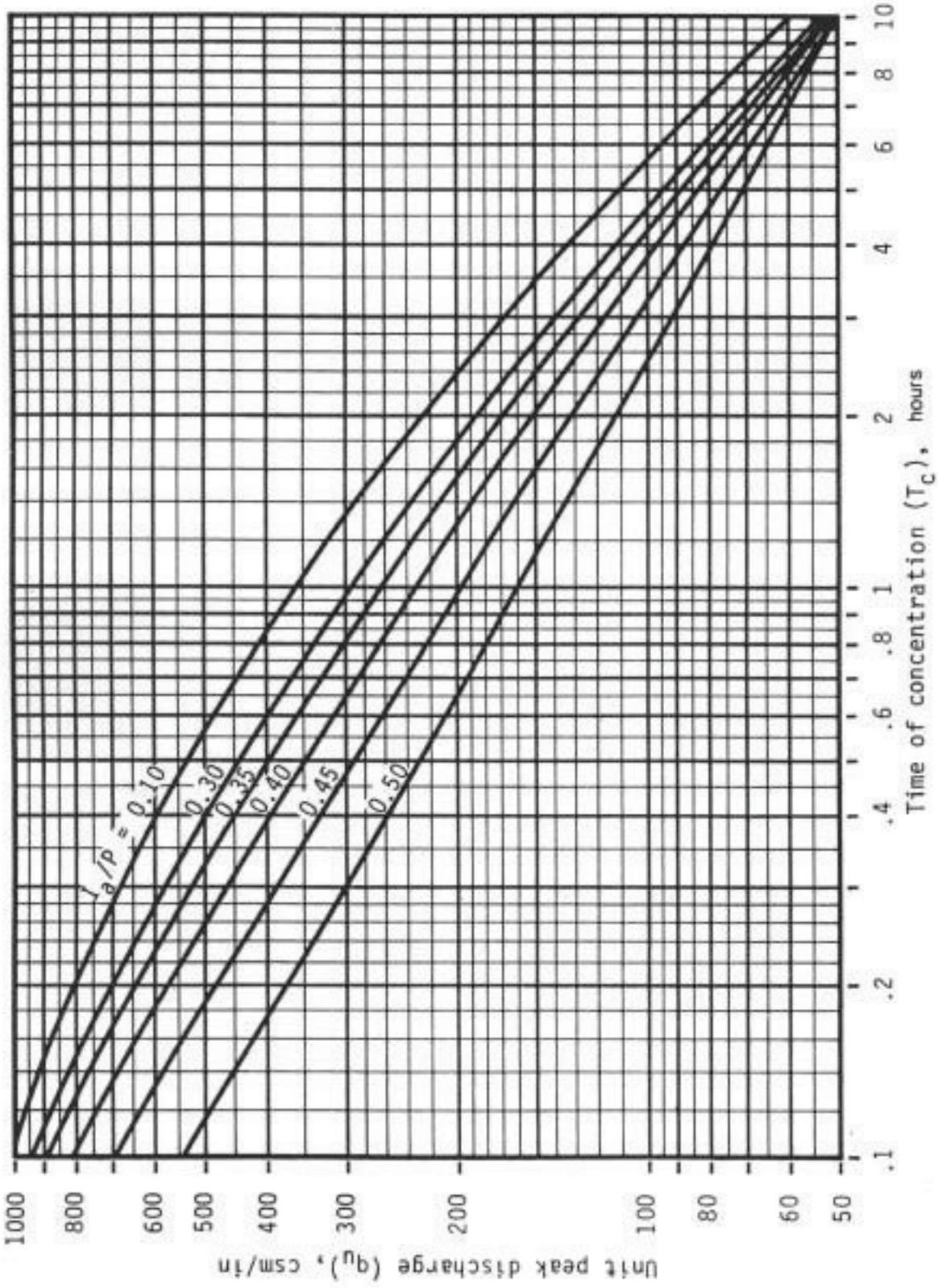
8. CALCULATE PEAK RUNOFF (Qp) IN CFS:

(using qu, DA, and WQv (inches))

Qp = qu x DA x WQv (inches)

Qp = 0.71 cfs

Figure 4.15
Unit Peak Discharge (qu) for SCS Type II Rainfall Distribution
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)



APPENDIX H

NOTICE OF INTENT (NOI) &

NOTICE OF TERMINATION (NOT) FORMs

1358331598

NOTICE OF INTENT

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NYR _____ (for DEC use only)

Stormwater Discharges Associated with Construction Activity Under State Pollutant Discharge Elimination System (SPDES) General Permit # GP-0-10-001

All sections must be completed unless otherwise noted. Failure to complete all items may result in this form being returned to you, thereby delaying your coverage under this General Permit. Applicants must read and understand the conditions of the permit and prepare a Stormwater Pollution Prevention Plan prior to submitting this NOI. Applicants are responsible for identifying and obtaining other DEC permits that may be required.

-IMPORTANT-

RETURN THIS FORM TO THE ADDRESS ABOVE

OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)
Greenpac Partnership

Owner/Operator Contact Person Last Name (NOT CONSULTANT)
Nadeau

Owner/Operator Contact Person First Name
Luc

Owner/Operator Mailing Address
4001 Packard Road

City
Niagara Falls

State
NY

Zip
14303 - ____

Phone (Owner/Operator)
450 - 461 - 8603

Fax (Owner/Operator)
___ - ___ - ____

Email (Owner/Operator)

FED TAX ID
27 - 2430266 (not required for individuals)

Project Site Information

Project/Site Name
New Paper Mill

Street Address (NOT P.O. BOX)
4001 Packard Road

Side of Street
○ **North** ● **South** ○ **East** ○ **West**

City/Town/Village (THAT ISSUES BUILDING PERMIT)
Niagara Falls

State: NY
Zip: 14304 -
County:
DEC Region: 9

Name of Nearest Cross Street
47th Street

Distance to Nearest Cross Street (Feet)
1000

Project In Relation to Cross Street
○ **North** ○ **South** ○ **East** ● **West**

Tax Map Numbers
Section-Block-Parcel
160-09-1.3

Tax Map Numbers
160-09-1.5

1. Provide the Geographic Coordinates for the project site in NYTM Units. To do this you **must** go to the NYSDEC Stormwater Interactive Map on the DEC website at:

www.dec.ny.gov/imsmaps/stormwater/viewer.htm

Zoom into your Project Location such that you can accurately click on the centroid of your site. Once you have located your project site, go to the tool boxes on the top and choose "i"(identify). Then click on the center of your site and a new window containing the X, Y coordinates in UTM will pop up. Transcribe these coordinates into the boxes below. For problems with the interactive map use the help function.

X Coordinates (Easting): 172706

Y Coordinates (Northing): 4779058

2. What is the nature of this construction project?

○ **New Construction**

● **Redevelopment with increase in imperviousness**

○ **Redevelopment with no increase in imperviousness**

3. Select the predominant land use for both pre and post development conditions.
SELECT ONLY ONE CHOICE FOR EACH

Pre-Development Existing Land Use	**Post-Development Future Land Use**
○ FOREST	○ SINGLE FAMILY HOME
○ PASTURE/OPEN LAND	○ SINGLE FAMILY SUBDIVISION
○ CULTIVATED LAND	○ TOWN HOME RESIDENTIAL
○ SINGLE FAMILY HOME	○ MULTIFAMILY RESIDENTIAL
○ SINGLE FAMILY SUBDIVISION	○ INSTITUTIONAL/SCHOOL
○ TOWN HOME RESIDENTIAL	● INDUSTRIAL
○ MULTIFAMILY RESIDENTIAL	○ COMMERCIAL
○ INSTITUTIONAL/SCHOOL	○ MUNICIPAL
● INDUSTRIAL	○ ROAD/HIGHWAY
○ COMMERCIAL	○ RECREATIONAL/SPORTS FIELD
○ ROAD/HIGHWAY	○ BIKE PATH/TRAIL
○ RECREATIONAL/SPORTS FIELD	○ LINEAR UTILITY (water, sewer, gas, etc.)
○ BIKE PATH/TRAIL	○ PARKING LOT
○ LINEAR UTILITY	○ CLEARING/GRADING ONLY
○ PARKING LOT	○ DEMOLITION, NO REDEVELOPMENT
○ OTHER	○ WELL DRILLING ACTIVITY *(Oil, Gas, etc.)
	○ OTHER

Number of Lots

*****note: for gas well drilling, non-high volume hydraulic fractured wells only

4. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law ? ○ **Yes** ● **No**

5. Is this a project which does not require coverage under the General Permit (e.g. Project done under an Individual SPDES Permit, or department approved remediation)? ○ **Yes** ● **No**

6. Is this property owned by a state authority, state agency, federal government or local government? ○ **Yes** ● **No**

7. In accordance with the larger common plan of development or sale, enter the total project site acreage, the acreage to be disturbed and the future impervious area (acreage)within the disturbed area. Round to the nearest tenth of an acre.

Total Site Acreage	**Acreage To Be Disturbed**	**Existing Impervious Area Within Disturbed**	**Future Impervious Area Within Disturbed**
50.5	41.9	27.0	29.6

8. Do you plan to disturb more than 5 acres of soil at any one time? ● **Yes** ○ **No**

9. Indicate the percentage of each Hydrologic Soil Group(HSG) at the site.

A	**B**	**C**	**D**
0 %	0 %	0 %	100 %

10. Is this a phased project? ○ **Yes** ● **No**

11. Enter the planned start and end dates of the disturbance

Start Date 06 / 01 / 2011 – **End Date** 06 / 01 / 2013

12. Identify the nearest, natural, surface waterbody(ies) to which construction site runoff will discharge.

Name

Niagara River

12a. Type of waterbody identified in Question 12?

- ○ Wetland / State Jurisdiction On Site (Answer 12b)
- ○ Wetland / State Jurisdiction Off Site
- ○ Wetland / Federal Jurisdiction On Site (Answer 12b)
- ○ Wetland / Federal Jurisdiction Off Site
- ○ Stream / Creek On Site
- ○ Stream / Creek Off Site
- ○ River On Site
- ● River Off Site
- ○ Lake On Site
- ○ Lake Off Site
- ○ Other Type On Site
- ○ Other Type Off Site

12b. How was the wetland identified?

- ○ Regulatory Map
- ○ Delineated by Consultant
- ○ Delineated by Army Corps of Engineers
- ○ Other (identify)

13. Has the surface waterbody(ies) in question 12 been identified as a 303(d) segment in Appendix E of GP-0-10-001? ○ **Yes** ● **No**

14. Is this project located in one of the Watersheds identified in Appendix C of GP-0-10-001? ○ **Yes** ● **No**

15. Is the project located in one of the watershed areas associated with AA and AA-S classified waters? **If no, skip question 16.** ○ **Yes** ● **No**

16. Does this construction activity disturb land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey? **If Yes, what is the acreage to be disturbed?** ○ **Yes** ○ **No**

[ ][ ][ ][ ].[ ]

17. Will the project disturb soils within a State regulated wetland or the protected 100 foot adjacent area? ○ **Yes** ● **No**

18. Does the site runoff enter a separate storm sewer system (including roadside drains, swales, ditches, culverts, etc)? ○ **Yes** ● **No** ○ **Unknown**

19. What is the name of the municipality/entity that owns the separate storm sewer system?

20. Does any runoff from the site enter a sewer classified as a Combined Sewer? ● **Yes** ○ **No** ○ **Unknown**

21. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book) ? ● **Yes** ○ **No**

22. Does this construction activity require the development of a SWPPP that includes Water Quality and Quantity Control components (Post-Construction Stormwater Management Practices) **(If No, skip questions 23 and 27-35)** ● **Yes** ○ **No**

23. Have the Water Quality and Quantity Control components of the SWPPP been developed in comformance with the current NYS Stormwater Management Design Manual ? ● **Yes** ○ **No**

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:

- ● **Professional Engineer (P.E.)**
- ○ **Soil and Water Conservation District (SWCD)**
- ○ **Registered Landscape Architect (R.L.A)**
- ○ **Certified Professional in Erosion and Sediment Control (CPESC)**
- ○ **Owner/Operator**
- ○ **Other**

SWPPP Preparer
Beardsley Design Associates

Contact Name (Last, Space, First)
Cudney, Raymond

Mailing Address
5789 Widewaters Parkway

City
DeWitt

State
NY

Zip
13214-

Phone
315-472-6980

Fax
315-472-3523

Email
rcudney@beardsley.com

SWPPP Preparer Certification

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-10-001. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First Name
Raymond

MI
N

Last Name
Cudney

Signature

Date
06/24/2011

25. Has a construction sequence schedule for the planned management practices been prepared? ● Yes ○ No

26. Select **all** of the erosion and sediment control practices that will be employed on the project site:

Temporary Structural

- ○ Check Dams
- ○ Construction Road Stabilization
- ○ Dust Control
- ○ Earth Dike
- ○ Level Spreader
- ○ Perimeter Dike/Swale
- ○ Pipe Slope Drain
- ○ Portable Sediment Tank
- ○ Rock Dam
- ○ Sediment Basin
- ● Sediment Traps
- ● Silt Fence
- ● Stabilized Construction Entrance
- ● Storm Drain Inlet Protection
- ○ Straw/Hay Bale Dike
- ○ Temporary Access Waterway Crossing
- ○ Temporary Stormdrain Diversion
- ○ Temporary Swale
- ○ Turbidity Curtain
- ○ Water bars

Biotechnical

- ○ Brush Matting
- ○ Wattling

Vegetative Measures

- ○ Brush Matting
- ○ Dune Stabilization
- ● Grassed Waterway
- ● Mulching
- ○ Protecting Vegetation
- ○ Recreation Area Improvement
- ● Seeding
- ○ Sodding
- ○ Straw/Hay Bale Dike
- ○ Streambank Protection
- ○ Temporary Swale
- ● Topsoiling
- ● Vegetating Waterways

Permanent Structural

- ○ Debris Basin
- ○ Diversion
- ○ Grade Stabilization Structure
- ○ Land Grading
- ○ Lined Waterway (Rock)
- ○ Paved Channel (Concrete)
- ○ Paved Flume
- ○ Retaining Wall
- ○ Riprap Slope Protection
- ● Rock Outlet Protection
- ○ Streambank Protection

Other

Water Quality and Quantity Control

Important: Completion of Questions 27-35 is not required if response to Question 22 is No.

Post-Construction Stormwater Management Practices

27. Indicate **all** Stormwater Management Practice(s) that will be installed/constructed on this site:

Ponds
- ○ **Micropool Extended Detention (P-1)**
- ● **Wet Pond (P-2)**
- ○ **Wet Extended Detention (P-3)**
- ○ **Multiple Pond System (P-4)**
- ○ **Pocket Pond (P-5)**

Filtering
- ○ **Surface Sand Filter (F-1)**
- ○ **Underground Sand Filter (F-2)**
- ○ **Perimeter Sand Filter (F-3)**
- ○ **Organic Filter (F-4)**
- ○ **Bioretention (F-5)**
- ○ **Other**

Alternative Practice
- ○ **Rain Garden**
- ○ **Cistern**
- ○ **Green Roof**
- ○ **Stormwater Planters**
- ○ **Permeable Paving (Modular Block)**

Wetlands
- ○ **Shallow Wetland (W-1)**
- ○ **Extended Detention Wetland (W-2)**
- ○ **Pond/Wetland System (W-3)**
- ○ **Pocket Wetland (W-4)**

Infiltration
- ○ **Infiltration Trench (I-1)**
- ○ **Infiltration Basin (I-2)**
- ○ **Dry Well (I-3)**
- ○ **Underground Infiltration System**

Open Channels
- ○ **Dry Swale (O-1)**
- ○ **Wet Swale (O-2)**

Verified Proprietary Practice
- ● **Hydrodynamic**
- ○ **Wet Vault**
- ○ **Media Filter**

28. Describe other stormwater management practices not listed above or explain any deviations from the technical standards.

29. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed? ● **Yes** ○ **No**

If Yes, Identify the entity responsible for the long term Operation and Maintenance

Norampac Industries, Inc.

30. Provide the total water quality volume required and the total provided for the site.

WQv Required 0.527 **acre-feet**

WQv Provided 0.554 **acre-feet**

31. Provide the following Unified Stormwater Sizing Criteria for the site.

Total Channel Protection Storage Volume (CPv) - Extended detention of post-developed 1 year, 24 hour storm event

CPv Required 5.28 **acre-feet**

CPv Provided 4.75 **acre-feet**

31a. The need to provide for channel protection has been waived because:

○ **Site discharges directly to fourth order stream or larger**

Total Overbank Flood Control Criteria (Qp) - Peak discharge rate for the 10 year storm

Pre-Development 144.99 **CFS**

Post-development 115.28 **CFS**

Total Extreme Flood Control Criteria (Qf) - Peak discharge rate for the 100 year storm

Pre-Development 210.12 **CFS**

Post-development 161.57 **CFS**

31b. The need to provide for flood control has been waived because:

○ **Site discharges directly to fourth order stream or larger**

○ **Downstream analysis reveals that flood control is not required**

IMPORTANT: For questions 31 and 32, impervious area should be calculated considering the project site and all offsite areas that drain to the post-construction stormwater management practice(s). (Total Drainage Area = Project Site + Offsite areas)

32. Pre-Construction Impervious Area - As a percent of the Total Drainage Area enter the percentage of the existing impervious areas before construction begins. 66 %

33. Post-Construction Impervious Area - As a percent of the Total Drainage Area, enter the percentage of the future impervious areas that will be created/remain on the site after completion of construction. 71 %

34. Indicate the total number of post-construction stormwater management practices to be installed/constructed. 10

35. Provide the total number of stormwater discharge points from the site. (include discharges to either surface waters or to separate storm sewer systems) 2

36. Identify other DEC permits that are required for this project.

DEC Permits

● Air Pollution Control	○ Navigable Waters Protection / Article 15
○ Coastal Erosion	○ Water Quality Certificate
○ Hazardous Waste	○ Dam Safety
○ Long Island Wells	○ Water Supply
○ Mined Land Reclamation	○ Freshwater Wetlands/Article 24
○ Other SPDES	○ Tidal Wetlands
○ Solid Waste	○ Wild, Scenic and Recreational Rivers
○ None	○ Stream Bed or Bank Protection / Article 15

○ Other

37. Does this project require a US Army Corps of Engineers Wetland Permit? ○ **Yes** ● **No**
If Yes, Indicate Size of Impact. [ ][ ][ ][ ][ ].[ ]

38. Is this project subject to the requirements of a regulated, traditional land use control MS4? ● **Yes** ○ **No**
(If No, skip question 39)

39. Has the "MS4 SWPPP Acceptance" form been signed by the principal executive officer or ranking elected official and submitted along with this NOI? ● **Yes** ○ **No**

40. If this NOI is being submitted for the purpose of continuing coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned. [N][Y][R][ ][ ][ ][ ][ ][ ]

Owner/Operator Certification

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Print First Name Luc **MI**

Print Last Name Nadeau

Owner/Operator Signature

Date [ ][ ] / [ ][ ] / [ ][ ][ ][ ]

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity

Please indicate your permit identification number: NYR ___ ___ ___ ___ ___ ___

I. Owner or Operator Information

1. Owner/Operator Name:

2. Street Address:

3. City/State/Zip:

4. Contact Person: | 4a.Telephone:

II. Project Site Information

5. Project/Site Name:

6. Street Address:

7. City/Zip:

8. County:

III. Reason for Termination

9a. ☐ All disturbed areas have achieved final stabilization in accordance with the general permit and SWPPP.
Date final stabilization completed (month/year): _____

9b. ☐ Permit coverage has been transferred to new owner/operator. Indicate new owner/operator's permit identification number: NYR ___ ___ ___ ___ ___ ___
(Note: Permit coverage can not be terminated by owner identified in I.1. above until new owner/operator obtains coverage under GP-0-08-001)

9c. ☐ Other (Explain on Page 2)

IV. Final Site Information:

10a. Did this construction activity require the development of a SWPPP that includes post-construction stormwater management practices? ☐ yes ☐ no (If no, go to question 10f.)

10b. Have all post-construction stormwater management practices included in the final SWPPP been constructed? ☐ yes ☐ no (If no, explain on Page 2)

10c. Identify the entity responsible for long-term operation and maintenance of practice(s)?

_____

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

10d. Has the entity responsible for long-term operation and maintenance been given a copy of the operation and maintenance plan required by the general permit? ☐ yes ☐ no

10e. Indicate the method used to ensure long-term operation and maintenance of the post-construction stormwater management practice(s):

☐ Post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain practice(s) have been deeded to the municipality.

☐ Executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s).

☐ For post-construction stormwater management practices that are privately owned, a deed restriction is in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan.

☐ For post-construction stormwater management practices that are owned by a public or private institution (e.g. school, college, university), or government agency or authority, policy and procedures are in place that ensures operation and maintenance of the practice(s) in accordance with the operation and maintenance plan.

10f. Provide the total area of impervious surface (i.e. roof, pavement, concrete, gravel, etc.) constructed within the disturbance area? _____ (acres)

V. Additional Information/Explanation:
(Use this section to answer questions 9c. and 10b., if applicable)

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

VI. Qualified Inspector Certification - Final Stabilization:

I hereby certify that all disturbed areas have achieved final stabilization as defined in GP-0-08-001, and that all temporary, structural erosion and sediment control measures have been removed. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:	
Title/Position:	
Signature:	Date:

VII. Qualified Inspector Certification - Post-construction Stormwater Management Practice(s):

I hereby certify that all post-construction stormwater management practices have been constructed in conformance with the SWPPP. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:	
Title/Position:	
Signature:	Date:

VIII. Owner or Operator Certification

I hereby certify that this document was prepared by me or under my direction or supervision. My determination, based upon my inquiry of the person(s) who managed the construction activity, or those persons directly responsible for gathering the information, is that the information provided in this document is true, accurate and complete. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:	
Title/Position:	
Signature:	Date:

(NYS DEC Notice of Termination - 4/10/08)

APPENDIX I

TEMPORARY EROSION CONTROL MEASURES

STANDARD AND SPECIFICATIONS FOR VEGETATING WATERWAYS



Definition

Waterways are a natural or constructed outlet, shaped or graded. They are vegetated as needed for safe transport of runoff water.

Purpose

To provide for the safe transport of excess surface water from construction sites and urban areas without damage from erosion.

Conditions Where Practice Applies

This standard applies to vegetating waterways and similar water carrying structures.

Supplemental measures may be required with this practice. These may include: subsurface drainage to permit the growth of suitable vegetation and to eliminate wet spots; a section stabilized with asphalt, stone, or other suitable means; or additional storm drains to handle snowmelt or storm runoff.

Retardance factors for determining waterway dimensions are shown in Table 5B.1 and "Maximum Permissible Velocities for Selected Grass and Legume Mixtures," are shown in Table 3.6.

Design Criteria

Waterways or outlets shall be protected against erosion by vegetative means as soon after construction as practical. Vegetation must be well established before diversions or other channels are outletted into them. Consideration should be given to the use of synthetic products, jute or excelsior matting, other rolled erosion control products, or sodding of channels to provide erosion protection as soon after construction as possible. It is strongly recommended that the center line of the waterway be protected with one of the above materials to avoid center gullies.

1. Liming, fertilizing, and seedbed preparation.

   A. Lime to pH 6.5.

   B. **The soil should be tested to determine the amounts of amendments needed.** If the soil must be fertilized before results of a soil test can be obtained to determine fertilizer needs, apply commercial fertilizer at 1.0 lbs/1,000 sq. ft. of N, P_2O_5, and K_2O.

   C. Lime and fertilizer shall be mixed thoroughly into the seedbed during preparation.

   D. Channels, except for paved section, shall have at least 4 inches of topsoil.

   E. Remove stones and other obstructions that will hinder maintenance.

2. Timing of Seeding.

   A. Early spring and late August are best.

   B. Temporary cover to protect from erosion is recommended during periods when seedings may fail.

3. Seed Mixtures:

Mixtures	Rate per Acre (lbs)	Rate per 1,000 sq. ft. (lbs)
A. Birdsfoot trefoil or ladino clover[1]	8	0.20
Tall fescue or smooth bromegrass	20	0.45
Redtop[2]	2	0.05
	30	0.70
OR		
B. Kentucky bluegrass[3]	25	0.60
Creeping red fescue	20	0.50
Perennial ryegrass	10	0.20
	55	1.30

[1] Inoculate with appropriate inoculum immediately prior to seeding. Ladino or common white clover may be substituted for birdsfoot trefoil and seeded at the same rate.

[2] Perennial ryegrass may be substituted for the redtop but increase seeding rate to 5 lbs/acre (0.1 lb/1,000 sq. ft).

[3] Use this mixture in areas which are mowed frequently. Common white clover may be added if desired and seeded at 8 lbs/acre (0.2 lb/1,000 sq. ft.)

4. Seeding

Select the appropriate seed mixture and apply uniformly over the area. Rolling or cultipacking across the waterway is desirable.

Waterway centers or crucial areas may be sodded. Refer to the standard and specification for Stabilization with Sod. Be sure sod is securely anchored using staples or stakes.

5. Mulching.

All seeded areas will be mulched. Channels more than 300 feet long, and/or where the slope is 5 percent or more, must have the mulch securely anchored. Refer to the standard and specifications for Mulching for details.

6. Maintenance

Fertilize, lime, and mow as needed to maintain dense protective vegetative cover.

Waterways shall not be used for roadways.

If rills develop in the centerline of a waterway, prompt attention is required to avoid the formation of gullies. Either stone and/or compacted soil fill with excelsior or filter fabric as necessary may be used during the establishment phase. See Figure 3.2, Rill Maintenance Measures. Spacing between rill maintenance barriers shall not exceed 100 feet.

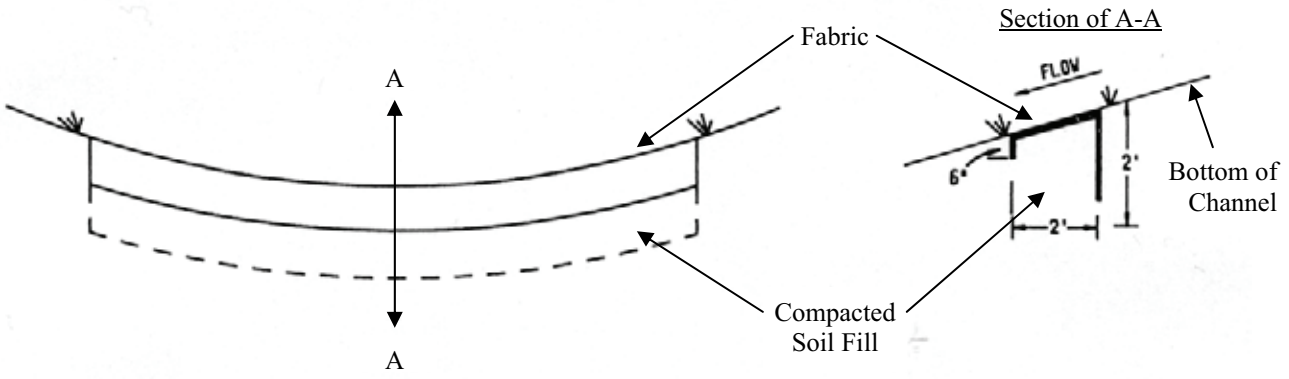
Table 3.6
Maximum Permissible Velocities for Selected Seed Mixtures

Cover	Slope Range [2] (%)	Permissible Velocity [1]	
		Erosion-resistant Soils (ft. per sec.) K=0.10 - 0.35 [3]	Easily Eroded Soils (ft. per sec.) K=0.36 - 0.80
Kentucky Bluegrass Smooth Brome Tall Fescue	0-5 5-10 Over 10	7 6 5	5 4 3
Grass Mixtures Reed Canarygrass	[2] 0-5 5-10	5 4	4 3
Redtop Alfalfa Red Fescue	[4] 0-5	3.5	2.5

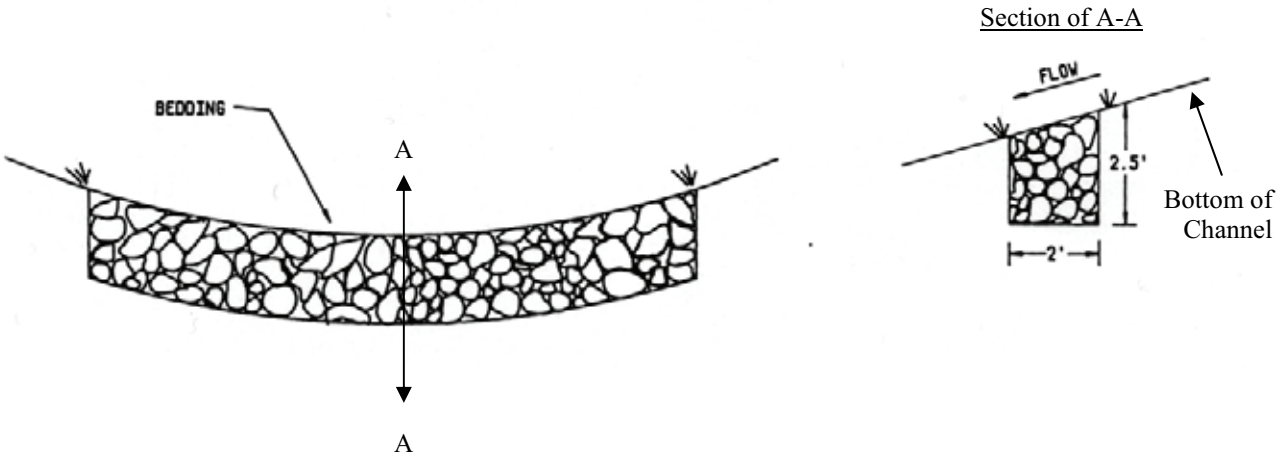
[1] Use velocities exceeding 5 feet per second only where good covers and proper maintenance can be obtained.
[2] Do not use on slopes steeper than 10 percent except for vegetated side slopes in combination with a stone, concrete, or highly resistant vegetative center section.
[3] K is the soil erodibility factor used in the Revised Universal Soil Loss Equation. Visit Appendix A or consult the appropriate USDA-NRCS technical guide for K values for New York State soils.
[4] Do not use on slopes steeper than 5 percent except for vegetated side slopes in combination with a stone, concrete, or highly resistant vegetative center section.
[5] Annuals - use on mild slopes or as temporary protection until permanent covers are established.
[6] Use on slopes steeper than 5 percent is not recommended.

Figure 3.2
Rill Maintenance Measures

Filter Fabric



Stone



STANDARD AND SPECIFICATIONS FOR TOPSOILING



Definition

Spreading a specified quality and quantity of topsoil materials on graded or constructed subsoil areas.

Purpose

To provide acceptable plant cover growing conditions, thereby reducing erosion; to reduce irrigation water needs; and to reduce the need for nitrogen fertilizer application.

Conditions Where Practice Applies

Topsoil is applied to subsoils that are droughty (low available moisture for plants), stony, slowly permeable, salty or extremely acid. It is also used to backfill around shrub and tree transplants. This standard does not apply to wetland soils.

Design Criteria

1. Preserve existing topsoil in place where possible, thereby reducing the need for added topsoil.

2. Conserve by stockpiling topsoil and friable fine textured subsoils that must be stripped from the excavated site and applied after final grading where vegetation will be established.

3. Refer to USDA Soil Conservation Service (presently Natural Resource Conservation Service) soil surveys or soil interpretation record sheets for further soil texture information for selecting appropriate design topsoil depths.

Site Preparation

1. As needed, install erosion control practices such as diversions, channels, sediment traps, and stabilizing measures, or maintain if already installed.

2. Complete rough grading and final grade, allowing for depth of topsoil to be added.

3. Scarify all compact, slowly permeable, medium and fine textured subsoil areas. Scarify at approximately right angles to the slope direction in soil areas that are steeper than 5 percent. Areas that have been overly compacted shall be decompacted to a minimum depth of 12 inches with a deep ripper or chisel plow prior to topsoiling.

4. Remove refuse, woody plant parts, stones over 3 inches in diameter, and other litter.

Topsoil Materials

1. Topsoil shall have at least 6 percent by weight of fine textured stable organic material, and no greater than 20 percent. Muck soil shall not be considered topsoil.

2. Topsoil shall have not less than 20 percent fine textured material (passing the NO. 200 sieve) and not more than 15 percent clay.

3. Topsoil treated with soil sterilants or herbicides shall be so identified to the purchaser.

4. Topsoil shall be relatively free of stones over 1 1/2 inches in diameter, trash, noxious weeds such as nut sedge and quackgrass, and will have less than 10 percent gravel.

5. Topsoil containing soluble salts greater than 500 parts per million shall not be used.

Application and Grading

1. Topsoil shall be distributed to a uniform depth over the area. It shall not be placed when it is partly frozen, muddy, or on frozen slopes or over ice, snow, or standing water puddles.

2. Topsoil placed and graded on slopes steeper than 5 percent shall be promptly fertilized, seeded, mulched, and stabilized by “tracking” with suitable equipment.

3. Apply topsoil in the following amounts:

Site Conditions	Intended Use	Minimum Topsoil Depth
1. Deep sand or loamy sand	Mowed lawn	6 in.
	Tall legumes, unmowed	2 in.
	Tall grass, unmowed	1 in.
2. Deep sandy loam	Mowed lawn	5 in.
	Tall legumes, unmowed	2 in.
	Tall grass, unmowed	none
3. Six inches or more: silt loam, loam, or silt	Mowed lawn	4 in.
	Tall legumes, unmowed	1 in.
	Tall grass, unmowed	1 in.

STANDARD AND SPECIFICATIONS FOR MULCHING



Definition

Applying coarse plant residue or chips, or other suitable materials, to cover the soil surface.

Purpose

The primary purpose is to provide initial erosion control while a seeding or shrub planting is establishing. Mulch will conserve moisture and modify the surface soil temperature and reduce fluctuation of both. Mulch will prevent soil surface crusting and aid in weed control. Mulch is also used alone for temporary stabilization in non-growing months.

Conditions Where Practice Applies

On soils subject to erosion and on new seedings and shrub plantings. Mulch is useful on soils with low infiltration rates by retarding runoff.

Criteria

Site preparation prior to mulching requires the installation of necessary erosion control or water management practices and drainage systems.

Slope, grade and smooth the site to fit needs of selected mulch products.

Remove all undesirable stones and other debris to meet the needs of the anticipated land use and maintenance required.

Apply mulch after soil amendments and planting is accomplished or simultaneously if hydroseeding is used.

Select appropriate mulch material and application rate or material needs. Determine local availability.

Select appropriate mulch anchoring material.

NOTE: The best combination for grass/legume establishment is straw (cereal grain) mulch applied at 2 ton/ acre (90 lbs./1000sq.ft.) and anchored with wood fiber mulch (hydromulch) at 500 – 750 lbs./acre (11 – 17 lbs./1000 sq. ft.). The wood fiber mulch must be applied through a hydroseeder immediately after mulching.

Table 3.7
Guide to Mulch Materials, Rates, and Uses

Mulch Material	Quality Standards	per 1000 Sq. Ft.	per Acre	Depth of Application	Remarks
Wood chips or shavings	Air-dried. Free of objectionable coarse material	500-900 lbs.	10-20 tons	2-7"	Used primarily around shrub and tree plantings and recreation trails to inhibit weed competition. Resistant to wind blowing. Decomposes slowly.
Wood fiber cellulose (partly digested wood fibers)	Made from natural wood usually with green dye and dispersing agent	50 lbs.	2,000 lbs.	—	Apply with hydromulcher. No tie down required. Less erosion control provided than 2 tons of hay or straw.
Gravel, Crushed Stone or Slag	Washed; Size 2B or 3A—1 1/2"	9 cu. yds.	405 cu. yds.	3"	Excellent mulch for short slopes and around plants and ornamentals. Use 2B where subject to traffic. (Approximately 2,000 lbs./cu. yd.). Frequently used over filter fabric for better weed control.
Hay or Straw	Air-dried; free of undesirable seeds & coarse materials	90-100 lbs. 2-3 bales	2 tons (100-120 bales)	cover about 90% surface	Use small grain straw where mulch is maintained for more than three months. Subject to wind blowing unless anchored. Most commonly used mulching material. Provides the best micro-environment for germinating seeds.
Jute twisted yarn	Undyed, unbleached plain weave. Warp 78 ends/yd., Weft 41 ends/ yd. 60-90 lbs./roll	48" x 50 yds. or 48" x 75 yds.	—	—	Use without additional mulch. Tie down as per manufacturers specifications. Good for center line of concentrated water flow.
Excelsior wood fiber mats	Interlocking web of excelsior fibers with photodegradable plastic netting	8" x 100" 2-sided plastic, 48" x 180" 1-sided plastic	—	—	Use without additional mulch. Excellent for seeding establishment. Tie down as per manufacturers specifications. Approximately 72 lbs./roll for excelsior with plastic on both sides. Use two sided plastic for centerline of waterways.
Compost	Up to 3" pieces, moderately to highly stable	3-9 cu. yds.	134-402 cu. yds.	1-3"	Coarser textured mulches may be more effective in reducing weed growth and wind erosion.
Straw or coconut fiber, or combination	Photodegradable plastic net on one or two sides	Most are 6.5 ft. x 3.5 ft.	81 rolls	—	Designed to tolerate higher velocity water flow, centerlines of waterways, 60 sq. yds. per roll.

Table 3.8
Mulch Anchoring Guide

Anchoring Method or Material	Kind of Mulch to be Anchored	How to Apply
1. Peg and Twine	Hay or straw	After mulching, divide areas into blocks approximately 1 sq. yd. in size. Drive 4-6 pegs per block to within 2" to 3" of soil surface. Secure mulch to surface by stretching twine between pegs in criss-cross pattern on each block. Secure twine around each peg with 2 or more tight turns. Drive pegs flush with soil. Driving stakes into ground tightens the twine.
2. Mulch netting	Hay or straw	Staple the light-weight paper, jute, wood fiber, or plastic nettings to soil surface according to manufacturer's recommendations. Should be biodegradable. Most products are not suitable for foot traffic.
3. Wood cellulose fiber	Hay or straw	Apply with hydroseeder immediately after mulching. Use 500 lbs. wood fiber per acre. Some products contain an adhesive material ("tackifier"), possibly advantageous.
4. Mulch anchoring tool	Hay or straw	Apply mulch and pull a mulch anchoring tool (blunt, straight discs) over mulch as near to the contour as possible. Mulch material should be "tucked" into soil surface about 3".
5. Tackifier	Hay or straw	Mix and apply polymeric and gum tackifiers according to manufacturer's instructions. Avoid application during rain. A 24-hour curing period and a soil temperature higher than 45^0 Fahrenheit are required.

STANDARD AND SPECIFICATIONS FOR SILT FENCE



Definition

A temporary barrier of geotextile fabric installed on the contours across a slope used to intercept sediment laden runoff from small drainage areas of disturbed soil.

Purpose

The purpose of a silt fence is to reduce runoff velocity and effect deposition of transported sediment load. Limits imposed by ultraviolet stability of the fabric will dictate the maximum period the silt fence may be used (approximately one year).

Conditions Where Practice Applies

A silt fence may be used subject to the following conditions:

1. Maximum allowable slope lengths contributing runoff to a silt fence placed on a slope are:

Slope Steepness	Maximum Length (ft.)
2:1	25
3:1	50
4:1	75
5:1 or flatter	100

2. Maximum drainage area for overland flow to a silt fence shall not exceed ¼ acre per 100 feet of fence, with maximum ponding depth of 1.5 feet behind the fence; and

3. Erosion would occur in the form of sheet erosion; and

4. There is no concentration of water flowing to the barrier.

Design Criteria

Design computations are not required for installations of 1 month or less. Longer installation periods should be designed for expected runoff. All silt fences shall be placed as close to the areas as possible, but at least 10 feet from the toe of a slope to allow for maintenance and roll down. The area beyond the fence must be undisturbed or stabilized.

Sensitive areas to be protected by silt fence may need to be reinforced by using heavy wire fencing for added support to prevent collapse.

Where ends of filter cloth come together, they shall be overlapped, folded and stapled to prevent sediment bypass. A detail of the silt fence shall be shown on the plan. See Figure 5A.8 on page 5A.21 for details.

Criteria for Silt Fence Materials

1. Silt Fence Fabric: The fabric shall meet the following specifications unless otherwise approved by the appropriate erosion and sediment control plan approval authority. Such approval shall not constitute statewide acceptance.

Fabric Properties	Minimum Acceptable Value	Test Method
Grab Tensile Strength (lbs)	90	ASTM D1682
Elongation at Failure (%)	50	ASTM D1682

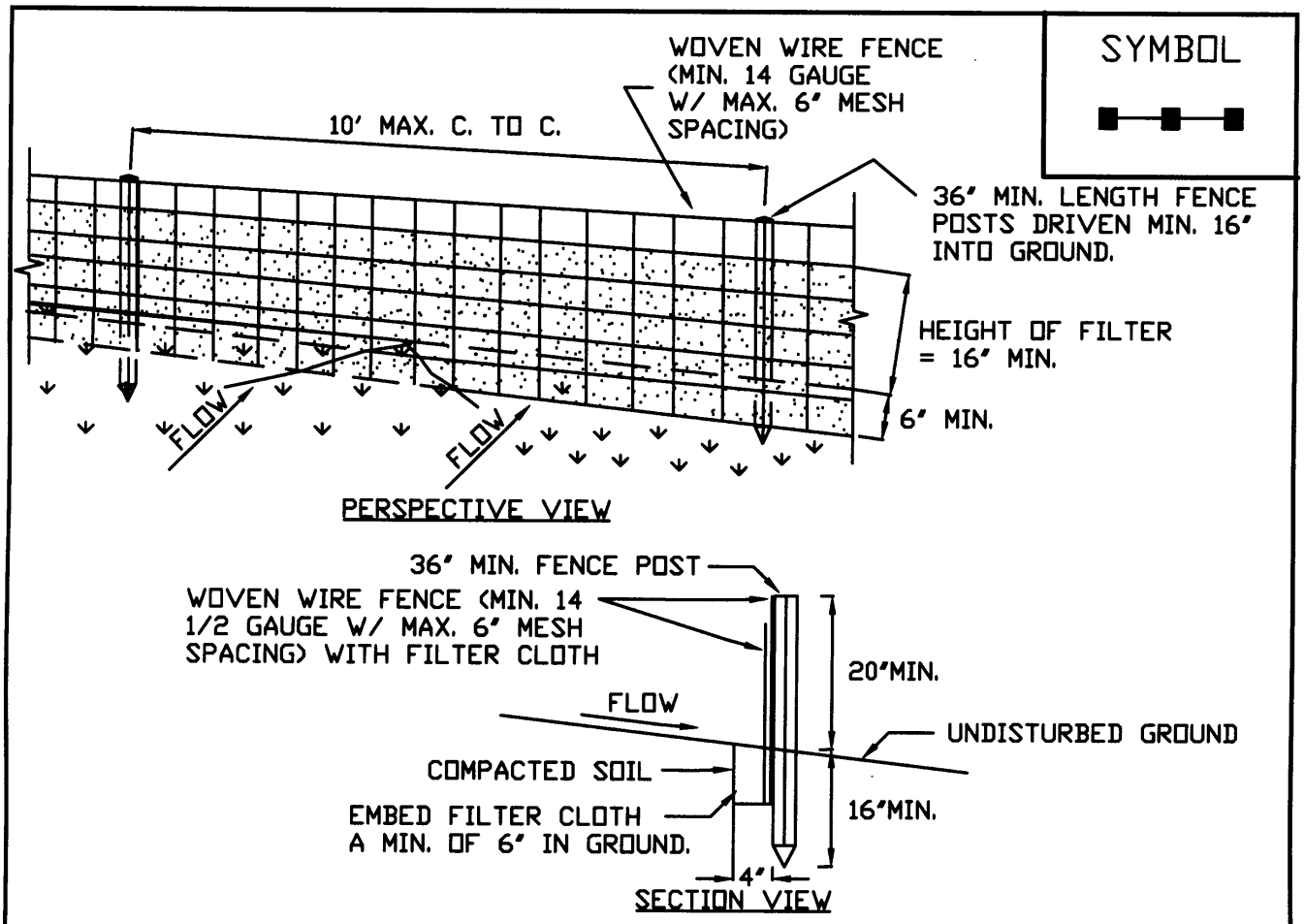
Mullen Burst Strength (PSI)	190	ASTM D3786
Puncture Strength (lbs)	40	ASTM D751 (modified)
Slurry Flow Rate (gal/min/sf)	0.3	
Equivalent Opening Size	40-80	US Std Sieve CW-02215
Ultraviolet Radiation Stability (%)	90	ASTM G-26

2. Fence Posts (for fabricated units): The length shall be a minimum of 36 inches long. Wood posts will be of sound quality hardwood with a minimum cross sectional area of 3.0 square inches. Steel posts will be standard T and U section weighing not less than 1.00 pound per linear foot.

3. Wire Fence (for fabricated units): Wire fencing shall be a minimum 14 gage with a maximum 6 in. mesh opening, or as approved.

4. Prefabricated Units: Envirofence, Geofab, or approved equal, may be used in lieu of the above method providing the unit is installed per details shown in Figure 5A.8.

Figure 5A.8
Silt Fence



CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUIVALENT.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	SILT FENCE

STANDARD AND SPECIFICATIONS
FOR
CHECK DAM



Definition

Small barriers or dams constructed of stone, bagged sand or gravel, or other durable material across a drainage way.

Purpose

To reduce erosion in a drainage channel by restricting the velocity of flow in the channel.

Condition Where Practice Applies

This practice is used as a temporary or emergency measure to limit erosion by reducing velocities in small open channels that are degrading or subject to erosion and where permanent stabilization is impractical due to short period of usefulness and time constraints of construction.

Design Criteria

Drainage Area: Maximum drainage area above the check dam shall not exceed two (2) acres.

Height: Not greater than 2 feet. Center shall be maintained 9 inches lower than abutments at natural ground elevation.

Side Slopes: Shall be 2:1 or flatter.

Spacing: The check dams shall be spaced as necessary in the channel so that the crest of the downstream dam is at the elevation of the toe of the upstream dam. This spacing is equal to the height of the check dam divided by the channel slope.

Therefore:

$$S = h/s$$

Where:

S = spacing interval (ft.)
h = height of check dam (ft.)
s = channel slope (ft./ft.)

Example:

For a channel with a 4% slope and 2 ft. high stone check dams, they are spaced as follows:

$$S = \frac{2 \text{ ft.}}{.04 \text{ ft/ft.}} = 50 \text{ ft.}$$

Stone size: Use a well graded stone matrix 2 to 9 inches in size (NYS – DOT Light Stone Fill meets these requirements).

The overflow of the check dams will be stabilized to resist erosion that might be caused by the check dam. See Figure 5A.9 on page 5A.24 for details.

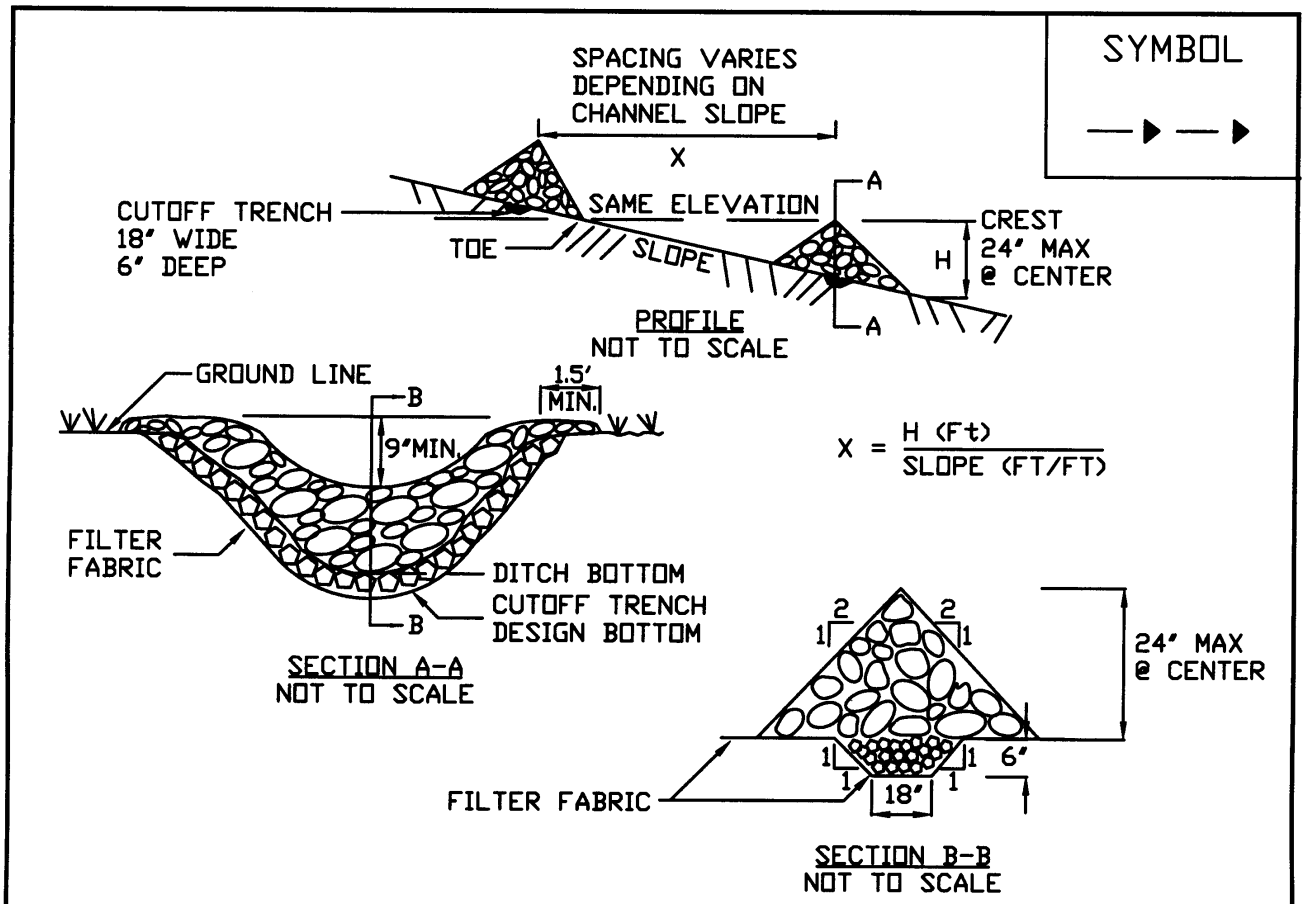
Check dams should be anchored in the channel by a cutoff trench 1.5 ft. wide and 0.5 ft. deep and lined with filter fabric to prevent soil migration.

Maintenance

The check dams should be inspected after each runoff event. Correct all damage immediately. If significant erosion has occurred between structures, a liner of stone or other suitable material should be installed in that portion of the channel.

Remove sediment accumulated behind the dam as needed to allow channel to drain through the stone check dam and prevent large flows from carrying sediment over the dam. Replace stones as needed to maintain the design cross section of the structures.

Figure 5A.9
Check Dam



CONSTRUCTION SPECIFICATIONS

1. STONE WILL BE PLACED ON A FILTER FABRIC FOUNDATION TO THE LINES, GRADES AND LOCATIONS SHOWN IN THE PLAN.
2. SET SPACING OF CHECK DAMS TO ASSUME THAT THE ELEVATIONS OF THE CREST OF THE DOWNSTREAM DAM IS AT THE SAME ELEVATION OF THE TOE OF THE UPSTREAM DAM.
3. EXTEND THE STONE A MINIMUM OF 1.5 FEET BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM.
4. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM SCOUR AND EROSION WITH STONE OR LINER AS APPROPRIATE.
5. ENSURE THAT CHANNEL APPURTENANCES SUCH AS CULVERT ENTRANCES BELOW CHECK DAMS ARE NOT SUBJECT TO DAMAGE OR BLOCKAGE FROM DISPLACED STONE.

MAXIMUM DRAINAGE AREA 2 ACRES.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	CHECK DAM

STANDARD AND SPECIFICATIONS FOR STORM DRAIN INLET PROTECTION



Definition

A temporary, somewhat permeable barrier, installed around inlets in the form of a fence, berm or excavation around an opening, trapping water and thereby reducing the sediment content of sediment laden water by settling.

Purpose

To prevent heavily sediment laden water from entering a storm drain system through inlets.

Conditions Where Practice Applies

This practice shall be used where the drainage area to an inlet is disturbed, it is not possible to temporarily divert the storm drain outfall into a trapping device, and watertight blocking of inlets is not advisable. **It is not to be used in place of sediment trapping devices.** This may be used in conjunction with storm drain diversion to help prevent siltation of pipes installed with low slope angle.

Types of Storm Drain Inlet Practices

There are four (4) specific types of storm drain inlet protection practices that vary according to their function, location, drainage area, and availability of materials:

I. Excavated Drop Inlet Protection
II. Fabric Drop Inlet Protection
III. Stone & Block Drop Inlet Protection
IV. Curb Drop Inlet Protection

Design Criteria

Drainage Area – The drainage area for storm drain inlets shall not exceed one acre. The crest elevations of these practices shall provide storage and minimize bypass flow.

Type I – Excavated Drop Inlet Protection

See details for Excavated Drop Inlet Protection in Figure 5A.11 on page 5A.29.

Limit the drainage area to the inlet device to 1 acre. Excavated side slopes shall be no steeper than 2:1. The minimum depth shall be 1 foot and the maximum depth 2 feet as measured from the crest of the inlet structure. Shape the excavated basin to fit conditions with the longest dimension oriented toward the longest inflow area to provide maximum trap efficiency. The capacity of the excavated basin should be established to contain 900 cubic feet per acre of disturbed area. Weep holes, protected by fabric and stone, should be provided for draining the temporary pool.

Inspect and clean the excavated basin after every storm. Sediment should be removed when 50 percent of the storage volume is achieved This material should be incorporated into the site in a stabilized manner.

Type II – Fabric Drop Inlet Protection

See Figure 5A.12 for details on Filter Fabric Drop Inlet Protection on page 5A.30.

Limit the drainage area to 1 acre per inlet device. Land area slope immediately surrounding this device should not exceed 1 percent. The maximum height of the fabric above the inlet crest shall not exceed 1.5 feet unless reinforced.

The top of the barrier should be maintained to allow overflow to drop into the drop inlet and not bypass the inlet to unprotected lower areas. Support stakes for fabric shall be a minimum of 3 feet long, spaced a maximum 3 feet apart. They should be driven close to the inlet so any overflow drops into the inlet and not on the unprotected soil. Improved performance and sediment storage volume can be obtained by excavating the area.

Inspect the fabric barrier after each rain event and make repairs as needed. Remove sediment from the pool area as

necessary with care not to undercut or damage the filter fabric. Upon stabilization of the drainage area, remove all materials and unstable sediment and dispose of properly. Bring the adjacent area of the drop inlet to grade, smooth and compact and stabilize in the appropriate manner to the site.

If straw bales are used in lieu of filter fabric, they should be placed tight with the cut edge adhering to the ground at least 3 inches below the elevation of the drop inlet. Two anchor stakes per bale shall be driven flush to bale surface. Straw bales will be replaced every 4 months until the area is stabilized.

Type III – Stone and Block Drop Inlet Protection

See Figure 5A.13 for details on Stone and Block Drop Inlet Protection on page 5A.31.

Limit the drainage area to 1 acre at the drop inlet. The stone barrier should have a minimum height of 1 foot and a maximum height of 2 feet. Do not use mortar. The height should be limited to prevent excess ponding and bypass flow.

Recess the first course of blocks at least 2 inches below the crest opening of the storm drain for lateral support. Subsequent courses can be supported laterally if needed by placing a 2x4 inch wood stud through the block openings perpendicular to the course. The bottom row should have a few blocks oriented so flow can drain through the block to dewater the basin area.

The stone should be placed just below the top of the blocks on slopes of 2:1 or flatter. Place hardware cloth of wire mesh with ½ inch openings over all block openings to hold stone in place.

As an optional design, the concrete blocks may be omitted and the entire structure constructed of stone, ringing the outlet ("doughnut"). The stone should be kept at a 3:1 slope toward the inlet to keep it from being washed into the inlet. A level area 1 foot wide and four inches below the crest will further prevent wash. Stone on the slope toward the inlet should be at least 3 inches in size for stability and 1 inch or smaller away from the inlet to control flow rate. The elevation of the top of the stone crest must be maintained 6 inches lower than the ground elevation down slope from the inlet to ensure that all storm flows pass over the stone into the storm drain and not past the structure. Temporary diking should be used as necessary to prevent bypass flow.

The barrier should be inspected after each rain event and repairs made where needed. Remove sediment as necessary to provide for accurate storage volume for subsequent rains. Upon stabilization of contributing drainage area, remove all materials and any unstable soil and dispose of properly.

Bring the disturbed area to proper grade, smooth, compact and stabilized in a manner appropriate to the site.

Type IV – Curb Drop Inlet Protection

See Figure 5A. 14 for details on Curb Drop Inlet Protection on page 5A.32.

The drainage area should be limited to 1 acre at the drop inlet. The wire mesh must be of sufficient strength to support the filter fabric and stone with the water fully impounded against it. Stone is to be 2 inches in size and clean. The filter fabric must be of a type approved for this purpose with an equivalent opening size (EOS) of 40-85. The protective structure will be constructed to extend beyond the inlet 2 feet in both directions. Assure that storm flow does not bypass the inlet by installing temporary dikes (such as sand bags) directing flow into the inlet. Make sure that the overflow weir is stable. Traffic safety shall be integrated with the use of this practice.

The structure should be inspected after every storm event. Any sediment should be removed and disposed of on the site. Any stone missing should be replaced. Check materials for proper anchorage and secure as necessary.

Figure 5A.11
Excavated Drop Inlet Protection

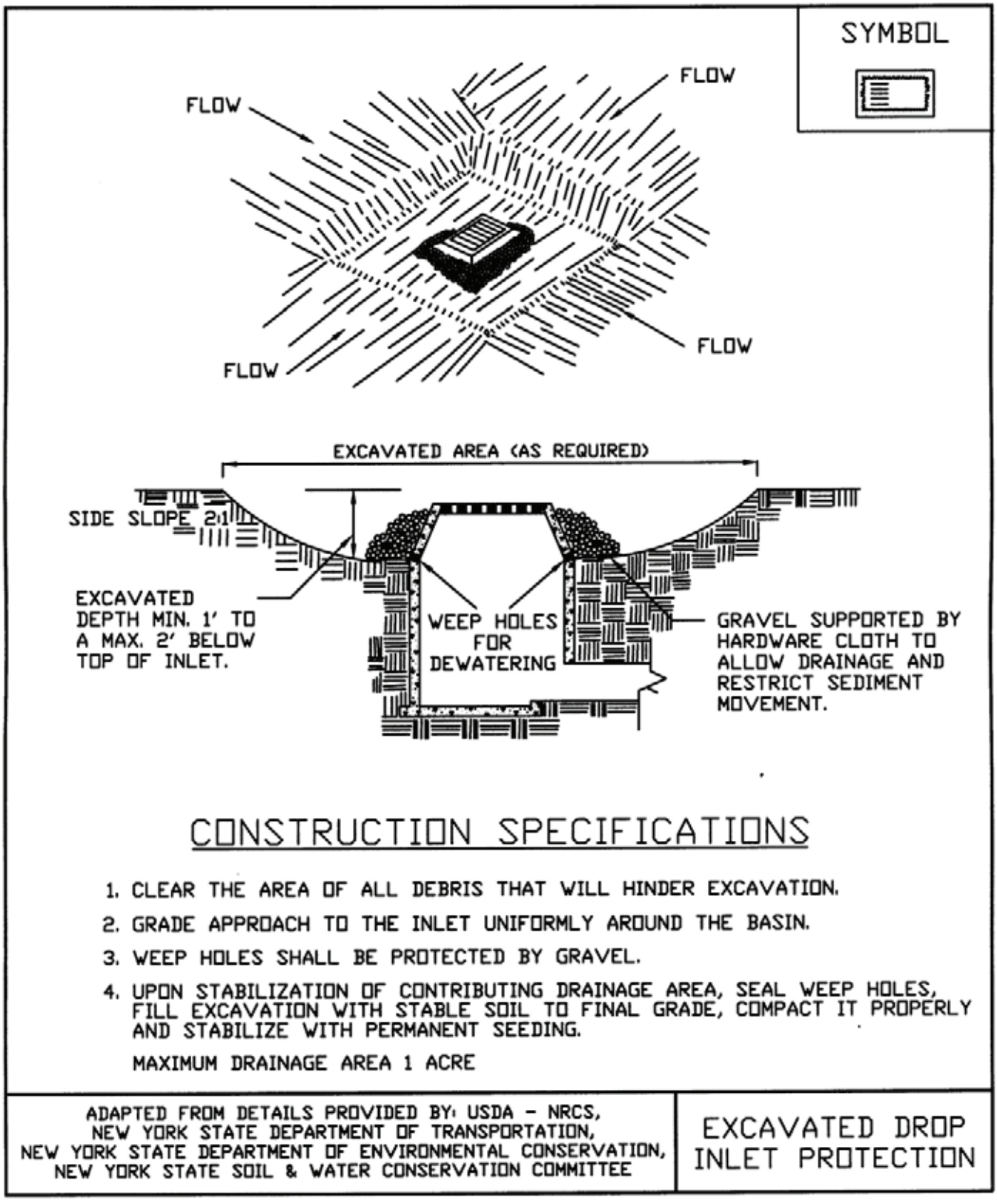
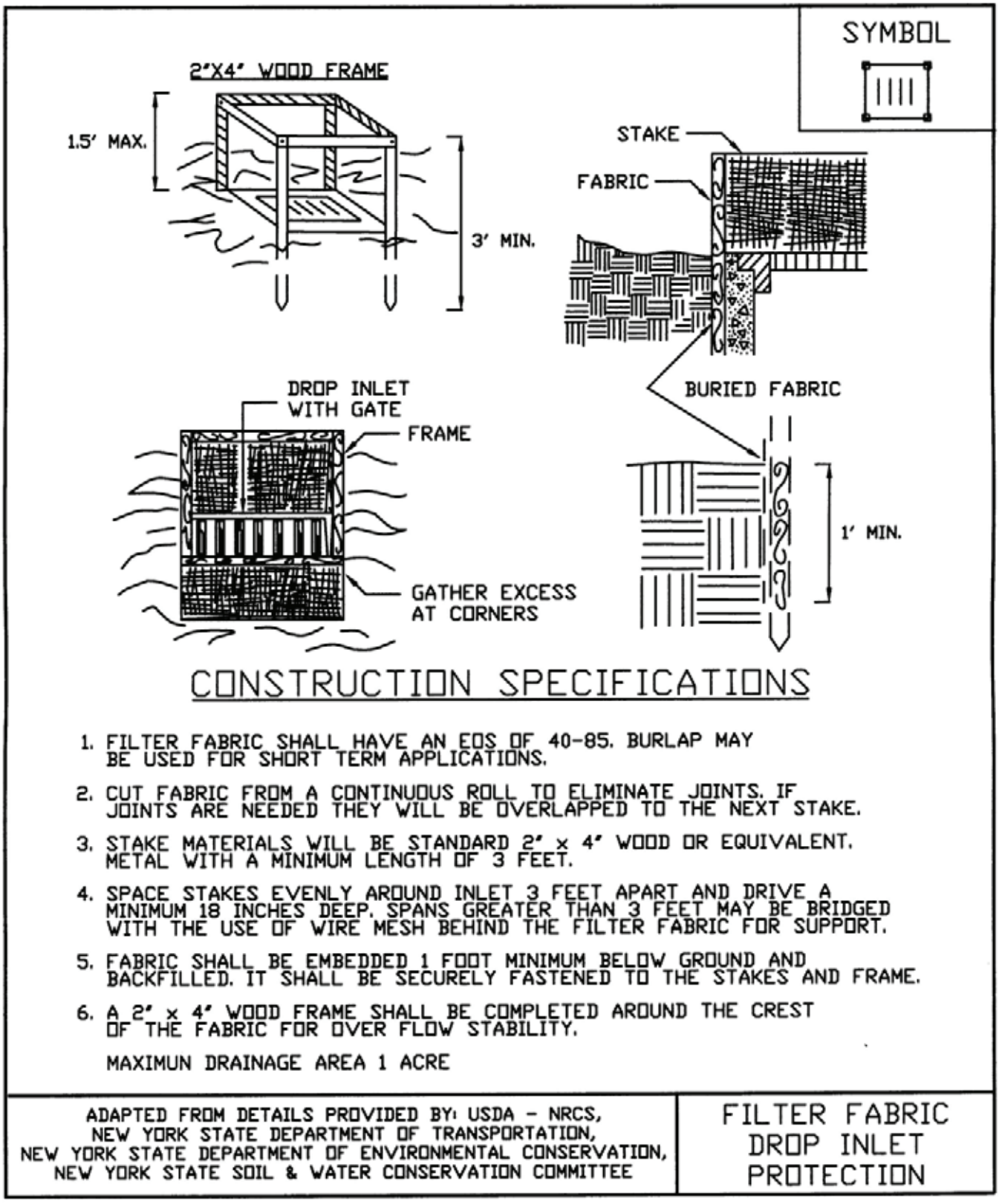


Figure 5A.12
Filter Fabric Drop Inlet Protection



CONSTRUCTION SPECIFICATIONS

1. FILTER FABRIC SHALL HAVE AN EOS OF 40-85. BURLAP MAY BE USED FOR SHORT TERM APPLICATIONS.
2. CUT FABRIC FROM A CONTINUOUS ROLL TO ELIMINATE JOINTS. IF JOINTS ARE NEEDED THEY WILL BE OVERLAPPED TO THE NEXT STAKE.
3. STAKE MATERIALS WILL BE STANDARD 2" x 4" WOOD OR EQUIVALENT. METAL WITH A MINIMUM LENGTH OF 3 FEET.
4. SPACE STAKES EVENLY AROUND INLET 3 FEET APART AND DRIVE A MINIMUM 18 INCHES DEEP. SPANS GREATER THAN 3 FEET MAY BE BRIDGED WITH THE USE OF WIRE MESH BEHIND THE FILTER FABRIC FOR SUPPORT.
5. FABRIC SHALL BE EMBEDDED 1 FOOT MINIMUM BELOW GROUND AND BACKFILLED. IT SHALL BE SECURELY FASTENED TO THE STAKES AND FRAME.
6. A 2" x 4" WOOD FRAME SHALL BE COMPLETED AROUND THE CREST OF THE FABRIC FOR OVER FLOW STABILITY.

MAXIMUN DRAINAGE AREA 1 ACRE

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

FILTER FABRIC
DROP INLET
PROTECTION

STANDARD AND SPECIFICATIONS FOR SEDIMENT TRAP



Definition

A temporary sediment control device formed by excavation and/or embankment to intercept sediment laden runoff and retain the sediment.

Purpose

The purpose of the structure is to intercept sediment-laden runoff and trap the sediment in order to protect drainage ways, properties, and rights-of-way below the sediment trap from sedimentation.

Conditions Where Practice Applies

A sediment trap is usually installed in a drainage way, at a storm drain inlet, or other points of collection from a disturbed area.

Sediment traps should be used to artificially break up the natural drainage area into smaller sections where a larger device (sediment basin) would be less effective.

Design Criteria

If any of the design criteria presented here cannot be met, see Standard and Specification for Sediment Basin on page 5A.49.

Drainage Area

The drainage area for sediment traps shall be in accordance with the specific type of sediment trap used (Type I through V).

Location

Sediment traps shall be located so that they can be installed prior to grading or filling in the drainage area they are to protect. Traps must not be located any closer than 20 feet from a proposed building foundation if the trap is to function during building construction. Locate traps to obtain maximum storage benefit from the terrain and for ease of cleanout and disposal of the trapped sediment.

Trap Size

The volume of a sediment trap as measured at the elevation of the crest of the outlet shall be at least 3,600 cubic feet per acre of drainage area. The volume of a constructed trap shall be calculated using standard mathematical procedures. The volume of a natural sediment trap may be approximated by the equation: Volume (cu.ft.) = 0.4 x surface area (sq.ft.) x maximum depth (ft.).

Trap Cleanout

Sediment shall be removed and the trap restored to the original dimensions when the sediment has accumulated to ½ of the design depth of the trap. Sediment removed from the trap shall be deposited in a protected area and in such a manner that it will not erode.

Embankment

All embankments for sediment traps shall not exceed five (5) feet in height as measured at the low point of the original ground along the centerline of the embankment. Embankments shall have a minimum four (4) foot wide top and side slopes of 2:1 or flatter. The embankment shall be compacted by traversing with equipment while it is being constructed. The embankment shall be stabilized with seed and mulch as soon as it is completed

The elevation of the top of any dike directing water to any sediment trap will equal or exceed the maximum height of the outlet structure along the entire length of the trap.

Excavation

All excavation operations shall be carried out in such a manner that erosion and water pollution shall be minimal. Excavated portions of sediment traps shall have 1:1 or flatter slopes.

Outlet

The outlet shall be designed, constructed, and maintained in such a manner that sediment does not leave the trap and that erosion at or below the outlet does not occur.

Sediment traps must outlet onto stabilized (preferable undisturbed) ground, into a watercourse, stabilized channel, or into a storm drain system. Distance between inlet and outlet should be maximized to the longest length practicable.

Trap Details Needed on Erosion and Sediment Control Plans

Each trap shall be delineated on the plans in such a manner that it will not be confused with any other features. Each trap on a plan shall indicate all the information necessary to properly construct and maintain the structure. If the drawings are such that this information cannot be delineated on the drawings, then a table shall be developed. If a table is developed, then each trap on a plan shall have a number and the numbers shall be consecutive.

The following information shall be shown for each trap in a summary table format on the plans.

1. Trap number
2. Type of trap
3. Drainage area
4. Storage required
5. Storage provided (if applicable)
6. Outlet length or pipe sizes
7. Storage depth below outlet or cleanout elevation
8. Embankment height and elevation (if applicable)

Type of Sediment Traps

There are five (5) specific types of sediment traps which vary according to their function, location, or drainage area.

I. Pipe Outlet Sediment Trap
II. Grass Outlet Sediment Trap
III. Catch Basin Sediment Trap
IV. Stone Outlet Sediment Trap
V. Riprap Outlet Sediment Trap

I. Pipe Outlet Sediment Trap

A Pipe Outlet Sediment Trap consists of a trap formed by embankment or excavation. The outlet for the trap is through a perforated riser and a pipe through the embankment. The outlet pipe and riser shall be made of steel, corrugated metal or other suitable material. The top of the embankment shall be at least 1 ½ feet above the crest of the riser. The top 2/3 of the riser shall be perforated with one (1) inch nominal diameter holes or slits spaced six (6) inches vertically and horizontally placed in the concave portion of the corrugated pipe.

No holes or slits will be allowed within six (6) inches of the top of the horizontal barrel. All pipe connections shall be watertight. The riser shall be wrapped with ½ to ¼ inch hardware cloth wire then wrapped with filter cloth with a sieve size between #40-80 and secured with strapping or connecting band at the top and bottom of the cloth. The cloth shall cover an area at least six (6) inches above the highest hole and six (6) inches below the lowest hole. The top of the riser pipe shall not be covered with filter cloth. The riser shall have a base with sufficient weight to prevent flotation of the riser. Two approved bases are:

1. A concrete base 12 in. thick with the riser embedded 9 in. into the concrete base, or

2. One quarter inch, minimum, thick steel plate attached to the riser by a continuous weld around the circumference of the riser to form a watertight connection. The plate shall have 2.5 feet of stone, gravel, or earth placed on it to prevent flotation. In either case, each side of the square base measurement shall be the riser diameter plus 24 inches.

Pipe outlet sediment traps shall be limited to a five (5) acre maximum drainage area. Pipe outlet sediment traps may be interchangeable in the field with stone outlet or riprap sediment traps provided that these sediment traps are constructed in accordance with the detail and specifications for that trap.

Select pipe diameter from the following table:

Minimum Sizes

Barrel Diameter[1] (in.)	Riser Diameter[1] (in.)	Maximum Drainage Area (ac.)
12	15	1
15	18	2
18	21	3
21	24	4
21	27	5

[1] Barrel diameter may be same size as riser diameter.

See details for Pipe Outlet Sediment Trap ST-I in Figure 5A.16 (1) and 5A.16 (2) on pages 5A.38 and 5A.39.

II. Grass Outlet Sediment Trap

A Grass Outlet Sediment Trap consists of a trap formed by excavating the earth to create a holding area. The trap has a discharge point over natural existing grass. The outlet crest width (feet) shall be equal to four (4) times the drainage area (acres) with a minimum width of four (4) feet. The outlet shall be free of any restrictions to flow. The outlet lip must remain undisturbed and level. The volume of this trap shall be computed at the elevation of the crest of the outlet. Grass outlet sediment traps shall be limited to a five (5) acre maximum drainage area.

See details for Grass Outlet Sediment Trap ST-II in Figure 5A.17 on page 5A.40.

III. Catch Basin Sediment Trap

A Catch Basin Sediment Trap consists of a basin formed by excavation on natural ground that discharges through an opening in a storm drain inlet structure. This opening can either be the inlet opening or a temporary opening made by omitting bricks or blocks in the inlet.

A yard drain inlet or an inlet in the median strip of a dual highway could use the inlet opening for the type outlet. The trap should be out of the roadway so as not to interfere with future compaction or construction. Placing the trap on the opposite side of the opening and diverting water from the roadway to the trap is one means of doing this. Catch basin sediment traps shall be limited to a three (3) acre maximum drainage area. The volume of this trap is measured at the elevation of the crest of the outlet (invert of the inlet opening).

See details for Catch Basin Sediment Trap ST-III in Figure 5A.18 on page 5A.41.

IV. Stone Outlet Sediment Trap

A Stone Outlet Sediment Trap consists of a trap formed by an embankment or excavation. The outlet of this trap is over a stone section placed on level ground. The minimum length (feet) of the outlet shall be equal to four (4) times the drainage area (acres).

Required storage shall be 3,600 cubic feet per acre of drainage area.

The outlet crest (top of stone in weir section) shall be level, at least one (1) foot below top of embankment and no more than one (1) foot above ground beneath the outlet. Stone used in the outlet shall be small riprap (4 in. x 8 in.). To provide more efficient trapping effect, a layer of filter cloth should be embedded one (1) foot back into the upstream face of the outlet stone or a one (1) foot thick layer of two (2) inch or finer aggregate shall be placed on the upstream face of the outlet.

Stone Outlet Sediment Traps may be interchangeable in the field with pipe or riprap outlet sediment traps provided they are constructed in accordance with the detail and specifications for those traps. Stone outlet sediment traps shall be limited to a five (5) acre maximum drainage area.

See details for Stone Outlet Sediment Trap ST-IV in Figure 5A.19 on page 5A.42.

V. Riprap Outlet Sediment Trap

A Riprap Outlet Sediment Trap consists of a trap formed by an excavation and embankment. The outlet for this trap shall be through a partially excavated channel lined with riprap. This outlet channel shall discharge onto a stabilized area or to a stable watercourse. The riprap outlet sediment trap may be used for drainage areas of up to a maximum of 15 acres.

Design Criteria for Riprap Outlet Sediment Trap

1. The total contributing drainage area (disturbed or undisturbed either on or off the developing property) shall not exceed 15 acres.
2. The storage needs for this trap shall be computed using 3600 cubic feet of required storage for each acre of drainage area. The storage volume provided can be figured by computing the volume of storage area available behind the outlet structure up to an elevation of one (1) foot below the level weir crest.
3. The maximum height of embankment shall not exceed five (5) feet.
4. The elevation of the top of any dike directing water to a riprap outlet sediment trap will equal or exceed the minimum elevation of the embankment along the entire length of this trap.

Riprap Outlet Sediment Trap ST-V
(for Stone Lined Channel)

Contributing Drainage Area (ac.)	Depth of Channel (a) (ft.)	Length of Weir (b) (ft.)
1	1.5	4.0
2	1.5	5.0
3	1.5	6.0
4	1.5	10.0
5	1.5	12.0
6	1.5	14.0
7	1.5	16.0
8	2.0	10.0
9	2.0	10.0
10	2.0	12.0
11	2.0	14.0
12	2.0	14.0
13	2.0	16.0
14	2.0	16.0
15	2.0	18.0

See details for Riprap Outlet Sediment Trap ST-V on Figures 5A.20(1) and 5A.20(2) on pages 5A.43 and 5A.44.

Optional Dewatering Methods

Optional dewatering devices may be designed for use with sediment traps. Included are two methods, which may be used. See Figure 5A.21 on page 5A.45 for details.

Figure 5A.16(1)
Pipe Outlet Sediment Trap: ST-I

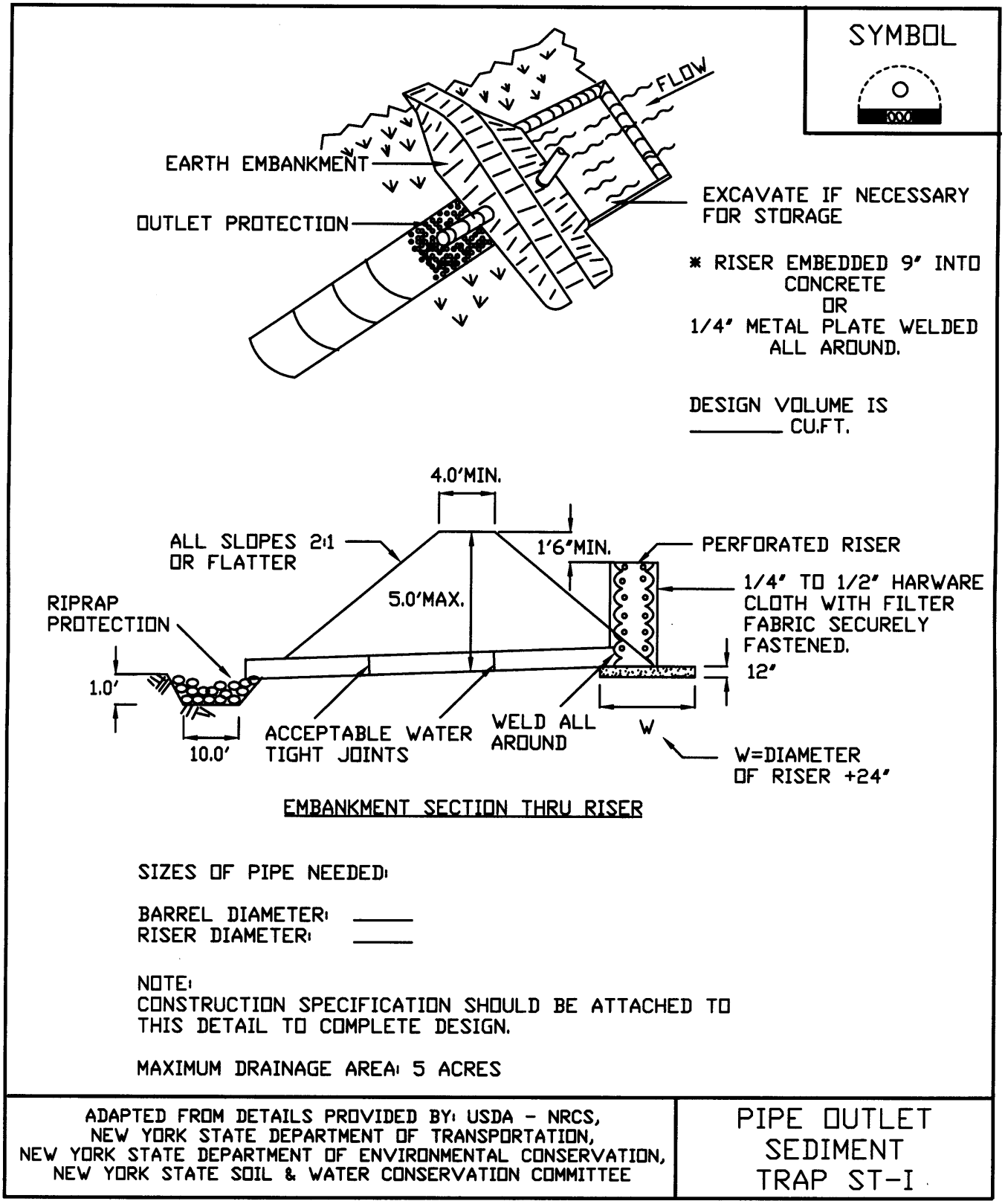


Figure 5A.16(2)
Pipe Outlet Sediment Trap: ST-I—Construction Specifications

SYMBOL



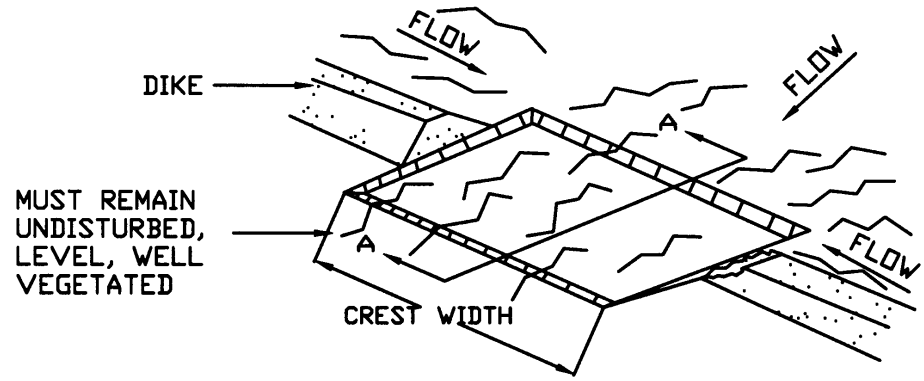
CONSTRUCTION SPECIFICATIONS

1. AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, ROCKS, ORGANIC MATERIAL, OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
3. VOLUME OF SEDIMENT STORAGE SHALL BE 3600 CUBIC FEET PER ACRE OF CONTRIBUTORY DRAINAGE.
4. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND STABILIZED.
5. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
6. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND SEDIMENT ARE CONTROLLED.
7. THE STRUCTURE SHALL BE REMOVED AND AREA STABILIZED WHEN THE DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
8. ALL FILL SLOPES SHALL BE 2:1 OR FLATTER; CUT SLOPES 1:1 OR FLATTER.
9. ALL PIPE CONNECTIONS SHALL BE WATERTIGHT.
10. THE TOP 2/3 OF THE RISER SHALL BE PERFORATED WITH ONE (1) INCH DIAMETER HOLES OR SLITS SPACED SIX (6) INCHES VERTICALLY AND HORIZONTALLY AND PLACED IN THE CONCAVE PORTION OF PIPE. NO HOLES WILL BE ALLOWED WITHIN SIX (6) INCHES OF THE HORIZONTAL BARREL.
11. THE RISER SHALL BE WRAPPED WITH 1/4 TO 1/2 INCH HARDWARE CLOTH WIRE THEN WRAPPED WITH FILTER CLOTH (HAVING AN EQUIVALENT SIEVE SIZE OF 40-80). THE FILTER CLOTH SHALL EXTEND SIX (6) INCHES ABOVE THE HIGHEST HOLE AND SIX (6) INCHES BELOW THE LOWEST HOLE. WHERE ENDS OF THE FILTER CLOTH COME TOGETHER, THEY SHALL BE OVER-LAPPED, FOLDED AND STAPLED TO PREVENT BYPASS.
12. STRAPS OR CONNECTING BANDS SHALL BE USED TO HOLD THE FILTER CLOTH AND WIRE FABRIC IN PLACE. THEY SHALL BE PLACED AT THE TOP AND BOTTOM OF THE CLOTH.
13. FILL MATERIAL AROUND THE PIPE SPILLWAY SHALL BE HAND COMPACTED IN FOUR (4) INCH LAYERS. A MINIMUM OF TWO (2) FEET OF HAND COMPACTED BACKFILL SHALL BE PLACED OVER THE PIPE SPILLWAY BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.
14. THE RISER SHALL BE ANCHORED WITH EITHER A CONCRETE BASE OR STEEL PLATE BASE TO PREVENT FLOTATION. FOR CONCRETE BASED THE DEPTH SHALL BE TWELVE (12) INCHES WITH THE RISER EMBEDDED NINE (9) INCHES. A 1/4 INCH MINIMUM THICKNESS STEEL PLATE SHALL BE ATTACHED TO THE RISER BY A CONTINUOUS WELD AROUND THE BOTTOM TO FORM A WATERTIGHT CONNECTION AND THEN PLACE TWO (2) FEET OF STONE, GRAVEL, OR TAMPED EARTH ON THE PLATE.

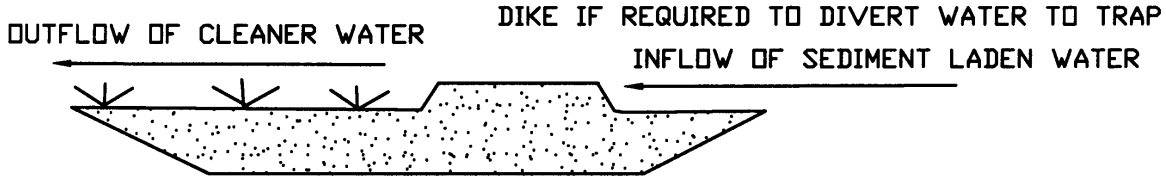
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NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

PIPE OUTLET
SEDIMENT TRAP
ST-I

Figure 5A.17
Grass Outlet Sediment Trap: ST-II



SYMBOL



CREST WIDTH (FT)=4xDRAINAGE AREA (ACRES)

SECTION A - A
EXCAVATED GRASS OUTLET SEDIMENT TRAP

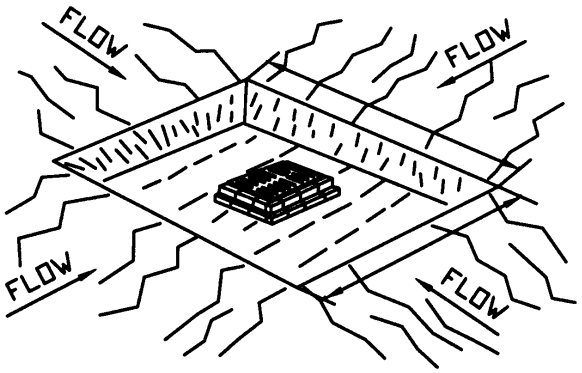
CONSTRUCTION SPECIFICATIONS

1. VOLUME OF SEDIMENT STORAGE SHALL BE 3600 CUBIC FEET PER ACRE OF CONTRIBUTORY DRAINAGE AREA.
2. MINIMUM CREST WIDTH SHALL BE 4 x DRAINAGE AREA
3. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND STABILIZED.
4. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
5. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND SEDIMENT ARE CONTROLLED.
6. THE SEDIMENT TRAP SHALL BE REMOVED AND AREA STABILIZED WHEN THE REMAINING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
7. ALL CUT SLOPES SHALL BE 1:1 OR FLATTER.

MAXIMUM DRAINAGE AREA: 5 ACRES

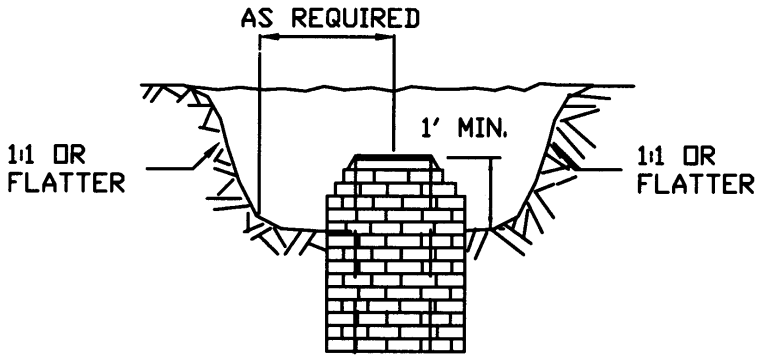
ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	GRASS OUTLET SEDIMENT TRAP ST-II

Figure 5A.18
Catch Basin Sediment Trap: ST-III



SYMBOL

YARD DRAIN



CROSS SECTION

CONSTRUCTION SPECIFICATIONS

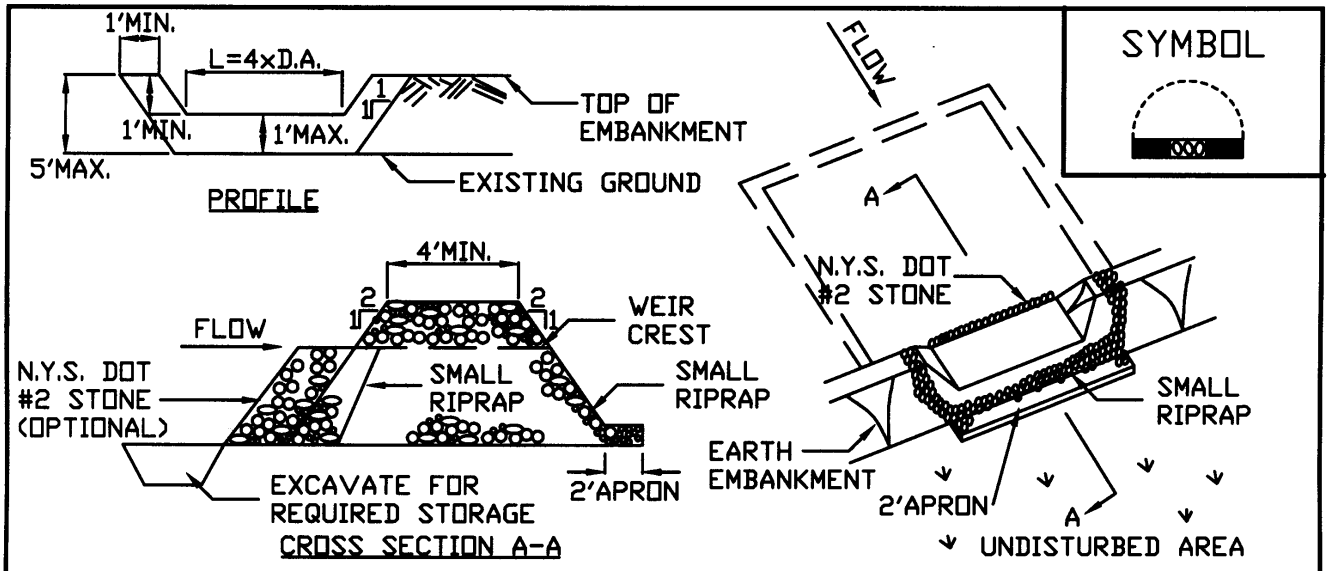
1. SEDIMENT SHALL BE REMOVED AND THE TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND STABILIZED.
2. THE VOLUME OF SEDIMENT STORAGE SHALL BE 3600 CUBIC FEET PER ACRE OF CONTRIBUTORY DRAINAGE.
3. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
4. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND SEDIMENT ARE CONTROLLED.
5. THE SEDIMENT TRAP SHALL BE REMOVED AND THE AREA STABILIZED WHEN THE CONSTRUCTED DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
6. ALL CUT SLOPES SHALL BE 1:1 OR FLATTER.

MAXIMUM DRAINAGE AREA: 3 ACRES

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NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

CATCH BASIN
SEDIMENT TRAP
ST-III

Figure 5A.19
Stone Outlet Sediment Trap: ST-IV



OPTION: A ONE FOOT LAYER OF N.Y.S. DOT #2 STONE MAY BE PLACED ON THE UPSTREAM SIDE OF THE RIPRAP INPLACE OF THE EMBEDDED FILTER CLOTH.

CONSTRUCTION SPECIFICATIONS

1. AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS AND OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, ROCKS, ORGANIC MATERIAL OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
3. ALL CUT AND FILL SLOPES SHALL BE 2:1 OR FLATTER.
4. THE STONE USED IN THE OUTLET SHALL BE SMALL RIPRAP 4"-8" ALONG WITH A 1' THICKNESS OF 2" AGGREGATE PLACED ON THE UP-GRADE SIDE ON THE SMALL RIPRAP OR EMBEDDED FILTER CLOTH IN THE RIPRAP.
5. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. IT SHALL BE PLACED ON SITE AND STABILIZED.
6. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
7. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND SEDIMENT ARE CONTROLLED.
8. THE STRUCTURE SHALL BE REMOVED AND THE AREA STABILIZED WHEN THE DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

MAXIMUM DRAINAGE AREA 5 ACRES

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STONE OUTLET SEDIMENT TRAP ST-IV

Figure 5A.20(1)
Riprap Outlet Sediment Trap: ST-V

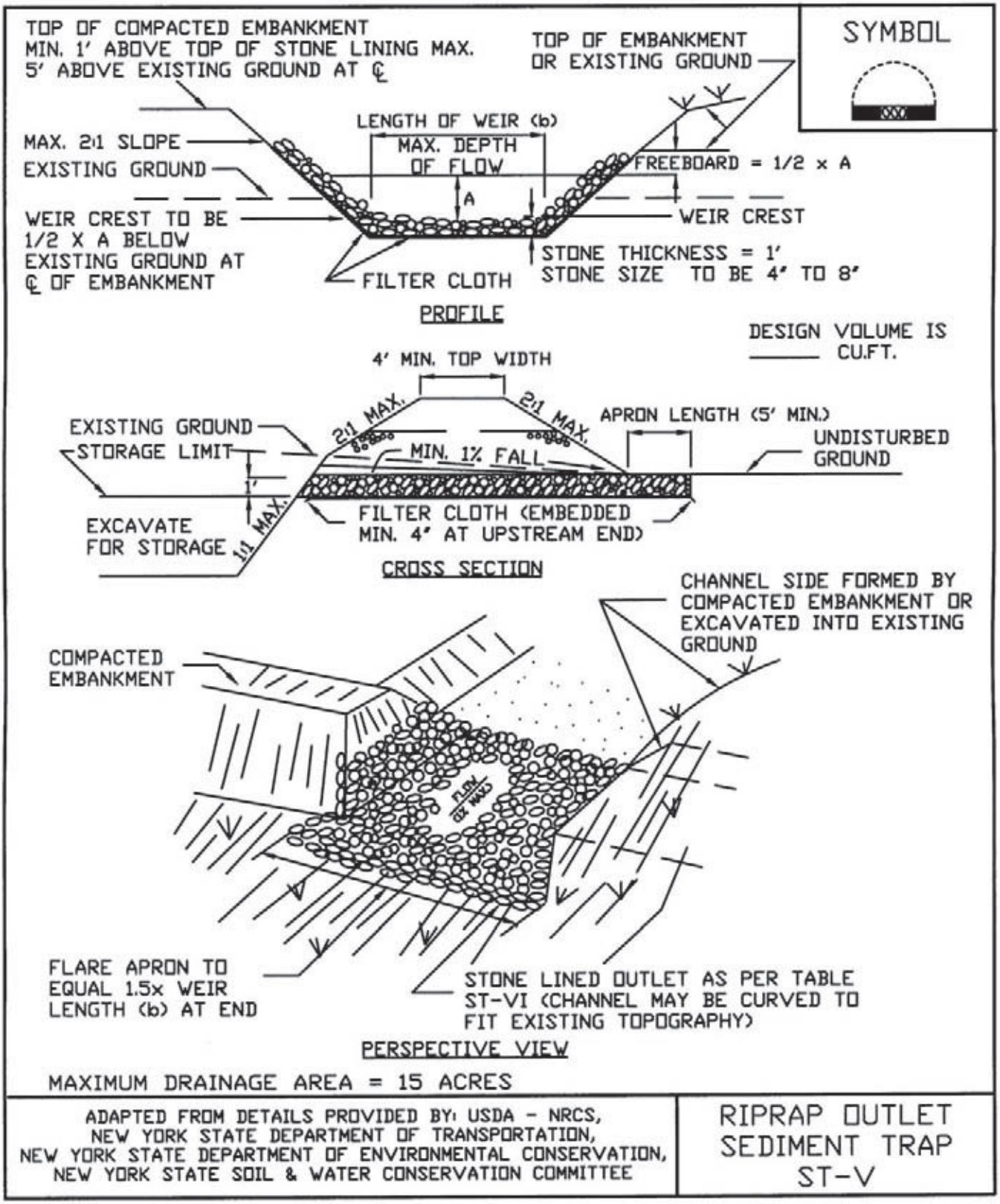


Figure 5A.202)
Riprap Outlet Sediment Trap: ST-V—Construction Specifications

SYMBOL



CONSTRUCTION SPECIFICATIONS

1. THE AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, ROCKS, ORGANIC MATERIAL OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED. MAXIMUM HEIGHT OF OF EMBANKMENT SHALL BE FIVE (5) FEET, MEASURED AT CENTERLINE OF EMBANKMENT.
3. ALL FILL SLOPES SHALL BE 2:1 OR FLATTER, CUT SLOPES 1:1 OR FLATTER.
4. ELEVATION OF THE TOP OF ANY DIKE DIRECTING WATER INTO TRAP MUST EQUAL OR EXCEED THE HEIGHT OF EMBANKMENT.
5. STORAGE AREA PROVIDED SHALL BE FIGURED BY COMPUTING THE VOLUME AVAILABLE BEHIND THE OUTLET CHANNEL UP TO AN ELEVATION OF ONE (1) FOOT BELOW THE LEVEL WEIR CREST.
6. FILTER CLOTH SHALL BE PLACED OVER THE BOTTOM AND SIDES OF THE OUTLET CHANNEL PRIOR TO PLACEMENT OF STONE. SECTIONS OF FABRIC MUST OVERLAP AT LEAST ONE (1) FOOT WITH SECTION NEAREST THE ENTRANCE PLACED ON TOP. FABRIC SHALL BE EMBEDDED AT LEAST SIX (6) INCHES INTO EXISTING GROUND AT ENTRANCE OUTLET CHANNEL.
7. STONE USED IN THE OUTLET CHANNEL SHALL BE FOUR (4) TO EIGHT (8) INCH RIPRAP. TO PROVIDE A FILTERING EFFECT, A LAYER OF FILTER CLOTH SHALL BE EMBEDDED ONE (1) FOOT WITH SECTION NEAREST ENTRANCE PLACED ON TOP. FABRIC SHALL BE EMBEDDED AT LEAST SIX (6) INCHES INTO EXISTING GROUND AT ENTRANCE OF OUTLET CHANNEL.
8. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.
9. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRED AS NEEDED.
10. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND WATER POLLUTION ARE MINIMIZED.
11. THE STRUCTURE SHALL BE REMOVED AND THE AREA STABILIZED WHEN DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
12. DRAINAGE AREA FOR THIS PRACTICE IS LIMITED TO 15 ACRES OR LESS.

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NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

RIPRAP OUTLET
SEDIMENT TRAP
ST-V

STANDARD AND SPECIFICATIONS FOR STABILIZED CONSTRUCTION ENTRANCE



Definition

A stabilized pad of aggregate underlain with geotextile located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk, or parking area.

Purpose

The purpose of stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights-of-way or streets.

Conditions Where Practice Applies

A stabilized construction entrance shall be used at all points of construction ingress and egress.

Design Criteria

See Figure 5A.35 on page 5A.76 for details.

Aggregate Size: Use a matrix of 1-4 inch stone, or reclaimed or recycled concrete equivalent.

Thickness: Not less than six (6) inches.

Width: 12-foot minimum but not less than the full width of points where ingress or egress occurs. 24-foot minimum if there is only one access to the site.

Length: As required, but not less than 50 feet (except on a single residence lot where a 30 foot minimum would apply).

Geotextile: To be placed over the entire area to be covered with aggregate. Filter cloth will not be required on a single-family residence lot. Piping of surface water under entrance shall be provided as required. If piping is impossible, a mountable berm with 5:1 slopes will be permitted.

Criteria for Geotextile

The geotextile shall be woven or nonwoven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The fabric shall be inert to commonly encountered chemicals, hydro-carbons, mildew, rot resistant, and conform to the fabric properties as shown:

Fabric Properties[3]	Light Duty[1] Roads Grade Subgrade	Heavy Duty[2] Haul Roads Rough Graded	Test Method
Grab Tensile Strength (lbs)	200	220	ASTM D1682
Elongation at Failure (%)	50	60	ASTM D1682
Mullen Brust Strength (lbs)	190	430	ASTM D3786
Puncture Strength (lbs)	40	125	ASTM D751 modified
Equivalent Opening Size	40-80	40-80	US Std Sieve CW-02215
Aggregate Depth	6	10	--

[1]Light Duty Road: Area sites that have been graded to subgrade and where most travel would be single axle vehicles and an occasional multi-axle truck. Acceptable materials are Trevira Spunbond 1115, Mirafi 100X, Typar 3401, or equivalent.

[2]Heavy Duty Road: Area sites with only rough grading, and where most travel would be multi-axle vehicles. Acceptable materials are Trevira Spunbond 1135, Mirafi 600X, or equivalent.

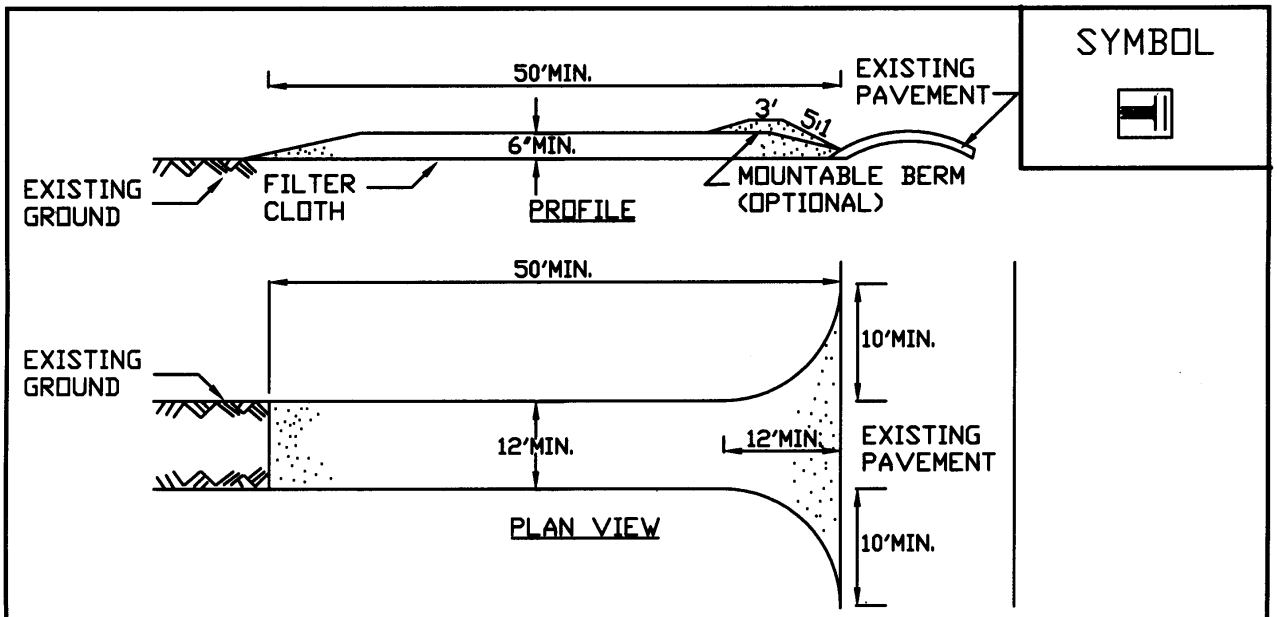
[3]Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

Maintenance

The entrance shall be maintained in a condition which will prevent tracking of sediment onto public rights-of-way or streets. This may require periodic top dressing with additional aggregate. All sediment spilled, dropped, or washed onto public rights-of-way must be removed immediately.

When necessary, wheels must be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with aggregate, which drains into an approved sediment-trapping device. All sediment shall be prevented from entering storm drains, ditches, or watercourses.

Figure 5A.35
Stabilized Construction Entrance



CONSTRUCTION SPECIFICATIONS

1. STONE SIZE - USE 1-4 INCH STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN SIX (6) INCHES.
4. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACTED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STABILIZED CONSTRUCTION ENTRANCE

STANDARD AND SPECIFICATIONS FOR GRASSED WATERWAY



Definition

A natural or man-made channel of parabolic or trapezoidal cross-section that is below adjacent ground level and is stabilized by suitable vegetation. The flow channel is normally wide and shallow and conveys the runoff down the slope.

Purpose

The purpose of a grassed waterway is to convey runoff without causing damage by erosion.

Conditions Where Practice Applies

Grass waterways are used where added vegetative protection is needed to control erosion resulting from concentrated runoff.

Design Criteria

Capacity

The minimum capacity shall be that required to confine the peak rate of runoff expected from a 10-year frequency rainfall event or a higher frequency corresponding to the hazard involved. This requirement for confinement may be waived on slopes of less than one (1) percent where out-of-bank flow will not cause erosion or property damage.

Peak rates of runoff values used in determining the capacity requirements shall be computed by TR-55, Urban Hydrology for Small Watersheds, or other appropriate methods.
Where there is base flow, it shall be handled by a stone center, subsurface drain, or other suitable means since sustained wetness usually prevents adequate vegetative cover. The cross-sectional area of the stone center or subsurface drain size to be provided shall be determined by using a flow rate of 0.1 cfs/acre or by actual measurement of the maximum base flow.

Velocity

Please see Table 5B.1, Diversion Maximum Permissible Design Velocities, for seed, soil, and velocity variables.

Cross Section

The design water surface elevation of a grassed waterway receiving water from diversions or other tributary channels shall be equal to or less than the design water surface elevation in the diversion or other tributary channels.

The top width of parabolic waterways shall not exceed 30 feet and the bottom width of trapezoidal waterways shall not exceed 15 feet unless multiple or divided waterways, stone center, or other means are provided to control meandering of low flows.

Structural Measures

In cases where grade or erosion problems exist, special control measures may be needed such as lined waterways (5B.17), or grade stabilization measures (5B.31). Where needed, these measures will be supported by adequate design computations. For typical cross sections of waterways with riprap sections or stone centers, refer to Figure 5B.8 on page 5B.13.

The design procedures for parabolic and trapezoidal channels are available in the NRCS Engineering Field Handbook; Figure 5B.9 on page 5B.14 also provides a design chart for parabolic waterway.

Outlets

Each waterway shall have a stable outlet. The outlet may be another waterway, a stabilized open channel, grade stabilization structure, etc. In all cases, the outlet must discharge in such a manner as not to cause erosion. Outlets shall be constructed and stabilized prior to the operation of the waterway.

Stabilization

Waterways shall be stabilized in accordance with the appropriate vegetative stabilization standard and specifications, and will be dependent on such factors as slope, soil class, etc.

Construction Specifications

See Figure 5B.10 on page 5B.15 for details.

STANDARD AND SPECIFICATIONS FOR ROCK OUTLET PROTECTION



Definition

A section of rock protection placed at the outlet end of the culverts, conduits, or channels.

Purpose

The purpose of the rock outlet protection is to reduce the depth, velocity, and energy of water, such that the flow will not erode the receiving downstream reach.

Scope

This standard applies to the planning, design, and construction of rock riprap and gabions for protection of downstream areas. It does not apply to rock lining of channels or streams.

Conditions Where Practice Applies

This practice applies where discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This applies to:

1. Culvert outlets of all types.

2. Pipe conduits from all sediment basins, dry storm water ponds, and permanent type ponds.

3. New channels constructed as outlets for culverts and conduits.

Design Criteria

The design of rock outlet protection depends entirely on the location. Pipe outlet at the top of cuts or on slopes steeper than 10 percent, cannot be protected by rock aprons or riprap sections due to re-concentration of flows and high velocities encountered after the flow leaves the apron.

Many counties and state agencies have regulations and design procedures already established for dimensions, type and size of materials, and locations where outlet protection is required. Where these requirements exist, they shall be followed.

Tailwater Depth

The depth of tailwater immediately below the pipe outlet must be determined for the design capacity of the pipe. If the tailwater depth is less than half the diameter of the outlet pipe, and the receiving stream is wide enough to accept divergence of the flow, it shall be classified as a Minimum Tailwater Condition; see Figure 5B.12 on page 5B.25 as an example. If the tailwater depth is greater than half the pipe diameter and the receiving stream will continue to confine the flow, it shall be classified as a Maximum Tailwater Condition; see Figure 5B.13 on page 5B.26 as an example. Pipes which outlet onto flat areas with no defined channel may be assumed to have a Minimum Tailwater Condition; see Figure 5B.12 on page 5B.25 as an example.

Apron Size

The apron length and width shall be determined from the curves according to the tailwater conditions:

Minimum Tailwater – Use Figure 5B.12 on page 5B.25
Maximum Tailwater – Use Figure 5B.13 on page 5B.26

If the pipe discharges directly into a well defined channel, the apron shall extend across the channel bottom and up the channel banks to an elevation one foot above the maximum tailwater depth or to the top of the bank, whichever is less.

The upstream end of the apron, adjacent to the pipe, shall have a width two (2) times the diameter of the outlet pipe, or conform to pipe end section if used.

Bottom Grade

The outlet protection apron shall be constructed with no slope along its length. There shall be no overfall at the end of the apron. The elevation of the downstream end of the apron shall be equal to the elevation of the receiving channel or adjacent ground.

Alignment

The outlet protection apron shall be located so that there are no bends in the horizontal alignment.

Materials

The outlet protection may be done using rock riprap, grouted riprap, or gabions.

Riprap shall be composed of a well-graded mixture of stone size so that 50 percent of the pieces, by weight, shall be larger than the d_{50} size determined by using the charts. A well-graded mixture, as used herein, is defined as a mixture composed primarily of larger stone sizes, but with a sufficient mixture of other sizes to fill the smaller voids between the stones. The diameter of the largest stone size in such a mixture shall be 1.5 times the d_{50} size.

Thickness

The minimum thickness of the riprap layer shall be 1.5 times the maximum stone diameter for d_{50} of 15 inches or less; and 1.2 times the maximum stone size for d_{50} greater than 15 inches. The following chart lists some examples:

D_{50} (inches)	d_{max} (inches)	Minimum Blanket Thickness (inches)
4	6	9
6	9	14
9	14	20
12	18	27
15	22	32
18	27	32
21	32	38
24	36	43

Stone Quality

Stone for riprap shall consist of field stone or rough unhewn quarry stone. The stone shall be hard and angular and of a quality that will not disintegrate on exposure to water or weathering. The specific gravity of the individual stones shall be at least 2.5.

Recycled concrete equivalent may be used provided it has a density of at least 150 pounds per cubic foot, and does not have any exposed steel or reinforcing bars.

Filter

A filter is a layer of material placed between the riprap and the underlying soil surface to prevent soil movement into and through the riprap. Riprap shall have a filter placed under it in all cases.

A filter can be of two general forms: a gravel layer or a plastic filter cloth. The plastic filter cloth can be woven or non-woven monofilament yarns, and shall meet these base requirements: thickness 20-60 mils, grab strength 90-120 lbs; and shall conform to ASTM D-1777 and ASTM D-1682.

Gravel filter blanket, when used, shall be designed by comparing particle sizes of the overlying material and the base material. Design criteria are available in Standard and Specification for Riprap Slope Protection on page 5B.57.

Gabions

Gabions shall be made of hexagonal triple twist mesh with heavily galvanized steel wire. The maximum linear dimension of the mesh opening shall not exceed 4 ½ inches and the area of the mesh opening shall not exceed 10 square inches.

Gabions shall be fabricated in such a manner that the sides, ends, and lid can be assembled at the construction site into a rectangular basket of the specified sizes. Gabions shall be of single unit construction and shall be installed according to manufacturers recommendations.

The area on which the gabion is to be installed shall be graded as shown on the drawings. Foundation conditions shall be the same as for placing rock riprap, and filter cloth shall be placed under all gabions. Where necessary, key, or tie, the structure into the bank to prevent undermining of the main gabion structure.

Maintenance

Once a riprap outlet has been installed, the maintenance needs are very low. It should be inspected after high flows for evidence of scour beneath the riprap or for dislodged stones. Repairs should be made immediately.

Design Procedure

1. Investigate the downstream channel to assure that nonerosive velocities can be maintained.

2. Determine the tailwater condition at the outlet to establish which curve to use.
3. Enter the appropriate chart with the design discharge to

determine the riprap size and apron length required. It is noted that references to pipe diameters in the charts are based on full flow. For other than full pipe flow, the parameters of depth of flow and velocity must be used to adjust the design discharges.

4. Calculate apron width at the downstream end if a flare section is to be employed.

Examples

Example 1: Pipe Flow (full) with discharge to unconfined section.

Given: A circular conduit flowing full.

Q = 280 cfs, diam. = 66 in., tailwater (surface) is 2 ft. above pipe invert (minimum tailwater condition).

Find: Read d_{50} = 1.2 and apron length (L_a) = 38 ft.

Apron width = diam. + L_a = 5.5 + 38 = 43.5 ft.

Use: d_{50} = 15", d_{max} = 22", blanket thickness = 32"

Example 2: Box Flow (partial) with high tailwater

Given: A box conduit discharging under partial flow conditions. A concrete box 5.5 ft. x 10 ft. flowing 5.0 ft. deep,

Q = 600 cfs and tailwater surface is 5 ft. above invert (max. tailwater condition).

Since this is not full pipe and does not directly fit the nomograph assumptions of Figure 7B.13 substitute depth as the diameter, to find a discharge equal to full pipe flow for that diameter, in this case 60 inches.

Since, $Q = AV$ and $A = \frac{\pi D^2}{4}$

First, compute velocity:

V = (Q/A) = (600/(5) (10)) = 12 fps

Then substituting:

$$Q = \frac{\pi D^2}{4} \times V = \frac{3.14\ (5\ ft)^2}{4} \times 12\ fps = 236\ cfs$$

At the intersection of the curve d = 60 in. and Q = 236 cfs, read d_{50} = 0.4 ft.

Then reading the d = 60 in. curve, read apron length (L_a) = 40 ft.

Apron width, W = conduit width + (6.4)(L_a) = 10 + (0.4) (40) = 26 ft.

Example 3: Open Channel Flow with Discharge to Unconfined Section

Given: A trapezoidal concrete channel 5 ft. wide with 2:1 side slopes is flowing 2 ft. deep, Q = 180 cfs (velocity = 10 fps) and the tailwater surface downstream is 0.8 ft. (minimum tailwater condition).

Find: Using similar principles as Example 2, compute equivalent discharge for a 2 foot, using depth as a diameter, circular pipe flowing full at 10 feet per second.

Velocity:

$$Q = \frac{\pi\ (2ft)^2}{4} \times 10\ fps = 31.4\ cfs$$

At intersection of the curve, d = 24 in. and Q = 32 cfs, read d_{50} = 0.6 ft.

Then reading the d = 24 in. curve, read apron length (L_a) = 20 ft.

Apron width, W = bottom width of channel + L_a = 5 + 20 = 25 ft.

Example 4: Pipe flow (partial) with discharge to a confined section

Given: A 48 in. pipe is discharging with a depth of 3 ft. Q = 100 cfs, and discharge velocity of 10 fps (established from partial flow analysis) to a confined trapezoidal channel with a 2 ft. bottom, 2:1 side slopes, n = .04, and grade of 0.6%.

Calculation of the downstream channel (by Manning's Equation) indicates a normal depth of 3.1 ft. and normal velocity of 3.9 fps.

Since the receiving channel is confined, the maximum tailwater condition controls.

Find: discharge using previous principles:

$$Q = \frac{\pi\ (3ft)^2}{4} \times 10\ fps = 71\ cfs$$

At the intersection of d = 36 in. and Q = 71 cfs, read d_{50} = 0.3 ft.

Reading the d = 36" curve, read apron length (L_a) = 30 ft.

Since the maximum flow depth in this reach is 3.1 ft., that is the minimum depth of riprap to be maintained for the entire length.

Construction Specifications

1. The subgrade for the filter, riprap, or gabion shall be prepared to the required lines and grades. Any fill required in the subgrade shall be compacted to a density of approximately that of the surrounding undisturbed material.

2. The rock or gravel shall conform to the specified grading limits when installed respectively in the riprap or filter.

3. Filter cloth shall be protected from punching, cutting, or tearing. Any damage other than an occasional small hole shall be repaired by placing another piece of cloth over the damaged part or by completely replacing the cloth. All overlaps, whether for repairs or for joining two pieces of cloth shall be a minimum of one foot.

4. Stone for the riprap or gabion outlets may be placed by equipment. Both shall each be constructed to the full course thickness in one operation and in such a manner as to avoid displacement of underlying materials. The stone for riprap or gabion outlets shall be delivered and placed in a manner that will ensure that it is reasonably homogenous with the smaller stones and spalls filling the voids between the larger stones. Riprap shall be placed in a manner to prevent damage to the filter blanket or filter cloth. Hand placement will be required to the extent necessary to prevent damage to the permanent works.

APPENDIX J

SITE INSPECTION FORMS

II. CONSTRUCTION DURATION INSPECTIONS

a. Directions:
Inspection Forms will be filled out during the entire construction phase of the project.
Required Elements:

(1) On a site map, indicate the extent of all disturbed site areas and drainage pathways. Indicate site areas that are expected to undergo initial disturbance or significant site work within the next 14-day period;

(2) Indicate on a site map all areas of the site that have undergone temporary or permanent stabilization;

(3) Indicate all disturbed site areas that have not undergone active site work during the previous 14-day period;

(4) Inspect all sediment control practices and record the approximate degree of sediment accumulation as a percentage of sediment storage volume (for example, 10 percent, 20 percent, 50 percent);

(5) Inspect all erosion and sediment control practices and record all maintenance requirements such as verifying the integrity of barrier or diversion systems (earthen berms or silt fencing) and containment systems (sediment basins and sediment traps). Identify any evidence of rill or gully erosion occurring on slopes and any loss of stabilizing vegetation or seeding/mulching. Document any excessive deposition of sediment or ponding water along barrier or diversion systems. Record the depth of sediment within containment structures, any erosion near outlet and overflow structures, and verify the ability of rock filters around perforated riser pipes to pass water; and

(6) Immediately report to the Operator any deficiencies that are identified with the implementation of the SWPPP.

SITE PLAN/SKETCH

_____ _____

Inspector (print name) **Date of Inspection**

_____ _____

Qualified Professional (print name) **Qualified Professional Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

Maintaining Water Quality

Yes No NA
[ ] [ ] [ ] Is there an increase in turbidity causing a substantial visible contrast to natural conditions?
[ ] [ ] [ ] Is there residue from oil and floating substances, visible oil film, or globules or grease?
[ ] [ ] [ ] All disturbance is within the limits of the approved plans.
[ ] [ ] [ ] Have receiving lake/bay, stream, and/or wetland been impacted by silt from project?

Housekeeping

1. General Site Conditions
Yes No NA
[ ] [ ] [ ] Is construction site litter and debris appropriately managed?
[ ] [ ] [ ] Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?
[ ] [ ] [ ] Is construction impacting the adjacent property?
[ ] [ ] [ ] Is dust adequately controlled?

2. Temporary Stream Crossing
Yes No NA
[ ] [ ] [ ] Maximum diameter pipes necessary to span creek without dredging are installed.
[ ] [ ] [ ] Installed non-woven geotextile fabric beneath approaches.
[ ] [ ] [ ] Is fill composed of aggregate (no earth or soil)?
[ ] [ ] [ ] Rock on approaches is clean enough to remove mud from vehicles & prevent sediment from entering stream during high flow.

Runoff Control Practices

1. Excavation Dewatering
Yes No NA
[ ] [ ] [ ] Upstream and downstream berms (sandbags, inflatable dams, etc.) are installed per plan.
[ ] [ ] [ ] Clean water from upstream pool is being pumped to the downstream pool.
[ ] [ ] [ ] Sediment laden water from work area is being discharged to a silt-trapping device.
[ ] [ ] [ ] Constructed upstream berm with one-foot minimum freeboard.

2. Level Spreader
Yes No NA
[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Constructed on undisturbed soil, not on fill, receiving only clear, non-sediment laden flow.
[ ] [ ] [ ] Flow sheets out of level spreader without erosion on downstream edge.

3. Interceptor Dikes and Swales
Yes No NA
[ ] [ ] [ ] Installed per plan with minimum side slopes 2H:1V or flatter.
[ ] [ ] [ ] Stabilized by geotextile fabric, seed, or mulch with no erosion occurring.
[ ] [ ] [ ] Sediment-laden runoff directed to sediment trapping structure

Runoff Control Practices (continued)

4. Stone Check Dam
Yes No NA
[ ] [ ] [ ] Is channel stable? (flow is not eroding soil underneath or around the structure).
[ ] [ ] [ ] Check is in good condition (rocks in place and no permanent pools behind the structure).
[ ] [ ] [ ] Has accumulated sediment been removed?.

5. Rock Outlet Protection
Yes No NA
[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Installed concurrently with pipe installation.

Soil Stabilization

1. Topsoil and Spoil Stockpiles
Yes No NA
[ ] [ ] [ ] Stockpiles are stabilized with vegetation and/or mulch.
[ ] [ ] [ ] Sediment control is installed at the toe of the slope.

2. Revegetation
Yes No NA
[ ] [ ] [ ] Temporary seedings and mulch have been applied to idle areas.
[ ] [ ] [ ] 4 inches minimum of topsoil has been applied under permanent seedings

Sediment Control Practices

1. Stabilized Construction Entrance
Yes No NA
[ ] [ ] [ ] Stone is clean enough to effectively remove mud from vehicles.
[ ] [ ] [ ] Installed per standards and specifications?
[ ] [ ] [ ] Does all traffic use the stabilized entrance to enter and leave site?
[ ] [ ] [ ] Is adequate drainage provided to prevent ponding at entrance?

2. Silt Fence
Yes No NA
[ ] [ ] [ ] Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
[ ] [ ] [ ] Joints constructed by wrapping the two ends together for continuous support.
[ ] [ ] [ ] Fabric buried 6 inches minimum.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
Sediment accumulation is ___% of design capacity.

Sediment Control Practices (continued)

3. Storm Drain Inlet Protection (Use for Stone & Block; Filter Fabric; Curb; or, Excavated practices)

Yes No NA

[ ] [ ] [ ] Installed concrete blocks lengthwise so open ends face outward, not upward.
[ ] [ ] [ ] Placed wire screen between No. 3 crushed stone and concrete blocks.
[ ] [ ] [ ] Drainage area is 1acre or less.
[ ] [ ] [ ] Excavated area is 900 cubic feet.
[ ] [ ] [ ] Excavated side slopes should be 2:1.
[ ] [ ] [ ] 2" x 4" frame is constructed and structurally sound.
[ ] [ ] [ ] Posts 3-foot maximum spacing between posts.
[ ] [ ] [ ] Fabric is embedded 1 to 1.5 feet below ground and secured to frame/posts with staples at max 8-inch spacing.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.

Sediment accumulation ___% of design capacity.

4. Temporary Sediment Trap

Yes No NA

[ ] [ ] [ ] Outlet structure is constructed per the approved plan or drawing.
[ ] [ ] [ ] Geotextile fabric has been placed beneath rock fill.

Sediment accumulation is ___% of design capacity.

5. Temporary Sediment Basin

Yes No NA

[ ] [ ] [ ] Basin and outlet structure constructed per the approved plan.
[ ] [ ] [ ] Basin side slopes are stabilized with seed/mulch.
[ ] [ ] [ ] Drainage structure flushed and basin surface restored upon removal of sediment basin facility.

Sediment accumulation is ___% of design capacity.

Note: Not all erosion and sediment control practices are included in this listing. Add additional pages to this list as required by site specific design.
Construction inspection checklists for post-development stormwater management practices can be found in Appendix F of the New York Stormwater Management Design Manual.

CONSTRUCTION DURATION INSPECTIONS

b. Modifications to the SWPPP (To be completed as described below)

The Operator shall amend the SWPPP whenever:
1. There is a significant change in design, construction, operation, or maintenance which may have a significant effect on the potential for the discharge of pollutants to the waters of the United States and which has not otherwise been addressed in the SWPPP; or
2. The SWPPP proves to be ineffective in:
   a. Eliminating or significantly minimizing pollutants from sources identified in the SWPPP and as required by this permit; or
   b. Achieving the general objectives of controlling pollutants in stormwater discharges from permitted construction activity; and
3. Additionally, the SWPPP shall be amended to identify any new contractor or subcontractor that will implement any measure of the SWPPP.

Modification & Reason:

III. Monthly Summary of Site Inspection Activities

Name of Permitted Facility:	Today's Date:	Reporting Month:
Location:	Permit Identification #:	
Name and Telephone Number of Site Inspector:		

Date of Inspection	Regular / Rainfall based Inspection	Name of Inspector	Items of Concern

Owner/Operator Certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law."

_____ _____

Signature of Permittee or Duly Authorized Representative Name of Permittee or Duly Authorized Representative Date

Duly authorized representatives must have written authorization, submitted to DEC, to sign any permit documents.

APPENDIX K

NYSDEC CORRESPONDENCE

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Division of Fish, Wildlife & Marine Resources
625 Broadway, 5th Floor, Albany, New York 12233-4757
Phone: (518) 402-8935 • **Fax:** (518) 402-8925
Website: www.dec.ny.gov

Joe Martens
Commissioner

May 10, 2011

Seth A. Livermore
Beardsley Design Associates
5789 Widewaters Parkway
Dewitt, NY 13214

Dear Mr. Livermore:

In response to your recent request, we have reviewed the New York Natural Heritage Program database, with respect to an Environmental Assessment for the proposed Expansion to the Existing Norampac Facility; and Stormwater Pollution Prevention Plan, Project # BDA 100 88, site as indicated on the map you provided, located in Niagara Falls, Niagara County.

We have no records of rare or state-listed animals or plants, significant natural communities or other significant habitats, on or in the immediate vicinity of your site.

The absence of data does not necessarily mean that rare or state-listed species, natural communities or other significant habitats do not exist on or adjacent to the proposed site. Rather, our files currently do not contain information which indicates their presence. For most sites, comprehensive field surveys have not been conducted. We cannot provide a definitive statement on the presence or absence of all rare or state-listed species or significant natural communities. This information should not be substituted for on-site surveys that may be required for environmental assessment.

Our databases are continually growing as records are added and updated. If this proposed project is still under development one year from now, we recommend that you contact us again so that we may update this response with the most current information.

This response applies only to known occurrences of rare or state-listed animals and plants, significant natural communities and other significant habitats maintained in the Natural Heritage Data bases. Your project may require additional review or permits; for information regarding other permits that may be required under state law for regulated areas or activities (e.g., regulated wetlands), please contact the appropriate NYS DEC Regional Office, Division of Environmental Permits, as listed at www.dec.ny.gov/about/39381.html.

Sincerely,

Jean Pietrusiak, Information Services
NYS Department Environmental Conservation

cc: Region 9

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APPENDIX L

SUGGESTED CONSTRUCTION SCHEDULE

SUGGESTED CONSTRUCTION SCHEDULE

1. PRIOR TO SITE DISTURBANCE, PROVIDE STABILIZED CONSTRUCTION ENTRANCES AT THE LOCATIONS SHOWN.

2. PROVIDE TEMPORARY SILT FENCING DOWN GRADIENT FROM CONSTRUCTION ACTIVITIES AND AROUND THE PROJECT SITE AS SHOWN.

3. CLEAR AND GRUB THE SITE WITHIN LIMITS OF GRADING OPERATIONS. STRIP AND STOCKPILE TOPSOIL ON SITE. IMMEDIATELY SEED STOCKPILE WITH TEMPORARY SEED MIXTURE AND INSTALL SILT FENCE AROUND PERIMETER OF STOCKPILE.

4. CONSTRUCT SEDIMENT TRAPS TO PREVENT SEDIMENT FROM ENTERING EXISTING AND PROPOSED STORM SEWER SYSTEMS.

5. CONSTRUCT PERMANENT STORMWATER BASIN (WET POND).

6. CONDUCT EARTHWORK OPERATIONS AND PROVIDE CATCH BASINS, DROP INLETS, STORMWATER MANHOLES, HYDRODYNAMIC STRUCTURES, AND ALL APPURTENANT STORM DRAIN PIPING. CONSTRUCT INLET PROTECTION AROUND DRAINAGE STRUCTURES.

7. CONSTRUCT DRAINAGE CHANNELS TO DIRECT RUNOFF TO TEMPORARY SEDIMENT TRAPS AND STORM STRUCTURES. PROVIDE STONE CHECK DAMS ALONG THE CHANNEL INVERT, SEED AND MULCH CHANNELS.

8. CONSTRUCT UNDERGROUND UTILITIES. CONTINUE CUTS AND FILLS TO BRING DISTURBED AREAS TO SUBGRADE.

9. CONSTRUCT PROPOSED BUILDINGS, PAVEMENTS, SIDEWALKS, PADS AND OTHER HARD SURFACES.

10. REMOVE STABILIZED CONSTRUCTION ENTRANCE PRIOR TO FINAL PAVEMENT PLACEMENT.

11. COMPLETE ON-SITE STABILIZATION. REMOVE ACCUMULATED SEDIMENT FROM SEDIMENT TRAPS. FILL ALL SEDIMENT TRAPS TO FINISHED GRADE.

12. TOPSOIL, SEED AND MULCH ALL DISTURBED AREAS IMMEDIATELY UPON COMPLETION OF FINAL EARTHWORK OPERATIONS.

13. ALL TEMPORARY EROSION CONTROL MEASURES SHALL BE MAINTAINED UNTIL A PERMANENT VEGETATIVE COVER IS ESTABLISHED.

APPENDIX M

SPECIFICATIONS

SECTION 01 57 50

TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.1 REFERENCES

A. New York State DEC Stormwater Management Design Manual

B. New York State Standards and Specifications for Erosion and Sediment Control.

C. New York State DEC "SPDES General Permit for Stormwater Discharges from Construction Activities."

D. New York State DEC Stormwater Regulations.

E. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; current edition; http://cfpub.epa.gov/npdes/stormwater/cgp.cfm.

F. EPA 832-R-92-005 - Storm Water Management for Construction Activities; U.S. Environmental Protection Agency; 1992.

G. FHWA (BMP) - Best Management Practices for Erosion and Sediment Control; Federal Highway Administration; 1995.

H. U.S. Army Corps of Engineers Specifications for Environmental Protection.

1.2 PERFORMANCE REQUIREMENTS

A. The Contractor shall minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract. The Contractor shall comply with all applicable environmental Federal, State, and Local laws and regulations. The Contractor shall be responsible for any delays resulting from failure to comply with environmental laws and regulations.

B. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.

1. Owner will secure required permits from authority having jurisdiction.

C. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control.

D. Comply with all requirements of New York State Standards and Specifications for Erosion and Sediment Control.

E. Comply with all requirements of U.S. Army Corps of Engineers (USACE) for erosion and sediment control.

F. Timing: Erosion and sediment control measures shall be in place prior to any disturbance of surface cover.

G. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.

1. Control movement of sediment and soil from temporary stockpiles of soil.
2. Prevent development of ruts due to equipment and vehicular traffic.
3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner. Penalties for non-compliancy shall be paid for by the Contractor.

H. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.

1. Prevent windblown soil from leaving the project site.
2. Prevent tracking of mud onto public roads outside site.
3. Prevent mud and sediment from flowing onto sidewalks and pavements.
4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner. Penalties for non-compliancy shall be paid for by the Contractor.

I. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, wetlands, sensitive water bodies, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

J. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

K. Open Water: Prevent standing water that could become stagnant.

L. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

M. No requirement in this Section shall be construed as relieving the Contractor of any applicable Federal, State, or Local environmental protection laws and regulations.

N. Any deviations, requested by the Contractor, from the drawings, plans, and specifications which may have an environmental impact will be subject to approval by the Owner's Representative and may require an extended review, processing, and approval time. The Owner's Representative reserves the right to disapproved alternate methods, even if they are more cost effective, if the Owner's Representative determines that the proposed alternate method will have an adverse environmental impact.

1.3 SUBMITTALS

A. Erosion and Sedimentation Control Plan:

1. Submit not less than 10 days prior to anticipated start of clearing, grading, or other work involving disturbance of ground surface cover.
2. Include:

a. Plan and Schedule of temporary preventive measures, in relation to ground disturbing activities.

3. Obtain the approval of the Plan by Owner's Representative.

B. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

C. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after substantial completion.

PART 2 PRODUCTS

2.1 REPAIRS TO EROSION CONTROL FACILITIES

A. All repairs to the erosion control facilities shall be made by the Contractor at no cost to the Owner.

B. All repairs will be made immediately upon notification by the Owner's Representative or when the Contractor finds an erosion control facility not properly functioning.

C. Conduct weekly inspections in accordance with NYSDEC Stormwater Regulation Requirements.

2.2 MATERIALS

A. Mulch: Use one of the following:

1. Straw or hay.
2. Wood waste, chips, or bark.
3. Erosion control matting or netting.
4. Polyethylene film, where specifically indicated only.

B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

C. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:

1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D 4751.
2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D 4491.
3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D 4355 after 500 hours exposure.
4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D 4632.
5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D 4632.
6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D 4533.

D. Silt Fence Posts: One of the following, minimum 5-feet long:

1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.

2. Hardwood, 2 by 2 inches in cross section.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible. Protect all wetland and sensitive water bodies.

3.2 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.3 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface underlined with filter cloth.

1. Width: As required; 20-feet, minimum.
2. Length: 50-feet, minimum.
3. Provide at each construction entrance from public right-of-way, street, alley, sidewalk, or parking area.
4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.

1. Provide linear sediment barriers:

   a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
   b. Along the top of the slope or top bank of drainage channels and swales that traverse disturbed areas.
   c. Along the toe of cut slopes and fill slopes.
   d. Along wetland perimeters and beach area within project work limits.

2. Space sediment barriers with the following maximum slope length upslope from barrier:

   a. Slope of Less Than 2 Percent: 100-feet.
   b. Slope Between 2 and 5 Percent: 75-feet.
   c. Slope Between 5 and 10 Percent: 50-feet.
   d. Slope Between 10 and 20 Percent: 25-feet.
   e. Slope Over 20 Percent: 15-feet.

3.4 INSTALLATION

A. Traffic-Bearing Aggregate Surface:

1. Excavate minimum of 6 inches.
2. Place geotextile fabric full width and length, as shown on Drawings, with minimum 12 inch overlap at joints.
3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.

B. Silt Fences:

1. Store and handle fabric in accordance with ASTM D 4873.

2. Silt fences shall be installed prior to any earth disturbance to reduce runoff velocity and transportation of sediment.
3. Where slope gradient is less than 3:1 or where barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
4. Where slope gradient is steeper than 3:1 or where barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
5. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
6. Install with top of fabric at nominal height and embedment as specified.
7. Embed bottom of fabric in a trench on the upslope side of fence, with 2 inches of fabric laid flat on bottom of trench facing upslope; backfill trench and compact.
8. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
9. Fasten fabric to wood posts using one of the following:

   a. Four 3/4 inch diameter, 1 inch long, 14 gage nails.
   b. Five 17-gage staples with 3/4 inch wide crown and 1/2 inch legs.

10. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
11. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

C. Stone Check Dams:

1. Stone check dams shall be placed at minimum 100' intervals along drainage channels.
2. Check dams shall consist of riprap stone with stone sizes of 4" to 9". Stone material shall be hard and angular and resist disintegration when exposed to water or weathering.
3. Stone material shall be underlain with a geotextile filter fabric.

D. Sediment Traps:

1. Sediment traps shall be installed in temporary surface drainage ways prior to any earth disturbance.
2. Sediment traps shall be installed in drainage ways, at storm drain inlets or other points of discharge from disturbed areas.
3. Sediment trap shall be limited to drainage areas less than 2 acres and provide storage volume of 1800 cf per acre of drainage area.
4. The trap embankment shall be seeded with temporary or permanent seeding immediately after installation.

E. Mulching Over Large Areas:

1. Dry Straw and Hay: Apply 2-1/2 tons per acre; anchor using dull disc harrow.

2. Wood Waste: Apply 6 to 9 tons per acre.
3. Erosion Control Matting: Comply with manufacturer's instructions.

F. Mulching Over Small and Medium Areas:

1. Dry Straw and Hay: Apply 4 to 6 inches depth.
2. Wood Waste: Apply 2 to 3inches depth.
3. Erosion Control Matting: Comply with manufacturer's instructions.

G. Temporary Seeding:

1. When hydraulic seeder is used, seedbed preparation is not required.
2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.
9. Contributing drainage area to sediment basin shall be limited to 2 acres.
10. Maximum embankment height shall be 5 feet.
11. Sediment trap outlets shall consist of a stone section of the embankment located at the basin low point. A combination of coarse aggregate and riprap shall be used to provide outlet stability.

3.5 MAINTENANCE

A. Inspections:

1. The Contractor shall have a qualified professional (such as a Professional Engineer, Licensed Landscape Architect or Certified Erosion Control Specialist) conduct an assessment of the site prior to the commencement of construction. The qualified professional shall be approved by the Owner’s Representative.
2. The qualified professional shall inspect preventive measures weekly and daily during prolonged rainfall.
3. A site map shall be maintained on the project site indicating the extent of all disturbed onsite areas and drainage ways throughout the duration of construction.
4. The qualified professional shall prepare weekly reports for submission to the Contractor and Owner’s Representative.

B. Inspection Log Book

1. The Contractor shall maintain an inspection logbook, which shall contain a record of all inspection reports. The site logbook shall be maintained on site and shall be made available to the permitting authority upon request. The Contractor shall post at the site, in a publicly accessible location, a summary of the site inspection activities on a monthly basis.

C. At the final site inspection the qualified professional shall certify that the site has

undergone final stabilization using either a vegetative or structural stabilization methods, and that all temporary erosion and sedimentation measures have been removed.

D. Silt Fences:

1. Promptly replace fabric that deteriorates unless need for fence has passed.
2. Remove silt deposits that exceed one-third of the height of the fence.
3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

E. Stone Check Dams:

1. Stone check dams shall be inspected at a minimum after each runoff event.
2. Any significant erosion that has occurred between structures shall be repaired and a liner of stone or other suitable material shall be provided in that portion of the channel.
3. Any sediment accumulated behind the dam shall be removed as needed to allow stormwater to drain through the stone check dam and prevent large flows from carrying sediment over the dam.
4. Replace stones as needed to maintain the design cross section of the structures.

F. Sediment Traps

1. Sediment traps shall be inspected weekly and after each runoff event.
2. The traps shall be cleaned and restored to their original size when sediment has accumulated to one-half of the basin depth.
3. Sediment traps have a maximum useful life of 18 months.
4. The height of the stone outlet shall be checked to ensure that the design flow depth is not reduced due to sediment accumulation. Any sediment buildup in the outlet shall be removed immediately.

3.6 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Owner's Representative.

1. Temporary measures may be removed only after upstream contributing areas have been completely stabilized.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade approved by the Owner’s Representative and finish to match adjacent ground surfaces.

END OF SECTION

APPENDIX N

MS4 SWPPP ACCEPTANCE FORM

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

MS4 Stormwater Pollution Prevention Plan (SWPPP) Acceptance Form

for

Construction Activities Seeking Authorization Under SPDES General Permit

*(NOTE: Attach Completed Form to Notice Of Intent and Submit to Address Above)

I. Project Owner/Operator Information
1. Owner/Operator Name: Greenpac Partnership
2. Contact Person: Luc Nadeau
3. Street Address: 4001 Packard Road
4. City/State/Zip: Niagara Falls, New York 14303
II. Project Site Information
5. Project/Site Name: New Paper Mill
6. Street Address: 4001 Packard Road
7. City/State/Zip: Niagara Falls, New York 14303
III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance Information
8. SWPPP Reviewed by: Kristy Harris
9. Title/Position: CPESC, CPSWQ
10. Date Final SWPPP Reviewed and Accepted: 6/24/11
IV. Regulated MS4 Information
11. Name of MS4: City of Niagara Falls
12. MS4 SPDES Permit Identification Number: NYR20A _____
13. Contact Person: Robert Buzzelli
14. Street Address: 745 Main Street – P.O. Box 69
15. City/State/Zip: Niagara Falls, NY 14302
16. Telephone Number: (716) 286-4410

(NYS DEC - MS4 SWPPP Acceptance Form - January 2010)

MS4 SWPPP Acceptance Form - continued

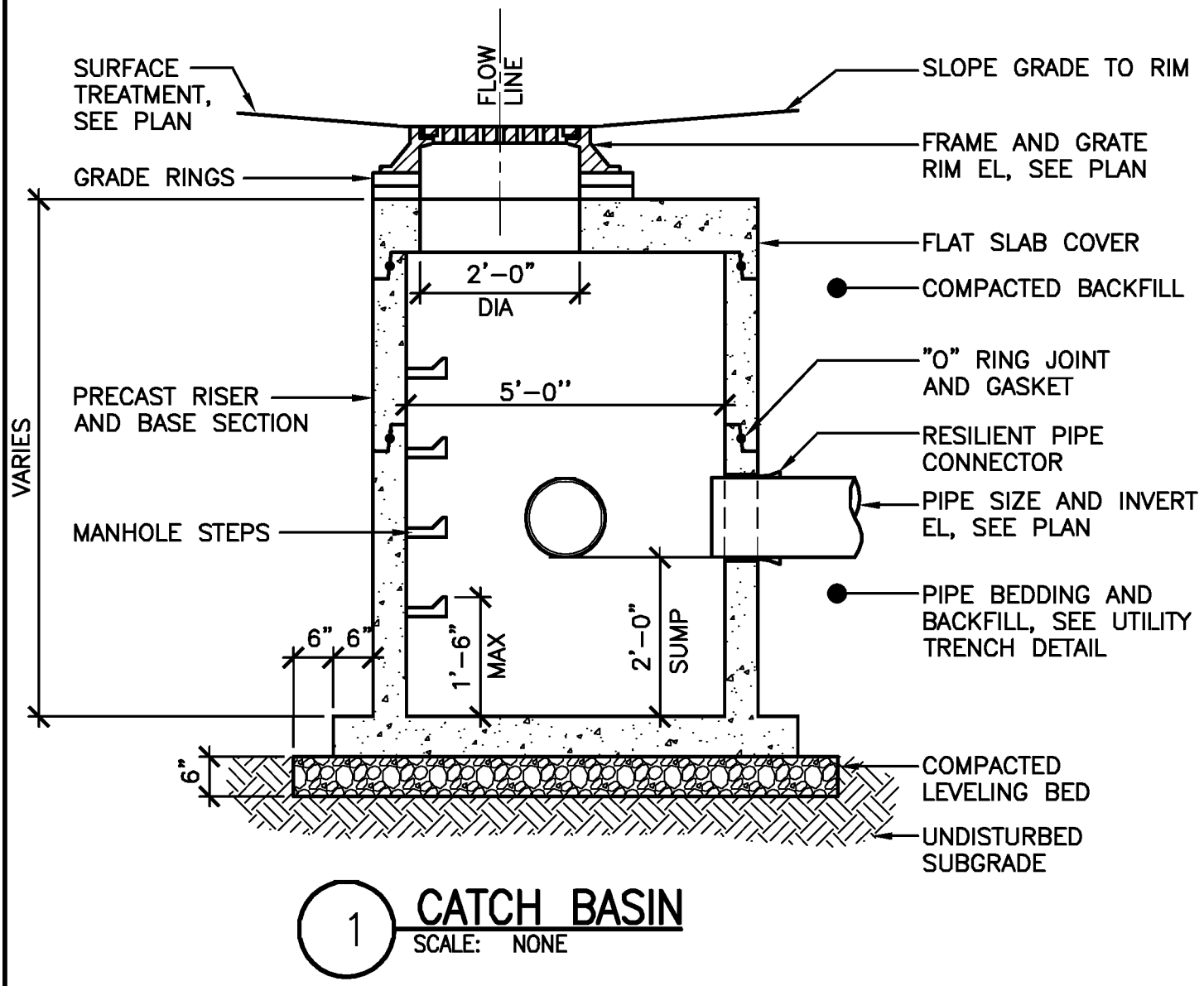
V. Certification Statement - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative

I hereby certify that the final Stormwater Pollution Prevention Plan (SWPPP) for the construction project identified in question 5 has been reviewed and meets the substantive requirements in the SPDES General Permit For Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s).
Note: The MS4, through the acceptance of the SWPPP, assumes no responsibility for the accuracy and adequacy of the design included in the SWPPP. In addition, review and acceptance of the SWPPP by the MS4 does not relieve the owner/operator or their SWPPP preparer of responsibility or liability for errors or omissions in the plan.

Printed Name:	Frank A. DeSignare, P.E.
Title/Position:	Vice President - CHA Consulting, Inc.
Signature:	Frank A DeSignare
Date:	6/24/11

VI. Additional Information

DRAWINGS



1 CATCH BASIN
SCALE: NONE

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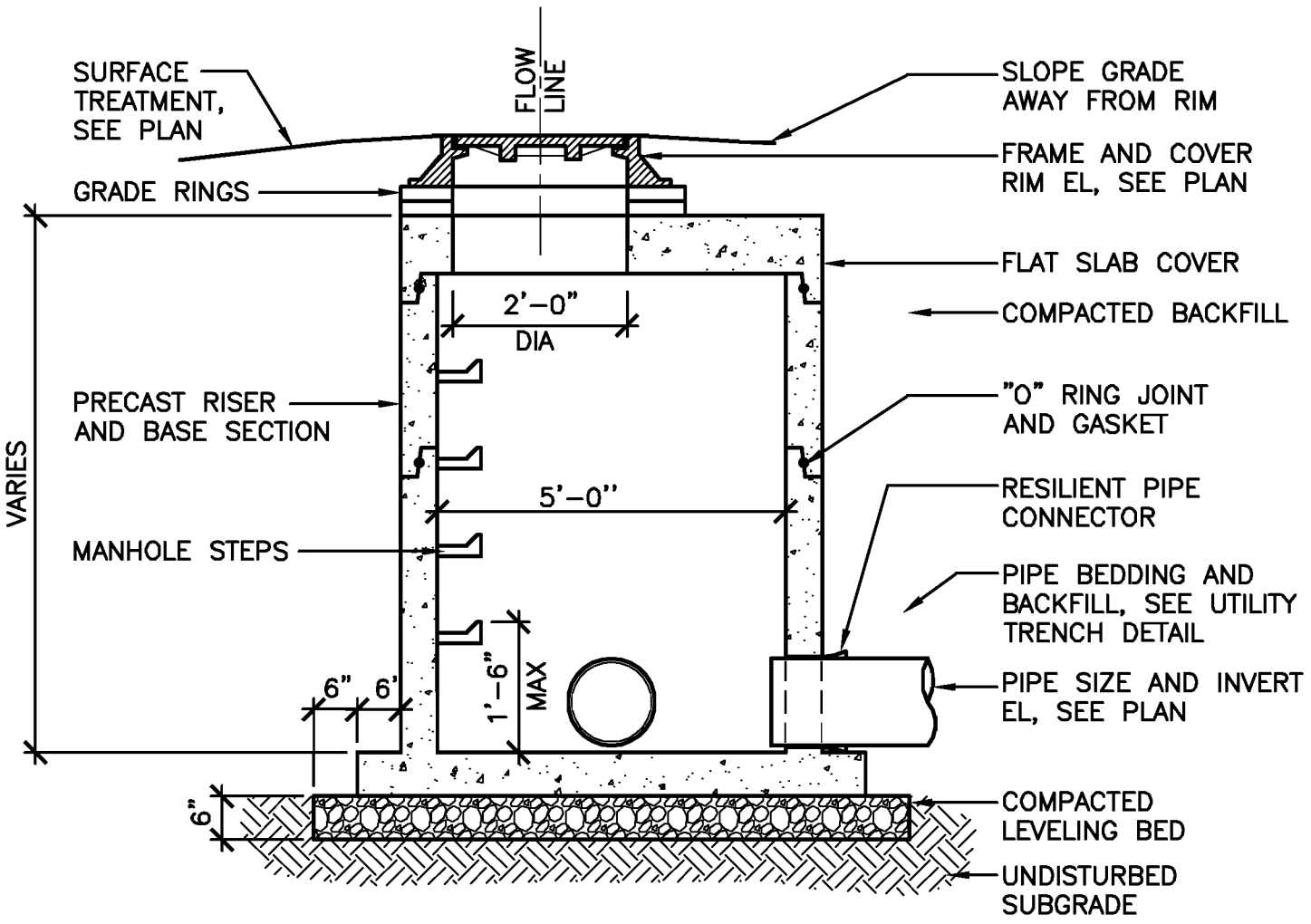
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CATCH BASIN

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1 STORMWATER MANHOLE
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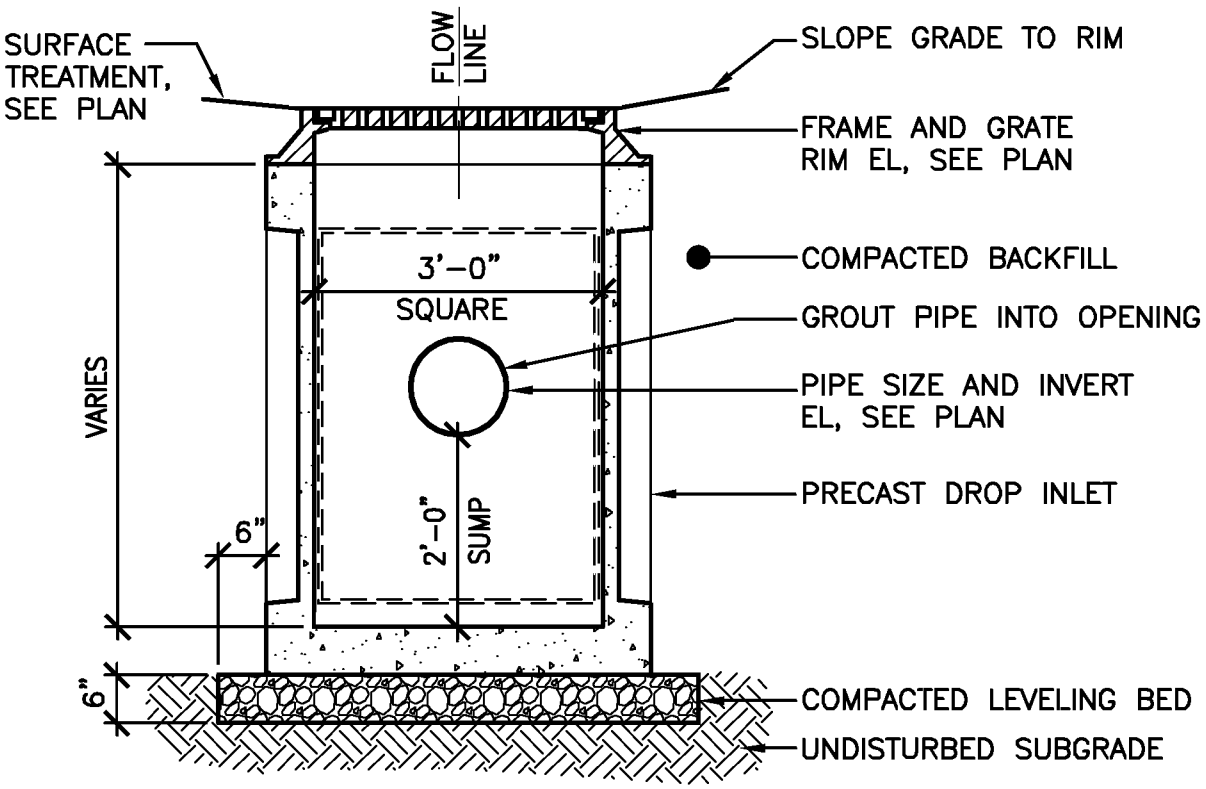
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STORMWATER MANHOLE

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1 **DROP INLET**
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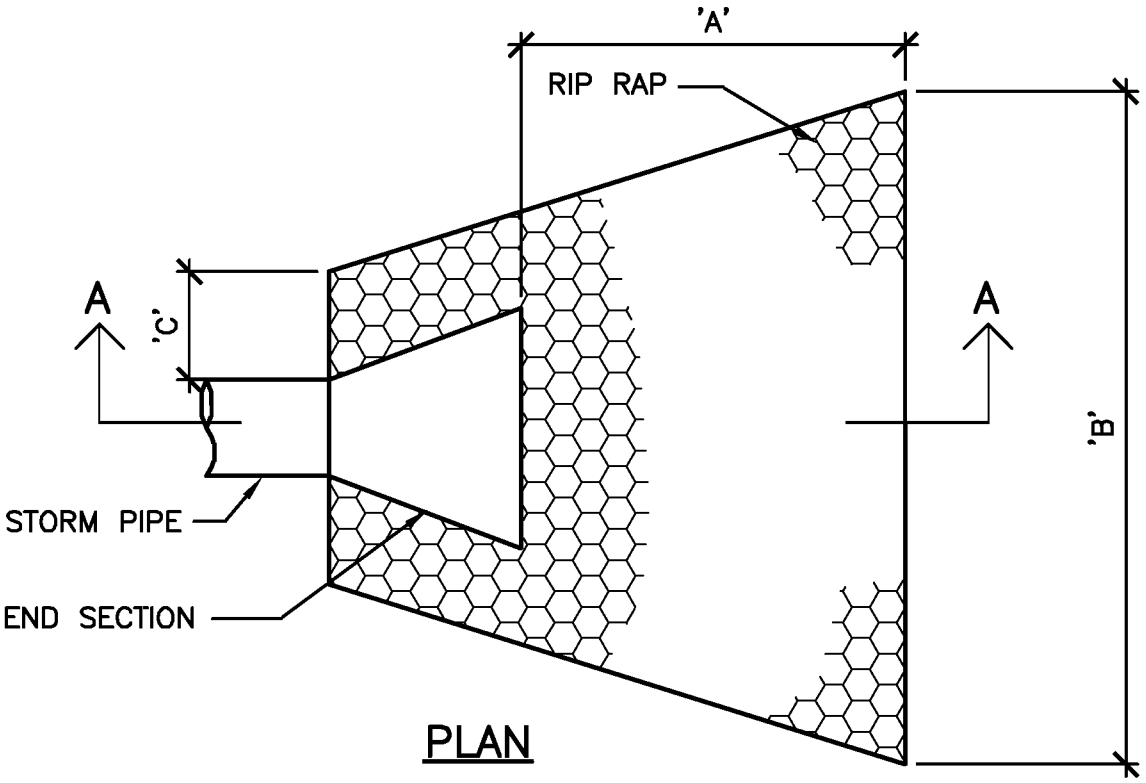
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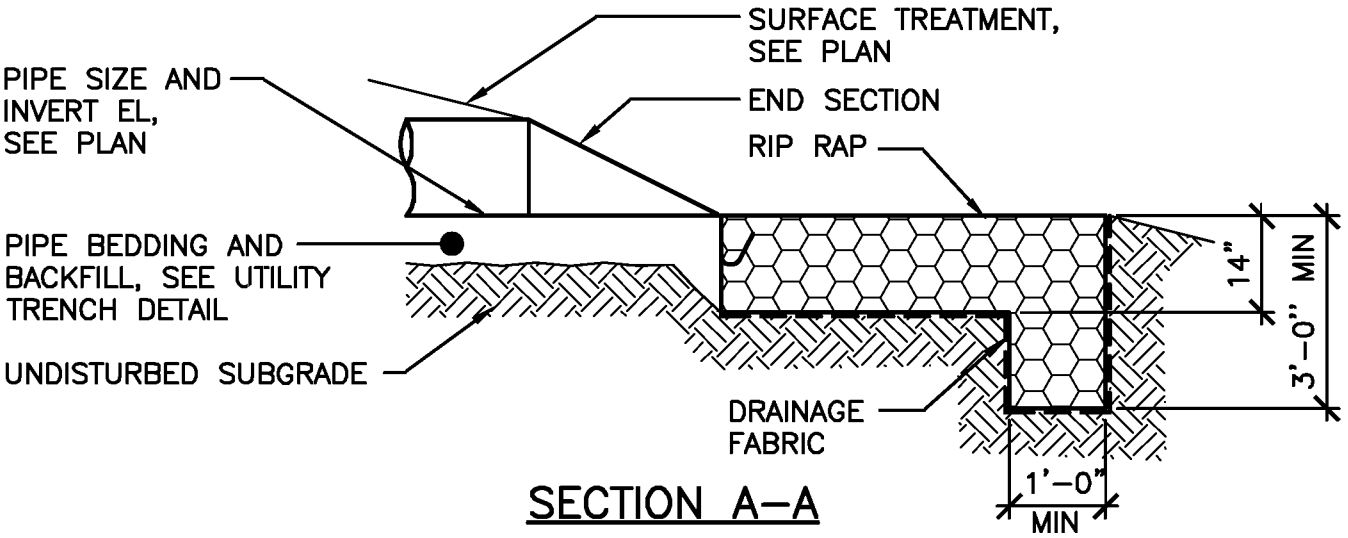
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PLAN



SECTION A–A

1 STORM DRAIN END SECTION

SCALE: NONE

STORM DRAIN END SECTION SCHEDULE			
DIA	'A' (FT)	'B' (FT)	'C' (FT)
12"	10'–0"	11'–0"	1'–0"
18"	10'–0"	12'–0"	1'–6"
24"	16'–0"	18'–0"	2'–0"

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RIP RAP END SECTION/
OUTLET PROTECTION

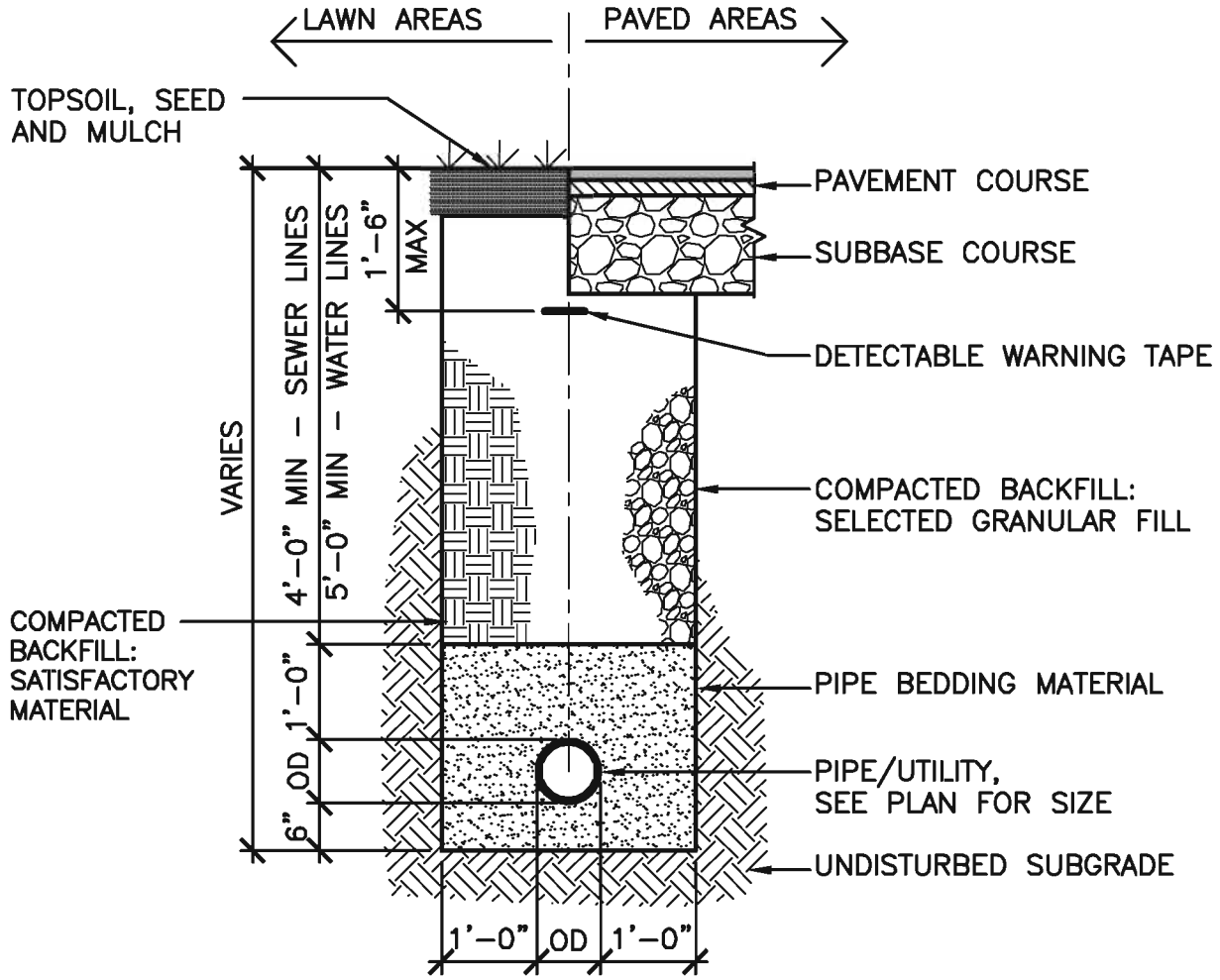
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1 UTILITY TRENCH

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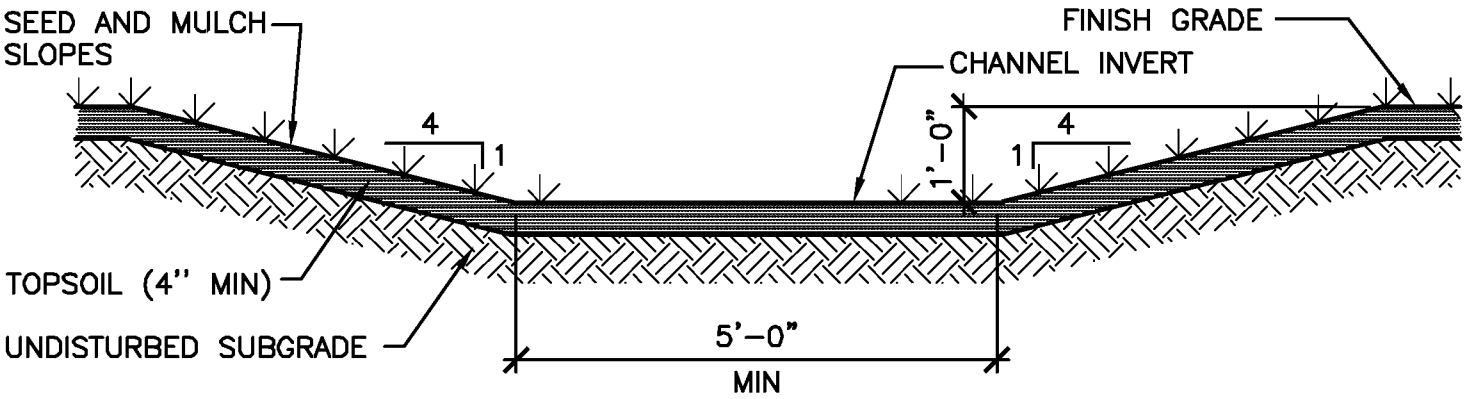
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1 GRASS-LINED CHANNEL

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GRASS-LINED CHANNEL

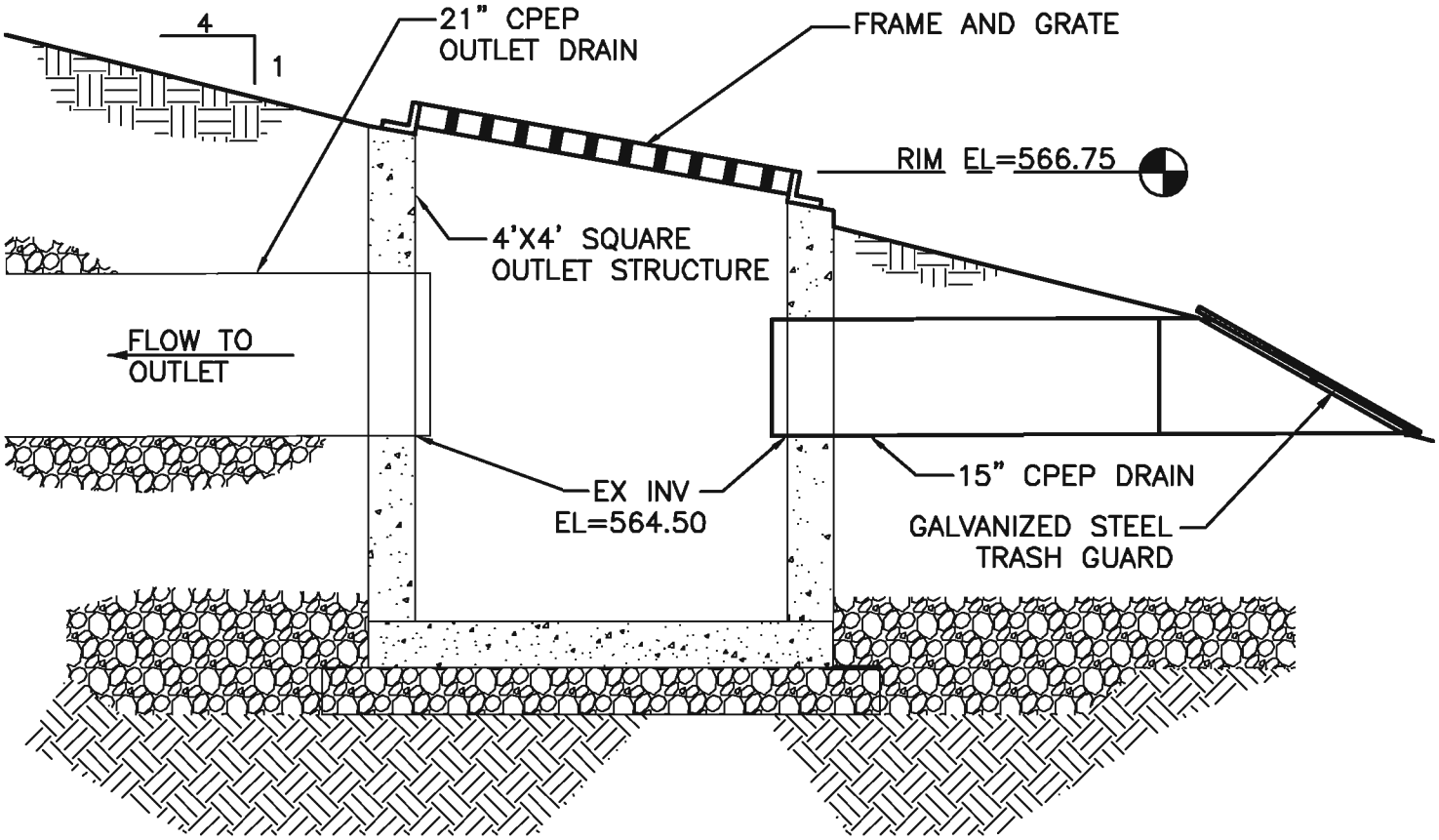
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1 STORMWATER POND OUTLET STRUCTURE

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GREENPAC PARTNERSHIPS, INC.
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NIAGARA FALLS, NEW YORK 14303

CIVIL

STORMWATER POND
OUTLET STRUCTURE

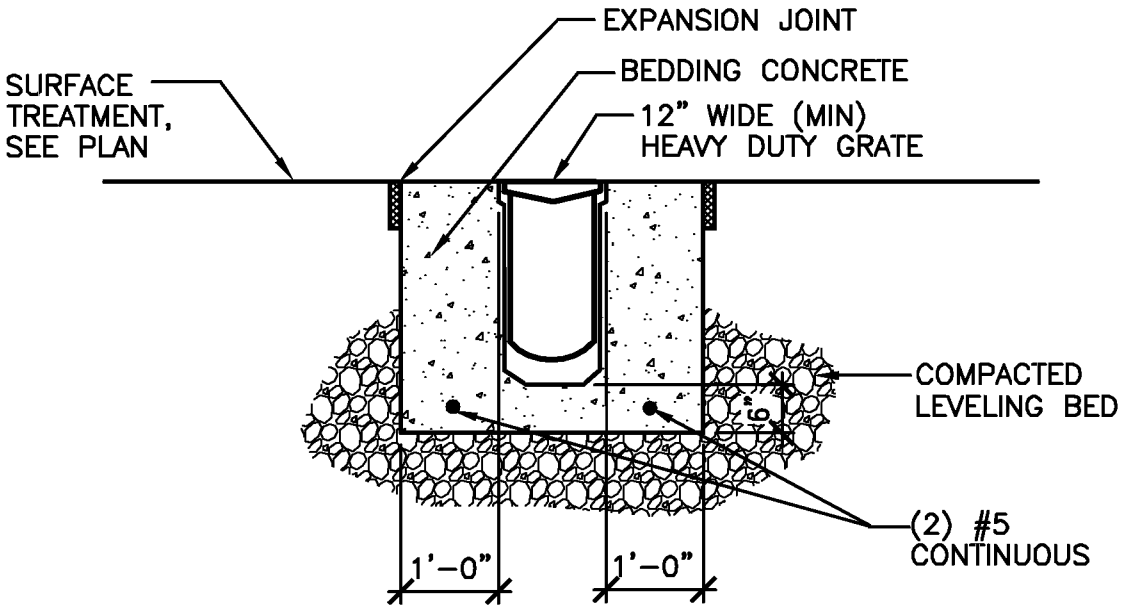
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SAL	SAL	CJL	5/20/11

Project No. 10088

Drawing No. C-7

of

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NOTE:

1. CONNECT 12" CPEP TO THE BOTTOM KNOCKOUT OF THE DEEPEST SECTION OF PRECAST DRAIN (SLOPE TRENCH AT 0.5% MIN.)

1 PRECAST TRENCH DRAIN
SCALE: NONE

1 PRECAST TRENCH DRAIN
SCALE: NONE

WARNING
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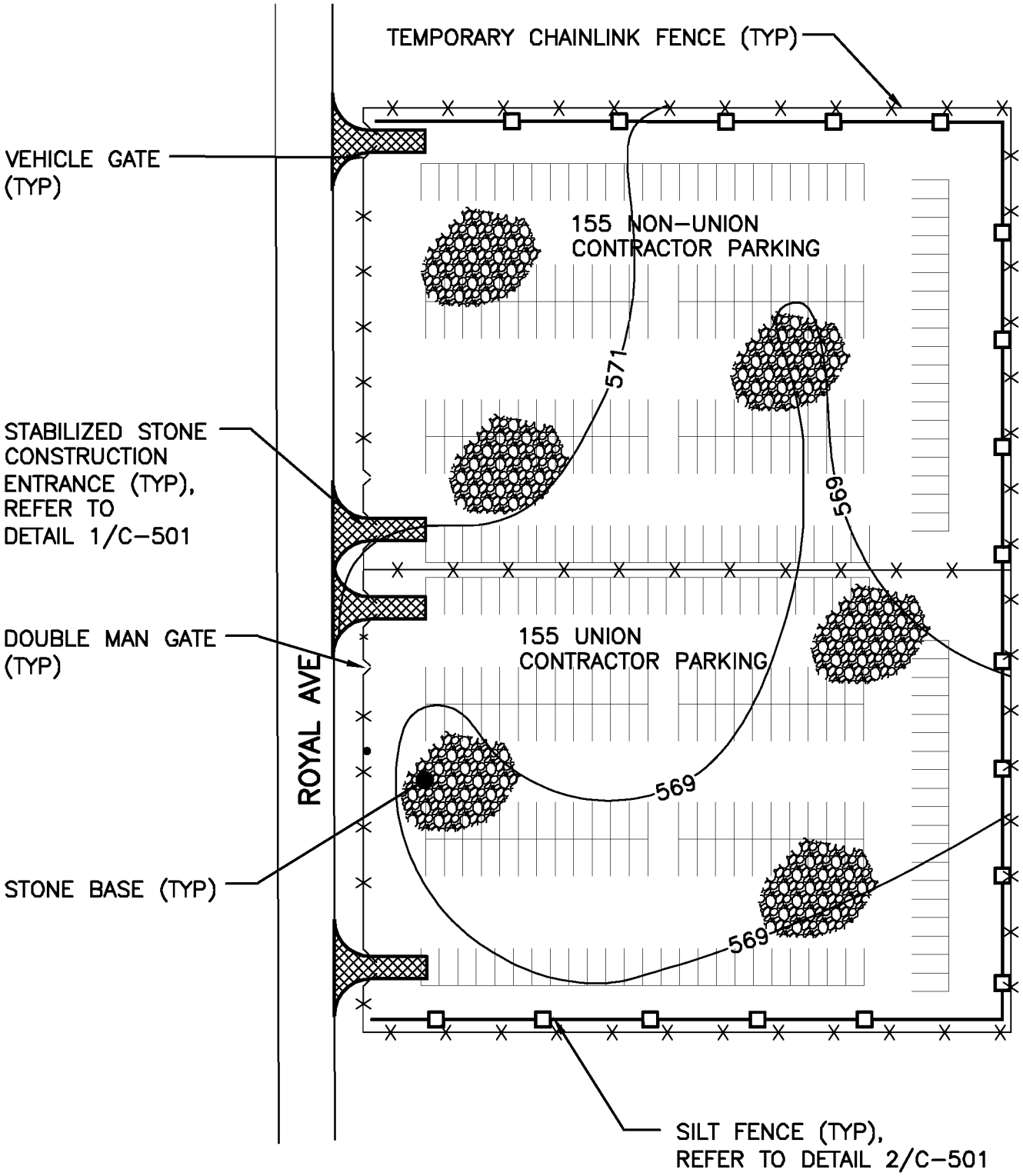
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CIVIL
PRECAST TRENCH DRAIN

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TEMPORARY CONTRACTOR PARKING LOT PLAN

1

SCALE: NONE

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TEMPORARY CONTRACTOR PARKING LOT PLAN

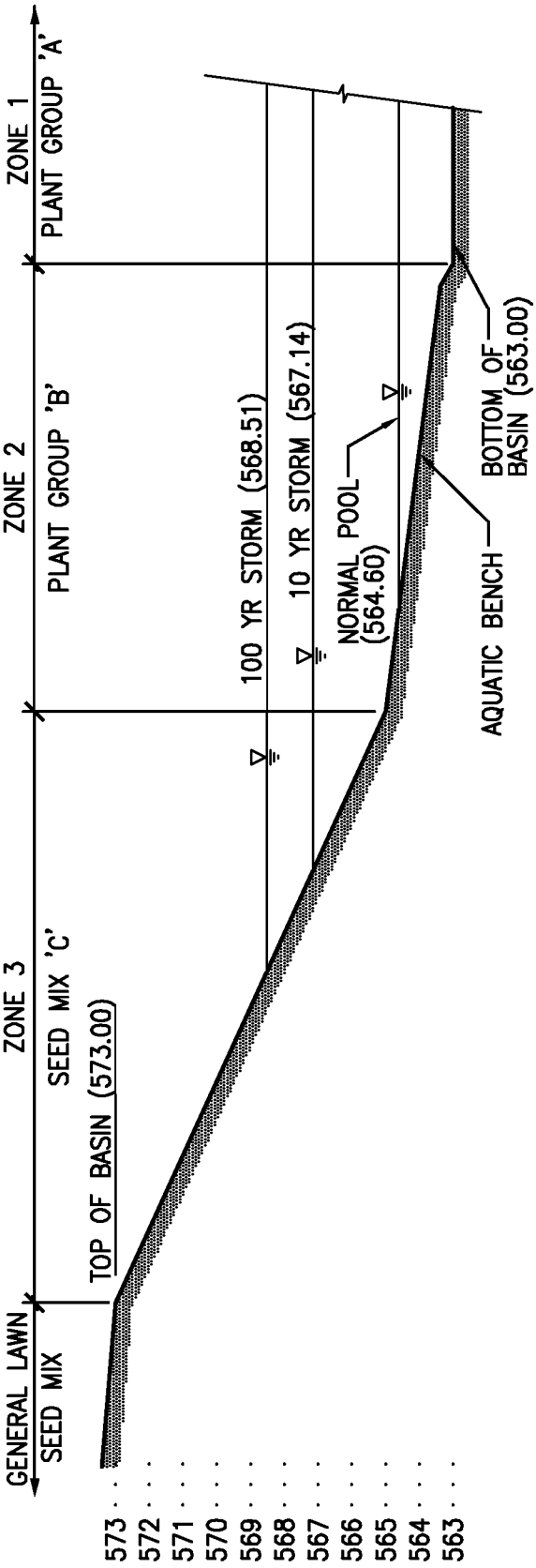
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Drawing No. C-9

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1 STORMWATER BASIN SECTION
SCALE: NONE

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STORMWATER BASIN SECTION

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ZONE 1 (SHALLOW MARSH) PLANT GROUP 'A' – 10,000SF

BURREED	–	SPARAGANIUM AMERICANUM
NORTHERN ARROWHEAD	–	SAGITTARIA LATIFOLIA
PICKERELWEED	–	PONTEDERIA CORDATA
SOFT–STEM BULRUSH	–	SCHOENOPLECTUS TABERNAEMONTANI
HARD–STEM BULRUSH	–	SCIRPUS ACUTUS

1. ALL PLANTS SHALL BE SUPPLIED AS 2" PLUGS OR CONTAINER GROWN IN ROUGHLY EQUAL QUANTITIES AND PLANTED 3'–0" ON CENTER.

ZONE 2 (AQUATIC BENCH) PLANT GROUP 'B' – 6,000SF

BLUE FLAG IRIS	–	IRIS VERSICOLOR
SWEET FLAG	–	ACORUS CALAMUS
WOOL GRASS	–	SCIRPUS CYPERINUS
JOE–PYE WEED	–	EUPATOREUM FISTULOSUM
BLUE JOINT	–	CALAMAGROSTIS CANADENSIS

1. ALL PLANTS SHALL BE SUPPLIED AS 2" PLUGS OR CONTAINER GROWN IN ROUGHLY EQUAL QUANTITIES AND PLANTED 3'–0" ON CENTER.

ZONE 3 SEED MIX 'C'

APPLICATION RATE: 35LBS/ACRE (1250 SQ FT/LB)

SWITCHGRASS	–	PANICUM VIRGATUM
VIRGINIA WILD RYE	–	ELYMUS VIRGINICUS
CREEPING RED FECUE	–	FESTUCA RUBRA
FOX SEDGE	–	CAREX VULPINOISEA
CREEPING BENTGRASS	–	AGROSTIS STOLONIFERS
SOFT RUSH	–	JUNCUS EFFUSUS
NEW ENGLAND ASTER	–	ASTER NAVA–ANGILEA
GRASS–LEAVED GOLDENROD	–	EUTHAMIA GRAMINIFOLIA
GREEN BULLRUSH	–	SCIRPUS ATROVIRENS
BONESET	–	EUPITORIUM PERFOLIATUM
BLUE VERVAIN	–	VERENA HASTATA
UPLAND BENTGRASS	–	AGROSTIS PERENNANS
BIG BLUESTEM, NIGARA	–	ANDROPOGON GERARDII
SENSITIVE FERN	–	ONOCLEA SENSIBILIS
LITTLE BLUESTEM	–	SCHIZACHYRIUM SCOPARIUM
WOOLGRASS	–	SCRIPUS CYPERINUS

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CIVIL

STORMWATER BASIN PLANTING MIX SCHEDULE

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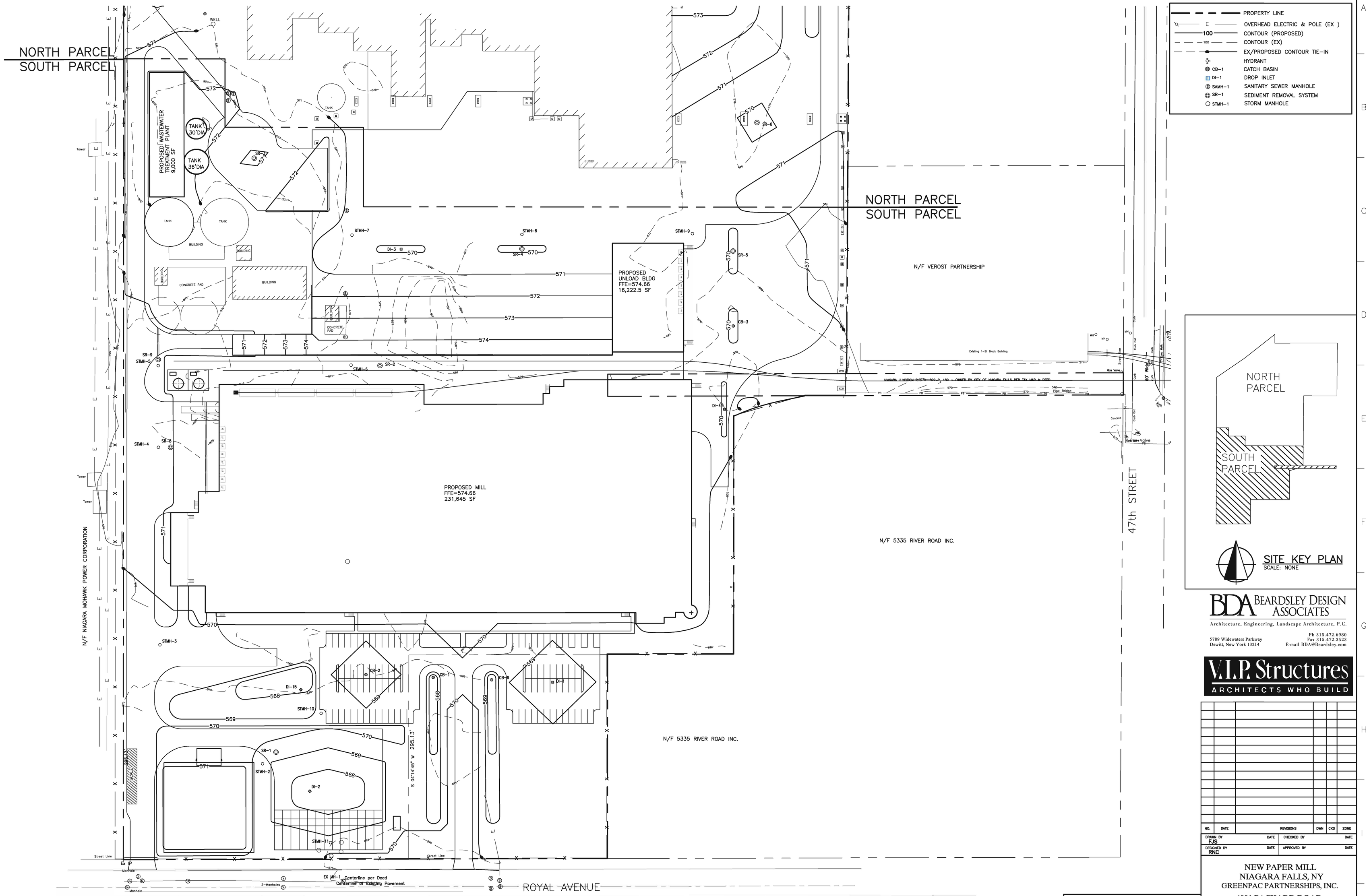
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REV. —

CLIENT DRAWING NO.

GRAPHIC SCALE 1" 0 1" 1/2



LEGEND

- PROPERTY LINE
- E — OVERHEAD ELECTRIC & POLE (EX)
- 100 — CONTOUR (PROPOSED)
- 100 — CONTOUR (EX)
- EX/PROPOSED CONTOUR TIE-IN
- HYDRANT
- CB-1 CATCH BASIN
- DI-1 DROP INLET
- SAMH-1 SANITARY SEWER MANHOLE
- SR-1 SEDIMENT REMOVAL SYSTEM
- STMH-1 STORM MANHOLE

SITE KEY PLAN
SCALE: NONE

A GRADING PLAN — SOUTH
SCALE: 1"=50'

50 0 50 100
SCALE: 1"=50'

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V.I.P. Structures
ARCHITECTS WHO BUILD

NO.	DATE	REVISIONS	DWN	CKD	ZONE

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GRADING PLAN — SOUTH

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DATE :
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MAY 20, 2011

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1" 1" 1" ½ 0 GRAPHIC SCALE

PACKARD ROAD
Variable Width

50' EASEMENT TO NIAGARA FALLS POWER CO., L 437 P. 139

47th STREET

EX MH-2

STMH-1

WATER

OUTLET STRUCTURE, SEE DETAIL

AQUATIC BENCH

STORMWATER BASIN — DETENTION — FOREBAY

BOX BEAM GUIDE RAIL

CATCH BASIN (TYP), SEE DETAIL

DROP INLET (TYP), SEE DETAIL

TRENCH DRAIN, SEE DETAIL

RETAINING WALL, SEE DETAIL

SEDIMENT REMOVAL SYSTEM (TYP), SEE DETAIL

EX BLDG
265,614 SF

PROPOSED WASTEWATER TREATMENT PLANT
9,000 SF

TANK 30'DIA

TANK 36'DIA

Fuel Tank

6" Gas Line

Gas Valves

Gas Service

WELL

Tower

N/F NIAGARA MOHAWK POWER CORPORATION

NORTH PARCEL
SOUTH PARCEL

351.47'

254.41'

42.42'

NORTH PARCEL
SOUTH PARCEL

A GRADING PLAN – NORTH
SCALE: 1"=50'

50 0 50 100
SCALE: 1"=50'

NORTH PARCEL
SOUTH PARCEL

SITE KEY PLAN
SCALE: NONE

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GRADING PLAN – NORTH

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GRAPHIC SCALE 1" 0 1/2 1"

NORTH PARCEL
SOUTH PARCEL

PROPOSED WASTEWATER TREATMENT PLANT 9,000 SF

TANK 30'DIA

TANK 36'DIA

TANK

TANK

BUILDING

BUILDING

BUILDING

CONCRETE PAD

BUILDING

BUILDING

CONCRETE PAD

DRAINAGE INLET PROTECTION (TYP)
REFER TO DETAIL 3/C-501

DI-3

DI-4

DI-15

DI-2

STMH-1

STMH-2

STMH-3

STMH-4

STMH-5

STMH-6

STMH-7

STMH-8

STMH-9

STMH-10

STMH-11

SR-1

SR-2

SR-4

SR-5

SR-6

SR-8

SR-9

CB-1

CB-2

CB-3

CB-6

PROPOSED UNLOAD BLDG
FFE=574.66
16,222.5 SF

PROPOSED MILL
FFE=574.66
231,645 SF

SILT FENCE (TYP)
REFER TO DETAIL 2/C-501

SEDIMENT TRAP (TYP)
REFER TO DETAIL 4/C-501

STONE CHECK DAM (TYP)
REFER TO DETAIL 5/C-501

MATERIAL STOCKPILE

STABILIZED CONSTRUCTION ENTRANCE
REFER TO DETAIL 1/C-501

NORTH PARCEL
SOUTH PARCEL

N/F VEROST PARTNERSHIP

N/F 5335 RIVER ROAD INC.

N/F 5335 RIVER ROAD INC.

N/F NIAGARA MOHAWK POWER CORPORATION

Existing 1-St Block Building

NIAGARA JUNCTION-R-9579—ROD R 180 — OWNED BY CITY OF NIAGARA FALLS PER TAX MAP & DEED

Gas Valve

Water Valve

Pipe Bridge

Concrete

Core Cut

Street Line

47th STREET

Ex IP

EX MH-1 Centerline per Deed
Centerline of Existing Pavement

ROYAL AVENUE

Tower

Tower

Tower

LEGEND

- PROPERTY LINE
- 100 CONTOUR (PROPOSED)
- 100 CONTOUR (EX)
- EX/PROPOSED CONTOUR TIE-IN
- SILT FENCE
- DRAINAGE INLET PROTECTION
- STONE CHECK DAM
- STABILIZED CONSTRUCTION ENTRANCE
- SEDIMENT TRAP

NORTH PARCEL
SOUTH PARCEL

SITE KEY PLAN
SCALE: NONE

A EROSION AND SEDIMENT CONTROL PLAN – SOUTH
SCALE: 1"=50'

50 0 50 100
SCALE: 1"=50'

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V.I.P. Structures
ARCHITECTS WHO BUILD

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EROSION AND SEDIMENT CONTROL PLAN – SOUTH

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1" 1/2 0 1"
GRAPHIC SCALE

LEGEND

- PROPERTY LINE
- 100 CONTOUR (PROPOSED)
- 100 CONTOUR (EX)
- EX/PROPOSED CONTOUR TIE-IN
- SILT FENCE
- DRAINAGE INLET PROTECTION
- STONE CHECK DAM
- STABILIZED CONSTRUCTION ENTRANCE
- SEDIMENT TRAP

PACKARD ROAD
Variable Width

50' EASEMENT TO NIAGARA FALLS POWER CO., L. 437 P. 139

STONE CHECK DAM (TYP)
REFER TO DETAIL 5/C-501

MATERIAL STOCKPILE

STABILIZED CONSTRUCTION ENTRANCE
REFER TO DETAIL 1/C-501

STORMWATER BASIN
DETENTION
FOREBAY

DRAINAGE INLET PROTECTION (TYP)
REFER TO DETAIL 3/C-501

SEDIMENT TRAP (TYP)
REFER TO DETAIL 4/C-501

SILT FENCE (TYP)
REFER TO DETAIL 2/C-501

DRAINAGE INLET PROTECTION (TYP)

47th STREET

N/F NIAGARA MOHAWK POWER CORPORATION

EX BLDG
265,614 SF

Parcel X

PROPOSED WASTEWATER TREATMENT PLANT
9,000 SF

TANK
30'DIA

TANK
36'DIA

Fuel Tank

6" Gas Line

NORTH PARCEL
SOUTH PARCEL

NORTH PARCEL
SOUTH PARCEL

NORTH PARCEL
SOUTH PARCEL

A EROSION AND SEDIMENT CONTROL PLAN — NORTH
SCALE: 1"=50'

50 0 50 100
SCALE: 1"=50'

SITE KEY PLAN
SCALE: NONE

BDA BEARDSLEY DESIGN ASSOCIATES
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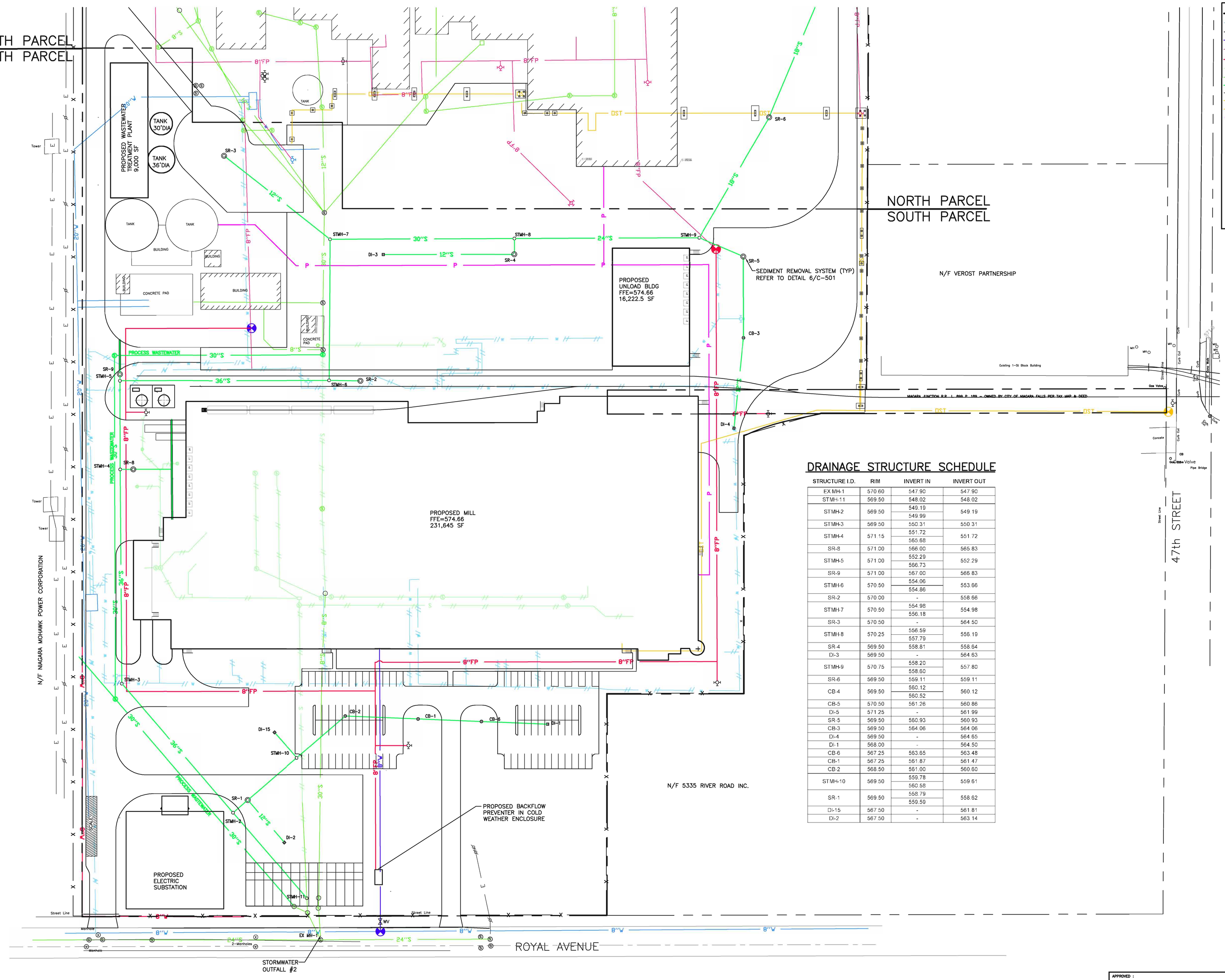
EROSION AND SEDIMENT CONTROL PLAN — NORTH

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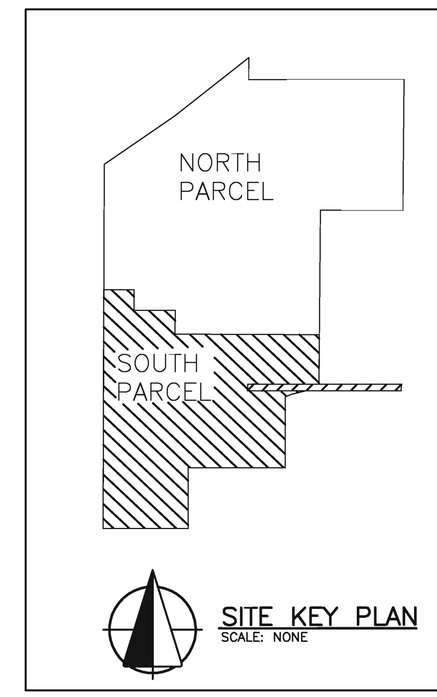


LEGEND

- PROPERTY LINE
- W — WATER (REMOVED/ABANDONDED)
- W — WATER (EX)
- W — WATER (PROPOSED)
- FP — FIRE PROTECTION LINE (EX)
- FP — FIRE PROTECTION LINE (PROPOSED)
- S — SEWER/STORM (REMOVED/ABANDONDED)
- S — SEWER/STORM (EX)
- S — SEWER/STORM (PROPOSED)
- PB — OVERHEAD STEAM (EX)
- OST — OVERHEAD STEAM (PROPOSED)
- UST — UNDERGROUND STEAM (PROPOSED)
- P — PROCESS WASTEWATER (FORCE MAIN)
- E — OVERHEAD ELECTRIC & POLE (EX)
- WV — WATER VALVE
- HYDRANT
- CB-1 — CATCH BASIN
- DI-1 — DROP INLET
- SAMH-1 — SANITARY SEWER MANHOLE
- SR-1 — SEDIMENT REMOVAL SYSTEM
- STMH-1 — STORM MANHOLE
- UTILITY TIE-IN LOCATION

DRAINAGE STRUCTURE SCHEDULE

STRUCTURE I.D.	RIM	INVERT IN	INVERT OUT
EX MH-1	570.60	547.90	547.90
STMH-11	569.50	548.02	548.02
STMH-2	569.50	549.19	549.19
		549.99	
STMH-3	569.50	550.31	550.31
STMH-4	571.15	551.72	551.72
		565.68	
SR-8	571.00	566.00	565.83
STMH-5	571.00	552.29	552.29
		566.73	
SR-9	571.00	567.00	566.83
STMH-6	570.50	554.06	553.66
		554.86	
SR-2	570.00	-	558.66
STMH-7	570.50	554.98	554.98
		556.18	
SR-3	570.50	-	564.50
STMH-8	570.25	556.59	556.19
		557.79	
SR-4	569.50	558.81	558.64
DI-3	569.50	-	564.63
STMH-9	570.75	558.20	557.80
		558.60	
SR-6	569.50	559.11	559.11
CB-4	569.50	560.12	560.12
		560.52	
CB-5	570.50	561.26	560.86
DI-5	571.25	-	561.99
SR-5	569.50	560.93	560.93
CB-3	569.50	564.06	564.06
DI-4	569.50	-	564.65
DI-1	568.00	-	564.50
CB-6	567.25	563.65	563.48
CB-1	567.25	561.87	561.47
CB-2	568.50	561.00	560.60
STMH-10	569.50	559.78	559.61
		560.58	
SR-1	569.50	558.79	558.62
		559.59	
DI-15	567.50	-	561.81
DI-2	567.50	-	563.14



SITE KEY PLAN
SCALE: NONE

A UTILITY PLAN – SOUTH
SCALE: 1"=50'

50 0 50 100
SCALE: 1"=50'

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V.I.P. Structures
ARCHITECTS WHO BUILD

NO.	DATE	REVISIONS	DWN	CKD	ZONE

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UTILITY PLAN – SOUTH

APPROVED :
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FILE: C107_108.DWG | CLIENT DRAWING NO.

REV. 1
CLIENT DRAWING NO.
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REV. —

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1" ½ 0 1"
GRAPHIC SCALE

PACKARD ROAD

50' EASEMENT TO NIAGARA FALLS POWER CO.- L. 437 P. 139

N/F- NIAGARA MOHAWK POWER CORPORATION

47th STREET

EX BLDG
265,614 SF

STORMWATER BASIN

STORMWATER OUTFALL #1

DETENTION BASIN OUTLET STRUCTURE

EX MH-2

STMH-1

SR-7

SR-3

SR-6

PROPOSED WASTEWATER TREATMENT PLANT 9,000 SF

TANK 30'DIA

TANK 36'DIA

NORTH PARCEL
SOUTH PARCEL

NORTH PARCEL
SOUTH PARCEL

SCALZ

SCALZ

LEGEND

- PROPERTY LINE
- WATER (REMOVED/ABANDONDED)
- W — WATER (EX)
- W — WATER (PROPOSED)
- FP — FIRE PROTECTION LINE (EX)
- FP — FIRE PROTECTION LINE (PROPOSED)
- SEWER/STORM (REMOVED/ABANDONDED)
- S — SEWER/STORM (EX)
- S — SEWER/STORM (PROPOSED)
- OHP — OVERHEAD STEAM (EX)
- OST — OVERHEAD STEAM (PROPOSED)
- UST — UNDERGROUND STEAM (PROPOSED)
- PROCESS WASTEWATER (FORCE MAIN)
- E — OVERHEAD ELECTRIC & POLE (EX)
- WV — WATER VALVE
- HYDRANT
- CB-1 — CATCH BASIN
- DI-1 — DROP INLET
- SAMH-1 — SANITARY SEWER MANHOLE
- SR-1 — SEDIMENT REMOVAL SYSTEM
- STMH-1 — STORM MANHOLE
- UTILITY TIE-IN LOCATION

DRAINAGE STRUCTURE SCHEDULE

STRUCTURE I.D.	RIM	INVERT IN	INVERT OUT
EX MH-2	573.00	563 10	563 00
STMH-1	572.40	563.61	563.61
ES-1	-	-	566 02
CB-7	572.50	567.00 567.40	566 60
CB-8	571.50	567.84	567.84
DI-6	572.00	-	568.33
DI-7	571.50	-	568.65
ES-2	-	-	566 00
CB-9	573.75	566.88 568.38	566 88
DI-8	576.50	-	573.25
CB-10	573.75	568.14 568.64	567.74
DI-9	576.50	-	573.25
CB-11	573.75	569.40 570.40	569 00
DI-10	576.50	-	573.25
CB-12	573.75	570 65	570 25
DI-11	576.50	-	573.25
ES-3	-	-	567 50
ES-4	-	-	571.00
ES-5	-	-	571 50
CB-13	575.00	571 90	571.73
DI-12	576.75	-	573 50
ES-6	-	-	565.67
CB-14	571.50	566 17	566 17
DI-13	570.50	-	567.00
CB-15	573.75	569.10	568 93
CB-16	573.75	570.47	570.47
DI-14	573.75	-	571 15
SR-7	572.50	-	569.00

NORTH PARCEL
SOUTH PARCEL

SITE KEY PLAN
SCALE: NONE

A UTILITY PLAN – NORTH
SCALE: 1"=50'

50 0 50 100
SCALE: 1"=50'

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V.I.P Structures
ARCHITECTS WHO BUILD

NO.	DATE	REVISIONS	DWN	CKD	ZONE

DRAWN BY FJS — DATE — CHECKED BY — DATE
DESIGNED BY RNC — DATE — APPROVED BY — DATE

NEW PAPER MILL
NIAGARA FALLS, NY
GREENPAC PARTNERSHIPS, INC.
4001 PACKARD ROAD
NIAGARA FALLS, NEW YORK 14303

UTILITY PLAN – NORTH

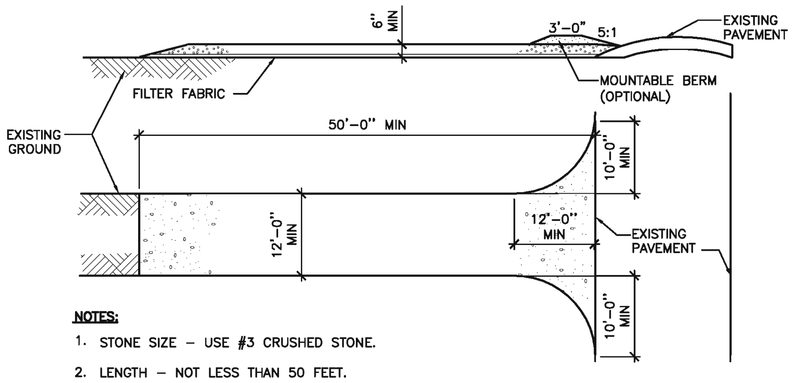
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MAY 20, 2011

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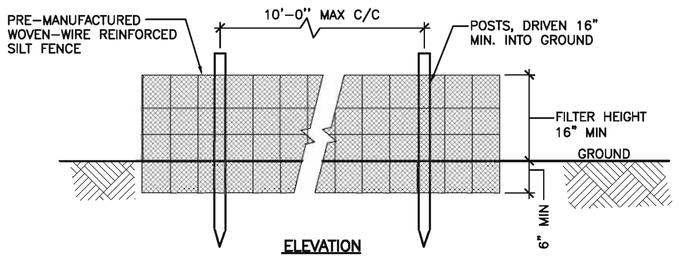
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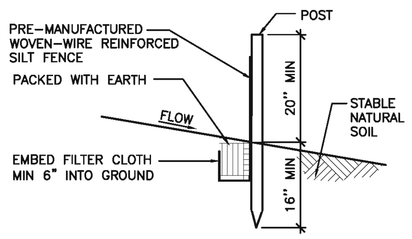
NOTES:

1. STONE SIZE – USE #3 CRUSHED STONE.
2. LENGTH – NOT LESS THAN 50 FEET.
3. THICKNESS – NOT LESS THAN 6".
4. WIDTH – 12'–0" MIN. BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. 24'–0" IF SINGLE ENTRANCE TO SITE.
5. FILTER FABRIC – PLACE OVER THE ENTIRE AREA PRIOR TO PLACEMENT OF STONE.
6. SURFACE WATER – ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCE SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE – MAINTAIN ENTRANCE IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO EXISTING PARKING AREAS AND PUBLIC RIGHTS–OF–WAY. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PAVED AREAS MUST BE REMOVED IMMEDIATELY.
8. WASH VEHICLE TIRES WHEN NEEDED ON THE STABILIZED CONSTRUCTION ENTRANCE, PRIOR TO EXITING THE AREA OF CONSTRUCTION.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN. TOP DRESS WITH NEW GRAVEL AS NEEDED.
10. UPON COMPLETION OF WORK ALL STONE AND FABRIC ARE TO BE REMOVED. RESTORE EXISTING LAWN AREAS, TO EXISTING CONDITIONS.

1 STABILIZED STONE CONSTRUCTION ENTRANCE
SCALE: NONE



ELEVATION

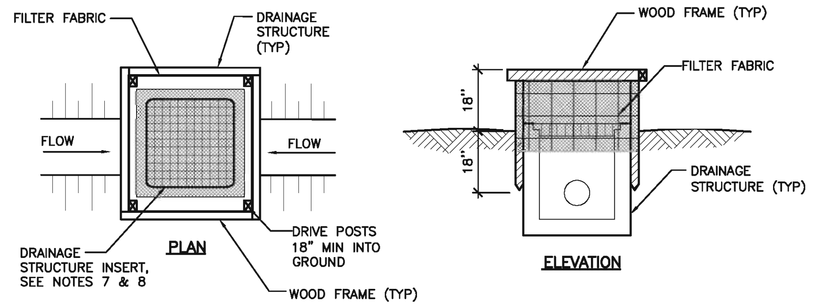


SECTION

NOTES:

1. PRE–MANUFACTURED SILT FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES.
2. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY 6" AND FOLDED.
3. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.
4. SILT FENCE TO REMAIN IN PLACE UNTIL LAWNS HAVE BEEN ESTABLISHED AND/OR FINISH SURFACE HAVE BEEN INSTALLED.

2 SILT FENCE
SCALE: NONE



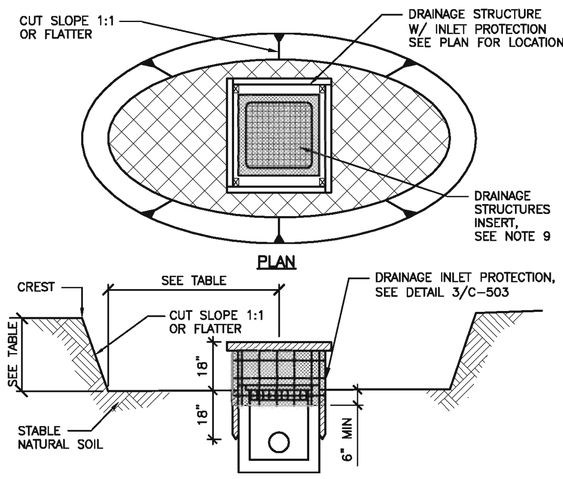
PLAN

ELEVATION

NOTES:

1. CUT FABRIC FROM A CONTINUOUS ROLL TO ELIMINATE JOINTS. IF JOINTS ARE NEEDED OVERLAP TO THE NEXT POST.
2. POST MATERIALS TO BE STANDARD 2"X4" WOOD OR EQUIVALENT.
3. SPACE POSTS EVENLY AROUND INLET 3 FEET APART AND DRIVE A MIN 18 INCHES DEEP. SPANS GREATER THAN 3 FEET MAY BE BRIDGED WITH THE USE OF WIRE MESH BEHIND THE FILTER FABRIC FOR SUPPORT.
4. FABRIC SHALL BE EMBEDDED 12" MIN BELOW GROUND AND BACKFILLED. IT SHALL BE SECURELY FASTENED TO POSTS AND FRAME.
5. A 2"X4" WOOD FRAME SHALL BE COMPLETED AROUND THE CREST OF THE FABRIC FOR 12" OVERFLOW STABILITY.
6. MAXIMUM DRAINAGE AREA 1 ACRE.
7. PROVIDE DRAINAGE STRUCTURE INSERTS FOR ADDITIONAL MEANS OF PREVENTING SEDIMENT FROM ENTERING THE STORM SEWER SYSTEMS. INSERTS SHALL HAVE SUFFICIENT FLOW RATE CAPACITY AND BE PROPERLY SIZED FOR THEIR RESPECTIVE DRAINAGE STRUCTURE.
8. DRAINAGE STRUCTURES INSERTS SHALL BE INSPECTED AND MAINTAINED PER MANUFACTURES INSTRUCTIONS.

3 DRAINAGE INLET PROTECTION DETAIL
SCALE: NONE



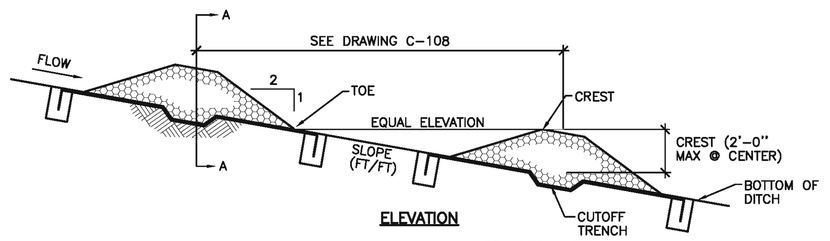
PLAN

SECTION

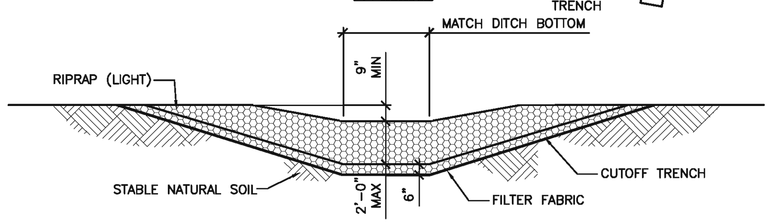
NOTES:

1. SEE PLAN FOR SEDIMENT TRAP LOCATIONS.
2. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.
3. THE VOLUME OF SEDIMENT STORAGE SHALL BE 3600 CUBIC FEET PER ACRE OF DRAINAGE AREA.
4. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NECESSARY.
5. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND WATER POLLUTION SHALL BE MINIMIZED.
6. THE SEDIMENT TRAP SHALL BE REMOVED AND AREA STABILIZED WHEN THE CONTRIBUTORY DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
7. ALL CUT SLOPES SHALL BE 1:1 OR FLATTER.
8. MAXIMUM DRAINAGE AREA: 3 ACRES.
9. PROVIDE DRAINAGE STRUCTURE INSERTS FOR ADDITIONAL MEANS OF PREVENTING SEDIMENT FROM ENTERING THE STORM SEWER SYSTEMS. INSERTS SHALL HAVE SUFFICIENT FLOW RATE CAPACITY AND BE PROPERLY SIZE FOR THEIR RESPECTIVE DRAINAGE STRUCTURE.
10. DRAINAGE STRUCTURES INSERTS SHALL BE INSPECTED AND MAINTAINED PER MANUFACTURES INSTRUCTIONS.

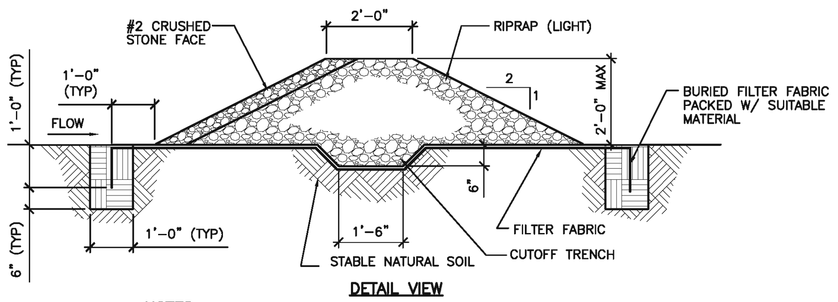
4 SEDIMENT TRAP
SCALE: NONE



ELEVATION



SECTION

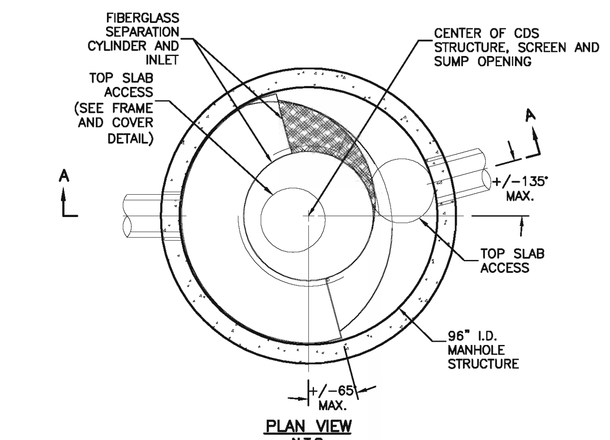


DETAIL VIEW

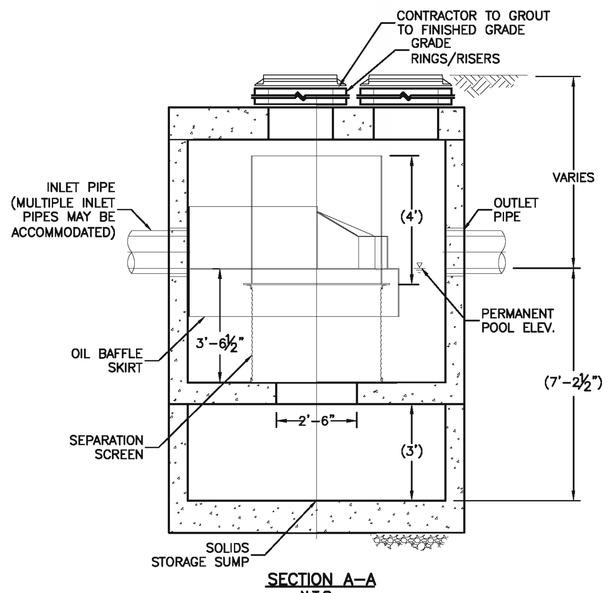
NOTES:

1. STONE WILL BE PLACED ON A FILTER FABRIC FOUNDATION TO THE LINES, GRADES, AND LOCATIONS SHOWN IN THE PLAN.
2. EXTEND THE STONE A MIN OF 1'–6" BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM.
3. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM SCOUR AND EROSION WITH STONE OR LINER AS APPROPRIATE.
4. ENSURE THAT CHANNEL APPURTENANCES SUCH AS CULVERT ENTRANCES BELOW CHECK DAMS ARE NOT SUBJECT TO DAMAGE OR BLOCKAGE FROM DISPLACED STONE.
5. CHECK DAMS SHALL REMAIN IN PLACE UNTIL PERMANENT VEGETATIVE COVER IS ESTABLISHED.
6. MAXIMUM DRAINAGE AREA 2 ACRES.

5 STONE CHECK DAM
SCALE: NONE



PLAN VIEW
N.T.S.

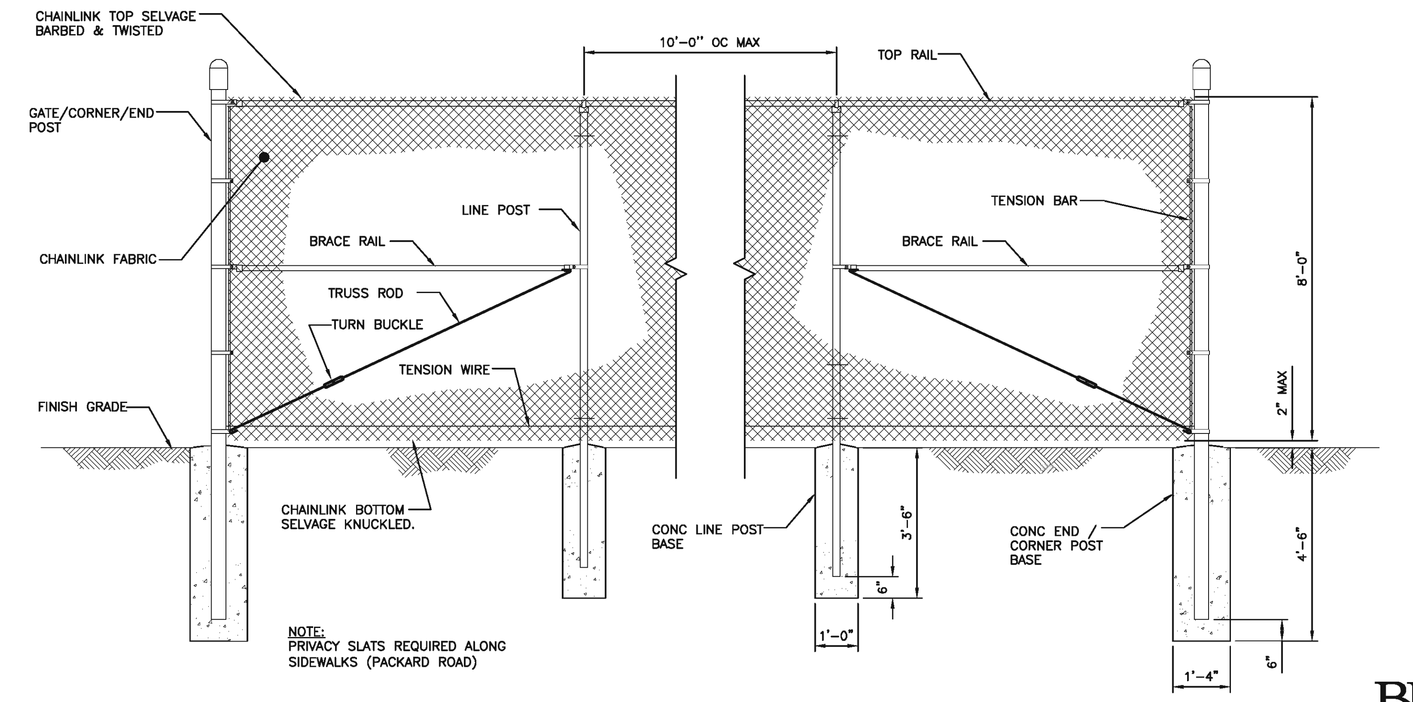


SECTION A–A
N.T.S.

NOTES:

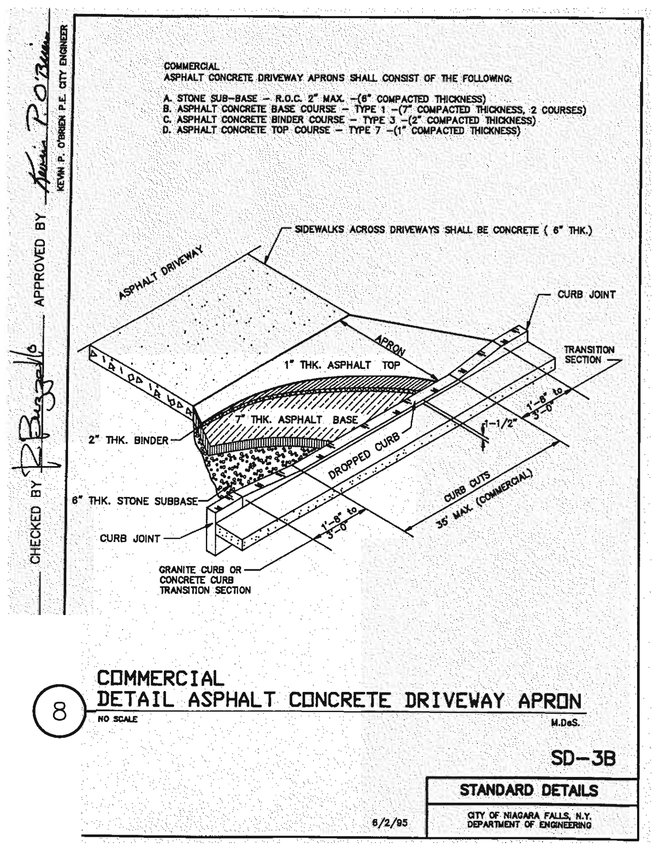
1. CONTRACTOR SHALL PROVIDE STORMWATER TREATMENT DEVICES AND APPURTENANCES.
2. REMOVAL EFFICIENCIES
   a. CAPABLE OF RETAINING 100 PERCENT OF POLLUTANTS GREATER THAN OR EQUAL TO 2.4 MILLIMETERS REGARDLESS OF THE POLLUTANT'S SPECIFIC GRAVITY (I.E.: FLOATABLE AND NEUTRALLY BUOYANT MATERIALS)
   b. CAPABLE OF CAPTURING AND RETAINING TOTAL PETROLEUM HYDROCARBONS
   c. CAPABLE OF ACHIEVING A REMOVAL EFFICIENCY OF 92 AND 78 PERCENT WHEN THE DEVICE IS OPERATING AT 25 AND 50 PERCENT OF ITS RATED–TREATMENT CAPACITY
   d. AT ITS RATED–TREATMENT CAPACITY, THE DEVICE SHALL BE CAPABLE OF ACHIEVING GREATER THAN 65 PERCENT REMOVAL OF PARTICLES TYPICALLY FOUND IN ROADSIDE SEDIMENTS .
3. BASIS OF DESIGN
   a. CONTECH CONTINUOUS DEFLECTION SEPARATION (CDS) OR EQUAL
   b. HTTP://WWW.CONTECH–CPI.COM/STORMWATER/PRODUCTS/14

6 SEDIMENT REMOVAL SYSTEM DETAIL
SCALE: NONE



NOTE:
PRIVACY SLATS REQUIRED ALONG SIDEWALKS (PACKARD ROAD)

7 CHAINLINK FENCE DETAIL
SCALE: NONE



8 COMMERCIAL DETAIL ASPHALT CONCRETE DRIVEWAY APRON
NO SCALE — M.DoS.

SD–3B

STANDARD DETAILS

CITY OF NIAGARA FALLS, N.Y. DEPARTMENT OF ENGINEERING

6/2/85

APPROVED :

DATE :

SIGNATURE SEAL

MAY 20, 2011

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V.I.P. Structures
ARCHITECTS WHO BUILD

NO.	DATE	REVISIONS	DWN	CKD	ZONE

DRAWN BY FJS — DATE — CHECKED BY — DATE
DESIGNED BY RNC — DATE — APPROVED BY — DATE

NEW PAPER MILL
NIAGARA FALLS, NY
GREENPAC PARTNERSHIPS, INC.
4001 PACKARD ROAD
NIAGARA FALLS, NEW YORK 14303

SITE DETAILS

SCALE: AS NOTED — CONTRACT — DRAWING NO. C–501
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REV. –
CLIENT DRAWING NO. LSDWG
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Appendix E
Health and Safety Plan

Greenpac Mill, LLC

Health & Safety Plan

Former Mill No.2
4001 Packard Road
Niagara Falls, New York
NYSDEC BCP Site No. C932150

January 2011
Revised April 2011

ERM Project Number 0128439

Environmental Resources Management
5788 Widewaters Parkway
Dewitt, New York 13214

Site-Specific

Health and Safety Plan:

BCP RI Implementation

Former Mill # 2
4001 Packard Road
Niagara Falls, New York

ERM Project No. 0128439

JOHN KUNN
Partner-in-Charge

JON FOX
Project Manager

ERNEST SWEET
Project Health & Safety Coordinator

Environmental Resources Management, Inc.

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Dewitt, New York 13214

Phone: (315) 445-2554

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ATTACHMENTS

A GREENPAC CONSTRUCTION SAFETY MANUAL

B JOB HAZARD ANALYSES

C JOB HAZARD ANALYSES (BLANK FORM)

D APPLICABLE STANDARD OPERATING PROCEDURES

E EXCAVATION POLICY AND PROCEDURES

F MAP AND DIRECTIONS FOR HOSPITAL

G DAILY SAFETY MEETING FORM

H UNSAFE ACT, AND UNSAFE CONDITION REPORT FORM

I NEAR REPORTING & INVESTIGATION FORM

J INCIDENT REPORTING & INVESTIGATION FORM

K NYS DEC COMMUNITY AIR MONITORING PROGRAM

1.0 HEALTH AND SAFETY PLAN

Environmental Resources Management (ERM) has prepared this Health and Safety Plan (HASP) for the BCP RI Implementation Plan work being conducted at the Greenpac Mill, Former # 2 Mill facility located at 4001 Packard Road in Niagara Falls, New York (the Site). This HASP is a supporting document to the BCP RI Implementation Plan.

This HASP applies to ERM personnel involved with the above mentioned Site investigation activities. This HASP will also be reviewed by ERM's sub-contractor personnel, who will be required to comply with the health and safety protocols outlined in the document. However, each sub-contractor will be responsible and held accountable for the health and safety and actions of their employees.

Greenpac requires that all Site contractors shall review and confirm that they have read Greenpac Construction Safety policies and procedures and provide signed documentation that they understand and agree to comply with policies and all Federal, State and Local Government safety regulations. Greenpac also requires that all employees receive site specific orientation training that covers facility specific Health and Safety information and procedures. ERM and its subcontractors must complete their review and confirmation of their understanding and conformance to Greenpac Construction Safety Policies before entering the Site.

Greenpac requires that ERM employees and subcontractor employees must pass a drug screening urine test and receive site-specific safety orientation training covering facility specific Health and Safety information and procedures prior to be allowed on site.

A copy of the Greenpac Construction Safety manual is included as Attachment A.

In addition, ERM will conduct an initial project kick-off meeting on the first day of field activities, along with daily tailgate meetings at the beginning of each day of field work, during which health and safety items will be reviewed. These daily tailgate meetings will be attended by ERM personnel, Greenpac personnel, and sub-contractor personnel who will be in the field on that given day. The daily safety meeting will include a discussion of the following health & safety-related topics, among others:

- Who is doing what, where, and how;
- The potential for overlapping site operations;

- Changes to the HASP or JHAs;
- Discussion of recent incidents or safety observations; and
- Comments from the project personnel.

The meetings will be documented on the Daily Safety Meeting form found in Attachment G.

The procedures set forth in this HASP are designed to minimize the risk of exposure to chemical substances and physical hazards that may be present at the Site. These procedures generally conform to applicable federal, state and local regulations, including Occupational Safety and Health Administration (OSHA) requirements governing activities at hazardous waste sites and the requirements in 29 CFR 1910.120.

Specific practices and procedures, including the level of personal protective equipment, are based on a review of currently available information for the Site.

ERM has fulfilled the requirements of a Hazardous Communication Program as specified in 29 CFR 1910.120.

Every potential safety hazard associated with this investigation may not be predicted. This HASP does not attempt to establish rules to cover every contingency that may arise, but it does provide a basic framework for the safe completion of field activities and plans for reasonable contingencies. The procedures provided herein are to be used on-Site by ERM employees.

2.0 SCOPE OF FIELD ACTIVITIES

ERM will.

Major tasks to be performed by ERM personnel and/or ERM Contractors include the following:

- Advancing Borings at specific locations that have been selected by Greenpac and the NYS DEC;

- Greenpac has had the site surveyed and used a third party firm to conduct investigations of subsurface buried utilities and approximate locations of underground tanks, vaults, piping systems, storm water, sanitary waster piping systems, etc;

- ERM may have to use another firm NY Leak Detection Services for additional subsurface investigations and clearance activities and may have to hand clear specific locations to a least 4 ft, based on site conditions and locations of underground utilities and structures;

- Environmental media (soil/ground water) sampling;

- Collection of soil samples in electrical transformer station will be conducted during an electrical outage being performed by client. After de-energization has been completed by National Grid and both National Grid and the client s' electrical subcontractor have placed their lock and tags on the electrical transformer substation lockout locations, ERM will place their locks and tags at the same lockout locations while they are conducting the sampling in the electrical transformer station fenced enclosure;

- Excavation of contamination soil from the Site and transport offsite for treatment and disposal;

Each of the tasks above has a Job Hazard Analysis (JHA) prepared for it. JHAs are further described in Section 5.1, below.

A detailed description of the field activities that will be conducted as part of this investigation is provided in the BCP RI Implementation Plan.

3.0 SITE ENTRY REQUIREMENTS

The Field Team Leader (FTL)/Site Safety Officer (SSO) will act in a supervisory capacity over ERM employees who participate in the field activities specified in this work plan. The FTL/SSO is responsible for ensuring that ERM Health and Safety responsibilities are carried out in conjunction with field activities. As part of these responsibilities, the FTL/SSO will distribute the HASP to field team personnel and discuss the HASP prior to the start of field activities. Field personnel will sign the "Acknowledgement" presented as Section 9, verifying that they have read and are familiar with the contents of this HASP. Sub-contractor personnel will also be asked to sign the "Acknowledgement" form indicating that they are familiar with the protocols outlined in the HASP.

NOTE: A personnel sign-in sheet will also be posted at the FTL's work station onsite, along with a copy of this HASP.

Training

ERM and sub-contractor personnel that will be conducting sub-surface activities (i.e., drilling) at the Site will have completed training requirements for hazardous waste site operations in accordance with OSHA 29 CFR 1910.120 (e)(1)(2)(3) or be certified by their employers as having equivalent training or experience.

ERM personnel and ERM subcontractors will have reviewed the Greenpac Construction Safety Manual, completed the Greenpac acknowledgement and agreement form prior to mobilizing to the Site.

ERM personnel and ERM subcontractors will receive facility and site specific orientation training prior to enter the work areas of the Site.

Medical Surveillance

ERM and sub-contractor personnel that will be conducting sub-surface activities (i.e., drilling) at the Site must have completed appropriate medical surveillance as required by OSHA 29 CFR 1910.120(f).

Respirator Fit Test

ERM and sub-contractor personnel that may be required to use a negative pressure air purifying respirator while on-Site must have successfully passed a quantitative fit test in accordance with OSHA 29 CFR 1910.1025 or 1926.58 within the previous 12 months. Employees will be permitted to wear only those brands and models of respirator for which a fit test has been successfully performed.

At this time, it is not anticipated that respirator use will be required.

It is anticipated that general ventilation via outdoor ambient air movement and dilution will be adequate to minimize chemical exposures levels below applicable exposure limits in the event that a potential chemical exposure level approaches the action level of the chemical of concern.

4.0 SITE HEALTH AND SAFETY PLAN RISK ANALYSIS

Based on historical processes that have occurred at the Site, the main groups of chemicals that may be encountered during work activities are listed below.

- Ground water, surface soil samples and excavation soil may contain detectable concentration levels of various VOCs, SVOCs, metals, and pesticides;

VOCs are the major group of chemicals that may be present in potentially hazardous concentrations in the breathing zone during investigation activities. Since the field activities involve subsurface disturbance for short periods of time and excavation of soil potentially containing various concentration levels of chemicals, metals, or pesticides, excavation activities may potentially generate the release of VOCs in vapor form and airborne dust particles containing various types and concentration levels of various VOCs, SVOCs, metals and pesticides with inhalation being the major pathway of concern. This HASP is primarily designed to protect individuals against exposure to these aforementioned compounds during the field activities. Risk posed by hazards of the on-site chemicals will be controlled by minimizing worker contact with these groups of chemicals.

4.1 BACTERTILOGICAL ISSUES AND CONCERNS

Sanitary waste has been transported from the facility through underground sanitary waste piping systems treatment for off-site treatment and disposal. As such, there is a potential that soil samples collected adjacent to these piping systems may have a sanitary waster component and as a result there is a risk of employee exposure to bacteriological agents such as *Escherichia coli, Micrococcus, Staphylococcus aureus, Streptococcus, Salmonella*, and many others. In addition, there is the concern for viral diseases such as *Bacteremia, Pneumonia,* skin infections, typhoid fever, dysentery, etc.

Therefore, when ERM employees have the potential to have incidental contact with soil samples that may contain sanitary water residual, these employees should be wearing the appropriate PPE, such an inner layer of Nitrile gloves, long sleeve clothing and appropriate face and eye protection. If accidental contact does occur with soil or groundwater that may contain sanitary water, these employees should cease work activities and proceed to remove their PPE, clean and sanitize their hands, arm and face surfaces and then put on clean PPE and proceed with work activities.

5.0 TASK RISK ANALYSIS

This hazard assessment identifies the general hazards associated with specific Site operations and presents an analysis of documented or potential hazards existing at the Site. Every effort must be made to reduce or eliminate these hazards. Those hazards that cannot be eliminated must be guarded against by use of engineering controls and/or personal protective equipment.

5.1 JOB HAZARD ANALYSES

Prior to initiating any new project activity or when there is a change in site conditions, the SSO will assist project team members in completing a Job Hazard Analysis (JHA). The JHA will list the hazards associated with the project activity as well as associated control strategies.

JHAs for the tasks listed in Section 2.0, are located in Attachment B and a blank copy of the JHA form are located in Attachment C.

5.2 PHYSICAL HAZARDS

Liquid Transfer

Based on field conditions, liquid transfer and/or handling may occur at the site during sampling activities (i.e., discharge of decontamination water or purge water into drums). During liquid handling operations that involve potential contact with skin, appropriate personal protective equipment will be utilized (e.g. gloves, etc.) as applicable.

Drum Handling

Based on field conditions, drum handling may occur at this site (i.e., soil cuttings, temporary storage of decontamination water). If necessary, the movement and opening of drums will be done in accordance with 29 CFR 1910.120(j).

Cold Stress

When the temperature falls below 40° Fahrenheit (F), cold stress protocol shall be followed. Employees must be supplied with adequate clothing to maintain body core temperature. To minimize the potential for hypothermia, a heated area outside the decontamination area will be available to Site workers during breaks.

Heat Stress

When the temperature exceeds 80° F, and personnel are wearing protective clothing, a heat stress-monitoring program shall be implemented as appropriate. Employees shall have access to break periods and drinking water as necessary. The signs of heat stress disorders are described below.

Heat Cramps

Heat cramps are caused by heavy sweating and inadequate electrolyte replacement. Signs and symptoms include muscle spasms and pain in the hands, feet, and abdomen.

Heat Exhaustion

Heat exhaustion occurs from increased stress on various body organs. The signs and symptoms include:

- Pale, cool, moist skin;
- Heavy sweating; and,
- Dizziness, nausea, fainting.

Heat Stroke

Heat stroke is the most serious form of heat stress, and should always be treated as a medical emergency. The body's temperature regulation system fails and the body temperature rapidly rises to critical levels. Immediate action must be taken to cool the body before serious injury or death occurs. Signs and symptoms of heat stroke include:

- Red, hot, unusually dry skin;
- Lack of, or reduced, perspiration;
- Nausea;
- Dizziness and confusion;
- Strong, rapid pulse and confusion; and,
- Coma.

Eye Protection

Operations involving the potential for eye injury, splash, etc. must have approved eye wash units locally available as per 29 CFR 1910.151(c).

Vehicular Traffic

Vehicular traffic associated with routine site operations and distribution activities, and excavation and transport of contaminated soil at the Site may pose a significant hazard to project personnel. Powered vehicles inside the facility include forklifts. Powered vehicles outside the facility include tractor-trailers and other motor vehicles. Precaution should be taken when Site activities make it necessary to work in or near active excavation areas and in or near high travel areas. High-visibility vests will be required for personnel will be working in such areas.

Sampling Hazards

Field activities will consist of collecting soil and ground water samples for analysis and evaluation. The hazards of this operation are primarily associated with the sample collection methods and procedures utilized. Standard methods and procedures that will be utilized for sampling activities are described in the Quality Assurance Project Plan. Of these specific procedures, none present hazards that are unique to sampling.

Overhead and Buried Utility Hazards

Utility lines, both above and below ground, may pose a safety hazard for Site personnel during soil boring or other heavy equipment operations. If overhead utilities have been identified as a hazard, the equipment operator must maintain a safe clearance between the lines and the equipment at all times during work operations. High voltage lines require greater clearance distances. As a safe work practice, equipment operators will maintain at least a 20-foot clearance between equipment and power lines or other energized sources unless the source is greater than 350 KV, in which case 29CFR 1910.180(j) (ii) must be applied. Overhead utility lines are present near the south end of the excavation. It is anticipated that all excavation activity will occur more than 20-feet away from the overhead utility lines.

The location of buried utilities lines in and around the excavation area has been assessed by the site. A request for subsurface utility clearance was filed through Dig Safely New York. Greenpac facility personnel assisted ERM by estimating the location of underground utilities in the excavation area.

ERM's sub-contractor, New York Leak Detection (NYLD) will be providing additional screening services for the boring locations as required at the time of actual boring activities using ground penetrating radar or other technologies/equipment as required based on Site conditions.

ERM has performed the following tasks as part of the ERM Subsurface Clearance Guidelines:

- ERM will complete a Subsurface Clearance Checklist ;
- ERM will utilize site specific and information provided by Dig Safely NY to identify underground pipelines, utility lines, and fiber optic cable;
- ERM has contracted with New York Leak Detection Services to be on-site and provide additional screening services as required for each specific boring location;
- ERM will be contacting site personnel to identify process specific underground piping systems, storm water, sanitary waste water piping systems etc and any other obstructions;

In the event that a subsurface utility is encountered during work activities, evacuate the work area and contact Greenpac Security personnel at the number provided in Section 8.0.

Drill Rig Operation

Drill rigs present multiple hazards while in operation. Excessive noise, boom raising, lowering and swing, cable and hook damage and operator error may result in injuries. To minimize potential accidents, the following safety measures should be required for all drilling operations. The drilling subcontractor is responsible for the health and safety of its personnel, equipment, and operations.

- Operators (drillers) of equipment used on site will be familiar with the requirement for inspection and operation of such equipment. The drilling subcontractor is responsible for ensuring proficiency in safe operation the equipment;

- Drilling shall be performed from a stable ground position. If unable to locate on level ground, the drill rig shall be appropriately checked, blocked, and braced prior to the derrick being raised;

- A competent person employed by the drilling subcontractor competent in drilling safety shall make daily inspections of the drilling area. The inspector shall note the safety of the drilling area and confirm the location of all utilities;

- Before drilling, the existence and location of utility lines (electric and gas) will be determined by the Site owner, Dig Safely New York, and New York Leak Detection Services. This will be done, if possible, by contacting the appropriate utility company and/or client representative to mark the location of the lines. If the knowledge is not available, an appropriate device, such as a cable-avoiding tool, will be used to locate the service line(s);

- If flammable or combustible materials are encountered, no ignition sources are permitted if the ambient airborne concentration of flammable vapors exceeds 10 percent of the Lower Explosive Limit (LEL) during drilling activities. A combustible gas indicator supplied by the driller will be used as needed to make this determination in conjunction with constituent-specific LEL percentages;

- Operations must be suspended and the area evacuated if the airborne flammable vapor concentration reaches 10 percent of the LEL in an area of an ignition source, such as an internal combustion engine or an exhaust pipe;

- Combustible gas readings of the general work area will be obtained as required based on the HSO's determination;

- If drilling equipment is located in the vicinity of overhead power lines, a distance of 20 feet must be maintained between the lines and any point on the drill rig;

- Daily inspection of the drill rig and associate machinery must be conducted and documented by the driller prior to each day's operation of the rig. Inspections shall include examination of wire, rope, hydraulic lines, etc;

- In the event that repairs to the drilling rig derrick are required, all personnel climbing the derrick to effect such repairs must wear a restraint system, including parachute harness and lifeline, to prevent an accidental fall.

Excavation of Contaminated Soils

The excavation work at the former No. 2 Mill facility site will be conducted as detailed below, (see Attachment E for additional information):

- The equipment, materials and supplies necessary to complete the work will be mobilized to the Site;

- ERM will conduct on-site outdoor ambient air monitoring consistent with the requirements of the NYSDOH Community Air Monitoring Program (CAMP) located in Attachment K;

- All excavated soil will be handled as a potentially hazardous waste and transported as for off-site disposal;

Confined Space Entry

ERM will not be performing any Permit Required Confined Space Entry activities at the Site.

5.3 STANDARD OPERATING PROCEDURES

ERM has Standard Operating Procedures (SOPs) that define the minimum requirements for controlling potential hazards related to the work and surroundings. SOPs are referenced as appropriate on the JHA form.

Copies of the SOPs that have been identified as pertinent to the hazards inherent in the work for this project have been included in Attachment D. These SOPs will be used to guide the development of JHAs by ERM personnel and ERM Contractors.

6.0 PERSONAL PROTECTIVE EQUIPMENT

The following is a brief description of the personal protective equipment that may be required during various phases of the project. The USEPA terminology that will be used for protective equipment includes Level D and Level C.

Level D protection shall be used when:

- The atmosphere contains no known hazard.
- Work functions preclude splashes, immersion, or the potential for unexpected inhalation of, or contact with, hazardous concentrations of any chemicals.

Level D protective equipment at a minimum shall consist of:

- Standard work uniform or coveralls.
- Reflective vest.
- Safety-toe work boots.
- Gloves as needed.
- Safety glasses.
- Hard hat.

Additional safety equipment that may be required for specific tasks includes:

- Chemical-resistant aprons.
- Dust/mist disposable mask (HEPA rated as specified in 1910.1025).
- Goggles.
- Face shields.
- Five-minute escape device.
- Welders goggles or shields.
- Hearing protection.

Level C protection shall be used when:

- The types and concentrations of air contaminants are known and an air-purifying respirator (APR) capable of protection is available.
- The substance has adequate warning properties and all criteria for the use of an APR are met.

- Greater than 5 ppm up to 25 ppm of unknown organic vapors above background levels may be encountered.

Level C protection at a minimum shall consist of:

- Chemical-resistant coveralls (Tyvek).
- Steel-toe and shank work boots with chemical resistant over boots.
- Disposable inner and outer gloves (Nitrile).
- APR with full-face mask with appropriate canisters or cartridges. Respiratory protective equipment shall be NIOSH-approved, and use of this equipment shall conform to OSHA 29 CFR 1910.134 requirements.
- Hard hat.
- All joints taped with duct tape.

Activity Specific Levels of Protection

The required level of protection is specific to the activity being conducted. At this Site, the anticipated levels of protection are as follows:

ACTIVITY	INITIAL LEVEL OF PROTECTION	SPECIAL REQUIREMENTS
Soil and ground water sampling.	Level D	Monitor breathing zone for vapor phase VOCs above background levels.
Excavation and loading of trucks for transport	Level D	Monitor breathing zone for vapor phase VOCs above background levels.

Safety Equipment

A first aid kit containing first aid items for minor incidents only, a fire extinguisher, and temporary eye wash station are maintained in each ERM vehicle.

7.0 HEALTH AND SAFETY AND OUTDOOR AMBIENT AIR MONITORING AND ACTION LEVELS

ERM will conduct on-Site air monitoring consistent with the requirements of the NYSDOH Community Air Monitoring Program (CAMP) provided in Appendix K. In accordance with the CAMP, air monitoring stations equipped with a photoionization detector (PID) for field measurement of VOCs, and a MiniRAE dust monitor will be established at the downwind perimeter of the work area to monitor for particulate emissions (dust) from the excavation activities. An upwind dust monitor will also be provided. Readings will be collected approximately every 15 minutes and recorded.

In addition, a PID and dust monitor will be used within the work zone to monitor for potential worker exposure and satisfy the requirements of the HASP.

According to 29 CFR 1910.120(h), periodic air monitoring shall be used to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection needed at the Site.

Routine air monitoring at a minimum shall be conducted:

- When work begins on a different portion of the Site;
- Contaminants other than those previously identified are being handled;
- Excavation activities are initiated and on-going;
- Employees are handling leaking drums or containers or working in areas with obvious liquid contamination;

Periodic Air monitoring will consist at a minimum of the criteria listed below. Air monitoring instruments will be calibrated and maintained in accordance with the manufacturer's specifications.

Instrument	Compound	Frequency of Monitoring	Action Level	Action
PID or FID	VOCs	Continuous	PID reads 5 ppm above the background level sustained in the breathing zone for 15 minutes	Stop work, vent area, and then continue to monitor.*
			PID reads above 25 ppm above the background level sustained in the breathing zone for 15 minutes.	Stop work. Contact Project Manager for further instruction.

* If outdoor natural ventilation of area is not sufficient to cause VOC readings to drop below the 5 ppm action level, work in that location shall be stopped, and workers should vacate the area. Additional engineering controls may be employed to mitigate the elevated readings during investigation. If other engineering controls are not adequate to mitigate the elevated VOC readings, the Project Manager and FTL, along with P&GM personnel, will discuss the use of Level C PPE to complete the boring.

8.0 SPILL CONTAINMENT PROGRAM

The spill contamination program for this project will involve the use of preventative measures in order to reduce the potential for environmental releases. These preventative measures will include the following:

- Equipment inspection;
- Staging equipment on containment pads;
- General housekeeping practices;

If project activities involve the use of drums or other containers, the drums or containers will meet the appropriate DOT regulations and will be inspected and their integrity assured prior to being moved.
Operations will be organized so as to minimize drum or container movement.
Drums or containers that cannot be moved without failure will be over packed into an appropriate container.

ERM personnel and subcontractors will comply with the applicable facility specific environmental policies.

8.1 DIESEL TANKS

Diesel storage tanks will not be necessary for this project.

8.2 HYDRAULIC FLUID/ENGINE OIL/FUEL SPILLS

In the event of an unexpected release of hydraulic fluid, engine oil, gasoline or diesel fuel, the release material will be absorbed with sorbent pads, which will be placed in a designated drum for disposal.
Impacted soil will be excavated and placed on plastic sheeting and covered until characterization and/or disposal can be arranged.

8.3 DRILLING MUD LEAKS/SPILLS AND "FRAC OUTS"

A frac out is defined as a release of drilling fluid that occurs when the fluid migrates to the surface instead of returning through the borehole into the returns box. These types of incidents are not expected to occur during the advancement of borings.

9.0 EMERGENCY RESPONSE PLAN

This section describes possible contingencies and emergency procedures to be implemented at the site.

9.1 PERSONNEL ROLES AND LINES OF AUTHORITY

The SSO has primary responsibility handling emergency situations. This includes taking appropriate measures to ensure the health and safety of site personnel and the public. The SSO will be responsible for evacuating any person and providing decontamination, and arranging for medical treatment or first aid for any person injured or requiring medical attention.

Possible actions may involve the evacuation of personnel from the site area and ensuring that corrective measures have been implemented, appropriate authorities notified, and follow-up reports completed. If the SSO is not available, other ERM field staff will assume the SSO's responsibilities. ERM and subcontractor personnel will assist as directed by the SSO in case of an emergency.

9.2 EMERGENCY ALARMS

In the event that an emergency alarm sounds at the facility, ERM personnel and subcontractors will comply with the Greenpac facility specific emergency evacuation procedures as provided in employee orientation training.

9.3 EVACUATION PROCEDURES AND ROUTES

In the event that an emergency alarm sounds at the facility, ERM personnel and subcontractors will comply with the Greenpac facility specific emergency evacuation procedures as provided in employee orientation training.

The nearest assembly point for the Former #2 Mill for ERM personnel and subcontractors is the guard building on north site of Site.

In the event of an emergency requiring evacuation to an Assembly Point, the SSO will be responsible to account for the presence of all project team members and subcontractors on-site at the time of the emergency. When evacuating, it is important to be aware of the prevailing wind direction and evacuate upwind or crosswind.

9.4 RESPONDING TO EMERGENCIES

In the event an actual or suspected incident where personal injury or illness occurs, the SSO should take the following actions sequentially as listed:

- Don appropriate PPE;
- Remove the exposed or injured person(s) from immediate danger;
- Decontaminate affected personnel as appropriate;
- Contact Greenpac Security to obtain ambulance transport to the local hospital in the event of any injury or illness deemed to require medical surveillance or treatment; and
- Evacuate other personnel until it is safe for work to resume.

9.5 REPORTING EMERGENCIES

At the earliest time practicable following the occurrence of the emergency situation, the SSO will contact the ERM PIC/PM and ERM H&S Coordinator to advise them of the situation. The PM will then be responsible for promptly informing the following parties about the emergency.

- Injured/involved personnel's supervisor;
- Partner-In-Charge; and
- Client Contact;

In the case of an Incident, the SSO, with the cooperation of the ERM H&S Coordinator will promptly begin formal documentation of and investigation into the root cases of the Incident following the occurrence of the incident. This process is defined in Section 10, below.

9.6 RESTARTING WORK FOLLOWING AN EMERGENCY

The SSO and Greenpac Security will determine when it is safe to resume work at the site following an emergency. Note that if there is any doubt regarding the safe condition of the area, work will not recommence until all safety issues are resolved. If the emergency was initialized by

Greenpac, facility personnel will contact the SSO when it is safe to recommence work activities.

9.7 EMERGENCY CONTACTS

Contact information for emergencies is provided in the project personnel list in Section 11.

10.0 MANAGEMENT AND INVESTIGATION OF SAFETY EVENTS

Safety events are occurrences or conditions that may contribute to or result in an injury, occupational illness or property damage. ERM seeks to learn from the investigation of the following types of safety events:

- Unsafe acts and unsafe conditions;
- Near misses; and
- Incidents (actual injury, illness or property damage);

Each type of event and the reporting / investigation required of it is described below.

Note: The Greenpac Construction Safety Manual states the following:

"Report <u>all</u> unsafe conditions, near misses and injuries – no matter how slight."

10.1 UNSAFE ACT AND UNSAFE CONDITION REPORTING & INVESTIGATION

All ERM and subcontractor personnel at the site should be vigilant to identify and correct Unsafe Acts and Unsafe Conditions that could lead to a Near Miss or an Incident. Not withstanding the Stop Work Authority described elsewhere, ERM and subcontractor personnel at the site should report the observation of an Unsafe Act or Unsafe Condition as soon as practicable to the SSO such that:

- Additional correctives action can be taken; and
- Important lessons learned can be disseminated to the site team.

Documentation of the reported Unsafe Acts and Unsafe Conditions will be made on the form provided in Attachment H. The SSO will note and track all corrective actions to completion.

10.2 NEAR MISS REPORTING & INVESTIGATION

Near Misses have the potential to become Incidents, but for some fortunate reason do not. Even though a worker illness or injury or property damage does not occur, it is important to understand why Near Misses happen and what can be done at the job site to stop their recurrence. Thus, all site personnel should be vigilant to identify Near

Misses that could lead to an Incident. Site personnel should report the observation of Near Misses as soon as practicable to the SSO such that:

- Appropriate additional corrective actions can be taken; and
- Important lessons learned can be disseminated to the site team.

Near Misses will be investigated within 24 hours of their occurrence. Documentation of the investigation of Near Misses, Unsafe Acts, and Unsafe Conditions will be made on the form provided in Attachment I.

Root cause analysis will be performed to assess the apparent cause and identify corrective measures to be implemented to prevent re-occurrence. Part II of the investigation will be completed within three working days of the occurrence of the report. The SSO will track to completion the corrective measures identified during the investigation.

The SSO will initiate verbal communications regarding the occurrence of the Near Miss to the parties listed in Section 11.

10.3 INCIDENT REPORTING & INVESTIGATION

Incidents result in worker illness, injury, or property damage. Incidents should be reported as soon as practicable to the SSO. The SSO will initiate verbal communications regarding the occurrence of the Incident to the appropriate parties listed in Section 11.

10.3.1 Standard Incident Investigation

For most incidents, the SSO will also begin documentation of the Incident using the ERM Incident Report & Investigation Form found in Attachment J. The form consists of two parts:

- Part I, in which the facts of the Incident are gathered and
- Part II, in which the root causes of the Incident are identified and actions are assigned to address those root causes;

The SSO will complete a draft version of the Part I Investigation and will forward it to the PM and ERM H&S Coordinator within 24 hours of the occurrence of the Incident. The SSO, PM, and ERM H&S Coordinator will schedule Part II of the investigation and include project supervision (ERM, ERM Contractors, and the Client), the injured/involved employee(s).

Root cause analysis will be performed to assess the apparent cause and identify corrective measures to be implemented to prevent re-occurrence. Part II of the investigation will be completed within three working days of

the occurrence of the Major Incident. The SSO will track to completion the corrective measures identified during the investigation.

10.3.2 Severe Incidents

In the case of very severe incidents, such as dismemberment, fatalities or substantial property damage, the project management team should consult with ERM and ERM management to develop an appropriate investigation strategy, in cooperation with any outside entities that may be involved. In such cases, the Incident and root cause analysis will still be documented, though the standard ERM Incident Investigation & Report Form may not be appropriate for such purposes. This determination will be made on a case-by-case basis by the project management team.

11.0 EMERGENCY PHONE NUMBERS

Emergency phone numbers are provided below.

AGENCY/ORGANIZATION	TELEPHONE
Fire Department	911
Police	911
Emergency Medical Services	911
Hospital	716-298-2249
Security must be notified first of any site emergency to allow emergency services access to the site.	
ERM Syracuse Office	(315) 445-2554
Project Director:	(315) (cell)
Project Manager:	(315) 341 (cell)
ERM Health and Safety Officer: Ernest Sweet	(315) 256-5354 (cell)
Ambulance	911

Hospital: Mount St Mary's Hospital
5300 Military Road
Lewiston, NY 14092-1997
(716) 297-4800

Directions to the Hospital from the facility:

1. Head Northeast on Packard road towards Ferry Ave for 0.3 miles.
2. Take 1st right turn onto Niagara Falls Blvd and go 1.1 miles.
3. Turn left to merge onto I-190 N for 5.3 miles.
4. Take Exit 25A for NY-265 towards Lewiston-0.1 mile
5. Turn left at NY-265 N/Military Rd- 0.3 mile

Approximate Total Distance =7.1 miles

12.0 ACKNOWLEDGMENT

I have read this Health & Safety Plan, and I understand the material in it. I agree to follow all procedures outlined herein.

Name	**Company**	**Date**	**Signature**

Attachment A
Greenpac Contractors Manual

Greenpac Construction Safety Manual

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Section 1: SAFETY COMMITMENT POLICY AND GOALS

Greenpac Company, particularly Greenpac Construction is committed to the principal that we have a moral and legal obligation to provide and maintain a safe and healthful work environment for all employees working on our projects. Greenpac believes that all incidents causing injury or property damage are preventable, and therefore we have adopted a “ZERO ACCIDENT” philosophy for all projects. All levels of management must be committed to this philosophy and never compromise or jeopardize the safety and health of any employee for any reason, including cost or schedule impact.

1.1 Goals and Objectives

The objective of Greenpac is to ensure that all work performed on our projects is consistent with safe work practices and in accordance with all federal, state, local, and company standards. Management is charged with the task of assuring this policy results in visible accident prevention efforts at every level of operation. Our goal is **Zero**, but to never exceed the following:

Recordable Incident Rate	2.0
DART Rate	1.5
Lost-Time Incident Rate	0

These rates far exceed the construction industry average but are attainable when each and every person is continuously instilled with the desire to have an accident-free workplace. All projects should strive to meet or exceed these goals.

1.2 Mission and Principles

Our mission is to “drive our projects toward world-class safety performance through management leadership, standard practices and correct use of data, as well as focus on greatest potential improvement.” These simple principles will guide and assist us in achieving our goals and objectives:

- Safety is proactive, not reactive.
- All incidents are preventable.
- Our commitment to safety is based on a genuine caring for all employees.
- Line management is responsible and accountable for the safety of employees under their control.
- Every employee is personally accountable for their own safety.
- Safety is a condition of employment.
- All injuries or near-misses no matter how insignificant they may appear are to be reported in a complete and timely fashion to the Safety Department.

Section 2: PROJECT SAFETY PLAN

Greenpac Construction will develop, administer and enforce a safety plan that incorporates all federal, state and local regulations as a minimum guideline. Management will be committed to placing the highest priority on the safety of every employee on-site and strictly abides by the rules and regulations contained in the following policy and procedure manual. We, as individuals, may not be able to prevent every incident that may occur on a job site, but by making this commitment to safety, we, as a company, will have done our part to provide a work site where there are no deaths, lost-time accidents, recordable injuries, or property damage.

The success of Greenpac projects is contingent on the strict attention and adherence to the following basic elements:

2.1 Management Commitment and Leadership

Management, from the top to the bottom, must be totally and thoroughly committed to the safety of every individual working or visiting a Greenpac project site. This commitment must be evidenced by their knowledge of the safety standards and their ability to enforce these standards while advancing the concept that they genuinely care and are concerned about you as an individual. “Leadership Behaviors at World Class” is the single most important element of the Greenpac Safety Strategy. Active, involved and visible leadership is critical to achieving world-class safety results and reaching our company goals. Leaders provide direction and motivation, and through their direction and support, they will enable others to succeed.

2.2 Safety Assessment

Management must be involved in the safety strategy of a project from the conceptual or proposal stage to the very end. Each project will undergo a stringent hazard and operability study to identify safety issues and facilitate proper planning and preparation for their control. This may actually be classified as the first safety assessment, or pre-assessment. Follow-up safety assessments, as well as other costs associated with the safety process, should be considered during the cost of budget phase of the project. Members of the leadership team, other safety professionals or other project management personnel may conduct the assessment. The safety assessment process is intended to assess the effectiveness of the field safety program for construction projects. It will consider how effectively the recognized safety processes are being used and determine the impact on the workers through one-on-one interviews and field observations. The assessment should result in direct feedback to project management and should include well dons, opportunities for improvement and specific recommendations to improve overall safety effectiveness.

Each project must implement a self-assessment or audit program. The contractors will conduct daily audits. Craft personnel from each contractor, along with the safety team, will conduct a weekly job site audit. The results of this audit will be distributed in writing to management and staff at the weekly staff meeting and will be made available to all employees.

2.3 Training

Just as engineering technique and production philosophies change and require continuous training, so do safety requirements. One of OSHA's primary functions is to develop new training criteria to facilitate the development of an accident-free workplace. Greenpac Construction will require that their employees receive the latest and most up-to-date training available. We will require that contractors involved with our projects provide trained and competent employees. Continuous training in all aspects of the safety process is essential to providing a safe work environment.

Greenpac Construction Safety Manager will develop and administer a site-specific safety orientation for the project. Every employee must complete this orientation prior to beginning work. Following the orientation, all employees should be knowledgeable of the safety process of the project and clear as to what is expected from them in order for this process to work. The project safety rules and regulations will be discussed in detail. All orientations and other training must be documented, and a verification of knowledge quiz must be completed.

Greenpac Construction Safety Manager may also develop other site-specific training that may be required for the project (lockout, confined space, equipment, etc.). Contractors must comply with all OSHA-required training.

2.4 Compliance and Enforcement

It is mandatory that all federal, state, local, and Greenpac standards are complied with by all contractors and employees on Greenpac projects. The purpose of these standards and policies is to facilitate a safe work environment and to prevent incidents from occurring. Contractor management must commit to enforcing compliance, and everyone must understand that failure to comply will result in disciplinary action that may involve termination.

Cooperation with all government agencies is mandatory. Employees will assist with investigations and provide legally requested information. Federal and state OSHA programs provide a consultation service. It is suggested that project management become familiar and involved in this process. It tends to establish rapport with our project and the local OSHA staff, and once they have visited our site, they will realize our wholehearted effort and commitment to the safety of our employees and become an invaluable asset to our safety process.

2.5 Medical Case Management

The Greenpac Construction Safety Manager should conduct a diligent search in the community to locate a physician that is familiar with all aspects of occupational injuries and is knowledgeable in the OSHA record keeping requirements. This doctor may serve as the project physician and the Medical Review Officer. All contractor safety managers should also introduce themselves and provide the doctor with information pertaining to their company. The physician will be made aware of our light duty and return-to-work programs. State Worker's Compensation laws must be complied with when choosing or sending an employee to the doctor.

First-aid facilities and some medical equipment must be provided on site. All contractor safety managers or contractor supervision must possess some ability to diagnose and treat minor injuries. Supervision must be CPR and first-aid certified. All contractor safety managers must be knowledgeable in case management and manage all injuries with the intent to return injured personnel to work as quickly as medically possible.

Greenpac management and all contractors will support the light duty or return-to-work program. The essence of this program is that all personnel will be returned to meaningful jobs that comply with the treating physician's directions. All parties should be clear on the return-to-work program details.

2.6 Data Analysis

The accurate recording of incidents and compilation of data is essential to identify needs, focus positive action and monitor progress to achieve our safety vision. This data enables us to project future problem areas and to adopt a proactive approach to our safety process. All near-miss incidents, injury-causing incidents and property-damage incidents must be investigated thoroughly. A system of reporting near-miss incidents that assures that management is made aware of these incidents must be established. The focus of these investigations should be to determine the cause and the corrective action required rather than to find someone to blame. All the information gathered during the scope of the investigation is entered into a Greenpac database for review and compilation. The information compiled by the investigation is made available to management and will assist in making sound decisions and assuring that our projects are closer to being accident free.

2.7 Behavior-Based Safety (BBS)

If you ask ten safety professionals the definition of behavior-based safety, you will, no doubt, receive ten different answers. It has been defined as "the application of principles and methods derived from the field of applied behavior analysis safety." Simply put, it is a change in behavior created by self-analysis, rewarding feedback and positive reinforcement. Behavior-based safety programs should be employee driven and contain a continuous improvement process. The perception is that we can affect beneficial change in others by focusing on their behavior, asking them to focus on their own behavior and rewarding positive behavior.

Each of our sites will implement a customized BBS program. Since each facility is unique, a site assessment that identifies strengths, deficiencies and cultural values must be conducted. This is accomplished by talking to employees and observing their behavior to determine their perception of safety. It is difficult to outline or provide specific guidelines to a behavior-based program, but they should contain these basic elements:

- Worker-based or employee-driven
- Trained observers
- Observation criteria developed by workers
- Data analysis

- Positive reinforcement and rewards for positive behavior

Employees will be introduced to the BBS theory during their initial orientation. All of the policies, standards, rules, and regulations are for naught if we are unable to convince an employee to “buy into our safety program” and that a change in their behavior benefits them.

Section 3: DRUG TESTING PROTOCOL

This protocol applies to all Greenpac projects to the extent that the law allows.

As part of its safety responsibility, Greenpac will contractually demand that all contractor employees submit to a pre-employment drug test prior to beginning work, random drug testing (dates and times to be selected by Greenpac project management), post-accident or incident drug and alcohol test, and “for-cause” test (requested when there is reasonable suspicion that an employee may be under the influence of drugs or alcohol). Refusal to submit to a drug test when requested will result in immediate discharge.

Greenpac projects will conduct on-site drug testing. The Greenpac Construction Safety Manager will contract with a certified laboratory to furnish all drug testing supplies and to conduct confirmation testing of all positive results. The on-site drug test will consist of a five panel drug screen for THC (marijuana), cocaine, methamphetamine, PCP, and morphine (synthetic opiates). The threshold or confirmation level for each of these is as follows:

Marijuana	15 Ng/mL
Cocaine.....	150 Ng/mL
PCP	25 Ng/mL
Methamphetamine	500 Ng/mL
Morphine.....	2000 Ng/mL

Lab tests that confirm these levels will be reported as a positive result.

The contractor safety manager or representative and the Greenpac Construction Safety Manager or designee will monitor the collection of specimens. All employees involved in the collection of specimens must be trained in the proper procedures. All federal, state, local, and laboratory collection procedures must be followed. Chain of custody forms and consent forms must be filled out and signed by the employee and the person collecting the specimen.

Facilities must provide privacy for the individual submitting the specimen. It must be noted that specific gravity, pH and temperature requirements, as set forth by the laboratory, are required in order for a specimen to be valid. Specimens may also be tested for adulterants. If an employee is requested to submit a second specimen because of any problem with the first, this second specimen will be a witnessed specimen.

If an on-site drug test indicates positive for any banned substance, the collector will explain (in privacy) to the employee the indications and advise him/her that they must leave the job site until the test results are confirmed by the certified laboratory. The specimen will then be sent to the lab immediately for confirmation. If the positive test is confirmed, the employee is forbidden to enter any Greenpac project sites or property for a minimum of six months. Some sites may also require a confirmation from the company medical review officer. If the test result is not confirmed or is reported by the laboratory to be negative, the employee will be notified immediately and will be allowed to return to the job.

If after the six-month period a contractor wishes to bring this individual onto Greenpac property or projects, the contractor must certify that the individual has two recent negative tests. One of these tests must have been within the last two days. The individual will also be subject to the pre-employment, on-site drug test. The contractor must also inform Greenpac of their plan to ensure that this individual will remain drug/alcohol free while working on Greenpac projects through random or some equally effective testing measures. A second positive drug test will result in the individual being forbidden to enter any Greenpac property or Greenpac project for a period of two years.

A refusal to submit to a drug test when requested or an adulterated diluted or other invalid sample will result in the same consequences as a positive drug test. Any individual, who after being advised of the drug testing procedures, leaves the site for any reason will be considered to have refused the drug test.

Any individual testing positive for a prescription drug must produce a valid prescription for that drug. The prescription must be specific to the individual and must not be out of date. The medical review officer (MRO) must review all positive tests for prescription drugs.

Project management must implement a process for randomly selecting individuals for drug testing. This procedure should result in approximately ten percent of the workforce being selected for random testing once a month.

Results of the test must be sent to the project safety manager via confidential means and must be treated with the utmost confidentiality. A designated representative of the contractor (human resources or project manager) will be notified of the results and the consequence.

Section 4: PROJECT SAFETY POLICIES AND PROCEDURES

4.1 Contractor Safety Requirements

Purpose
To ensure that all contractors employed with or for Greenpac abide by all safety rules and place the highest priority on the safety of their employees.

Scope
The scope applies to all contractors, subcontractors and lower-tiered contractors throughout the construction process.

Expectations
Contractors will develop, administer and enforce a safety plan that incorporates all Greenpac, federal, state, and local regulations as the minimum guideline to provide a work site where there are no deaths, lost-time or recordable incidents.

Guidelines
Contractors applying for work with Greenpac must have a companywide recordable incident rate that does not exceed 4.0. Exceptions to this must be approved by the director of construction.

Contractors on site must:

- Supply trained competent employees to perform their intended work activities and provide documentation to support the required training of employees (forklift, cranes, rigging, etc.).
- Comply with all Greenpac safety policies and federal, state and local regulations; acknowledge, in writing, the receipt and understanding of the Greenpac project safety manual.
- Supply to project safety manager a daily manpower report that includes the number of employees, absentees and any first-aid or doctor cases.
- Provide the names and social security numbers of all intended new hires at least one day prior to hire date.
- Provide brass numbers and name tags to be placed on the front of hard hats of all employees.
- Report all incidents immediately to project safety manager and provide a written report within 24 hours of incident.
- Participate in all project safety audits.
- Ensure that all subcontractors and lower-tiered contractors meet all Greenpac contractor requirements.
- Contractors with:
  - 1 to 45 employees must have a safety representative or a supervisor that is also a safety representative on site
  - Over 45 employees must have a full-time safety professional on site

4.2 Education

Purpose
To ensure that all Greenpac project personnel and all contractor personnel are properly trained in the safety regulations and procedures affecting their project and specific operations.

Scope
The requirement to be knowledgeable in the safety regulations and procedures, which affect the site and its personnel, apply to all projects and Greenpac project team members and contractor/ subcontractor personnel.

Expectations
Greenpac project team members, site safety personnel and contractor/subcontractor management personnel will be knowledgeable in the appropriate safety precautions to be taken during the anticipated work and the regulatory requirements applying to their specific operations.

Further, the aforementioned knowledge will be shared with all affected site personnel through special meetings or toolbox meetings.

It is recommended that contractor supervision be trained and certified in CPR and first-aid.

Guidelines

- Greenpac project staff must be knowledgeable in the safety procedures and regulations appropriate to their project.
- Contractors and subcontractors must be knowledgeable in the safety procedures and regulatory requirements applicable to the project or the portions of the job for which they are responsible.
- Foremen must be trained in the safety procedures in order to properly enforce and support the program. In addition to first-aid/CPR, the foremen must be trained in accident investigation, behavioral safety techniques and competent persons sessions (if they are to act as competent persons on the job).
- Contractors must be attuned to OSHA training requirements, such as worker right-to-know, personal protective equipment, confined space entry, lockout/tag out, and more. There may also be job-specific exposures, which will require specialized training.
- Contractors will be expected to educate their hourly employees as to the upcoming tasks on the project. This can typically be done through the toolbox meetings, but special meetings or training sessions may sometimes be necessary.

4.3 New Employee Orientation

Purpose
To provide a site-specific safety orientation for every new employee prior to beginning work on any Greenpac project.

Scope
The orientation will be carried out at every project under Greenpac management.

Expectations
The project safety manager will establish a new employee safety orientation program. This program will be site-specific and will include the Safety Processes and Procedures found in this manual. Every employee on the project will complete the orientation before beginning work on the site. The orientation will be completed in such a manner that all subjects are covered in an easily understood way (allowing for language differences as needed), and the orientation will be documented (including signatures of both the new employee and the person conducting the orientation). For extended projects, a refresher orientation will be required annually.

Orientation Topics
All new employees must receive an orientation that provides information about the safety program. Topics include:

<u>Personal Safety</u>

- Back injury prevention
- Blood borne pathogen procedures
- Drug and alcohol policy
- Equipment issues
- Fire prevention
- Hazardous communications
- Hearing conservation
- Housekeeping expectations
- Job hazard analysis
- List of key contacts
- Process safety management (PSM)
- Personal protective equipment
- Respiratory program
- Sign-in procedure
- Traffic, parking, pickup stations, and laydown areas

<u>General Safety Policies</u>

- Drug testing protocol
- Electrical safety enforcement
- Emergency preparedness/emergency numbers
- Emergency weather and natural disaster procedures
- Environmental procedures
- Jewelry and dress policy
- Lockout/tag out policy
- Near miss/accident investigation procedures
- Project safety rules
- Radio and electronic equipment use
- Safety meetings
- Safety watches
- Greenpac facility safety precautions

Safety around Equipment

- Articulating/suspended boom safety
- Barricades
- Demolition safety
- Excavation and trenching
- Fall protection
- Floor, roof, wall, and platform opening hazards
- Hand, air and electric tool use
- Ladder safety
- Mobile equipment safety
- Radiography
- Roofing work
- Scaffolding and platforms
- Signs and tags
- Welding, cutting and burning safety

4.4 Safety Team

Purpose
To assemble a group of safety professionals that are able to work together in a proactive manner to ensure the safety of every employee on the project.

Scope
All contractor safety managers assigned to the project.

Expectations
All safety managers will work together as a team under the direction of a designated project safety director. They will share office space, when possible, and interact daily with meetings and discussions.

Guidelines

- The Project Construction Manager will designate a Project Construction Safety Manager to administer the daily operations of the safety department and direct the safety team. The project safety director will administratively report to the Project Construction Safety Manager.
- The Project Safety Manager will functionally report to the Project Manager and will be responsible for daily and monthly reports, establishing first-aid facilities and supplies, scheduling other safety managers, training, drug testing, office needs for safety managers, and the overall safety program for the project.
- All Contractor Safety Managers will share office space, when possible, and work together as a safety team.
- All Safety Managers will share responsibilities (training, orientation, drug testing, etc.).
- Contractor Safety Managers will be responsible for investigating incidents involving their contractor personnel and furnishing the results of the investigation to the Project Construction Safety Manager. All Safety Managers on site may assist with investigations.
- Safety managers must manage cases involving injuries to their employees, provide the care required, and provide as positive a result as possible.
- Contractor safety managers are responsible for their company OSHA logs and reporting.
- Safety Professionals must be willing to work together, regardless of their individual agendas, to ensure the success of the safety team and the safety of every employee on the project.

4.5 Site Self-Inspection Process/Safety Audits

Purpose
The purpose is to implement a safety self-inspection process for each project and thereby identify and control potential safety hazards.

Scope
All Greenpac projects will develop and implement a safety self-inspection process involving the contractors on the site.

Expectations
Project management will develop and implement a safety self-inspection or audit process for operations on the site. This process will involve the craft employed on site. The system will also include development of controls for the identified issues and a documentation protocol to record the issues, their controls and corrective action taken.

Guidelines
Guidelines are as follows:

- Safety management will implement this procedure in a proactive manner.
- All contractors will conduct daily audits of their work areas.
- All contractors will be involved in a weekly job site audit.
- The weekly audit will be led by a member of the safety team.
- Both supervision and craft will be involved.
- Both physical hazards and unsafe work practices will be sought out.
- Inspection teams may need to involve affected personnel in the solutions to ensure “buy-in” and effectiveness.
- Inspections are also an opportunity to recognize safe work habits!

The results of this audit will be documented and made available to management and all contractors and a copy sent to the Greenpac safety director.

4.6 Work Hour Policy

Purpose
The purpose is to prevent incidents resulting from work fatigue.

Scope
This policy applies to all Greenpac projects and all contractor and subcontractor personnel on these sites. It will also apply to all shutdowns throughout the Greenpac system.

Expectations
Greenpac project management teams are expected to enforce the described limits on overtime work hours on all Greenpac projects and on all Greenpac shutdowns.

All hourly employees are expected to abide by the restrictions applied herein.

Guidelines
- Project managers must schedule work hours so as to alleviate any employee from working too many hours and prevent employee fatigue.
- This policy will apply to all shutdowns as well.
- The maximum scheduled shift length will be twelve (12) hours. Exceptions by circumstance require project management approval.
- No employee will be allowed to work in excess of sixteen (16) continuous hours without approval from the project manager.
- All federal, state and local labor laws will be followed.
- All work should be preplanned and proceed according to schedule, whenever possible.
- The impact of this policy can be reduced by rotating craft or shutting down a job for a day in accordance with this work hour policy.
- Greenpac project management must approve all overtime or extra work hours.

4.7 Job Safety Planning

Purpose
To ensure that every foreman plans the next day's work so that safety issues are considered and included in the next day's work.

Scope
All foremen must preplan the next day's work to include the safety concerns and controls and communicate that plan to the crew the following day at the beginning of the shift during the toolbox meeting.

Expectations
Contractor and subcontractor foremen will plan the next day's work, fully including safety in that plan, and communicate that entire plan to his/her crew during the next day's toolbox talk. Contractor management will ensure that this planning and communication take place and that safety hazards are controlled. The checklist (at the end of this document) will help foremen remember to address the most important issues. The list should be amended whenever necessary to capture the areas of concern for the task at hand.

Greenpac project staff will review this process through observation at toolbox meetings. Spot checks will also be made throughout the day to see if the planned controls were carried out.

Guidelines

- Foremen will plan the next day's work and communicate that plan to the crew during the toolbox talk.
- This job planning will include all anticipated safety concerns.
- The provided checklist will assist foremen in doing this.
- Contractor and subcontractor management teams will ensure that such planning is taking place with emphasis on safety concerns.
- Greenpac project personnel will confirm that this process is taking place through observation at toolbox safety meetings.

4.8 Toolbox Meetings

Purpose
To provide safety information and training to all project personnel.

Scope
This safety toolbox meeting requirement will apply to all contractor and subcontractor personnel on each site.

Expectations
All contractors and subcontractors will hold toolbox safety meetings for all site personnel. Safety and the daily work plan will be discussed for each craft or crew, and each meeting will be documented.

Guidelines

- All contractors and subcontractors must hold a toolbox meeting.
- Such meetings will be held daily at the beginning of each shift.
- Toolbox meetings will include the crew or craftwork plan for the day, including safety. Safety should be the first subject on the list.
- Primary safety subject material will be provided by contractor safety personnel.
- Employees will be allowed to ask questions, make suggestions and voice complaints.
- The project safety manager will select a weekly toolbox safety topic to be used by all contractors on site.
- General operational content will be provided by the superintendent or foreman conducting the meeting. Supervision may have specific safety issues to add to the discussion.
- All meetings will be documented on a form depicting the date, company or craft, superintendent’s name, primary topics, and the signature of all attendees.

4.9 Personal Protective Equipment (PPE)

Purpose

These guidelines provide minimum PPE requirements for all employees while working on a project.

Scope

These guidelines cover PPE requirements for all workers on a project.

Expectations

Each worker is responsible for knowing what is required and for wearing and maintaining the proper safety equipment while working on the project.

Project supervision has the responsibility to enforce the use and proper care of PPE by all employees during the execution of the work, including termination for refusal to wear required PPE.

Guidelines

- Pants must be full length. Shirts must have full or half sleeves (at least 6 inches). Sleeves must remain at this length, not rolled up. Clothing must not be torn, have holes worn in them or hang loose to the point that they may be caught in moving machinery. Dangling necklaces are not to be worn. Only stud-type earrings shall be worn — **NO** loop- or hoop-type earrings allowed. Employees having hair of shoulder length or longer must keep it secured such that it does not serve as a hazard.
- Gloves will be worn as a minimum protection from hand injuries.
- Each employee will be required to wear sturdy, high top, leather, hard-toed work boots meeting the protective requirement of ANSI Z41.1-196. Steel-toed tennis shoes, low-quarter shoes, or shoes or boots made of canvas material are not allowed.
- **All employees and visitors will wear hard hats meeting ANSI Z89.1-1969. Hard hats will be worn with the bill to the front (no hard hats to be worn backwards), unless performing welding operations. Hard hats are to be worn according to manufacturer specifications and should fit properly to allow the protection intended. No baseball-type caps to be worn under hard hats.**
- All employees and visitors must wear safety glasses with rigid side shields meeting the requirements of ANSI Z87.1-1968. When required by site conditions or while performing certain tasks (grinding, chipping, burning, etc.), employees will be required to wear full-face shields or goggles, in addition to safety glasses.
- Hearing protection, consisting of earplugs or earmuffs acceptable to OSHA, will be worn by all potentially exposed personnel. The project manager and project safety manager will determine where and when hearing protection is required. This determination will be made in accordance with the mill policy and OSHA standard 1926.52.
- Where required, employees will be issued escape respirators, which will be worn on the employee at all times.

- Fall protection, consisting of a full body harness and double shock-absorbing lanyards, will be worn by all employees exposed to a fall of 6 feet or more.
- When working in areas of high vehicular or equipment travel, employees will be required to wear a high-visibility vest.
- There may be other safety or PPE requirements as a result of unique conditions on the project. The safety manager will identify any additional requirements as the need arises.

4.10 Housekeeping and Sanitation

Purpose
To maintain an orderly work site in an effort to reduce incidents involving fire, slips and falls, puncture injuries, and ergonomic exposures. The purpose is to provide and maintain a sanitary work environment.

Scope
A high standard of housekeeping will be maintained by all personnel and contractors across the site.

Expectations
Material process waste will be controlled as produced. Materials will be properly stored in lay down areas. Combustibles and flammables will be properly stored to prevent/control potential fire or container failure. Stairs and walkways will remain free of debris, materials and equipment.

Guidelines

Housekeeping

- Poor housekeeping is not acceptable on Greenpac Company projects. A clean project will be a daily priority. The construction manager will be responsible for developing and implementing adequate housekeeping for a project using these guidelines.
- Supervisors will be responsible for keeping work areas clean. Clean-up will occur as the work is being done and will be part of daily task planning. On larger projects, a clean-up crew should be assigned to continuously clean up. (Having a clean-up crew does not alleviate any supervisor from keeping their work area clean.)
- Dumpsters, trash skips and trash cans will be of adequate number and location to facilitate daily waste removal. All containers shall be marked as to their content.
- Reusable scrap material shall be removed from the work area and stacked in neat piles. Nails and other sharp fastening devices shall be removed from lumber as it's being dismantled.
- Combustible waste, such as oily rags, shall be stored in a closed metal container and disposed of as hazardous waste.
- Areas used by personnel for smoking, breaks and lunch shall be cleaned on a regular basis.
- An area, such as electrical panels, safety disconnects, fire extinguishers, and emergency exits, shall be kept free of excess materials and debris.
- Cords, leads and hoses shall be elevated a minimum of 8 feet whenever possible. When it is not possible to elevate, they shall be kept out of walkways, stairways, etc.

Sanitation

- Where adequate permanent toilet facilities are not available, temporary toilets shall be supplied and maintained in accordance with local, state and federal regulations. Portable toilets shall not be kept inside buildings. Any employee involved in the destruction or damage of toilet facilities (including writing on walls) will be subject to immediate termination from the project.
- An adequate supply of potable water shall be made available to employees on the job site. When permanent drinking water dispensers are not available, portable drinking water containers shall be made available. These containers shall be clearly marked “DRINKING WATER” and not used for any other purpose. They must have a tightly closed lid and be equipped with a spigot. The lid must be taped and dated to prevent tampering. Disposable cups and trash receptacle will be provided by each container. The use of pails, dippers, common cups, or drinking from spigot is prohibited. Water containers will be sanitized on a regular basis. Only clear, reinforced hoses, suitable for transferring potable water, may be used to clean and fill containers. Other water sources not suitable for drinking purposes shall be clearly marked “NON-POTABLE WATER.”
- Care must be taken to ensure the cleanliness of ice machines and ice.
- An adequate supply of hand-washing facilities must be available.

4.11 Ergonomics Program

Purpose
To minimize muscle strains, repetitive motion injuries and related ergonomic injuries.

Scope
All contractors and subcontractors on all projects will work to support ergonomic efforts.

Expectations
All contractors and subcontractors will support and enforce ergonomic procedures wherever possible in an effort to reduce soft tissue injuries. Employees will follow ergonomic practices whenever possible.

Contractors will provide basic employee training through toolbox safety talks.

Guidelines
Guidelines are as follows:

- All contractors and subcontractors will support ergonomic procedures whenever possible on all jobs.
- Basic ergonomic training will be provided to all employees via toolbox talks.
- Ergonomic areas to watch include the following: proper lifting procedures; using mechanical aids to lift materials; getting a coworker to assist with the lift; in storage areas, placing the most often used material at approximately waist height; using powered screwdrivers, nail guns, etc.; providing vibratory tools (e.g., concrete vibrators, chain saws, jack hammers), which are fitted with vibration-reducing equipment; providing vibration-absorbing gloves; using rebar jigs, which hold rebar “nests” at waist height; and placing raw material close to the point of insertion in the process.

4.12 Fall Protection

Purpose
To prevent falls on every project.

Scope
This protocol applies to all projects and will be site-specific to address all fall potentials at each project.

Expectations
Every site will develop a site-specific fall prevention plan that will require 100 percent tie-off at 6 feet and higher above the immediate working surface and/or other acceptable means of fall protection.

Guidelines
The following guidelines will be administered on every Greenpac project:

- Any employee in an elevated work area whose work places them outside any secured areas or where their work is to be performed on scaffolds, from boatswain chairs, structural steel, aerial lifts, or on any other working surface where they may be subject to a fall greater than 6 feet shall wear and use a full body harness, with two lanyards, and be tied off 100 percent of the time.
- It will be the supervisor's responsibility to ensure the safety of employees working above the 6-foot limit by using fall protection as needed.
- At the time of hire and during safety meetings, each employee shall be made aware of their obligation to wear and use full body harnesses and associated equipment when the work task dictates. This policy will be adhered to strictly. Contractors must strictly enforce this policy, through discipline, if necessary. Any employee observed not using a full body harness as required will be subject to disciplinary action by their contractor employer.
- Policy statements to this fact shall be posted throughout the job site and will be given to each employee to sign in his/her handwriting at the time of hire and will be placed in their personnel file for record.
- Safety belts will not be used on Greenpac Company projects for fall protection. A Class III full body harness will be required.
- Lifelines, full body harnesses and lanyards shall be used only for employees' safeguarding. When any of these are actually subjected to in-service loading (as distinguished from static load testing), they shall be immediately removed from service and shall not be used again for employee safeguarding.
- Lifelines shall be secured above the point of operating to an anchorage or structural member capable of supporting a minimum dead weight of 5400 pounds.
- Lifelines used in areas where the lifeline may be subjected to cutting or abrasion shall be a minimum of 7/8-inch wire core manila rope or its equivalent. For all other lifeline applications, a minimum of 5400 pounds tensile strength shall be used. Wire rope of equivalent strengths may be substituted, but in no case shall standard wire

rope of less than 1/2-inch diameter be used. 3/8-inch airline cable that develops a tensile strength of 5400 pounds may be used.

- Safety lanyards shall be a minimum of 1/2-inch nylon or equivalent with maximum length for a fall of no greater than 6 feet. The lanyard shall have a breaking strength of 5400 pounds. All lanyards shall have double-locking safety snaps.
- All full body harness and lanyard hardware shall be drop-forged or pressed steel, cadmium-plated. Surfaces shall be smooth and free of sharp edges.
- All full body harness and lanyard hardware, except rivets, shall be capable of withstanding a tensile loading of 5000 pounds without cracking, breaking or taking a permanent deformation. “Quick-release” lanyards shall not be used.

Exceptions

- The provisions of this section do not apply at points of access, such as stairways, ladders, ramps, or when employees are on the roof only to inspect, investigate or estimate roof level conditions. Roof edge materials handling areas and materials storage areas shall be guarded as provided in this section.
- Employees engaged in built-up roofing on low-pitched roofs less than 50 feet wide may elect to utilize a safety system without warning lines where the use of hot tar poses an additional hazard to workers.

Warning Line System for Roof Worker

- Warning lines shall be erected around all sides of the work area.
- When mechanical equipment is not being used, the warning line shall be erected not less than 6 feet from the edge of the roof.
- When mechanical equipment is being used, the warning line shall be erected not less than 6 feet from the roof edge, which is parallel to the direction of mechanical equipment operation and not less than 10 feet from the roof edge, which is perpendicular to the direction of mechanical equipment operation.
- The warning line shall consist of a rope, wire, or chain and supporting stanchions erected as follows:
  - The rope, wire or chain shall be flagged at not more than 6-foot intervals with high-visibility material.
  - The rope, wire or chain shall be rigged and supported in such a way that its lowest point (including sag) is no less than 39 inches from the roof surface and its highest point is not more than 45 inches from the roof surface.
- After being erected, with the rope, wire or chain attached, stanchions shall be capable of resisting, without tipping over a force of at least 16 pounds applied horizontally against the stanchion, 30 inches above the roof surface, perpendicular to the warning line and in the direction of the roof edge.
- The rope, wire or chain shall have a minimum tensile strength of 500 pounds and, after being attached to the stanchions, shall be capable of supporting, without breaking, the loads applied to the stanchions.

- The line shall be attached at each stanchion in such a way that pulling on one section of the line between stanchions will not result in slack being taken up in adjacent sections before the stanchion tips over.
- Access paths shall be erected as follows:
  - Points of access, materials handling areas and storage areas shall be connected to the work area by a clear access path formed by two warning lines.
  - When the path to a point of access is not in use, a rope, wire or chain, equal in strength and height to the warning line, shall be placed across the path at the point where the path intersects the warning line erected around the work area.

Material Storage and Handling

- Employees working in a roof edge materials handling or materials storage area location on a low-pitched roof with ground-to-eaves height greater than 6 feet shall be protected from falling along all unprotected roof sides and edges of the area.
- When guardrails are used at hoisting area, a minimum of 4 feet of guardrail shall be erected on each side of the access point through which materials are hoisted.
- A chain or gate shall be placed across the opening between the guardrail sections when hoisting operations are not taking place.
- When guardrails are used at bitumen pipe outlets, a minimum of 4 feet of guardrail shall be erected on each side of the pipe.
- When safety harness systems are used, they shall not be attached to the hoist.
- When fall restraint systems are used, they shall be rigged to allow the movement of employees only as far as the edge of the roof edge.
- Materials shall not be stored within 6 feet of the roof edge unless guardrails are erected at the roof edge.

Leading Edge Control Zone

- When performing leading edge work, project management shall ensure that a control zone be established according to the following requirements:
  - The control zone shall begin a minimum of 6 feet back from the leading edge to prevent exposure by employees who are not protected by fall restraint or fall arrest systems.
  - The control zone shall be separated from other areas of the low-pitched roof or walking/working surface by the erection of a warning line system.
  - The warning line system shall consist of wire, rope or chain supported on stanchions or a method which provides equivalent protection.
  - The spacing of the stanchions and support of the line shall be such that the lowest point of the line (including sag) is not less than 39 inches from the walking/working surface and its highest point is not more than 45 inches from the working/walking surface.
  - Each line shall have a minimum tensile strength of 500 pounds.

- Each line shall be flagged or clearly marked with high visibility materials at intervals not to exceed 6 feet.
- When positive means of fall protection, as described in OSHA, are not utilized, a safety monitor system, as described in OSHA 1926.500 (g) (iii), shall be implemented to protect employees working between the forward edge of the warning line and the leading edge.

Safety Monitor System

- A safety monitor system may be used in conjunction with a warning line system as a method of guarding against falls during work on low-pitched roofs and leading edge work only.
- When selected, the employer shall ensure that the safety monitor system shall be addressed in the fall protection work plan, including the name of the safety monitor(s) and the extent of their training in both the safety monitor and warning line systems, and shall ensure that the following requirements are met:
  - The safety monitor system shall not be used when adverse weather conditions create additional hazards.
  - A person acting in the capacity of safety monitor shall be trained in the function of both the safety monitor and warning line systems and shall:
    - Be a competent person as defined in OSHA 1926.32(f).
    - Have a control authority over the work as it relates to fall protection.
    - Be instantly distinguishable over members of the work crew.
    - Engage in no other duties while acting as safety monitor.
    - Be positioned in relation to the workers under his/her protection so as to have a clear, unobstructed view and be able to maintain normal voice communication.
  - Control zone workers shall be distinguished from other members of the crew by wearing a high-visibility vest only while in the control zone.

Inspection of Equipment

- All lifelines, full body harnesses, lanyards, and associated hardware shall be inspected on arrival at the job site by a competent person. Employees will inspect equipment before and after each use for wear and possible damage due to use. Additionally, monthly inspections of full body harnesses, lanyards and associated hardware shall be done by a designated, competent person to ensure they have not been subject to damage and/or deterioration due to storage conditions and other factors that may reduce their strength characteristics. If any harness or lanyard, at any time, has a stress load placed on it, then it must be removed from service. An inspection report form shall be maintained on all full body harnesses, lifelines and lanyards, and will show the date inspected, the condition of the equipment, and the serial number for each full body harness. These reports shall be copied to the Greenpac Company safety manager. Proper color codes for the month shall be attached to harness and lanyards.

Color Code System	
Jan/Jun.....	Green
Feb/Aug.....	Brown
Mar/Sep.....	Gray
Apr/Oct	Yellow
May/Nov	Blue
Jul/Dec	Red

4.13 Steel Erection

Purpose
To ensure that all steel erection standards and guidelines are followed so that injuries associated with steel erection will be prevented.

Scope
All contractors on Greenpac projects that may be involved in the erection of steel as defined in OSHA subpart R steel erection standards.

Guidelines

- Prior to steel arriving on site, contractor supervision must provide Greenpac project management with a detailed work plan that includes staging, erection procedures and safety plan.
- All employees involved in steel erection activities must utilize adequate fall protection if the work requires them to be at a level of 6 feet above a working surface. **Absolutely no exception to the 6-foot fall protection rule.**
- Controlled decking zones will not be recognized. This work must be preplanned to allow for adequate personal fall arrest systems and/or fall restraint systems.
- Steel laydown areas must be firm, properly graded, drained, and readily accessible to the work with adequate space for the safe storage of materials and the safe operation of the erectors' equipment.
- Climbing or sliding columns will not be allowed. Access and egress will be established as close to the work area as possible to reduce the travel required on "open" steel.
- All safety equipment, aerial work platforms, static lines, temporary flooring, perimeter guarding, ladders, scaffolding, stairways, and falling debris protection must be on site and ready for use prior to the beginning of work.
- OSHA subpart R steel erection standards effective in January 2002 will be strictly adhered to and enforced.

4.14 Cranes and Rigging

Purpose
To ensure safe use of cranes, rigging and related lifting equipment on each project.

Scope
All contractors and sites using cranes and rigging materials to complete construction will abide by this protocol.

Expectations
All contractors using cranes and rigging equipment will work to ensure that all cranes and lifting equipment are certified, properly inspected and maintained, and used safely throughout the course of the project. Detailed lift planning will be conducted to ensure that rigging and cranes are suitable to the conditions of the lift.

Guidelines
Guidelines are as follows:

- All cranes will be certified before being put into service on the site. Such certification will be documented.
- All cranes must be inspected daily, monthly and annually. These inspections must be documented.
- Contractors must provide documentation to Greenpac Site Manager and/or Safety Manager attesting to the competency and training of all crane operators and riggers. Training credentials must be up to date and valid.
- All critical lifts (lifts that exceed 75 percent of the rated capacity of the crane, any lift that requires the use of more than one crane, lifts to be made in close proximity to electrical lines or other hazards, and/or any unusual lifts) will be thoroughly planned and documented in advance and coordinated with Greenpac project staff and all affected site personnel. Soil conditions will also be included in the critical lift plan (soil tests and soil enhancement may be necessary prior to completing a large lift). Critical Lift Plan must be thorough and complete and must be signed by equipment coordinator, operator, rigging supervisor, safety, and Greenpac management.
- Smaller, more routine lifts will also be planned to ensure they are completed safely.
- Cranes must be equipped with anti-two blocking device.
- Outriggers must be placed on outrigger pads.
- Where cloth slings are necessary and appropriate, protective cushions will be used on all sharp edges to prevent severing slings. Softeners will be used on all rigging where damage may be possible.
- No more than one eye to a hook; shackles shall be used.
- Rigging will be inspected prior to each use, especially at the first usage on the shift. Damaged slings or other lifting equipment will be removed from service immediately. All rigging will be inspected monthly by a competent person and the appropriate monthly color code attached.

- Rigging will be stored on racks, protected from precipitation and dirt, and properly lubricated. Cloth slings will also be protected from direct sunlight to prevent deterioration resulting from ultraviolet radiation exposure.
- Cranes will be properly maintained and inspected. Any potential misuse or damage (e.g., a load swinging into the boom, shock loading) will be cause for immediately stopping crane use and thoroughly inspecting it. Any deficiencies will be corrected immediately, regardless of production impact.
- Proper communications (hand signals or radios) will be used at all times. Only one person, wearing an orange vest for identification, will give lift directions to the crane operator, but anyone can give the “stop” signal.
- Loads will not be passed over personnel. No one is to work or pass under a suspended load.
- Tag lines must be attached to every load being lifted.
- Multiple lifts will only be permitted under the guidelines and conditions of the new steel erection standard; OSHA subpart R of January 2002.

4.15 Personnel Hoisting

Purpose
The purpose is to ensure that the use of personnel hoisting equipment is absolutely necessary and conducted in a safe manner.

Scope
All contractors involved in the use of man-baskets or other personnel hoisting equipment.

Expectations
Employee safety, not convenience or practicality, must be the basis for personnel hoisting.

Guidelines

- The Construction Manager and the Project Safety Manager shall determine that there is not a safe alternative way to perform the needed work.
- A personnel or suspended basket permit must be filled out in its entirety and signed by all involved.
- Prior to lifting any personnel, the hoisting device shall be inspected in accordance with the requirements set aside for that particular piece of equipment (crawler, locomotive, truck, crane, hydraulic crane, or derrick).
- A pre-lift plan, which shows boom angle and maximum intended load, should be prepared for each lift or group of lifts.
- A firm footing, uniformly level within 1 percent (1 foot in 100 feet) shall be provided for cranes. Crane outriggers shall be utilized when hoisting employees.
- A full-cycle operational test lift will be conducted prior to lifting of employees. The platform shall carry the intended load during the test lift. The stability of the crane footing must be verified during the full-cycle operational test.
- A meeting attended by the operator of the hoisting equipment, signal person, person(s) to be lifted, and the project safety manager shall be responsible for planning and reviewing procedures to be followed, including procedures for entering and leaving the man lift, including exit locations, etc.
- The live load of the man lift platform, including the basket, personnel and tools/material, shall not exceed 25 percent of the rated capacity of the crane at the radius at which the lift will occur.
- Voice communication between the operator, signal person and person(s) being lifted shall be maintained whenever voice communication equipment is available. If voice communication equipment is not available, a qualified signal person must be used.
- The hoisting machine must be equipped with a working anti-two block device. The hoisting equipment, boom and load line shall be operated so that the downward motion will be power controlled lowering. That is, the hoisting equipment shall be power-operated in both up and down directions.

- When welding is done by an employee on the platform, welding rod holders shall be protected from contact with metal components of the platform.
- Employees on the platform shall wear full body harness with lanyards attached to the platform.
- The operator shall remain at the controls while the platform is suspended.
- When lifting or lowering platforms, the speed shall not exceed 100 feet per minute.
- A signal person shall be used. If direct visual contact cannot be maintained, radio/telephone communication is required. The employees being lifted, moved and/or positioned shall remain in continuous sight of and in contact with the operator or signal person.
- A platform, which is designed and constructed in accordance with the following, shall be used:
  - The platform shall be designed by a competent and qualified person.
  - The number of personnel occupying the platform shall be limited to the work being performed and the platform design limitations. In any situation, the number shall never exceed four (4).
  - The platform shall have a minimum design safety factor of 5.
  - The platform shall have a plate specifying the weight of the empty platform and the maximum number of persons and weight for which the platform is rated.
  - The platform shall have standard railing as defined in 20 CFR 1910.28(a) and 20 CFR 1926.451(a) OSHA standards. “Grabbers” or handholds internal to the railings shall be provided to prevent holding on to the basket railing and thereby being exposed to “pinch points.”
  - The sides of the platform shall be enclosed from the floor to railing.
  - If access doors are installed, they shall open only to the interior to the platform. Access doors shall be equipped with a device to restrain the door from inadvertently opening.
  - The platform shall have overhead protection when there is an overhead hazard.
  - The platform shall be identifiable by high visibility color or marking.
  - Wedge and socket shall not be used to secure the load line to the platform unless the free end (dead end) of the load line either has a clip attached to it or is looped back and secured to itself by a clip.
  - An independent steel cable shall be attached between the work platform harness and above the block of the load line. This cable shall be of sufficient enough strength to support the work platform and its rated capacity with a safety factor of 5 in the event of hook failure. The platform shall not be used during high winds, electrical storms, snow, or other adverse weather conditions that could endanger employees on the platform.
  - Employees using the platform shall be considered as weighing 250 pounds each.
  - All lifts shall be made in accordance with the manufacturer’s lifting recommendations.

- The employer must retain at the job site, and produce when requested, documentation, such as lift capacity information verifying that the requirements in OSHA guidelines for work platforms suspended from cranes have been met.

Platform Requirements

- The platform and its components must be capable of supporting, without failure, at least four times the maximum intended load. The platform shall be enclosed with a guardrail system, including a top guardrail of approximately 42 inches, a mid-rail and a toe-board. The guardrail system shall withstand a load of at least 200 pounds applied in any direction.

Lifting Bridle Requirements

- Lifting bridles on working platforms suspended from cranes shall consist of four legs so attached that the stability of the platform in ensured. The lifting bridle on working platforms suspended from cranes shall be secured by a shackle or attached by a closed hook, which cannot open due to load position in the hook.

Crane Requirements

- For the proper design, inspection, construction, testing, maintenance, and operation of crawler, locomotive and truck cranes, refer to the applicable standards (27 CFR 1926.-550 and ANSI B30.5-1968).

Communication Requirements

- The standard hand signals to the operator shall be in accordance with 29 CFR 1926.550 (a) (4) unless voice communication equipment (telephone, radio or equivalent) is utilized. Signals shall be visible or audible to the operator at all times.

4.16 Man lift and Elevator Policy

Purpose
To prevent man lift and elevator accidents by establishing safety protocols.

Scope
This protocol applies to all projects and all contractors.

Expectations
Man lifts (vertical, continuous belts used to elevate personnel from one level to another) will not be used by Greenpac construction personnel. Elevators will be used when feasible for moving personnel and materials.

Guidelines
Guidelines are as follows:

- Man lifts are forbidden on any project.
- Elevators may be used when feasible.
- Elevators will meet ANSI and OSHA (or the respective state code) regulations, be inspected by the operator on each shift and each week by trained elevator personnel, and be well-maintained (all inspections and maintenance will be documented).
- All elevators will have a full-time operator.
- Operator will have authority to deny service or to adjust loads as deemed appropriate.

4.17 Scaffold Use and Inspection

Purpose
The purpose is to prevent injuries resulting from the use of scaffolds.

Scope
This applies to all projects that will use scaffolds during the life of the project.

Expectations
All contractors will ensure that a competent person has reviewed all scaffold installations prior to use and that such installations are inspected each shift to ensure that conditions have not changed.

Guidelines
Guidelines are as follows:

- Only qualified scaffold erectors will erect or modify scaffolds.
- All scaffolding must meet or exceed OSHA requirements found in 29 CFR 1926.451.
- All scaffolds and their components must be capable of supporting at least four times the intended load.
- All scaffolds must be tagged with the appropriate tag:
  - Green Tag — this scaffold meets or exceeds all OSHA standards and it complete and safe to work from.
  - Yellow Tag — this scaffold may have missing handrail(s), holes in deck(s), etc., and will require 100 percent tie-off.
  - Red Tag — this scaffold is either being erected or dismantled or is otherwise unsafe. DO NOT USE.
- A competent person, as defined in OSHA 1926, will be on site and will inspect and tag all scaffolding prior to use each shift. All defects will be corrected prior to commencing work from the scaffolding.
- Any components of a scaffold damaged or weakened from any cause shall be immediately repaired or replaced.
- Mud sills and base plates will be used and will be in good condition.
- All scaffolding will be level and will be secured to the structure when required by OSHA, site conditions or WES project personnel.
- Scaffolding will be designed for the imposed loads.
- All scaffolds will have top rails, mid-rails and toe boards on all open sides.
- 100 percent tie-off on all scaffolds unless exception made by project construction manager and project safety manager.
- Areas beneath scaffolding will be barricaded.
- Adjoining planking sections will be set in such a manner as to prevent plank failure, movement or unprotected openings.

- All scaffolds must be at least two planks wide.
- All scaffold planks must be secured to prevent movement.
- Scaffold boards should not be painted.
- An access ladder shall be provided on all scaffolds.
- Overhead protection must be provided for employees that may be exposed to overhead hazards while working on a scaffold.
- The use of shore or lean-to scaffolds is prohibited.
- All scaffolds exceeding 100 feet in height must be designed by a licensed professional engineer.

Rolling Scaffolds

- Casters will be properly designed for strength and dimension to support four times the maximum intended load. All casters will be provided with a positive locking device to hold the scaffold in position. All casters will be locked prior to employees ascending to the work platform. Rolling scaffolds must be erected on level surfaces before work can be performed off of them.
- The force necessary to move the mobile scaffold will be applied near or as close to the base as practical and provisions will be made to stabilize the tower during movement from one location to another. Scaffolds will only be moved on level floors free of obstructions and openings.
- Employees shall not ride on manually propelled scaffolds.
- All tools and materials must be secured or removed from the platform before the mobile scaffold is moved.
- The height of rolling scaffolds must not exceed four times the minimum base dimension, including the attached outriggers.

Outrigger Scaffolding

- Outrigger beams will extend not more than 6 feet beyond the face of the building. The inboard end or outrigger beams, measured from the fulcrum point to the extreme point of support, will not be less than one-half times the outboard end in length. The beams will rest on edge, the sides will be plumb and the edges will be horizontal. The fulcrum point of the beam will rest on a secure bearing at least 6 inches in each horizontal dimension. The beam will be secured in place against movement and will be securely braced at the fulcrum point against tipping.
- The inboard ends of outrigger beams will be securely supported either by means of struts bearing against sills in contact with the overhead beams or ceiling, by means of tension members secured to the floor joists underfoot, or by both, if necessary. The inboard ends of outrigger beams will be secured against tipping, and the entire supporting structure will be securely braced in both directions to prevent any horizontal movement.

- Outrigger scaffolds and scaffold components shall be designed by a registered professional engineer and shall be constructed and loaded in accordance with such design.

Suspended Scaffolds

- Suspended scaffolds will not be less than 20 inches or more than 36 inches wide.
- Wire ropes used to suspend such scaffolds must have a safety factor six times the maximum intended load (6:1).
- Nonconductive insulating material must be placed over the suspension cables of each scaffold for protection when the chance of contact with an electric arc exists.
- Only engineered, manufactured suspended scaffolding will be used on Greenpac construction projects.
- No employee will be permitted on the suspended scaffolding until it has been checked for integrity of assembly and found to be in accordance with the manufacturer's assembly plans and procedures. A copy of the procedure will be signed and certified by a competent person attesting to the integrity of the suspended scaffolding.
- When working from any suspended scaffold, employees are required to wear a safety harness and to be tied off to the structure or an independent lifeline.

Needle Beam Scaffolds

- All needle beam scaffolds must be constructed to support the intended load with a safety factor of 4 (4:1).
- All employees working from needle beam scaffolds must use safety harnesses and lifelines.
- Needle beams must be at least 4 inches by 6 inches, and the span must not exceed 10 feet.
- Rope supports must be at least 1-inch manila or larger. Attach with a scaffold hitch or eye splice properly secured to prevent the beam from rolling or being displaced.
- Rope that has been exposed to acid must be replaced and destroyed.
- Needle beams suspended by wire rope must be secured with 3 wire-rope clamps, properly attached.
- A 1-inch by 2-inch edging must be placed on all sides of the platform to prevent tools from rolling off. Supporting ropes must be placed on all sides of the platform to prevent tools from rolling off. Supporting ropes must be 1-inch manila or equivalent in "as new" condition and must be fastened so that the platform cannot slip or shift.

Boatswain's Chair

- The chair will not be less than 12 inches by 24 inches, with a 1-inch thickness. The seat will be reinforced on the underside by cleats securely fastened to prevent the board from splitting.

- The two fiber rope seat slings will be of 5/8-inch diameter reeved through the four seat holes so as to cross each other on the underside of the seat.
- Seat slings will be of at least 3/8-inch wire rope when an employee is conducting a heat-producing process, such as gas or arc welding.
- The employee will be protected by a safety harness and lifeline. The attachment point of the lifeline to the structure will be appropriately changed as the work progresses.
- The tackle will consist of correct size ball bearing or bushed blocks and properly spliced 5/8-inch first grade manila rope or equivalent.
- The roof irons, hooks or object to which the tackle is anchored will be securely installed. Tiebacks, when used, will be installed at right angles to the face of the building and securely fastened.

4.18 Ladder Safety

Purpose
The purpose is to ensure the safe use of appropriate ladders.

Scope
The scope includes all employees on Greenpac projects, which are required to work from ladders.

Guidelines
Guidelines are as follows:

- No aluminum or wooden ladders allowed on this project.
- Inspect ladders daily for defects. All defective ladders must be tagged and removed from service immediately. All ladders must be inspected by a competent person monthly and tagged with the appropriate monthly color code.
- Extension ladders must have nonskid feet and be set on a solid, level surface.
- Extension ladders must be set at a proper angle of 4:1.
- Step ladders must be set on a solid, level surface, fully opened with spreaders locked in place. Do not use step ladders in a folded position.
- Do not use the top two steps or rungs of a step ladder.
- All ladders must be secured by tying off or other acceptable means.
- Ladders shall be extended 36 inches above landing.
- Do not carry tools, materials, etc., while climbing ladders. Both hands must remain free to assist in climbing.
- Always face ladder while climbing ladder and/or working from ladder.
- Job-built ladders must be constructed to meet all OSHA requirements.
- Job-built ladders must be secured in place and have side rails that extend 42 inches above the landing surface. Workers must be able to walk through the side rails.

4.19 Material Handling and Storage

Purpose
To prevent injuries caused by the improper handling and storage of materials.

Scope
The scope includes all projects and areas where materials are stored and/or handled.

Expectations
All employees will follow guidelines to ensure the safe handling and storage of materials (lumber, flammables, etc.).

Guidelines
Guidelines are as follows:

General Storage

- Storage areas shall be kept neat and orderly. There must be unobstructed access to fire suppression equipment, electrical power panels and access to emergency exits. Aisle ways shall be kept clear and be large enough to facilitate proper access of equipment and personnel.
- Materials shall be segregated by kind, size and length, and shall be stacked in neat, orderly piles.
- Inside storage areas require these additional precautions:
  - Material shall not be stacked within 24 inches of overhead sprinkler systems.
  - Material shall not be stacked or stored in aisle ways or within 10 feet of a hoist way or 3 feet of a fuse box.
  - Racks, elevated floors and platforms shall be labeled with the maximum allowable weight per square foot.
- Storage of materials in the immediate work area shall be limited to that which will be used and/or installed in the near future. Excess materials and debris shall be immediately removed from the work area.

Lumber Storage

- Lumber shall be stored on a solid, level surface. Lumber shall be placed on cribbing (dunnage) and repeated every 4 feet in height. Lumber shall not be stacked more than 10 feet in height.
- Nails/staples shall be removed from all material that will be reused prior to final stacking. Nails/staples shall be bent over (clinched) in lumber that will be disposed of.

Steel Storage

- Structural steel shall be stored in the sequence it will be used and will be stacked to prevent tipping or rolling. Large beams and trusses shall be braced to prevent falling.
- Reinforced steel shall be stored in separate piles, according to size and length.

- Sheet metal shall be stacked in flat piles and banded/lashed to prevent being picked up by the wind.

Pipe Storage

- Pipe shall be stored on designed sills or racks and shall be blocked to prevent rolling.
- When removing pipe from stacks, workers shall stay to the end of the stacks whenever possible.

Flammable and Combustible Liquid Storage

- All storage and transfer areas will meet requirements found in 29 CFR 1926.152.
- Only approved containers and portable tanks shall be used for the storage and handling of flammable and combustible liquids.
- Approved metal safety cans with self-closing, self-venting lids shall be used for transferring flammable liquids in quantities of 10 gallons or less. For containers larger than 10 gallons, a pump shall be used to transfer flammable or combustible liquids. Storage of 1 gallon or less of flammable liquids shall be in the original container or an approved safety can.
- All containers of flammable and combustible liquids must be labeled with the HMIS label and appropriate warning labels.
- At least one portable fire extinguisher rated not less than 20 B shall be located not less than 20 feet and not more than 75 feet from an outside storage or transfer area.
- When transferring flammable liquids from one container to another, the containers shall be bonded.

Liquefied Petroleum Gas Storage

- All storage and transferring areas used for liquefied petroleum gas shall meet 29 CFR 1926.153.

Compressed Gas Cylinder Storage

- Cylinders shall be stored outside in a well-ventilated, well-protected, dry location shielded from the sun and other sources of heat, at least 20 feet from highly combustible materials, such as oil or excelsior. Cylinders should be sorted into assigned storage spaces located and secured where cylinders will not be knocked over or damaged by passing or falling objects or subject to tampering by unauthorized persons. Cylinders shall not be kept in unventilated enclosures, such as lockers and cupboards.
- Empty cylinders shall have their valves closed, removed from the work area, and be stored separated from fully-charged cylinders.
- Valve protection caps, where cylinder is designed to accept a cap, shall always be in place and hand-tight, except when cylinders are in use or connected for use.

- Compressed gas cylinders shall be secured in appropriate racks in an upright position at all times, including when being hoisted or transported. Do not transport in rear of pickup trucks unless equipped with specifically designed racks.
- A fire extinguisher of appropriate rated capacity and type shall be placed no closer than 25 feet but not farther than 75 feet from compressed fuel gas storage places.
- Retention chains will be provided on storage racks so that compressed gas cylinders will be secured against falling. Storage racks shall be identified as to compressed gas cylinder content.
- Warning signs shall be conspicuously placed at fuel gas storage and read, “Danger: No Smoking or Open Flames,” or other equivalent wording.
- Acetylene cylinders shall be stored and transported valve end up.
- Oxygen cylinders in storage shall be separated from fuel-gas cylinders or combustible materials (especially oil or grease) a minimum of 25 feet or by a noncombustible barrier at least 5 feet high having a fire-resistant rating of at least a half hour.
- Gas cylinders that require a special wrench for opening or closing the valves are required to have the wrench in place on the cylinder while the cylinder is in use.

4.20 Motor Vehicles and Mobile Equipment

Purpose
The purpose is to prevent injuries and equipment damage resulting from motor vehicles and equipment accidents.

Scope
All projects involving motor vehicles and mobile equipment will include their safe operation in their overall site safety plan.

Expectations
All motor vehicles and equipment will be properly maintained and operated by qualified personnel. Appropriate attention will be devoted to traffic control and speeds. Special idiosyncrasies (e.g., driver's range of vision in large vehicles) must also be addressed.

Guidelines
Guidelines are as follows:

- All equipment must be maintained and inspected daily.
- All vehicle and equipment operators must be properly trained and hold a current, valid operator's permit or license.
- Qualified operators will be briefed on any unusual conditions present at this site prior to beginning work.
- Special attention will be given to speed and overall traffic controls on the site.
- Site protocols and employee training must include special conditions, such as a driver's inability to see all around the vehicle when especially large vehicles are used.
- All equipment will be fitted with backup alarms, rollover protection, and seat belts. Cars and pickup trucks may be exempt from backup alarms (to be determined by project manager and safety manager).
- Inoperative backup alarms will be repaired immediately. Equipment is to be removed from service until alarm is operable.
- Seatbelt use is mandatory.
- Equipment shall be shut off, brakes set, and buckets, blades, forks, etc., lowered to the ground prior to operator exiting for any reason.
- All motor vehicles and equipment must be equipped with a horn or other audible warning device.
- All vehicles and equipment shall have operable brake lights regardless of light conditions.
- When visibility conditions warrant, all vehicles will be equipped with two head lights and two tail lights.
- Vehicles designed and manufactured with fenders must have fenders in place.

- Vehicles and equipment shall have operable braking systems capable of stopping and holding when fully loaded.
- All glass windows and windshields must be of safety glass and free of visibility obstructions. Broken and cracked glass should be repaired immediately.
- All vehicles and equipment on site must be equipped with readily accessible adequate fire extinguisher.
- Only the appropriate number of passengers will be allowed to ride in a vehicle and all must wear seatbelts.
- No one is allowed to ride in the rear or bed of trucks.
- Smoking is prohibited in any vehicles leased or owned by Greenpac.
- Smoking is prohibited in or on any equipment (forklifts, cranes, etc.).

4.21 Excavation, Trenching and Shoring

Purpose
The purpose is to prevent trenching and excavation accidents by establishing primary safety parameters to be followed.

Scope
These basic trenching guidelines apply to all contractors performing or working around trenching and excavation.

Expectations
All contractors and subcontractors will follow project guidelines and regulatory requirements for excavating, trenching and shoring. All superintendents and foremen will enforce these guidelines. No employee will work in a trench or excavation without proper protection.

Guidelines
Guidelines are as follows:

- An excavation permit that is designed to ensure that all safety requirements are met and identifies all underground utilities must be completed and signed by the proper personnel.
- Soil classification must be made by a soil engineer prior to beginning any excavation. All soils without an engineer classification will be considered as Class C and will be treated accordingly.
- An exit from the excavation must be within 25 feet of every worker if the excavation if 4 feet deep or greater.
- All excavations 5 feet or greater in depth must be shored, sloped, benched, or shielded in accordance to OSHA regulations.
- A competent person, as defined by OSHA 1926, will be on-site, will analyze the soil, will inspect shoring and related equipment, and will inspect the general site conditions (e.g., working near a building, increased traffic vibration, etc.) prior to the crew beginning work in the trench or excavation daily.
- Spoil piles must be placed a minimum of 2 feet from the edge of the excavation. Maintain all spoil piles.
- Excavations will be marked and barricaded.

4.22 Confined Space Entry

Purpose
The purpose is to prevent a death or injury resulting from improper entry into a confined space.

Scope
This protocol applies to all contractors and subcontractors on all projects involved with the entry into any confined or enclosed space.

Expectations
Greenpac project team members will enforce proper confined space entry procedures throughout the life of the project. All contractors and subcontractors will enforce the confined space rules in all facets of the project and will provide affected personnel with appropriate training prior to making an entry.

Guidelines
Guidelines are as follows:

Training

- Employees required to enter into confined or enclosed space shall be trained, oriented and instructed as to:
  - The nature of the potential hazards
  - The necessary precautions to be taken
  - The use of protective and emergency equipment required
  - The site-specific permit requirements

Environmental Testing

- Before entry into any confined or enclosed space, an adequate forced-air ventilation system will be installed. Appropriate testing of the atmosphere shall be made by the Greenpac Project Safety Manager or qualified person in charge to assure that explosive or toxic limits are not exceeded or the oxygen concentration is not below 19.5 percent or above 23 percent.
- Any confined or enclosed space found to have or suspected of having oxygen deficiency or exceeding toxic or flammable limits shall be:
  - Promptly reported to the Greenpac Company Safety Department
  - Posted with appropriate warning signs (e.g., KEEP OUT, FLAMMABLE, TOXIC, etc.)
  - Ventilated/exhausted
  - Rechecked by approved methods prior to entry in accordance with Item No.1
- During inert gas welding in confined spaces, portable and/or fixed oxygen analyzers with visual/audible alarms shall be provided in areas where oxygen-deficient atmosphere may occur. In addition, continuous oxygen monitoring devices equipped with appropriate warning alarms shall be provided in areas designated by the Greenpac Construction Safety Manager.

- All monitoring and air sampling equipment will be maintained and calibrated in accordance with the manufacturer's specifications and shall be coordinated by the Greenpac Construction Safety Manager.

Personal Protective Equipment

- Suitable and necessary work/rescue equipment, including lifelines, harnesses, stretchers, hoists, etc., shall be immediately available at all times. This equipment shall be selected with the potential hazards or possible contingencies anticipated during the work operations.
- Appropriate clothing, eye, face, and ear protection shall be worn by all employees.

Respirator Protection

- Where air sampling has determined that flammable or toxic limits have been exceeded or an oxygen deficiency exists and accepted engineering control measures, such as general and local ventilation, are not feasible, respiratory protection (cartridge masks, air line respirators, etc.) shall be worn, which are applicable and suitable for the identified air contaminants and as stipulated in the "Safe Work Permit."
- Selection of respiratory equipment will comply with applicable standards and regulations and as stipulated in the "Safe Work Permit."
- Person must be clean shaven and fit tested before being allowed to use a facial respirator.

Ventilation and Exhaust Systems:

- When ventilation is used as an air engineering control method in maintaining acceptable concentration of flammable and toxic contaminates (such as dust, fumes, mists, vapors, and gases), this section will be used as a guide in the installation and operation of ventilation systems.
- Ventilation and exhaust systems must be designed, constructed, maintained, and operated as to ensure the required protection by maintaining a volume and velocity of exhaust air sufficient to gather dusts, fumes, vapors, or gases from the confined or enclosed space and to convey them to suitable points of safe disposal, thereby preventing their dispersion in harmful concentrations into other atmospheres where employees may be working during ventilation operations.
- Periodic air sampling, as required by the "Safe Work Permit," for flammable and toxic materials and oxygen deficiencies shall be done before, during and after employee work assignments in the confined or enclosed space to ensure toxic limits are not exceeded and safe environment is maintained.
- The Greenpac Construction Safety Manager or a qualified person in charge is responsible for making appropriate tests and advising the employees doing the confined space work when the breathing air meets requirements.
- Mechanical heaters used to heat an enclosed or confined space must be approved for this purpose. Heaters are not allowed to be located within the confined space. If

heating of an enclosed space is required where the potential of flammable vapors is present, heating must be by ducted forced air.

Electrical Lighting

- Lighting will be provided in areas where sufficient natural light does not meet requirements.
- Any work area that may contain concentrations, which could exceed explosive limits of flammable materials, appropriate lighting systems, such as explosion-proof fixtures, or equipment otherwise designed for explosive atmospheres shall be used.
- Emergency lighting shall be provided at all points of access and egress. When this is not practical, explosion-proof flashlights shall be provided to persons required to enter confined or enclosed spaces, which are subject to blackout.
- In areas where moisture exists, portable electric lighting shall be operated at a maximum of 12 volts and as defined within the OSHA regulations.
- In enclosed or confined spaces where explosive limit concentrations are exceeded, all electrical equipment shall conform to Article 500 of the National Electric Code.
- No AC current will be allowed for lighting inside a confined space. Unless approved through the Greenpac Construction Safety Manager, lighting must be 12-volt DC or on GFCI.

Communications

- Communications, as stipulated by the “Safe Work Permit,” shall be maintained with all personnel in enclosed or confined spaces by a trained hole watch person outside those areas. This shall be accomplished by utilizing one and/or more of the following methods:
  - Visual
  - Voice
  - Telephone
  - Two-way radio

NOTE: Proper selection shall be dictated as to whether an explosive atmosphere exists in areas of intended use.

Fire Protection

The following conditions shall be assured in confined or enclosed spaces at all times:

- Access and egress will be maintained at all times while work is being performed in a confined or enclosed space. Access ladders, floors and components that are constructed out of combustible materials shall be protected, covered, or wrapped with a flame-retardant material.
- Flammable liquids (e.g., acetone, alcohol, etc.) must be stored in approved (UL or FM) flammable liquid containers or dispensers. The amount of such flammable liquids shall not be in excess of the amount necessary to perform the work each shift.

- Properly rated fire extinguishers shall be immediately available. In instances where extreme fire potential exists, a charged fire hose shall be readily available for immediate use. Cylinders containing oxygen, acetylene or other fuel gases shall not be taken into contained or enclosed spaces.
- All rags, brushes, wipes, gloves, etc., shall be stored in metal containers with lids.
- A trained fire watch shall be present at all times during welding, burning and heating operations to monitor for fires and will ensure there are no fire conditions present for a thirty-minute period after work has ceased.
- All flammable gas equipment, hoses, torches, etc., shall be free of defects and inspected by the crew foreman and the user prior to such operations.
- For the elimination of possible fire in enclosed spaces as a result of gas escaping through leaking or improperly closed torch valves, the gas supply to the torch shall be positively shut off whenever the torch is left unattended for long periods of time, such as during lunch breaks. At the end of a work shift, the torch and hose shall be removed from the confined or enclosed space. Fuel gas and oxygen hoses shall be immediately removed from enclosed spaces when they are disconnected from the torch or other gas-consuming device or are not in use.
- All fire prevention precautions stipulated on the “Safe Work Permit” are to be implemented prior to and during the hot work activities.

Lockout and Tagging

- All lines, pipes or other conveyance of flammable and/or toxic materials shall be positively blinded, locked out and tagged in accordance with the Lockout and Tagging procedure.

Permits and Records

- A confined space work permit is to be completed by the supervisor and approved by the Greenpac Construction Safety Manager after visual inspection and before entrance is made into a confined space or any work is performed within a confined space as defined in this procedure. On questionable items, contact the Greenpac Company Safety Manager to obtain his interpretation as whether construction has reached the stage such that the element should be considered as a confined space.
- If the scope of work should change after work has been commenced, the Greenpac Construction safety Manager shall be notified immediately by the supervisor or employees performing the work.
- A confined space work permit must be issued on a daily basis. If work is not completed after the workday is over, a new permit must be issued before work is commenced again on the next day. This also applies to situations where work is commenced and then suspended for an extended period of time during the same workday.
- A confined space tag must be affixed to the confined space in addition to the confined space permit. The tag can be developed according to site-specific needs. The tag serves as a log of specific information about the confined space and also a log of monitoring activities. Prior to each entry into a confined space, air quality

readings of the confined space entry tag must be taken and logged. Air quality readings must be taken as often as stipulated on the permit, but in any case, no less than four times per shift.

- A log of sampling results will be kept for each confined or enclosed area and will be maintained by the Greenpac Construction Safety Manager. Confined space entry permits and confined space tags must be returned to the Greenpac Construction Safety Manager for filing when the confined space work activity is complete.
- Employee training records will be maintained by the contractor.
- A hot work permit may be required in addition to the confined space work permit.

Rescue

- Whenever work is going to be performed in a confined or enclosed space, emergency rescue must be anticipated. In the event of an emergency, the contractor will coordinate and work with emergency medical and rescue personnel. Rescue plans and training shall be conducted and maintained by the Greenpac Construction Safety Manager and will encompass all foreseeable contingencies that might occur during work in confined or enclosed spaces. An observer will be present at all times at the opening of the confined space whenever work is being performed within the confinement of the space, and he/she will carry a radio to notify if help is needed. Respirators must be located outside vessel during work inside.
- It is the contractor's responsibility to make sure his employees know of, understand and comply with policies and procedures.

NOTE: The hole watch attendant is a critical person in confined space entry projects. This person shall be trained in compliance with OSHA standards. If you have any questions about the training, consult the Greenpac Project Safety Manager.

4.23 Electrical

Purpose
To ensure the proper installation, maintenance, inspection, and testing of equipment grounding conductors on construction sites in order to minimize injuries due to electrical ground faults.

Scope
This procedure has direct application at all field locations. Competent persons, as designated in 1926.32 (f), will be designated to implement this program at projects.

Expectations
All high-, medium- and low-voltage electrical work or testing will be done in accordance with the National Electric Code, OSHA regulations, local regulations, ANSI, ASTM, NFPA, and Greenpac electrical safety policies and procedures.

Guidelines
Only trained and qualified employees will be permitted to perform electrical work.

- All site-specific lockout/tag out, PPE and permit requirements must be followed.
- All electrical installations will be made in a professional manner and will be so designed, constructed, installed, and maintained to be free from recognized hazards that would be likely to cause death or serious injury to employees.
- All tools and equipment must be operated in accordance with manufacturer's intended use and guidelines.
- No employee is permitted to work on any part of an electrical power circuit unless the employee is protected against electrical shock by de-energizing the circuit or guarding it with effective insulation.
- All electrical work must be in accordance with provisions of the current NFPA-70E standard.
- Electrical cords must be protected against accidental damage caused by traffic, sharp corners, projections, and pinching.
- Cords will not be permitted to lay on floors, stairs or walkways. Cords must be routed overhead when possible.
- Splicing of cords is prohibited.

<u>Installation</u>

- All 120-volt, single phase, and 15- and 20-ampere receptacles shall be of a grounding type, and their grounding contacts shall be grounded by connection to the equipment.
- All 120-volt flexible cord sets (extension cords) shall have an equipment grounding conductor, which shall be connected to the grounding contact of the connector(s) on each end of the cord.

- The exposed noncurrent-carrying metal parts of 120-volt cord and plug-connected tools and equipment that are likely to become energized shall be grounded in accordance with the applicable requirements of Sections 250-45 and 250-59 of the National Electric Code.

Ground Fault Circuit Interrupters

- This uniform ground fault protection policy is a mandatory requirement for all construction contractors, subcontractors, suppliers, and vendors providing services at Greenpac facilities. Ground fault circuit interrupter devices (GFCIs) are required on all 15- and 20-amperes 120-volt (alternating current) receptacles and outlets for single phase circuits on all temporary wiring situations. Temporary wiring is defined as the extension of electrical power from a permanent source of outlet by means of extension cords and temporary wiring devices (other than power cord) supplied as part of an electrical tool.

  NOTE: This policy requirement is in addition to any other requirements for equipment grounding conductors established by the Occupational Safety and Health Act or State Industrial Safety and Health Acts.

- The use of ground fault protection devices does not relieve the user or employer from the responsibility of providing proper inspection of all temporary electrical cords, connections and portable electric tools. Repair and replacement of such electrical equipment will be performed in accordance with safety requirements referenced in this section.

Assured Grounding Program

- The employees shall be instructed that each cord set and any equipment connected by cord and plug, except cord sets and receptacles that are fixed and not exposed to damage, shall be visually inspected by the user before each day's use for external defects, such as deformed or missing pins, insulation damage and indication of possible internal damage. Equipment found to be damaged or defective may not be used until repaired.
- All 120-volt, single phase, 15- and 20-ampere receptacles, 120-volt flexible cord sets, and 120-volt equipment connected by cord and plug that are not a part of the permanent wiring of the building or structures shall be tested to assure that electrical continuity is maintained through all required equipment grounding conductors and their connectors. These tests shall be conducted as follows:
  - All equipment grounding conductors shall be tested for continuity.
  - Receptacles of cord sets shall be tested for correct attachment of the equipment grounding conductor. The equipment grounding conductor shall be connected to its proper terminal.
  - A test log will be maintained on all equipment tested.
  - All required tests shall be performed:
    - Before the first use
    - Before equipment is returned to service following any repairs
    - Before equipment is used after any incident that can be reasonably suspected to have caused damage (e.g., when a cord set is run over)

- At intervals not to exceed once per month, except cord sets and receptacles that are fixed and not exposed to damage, which shall be tested at intervals not exceeding three months

– All receptacles, attachment caps and plug, and receptacle of cord sets shall be tested in the following manner:
  - While in service with receptacle circuit tester
  - When not in service with a continuity tester

  NOTE: All equipment connected by cord and plug shall be tested for ground wire continuity with a volt-ohm meter or a continuity tester.

– Tests shall be documented by means of color coding. The following color coding system is suggested to verify that testing is current and that all receptacles, portable cords and tools have been inspected and tested, as required:

Color Code System	
Jan/Jun.....	Green
Feb/Aug.....	Brown
Mar/Sep.....	Gray
Apr/Oct.....	Yellow
May/Nov.....	Blue
Jul/Dec.....	Red

– All receptacles, cords and tools shall be marked with the tape used to designate the period for which the inspections and tests were conducted. The tape will be placed on the receptacle cover of any electrical equipment installed as a permanent fixture in a temporary electrical system. The tape will be placed within 4 inches of the male end of any electrical cord set or electrical tool cord.

4.24 Electrical Lockout

Purpose
The purpose is to prevent electrocution through a systematic energy control process.

Scope
This protocol applies to all employees on all projects, especially to those who work with electrically energized equipment.

Expectations
Greenpac project team members and all contractor management teams will enforce the electrical lockout program across each project without exception. Further, contractors will train all affected personnel in the electrical lockout program.

All affected personnel will abide by the electrical lockout program.

Guidelines
Guidelines are as follows:

- All site-specific lockout/tag out procedures will be adhered to.
- This program will be rigidly enforced by Greenpac project team members and contractor management.
- Contractors will train all affected personnel in the electrical lockout program and, thereafter, all personnel will abide by the program.
- Each involved person must have a unique lock/key set and apply that lock whenever working on electrically energized equipment (if power is not needed to complete the required work).
- Once locks are applied, a system must be in place to ensure that the equipment is truly de-energized (including power stored in capacitors).
- When work is complete, a system must be in place to ensure that all personnel, tools and equipment are out of the machinery prior to re-energizing.
- Each person must remove his/her own lock.
- There must be a written protocol for lock removal in the event an employee leaves the site without removing his/her lock.
- Machine-specific de-energizing and start-up procedures must be in place.

4.25 Valve Lockout

Purpose
The purpose is to prevent injury during start-up or maintenance work resulting from exposure to chemicals delivered through an open valve and piping.

Scope
This protocol applies to all employees working for all contractors at all sites.

Expectations
Greenpac project team members and contractor management teams will rigidly enforce this requirement for the life of the project.

Guidelines
Guidelines are as follows:

- All site-specific lockout/tag out procedures will be adhered to.
- This rule will be rigidly enforced by Greenpac project team members and all contractor management teams.
- All valves affecting the area of start-up, clearance or maintenance will be locked out while the work is carried out. Valves will also be tagged so that personnel know what is taking place.
- Blinds will also be inserted as necessary to prevent chemicals from reaching a work area.
- A written program will be in place to ensure that all valves and piping affecting the work area are effectively blinded and locked out as appropriate to prevent any chemical contact; that each person uses his/her own unique lock and key; that each person removes his/her own lock; that all personnel, tools and equipment are clear of the machine or piping prior to unlocking any valves or removing any blinds or flanges; and that there is a protocol for removing a lock left in place by an employee leaving the shift or site without removing his/her lock.
- All affected personnel will be trained in the valve lockout program, and this process will be documented.

4.26 Commissioning and Start-up Safety

Purpose
To ensure that start-up processes proceed without employee injury and are completed in accordance with set protocols; to ensure that all hazards are identified and eliminated.

Scope
This protocol applies to all new equipment installations, as well as significant equipment modifications.

Expectations
Greenpac project team members, Greenpac mill/plant management, and all contractors will enforce these safety protocols during commissioning and start-up activities.

Guidelines
Guidelines are as follows:

- Commissioning and start-up safety protocols will be enforced by Greenpac project teams, mill/plant management and contractor management.
- Equipment shall not be started for production prior to inspection by a start-up inspection team.
- The inspection team will be chosen by the corporate commissioning director or his designee, the project manager and the mill manager.
- It is recommended, as a minimum, that the start-up inspection team consist of the project coordinator, two production people and a designated safety person.
- Ideally, start-up inspection teams should be involved in the planning and installation phase of the projects. This involvement will result in the elimination of many hazards before projects reach completion.
- The inspection team should complete the safety start-up checklist (see *Safety Start-up Checklist for New or Modified Equipment* at the end of this document).
- All OSHA and project process safety management (PSM) procedures must be followed.
- Confirm that the construction safety rules are coordinated with the mill safety rules.
- Develop and implement special safety training for contractor, owner and supplier personnel involved in start-up.
- Safety awareness will be heightened in toolbox talks during commissioning and start-up work.

<u>General Items</u>

- All construction and checkout personnel shall follow accepted Greenpac electrical safety procedures without exception while working on a Greenpac project. All personnel shall also follow applicable federal and/or state safety standards whether legislative (i.e., OSHA) or consensus (i.e., NFPA 70E) in nature.

- Whenever possible, no electrical circuits shall be terminated, de-terminated or handled without de-energizing the power source. When live circuit work is required, proper personal protective equipment as defined by Greenpac and NFPA 70E shall be followed (i.e., flash suits, nonconductive face shields, nonconductive mats, line gloves, hot sticks, etc.) and all permit procedures shall be followed.

Motor Starters

- Under no conditions shall motor starters be energized while the starter door is open and unlocked. The door locking mechanism shall always be used. The circuit breaker interlock mechanism shall never be used in lieu of the door locking mechanism. The main circuit breaker shall be in the OFF position at all times while the door is open. Exceptions to this shall be when motor starter troubleshooting is required and, in this case, the motor leads to the motor shall be disconnected, if possible. In cases when cable sizes prevent easy disconnection for troubleshooting, the starter main circuit breaker will remain in the OFF position while the power compartment of the motor starter is open. The starter shall then be diagnosed in the de-energized state.
- Motor starters shall always be energized using one of the following procedures:
  - Executing a "START ORDER" from the DCS keyboard.
  - Forcing the digital output from the DCS keyboard.
  - Using a jumper wire to short circuit across the digital output terminals, inside the DCS connection cabinet only.
  - Temporarily connecting with a cable pigtail a momentary pushbutton at the magnetic coil terminals in the starter and routing the pigtail wiring through the adjacent MCC vertical wire way to facilitate closing the motor starter door.
  - Using the start/stop pushbutton station that is intended to be the primary means of control.
  - Using the start/stop pushbutton located on the motor starter door.
- A motor starter circuit breaker shall not be turned from the ON position to the OFF position if the motor starter is energized and the motor is connected unless an emergency situation requires immediate disconnection of power.
- The main circuit breaker shall not be turned to the ON position until the control signal that energizes the motor starter is verified as being in the OFF state.
- Motor phase current measurements using a clamp-on ammeter shall only be taken when the ammeter is capable of being used with the door to the starter in the closed and locked position. In these cases, the vertical MCC wire way can be used to access the motor leads. For medium voltage motors, the CT secondary wiring should always be used to measure the motor phase currents.
- Motor starter overload relays shall be reset only when the starter door is closed and locked.
- Motors shall not be started until a megohmmeter check has been made and recorded for the motor. The motor resistance shall not be below 1000 ohms/volt plus 1 megohm.

4.27 Concrete and Reinforcing Steel (Rebar)

Purpose
To prevent injuries resulting from the forming, placement and finishing of concrete and reinforcing steel (rebar).

Scope
This protocol applies to all projects that will use concrete in any facet of the construction activity.

Expectations
Wherever concrete is to be placed, provisions will be taken to ensure that personnel who are forming or placing the concrete and/or rebar are safely positioned, provided necessary PPE and protected from impalement hazards and placement equipment failures. All finishers will also be protected by PPE to protect knees and prevent contact with wet concrete.

Guidelines
Guidelines are as follows:

- Precautions will be taken to ensure protection against pumping equipment failure.
- All who can contact fresh concrete will be provided gloves, protective eyewear and other protection to prevent skin burns and eye injury.
- Kneepads will be provided for finishers and vibration-absorbing gloves for those operating powered finishing equipment.
- Those not directly involved in pumping operations should stay away from the unit to avoid potential electric shock or other hazards.
- Sufficient numbers of employees will be provided on the concrete hoses to prevent muscle strains.
- Mechanical aids, such as cranes, will be used to set and strip formwork.
- All vertically protruding rebar must be protected to eliminate impalement hazards.
- Horizontal rebar must be protected to eliminate hazards.
- Safe walking surfaces (planking) must be provided on reinforcing or rebar mats to ensure safe footing.
- Employees working more than 4 feet above the ground or other working surface placing or tying rebar will wear a full body harness with lanyards attached to proper anchorage in addition to placement hooks (wall chain). Placement hooks are not to be used as fall protection.
- Gloves must be worn when placing or tying rebar.
- A two-part sling must be used when moving bundles of rebar over 20 feet in length. Bundles will be secured at each end to prevent recoil.

- All necessary precautions shall be taken to ensure the prevention of injuries resulting from the handling (lifting, carrying, etc.) of rebar. Utilize adequate personnel and/or equipment.

4.28 Welding and Cutting

Purpose
To prevent injuries caused by the hazards associated with welding and cutting operations.

Scope
All projects where welding and cutting operations are to be performed.

Expectations
Only trained, competent employees that are thoroughly knowledgeable in the elimination of hazards will be allowed to perform welding and/or cutting operations.

Guidelines

- Proper PPE must be worn at all times during the performance of welding and/or cutting operations. Soft-cap welding may be allowed in special circumstances only with the approval of the project safety director.
- Long sleeve shirts must be worn.
- The following table shall be used in determining the proper eye protection against radiant energy:

Table 1
Filter Lens Shade Numbers for Protection Against Radiant Energy

Welding Operation	Shade No.
Shielded metal arc welding, 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes	10
Gas-shielded arc welding (nonferrous), 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes	11
Gas-shielded arc welding (ferrous), 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes	12
Shielded metal arc welding, 3/16-, 7/32-, 1/4-inch diameter electrodes	12
Shielded metal arc welding, 5/16-, 3/8-inch diameter electrodes	14
Atomic hydrogen welding	10–14
Carbon arc welding	14
Soldering	2
Torch brazing	3 or 4
Light cutting, up to 1 inch	3 or 4
Medium cutting, up to 6 inches	4 or 5
Heaving cutting, over 6 inches	4 or 5
Gas welding (light), up to 1/8 inch	4 or 5
Gas welding (medium), 1/8 inch to 2 inches	5 or 6
Gas welding (heavy), over 2 inches	6–8

- Site-specific burn permits must be obtained and completed prior to beginning any welding or cutting.

- Inside buildings, cylinders shall be stored in a well-protected, well-ventilated, dry location at least 20 feet from highly combustible materials, such as oil or excelsior. Cylinders should be stored in definitely assigned places away from elevators, stairs or gangways. Assigned storage places shall be located where cylinders will not be knocked over or damaged by passing or falling objects or subject to tampering.
- The handling, storage and utilization of all compressed gases in cylinders, portable tanks, rail tank cars, or motor vehicle cargo tanks shall be in accordance with Compressed Gas Association Pamphlet P-1-1965.
- A 10-pound ABC fire extinguisher shall be located within 25 feet of storage and used areas.
- "No smoking" signs will be located in the area.
- Cylinders shall not be stored within 40 feet of an occupied dwelling (e.g., office trailer).

Placing Cylinders

- Cylinders shall be kept far enough away from the actual welding or cutting operation so that sparks, hot slag or flame will not reach them. When this is impractical, fire-resistant shields shall be provided.
- Cylinders shall be placed where they cannot become part of an electrical circuit. Electrodes shall not be struck against a cylinder to strike an arc.
- Fuel gas cylinders shall be placed with valve end up whenever they are in use. They shall not be placed in a location where they would be subject to open flame, hot metal or other sources of artificial heat.

Treatment of Cylinders

- Cylinders, whether full or empty, shall not be used as rollers or supports.
- No person, other than the gas supplier, shall attempt to mix gases in a cylinder. No one, except the owner of the cylinder or person authorized by them, shall refill a cylinder. No one shall use a cylinder's contents for purposes other than those intended by the supplier. All cylinders used shall meet the Department of Transportation's requirements, published in 49 CFR Part 178 Subpart C Specification for Cylinders.
- No damaged or defective cylinder shall be used.

Use of Fuel Gas

- The employer shall thoroughly instruct employees in the safe use of fuel gas as follows:

    A. Fuel gas shall not be used from cylinders through torches or other devices, which are equipped with shutoff valves, without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold.

    B. The system must be tested for leaks before lighting the torch. Leak test the system by performing the following steps:

1. With the oxygen cylinder valve open, adjust the oxygen regulator to deliver 20 PSIG.
2. With the fuel cylinder valve open, adjust the fuel regulator to deliver 10 PSIG.
3. Be sure that both the oxygen and fuel control valves on the torch handle are closed.
4. Close both the oxygen and fuel cylinder valves.
5. Turn the adjusting screws counterclockwise one turn.
6. Observe the gauges on both regulators for five minutes. If the gauge readings do not change, the system is leak tight. If there is a leak, use an approved leak detection solution to locate it. If the HP gauge reading decreases there is a leak at the cylinder valve or inlet connection. Tighten the inlet connection after the pressure has been released from the regulator. If the inlet connection still leaks, take the regulator to a qualified repair technician. Never tighten a cylinder valve. If the cylinder valve is leaking, remove the regulator from the cylinder and place the cylinder outdoors. Notify your gas supplier immediately. If the LP gauge reading decreases, there is a leak at the regulator outlet connection within the hose at the torch inlet connections or at the control valves on the torch handle. Tighten the regulator outlet connection and the torch handle inlet connections after the pressure has been released from the system. If these connections are still leaking, take the regulator or torch handle to a qualified repair technician. If the hoses are leaking, replace them.
7. After leak testing the system, open the cylinder valves and proceed.

C. Before a regulator is connected to a cylinder valve, the valve shall be opened slightly and closed immediately. This action is generally termed “cracking” and is intended to clear the valve of dust or dirt that might otherwise enter the regulator. The person cracking the valve shall stand to one side of the outlet, not in front of it. The valve of a fuel gas cylinder shall not be cracked where the gas would reach welding work, sparks, flame, or other possible sources of ignition.

D. The cylinder valve shall always be opened slowly to prevent damage to the regulator. For quick closing, valves of fuel gas cylinders shall not be opened more than one and a half turns. When a special wrench is required, it shall be left in position on the stem of the valve while the cylinder is in use so that the fuel gas flow can be shut off quickly in case of an emergency. In the case of manifold or coupled cylinders, at least one such wrench shall always be available for immediate use. Nothing shall be placed on top of a fuel gas cylinder when in use because damage may occur to the safety device or interfere with the quick closing of the valve.

E. Flashback arrestors (check valves) shall be used with oxygen, fuel gas welding, heating, cutting, and allied processes. They are to be installed in the system between the outlet of the regulator and the inlet of the hose leading to the torch.

F. Before a regulator is removed from a cylinder valve, the cylinder valve shall always be closed and the gas released from the regulator.

G. If, when the valve on a fuel gas cylinder is opened, there is found to be a leak around the valve stem, the valve shall be closed and the gland nut tightened. If this action does not stop the leak, the use of the cylinder shall be discontinued, and it shall be properly tagged and removed from the work area. In the event that fuel gas should leak from the cylinder valve rather than from the valve stem, and the gas can not be shut off, the cylinder shall be properly tagged and removed from the work area. If a regulator attached to a cylinder valve will effectively stop a leak through the valve seat, the cylinder does not need to be removed from the work area.

H. If a leak should develop at a fuse plug or other safety device, the cylinder shall be removed from the work area.

I. Acetylene shall not be used at pressures above 15 pounds PSI.

Hose

- Fuel gas and oxygen hose shall be easily distinguishable from each other. The contrast may be made by different colors or by surface characteristics readily distinguishable by the sense of touch. Oxygen and fuel gas hoses shall not be interchangeable. A single hose having more than one gas passage shall not be used.
- When parallel sections of oxygen and fuel gas hose are taped together, not more than 4 inches out of 12 inches shall be covered by tape.
- All hose in use carrying acetylene, oxygen, natural or manufactured fuel gas, or any gas or substance that may ignite, enter into combustion, or be in anyway harmful to employees shall be inspected at the beginning of each working shift. Defective hose shall be removed from service.
- Hose that has been subjected to flashback or shows evidence of severe wear or damage, defective hose, or hose in doubtful condition shall not be used.
- Hose couplings shall be of the type that cannot be unlocked or disconnected by means of a straight pull without rotary motion.
- Boxes used for the storage of gas hose shall be ventilated.
- Hoses, cables and other equipment shall be kept clear of passageways, ladders and stairs.
- Oxygen/acetylene hoses are not to be crimped or tied prior to removing torch. Bottles must be turned off before disconnecting torch.

Torches

- Clogged torch tip openings shall be cleaned with suitable cleaning wires, drills or other devices designed for such purpose.
- Torches in use shall be inspected at the beginning of each working shift for leaking shutoff valves, hose couplings and tip connections. Defective torches shall not be used. All torches shall be equipped with “Back Flash” valves.
- Torches shall be lighted by friction lighters or other approved devices and not by matches or from hot work.

Regulators and Gauges

- Oxygen and fuel gas pressure regulators, including their related gauges, shall be in proper working order while in use.

Oil and Grease Hazards

- Oxygen cylinders and fittings shall be kept away from oil or grease. Cylinders, cylinder caps and valves, couplings, regulators, hose, and apparatus shall be kept free from oil or greasy substances and shall not be handled with oily hands or gloves.

Manual Electrode Holders

- Only manual electrode holders that are specifically designed for arc welding and cutting and are of a capacity of safely handling the maximum rated current required by the electrodes shall be used.
- Any current-carrying parts or grips must be fully insulated against the maximum voltage encountered to ground.

Welding Cables and Connectors

- All arc welding and cutting cables shall be completely insulated, flexible and capable of handling the maximum current requirements of the work in progress, taking into account the duty cycle under which the arc welder or cutter is working.
- Only cable free from repair or splices, for a minimum distance of 10 feet from the cable end to which the electrode holder is connected, shall be used.
- Cables in need of repair shall not be used. When cable, other than the cable lead referred to above, becomes worn to the extent of exposing bare conductors, the portion exposed shall be protected by means of rubber, friction tape or equivalent insulation that is equal to or greater than the existing insulation.
- When it becomes necessary to connect or splice lengths of cable one to another, substantial insulated connectors of a capacity at least equivalent to that of the cable shall be used. If connections are made by means of cable lugs, they shall be securely fastened together to give a good electrical contact and the exposed metal parts of the lugs shall be completely insulated.

Ground Returns and Machine Grounding

- A ground return cable shall have a safe current-carrying capacity equal to or exceeding the specified maximum output capacity of the arc welding or cutting unit that it services. When a single ground return cable services more than one unit, its safe current-carrying capacity shall exceed the total specified maximum output capacities of those of all the units that it services.
- Pipelines containing gases or flammable liquids or conduits containing electrical circuits shall not be used as a ground return.
- When a structure or pipeline is employed as a ground return circuit, it shall be determined that the required electrical contact exists at all joints. The generation of

an arc, sparks or heat at any point shall cause rejection of the structures as a ground circuit.

- When a structure or pipeline is continuously employed as a ground return circuit, all joints shall be bonded and periodic inspections shall be conducted to ensure that no condition of electrolysis or fire hazard exists by virtue of such use.
- The frames of all arc welding and cutting machines shall be grounded either through a third wire in the cable containing the circuit or a separate wire that is grounded at the source of the current. Grounding circuits other than by means of the structure shall be checked to ensure that the circuit between the ground and the grounded power conductor has resistance low enough to permit sufficient current to flow to cause the fuse or circuit breaker to interrupt the current. All ground connections shall be inspected to ensure that they are mechanically strong and electrically adequate for the required current.

Operating Instructions

- Supervisors shall instruct employees in the safe means of arc welding and cutting as follows:
  - Permits, when required, should be satisfied prior to the start of work.
  - When electrode holders are to be left unattended, the electrodes shall be removed and the holders shall be so placed or protected that they cannot make electrical contact with employees or conducting objects. Rod stubs shall be placed in a nonflammable container and never be allowed to fall to ground or other working surface.
  - Hot electrode holders shall not be dipped in water; to do so may expose the arc welder or cutter to electric shock.
  - When the arc welder or cutter has occasion to leave his work or to stop work for any appreciable length of time or when the arc welding or cutting machine is to be moved, the power supply switch to the equipment shall be opened.
  - Any faulty or defective equipment shall be reported to the supervisor.

Shielding

- Whenever practical, all arc welding and cutting operations shall be shielded by noncombustible or flameproof screen, which will protect employees and other persons working in the vicinity from the direct rays of the arc.

Fire Prevention

- When practical, objects to be welded, cut or heated shall be moved to a designated safe location. If these objects cannot be readily moved, all movable fire hazards in the vicinity shall be taken to a safe place or otherwise protected. If these objects cannot be moved and if all the fire hazards cannot be removed, positive means shall be taken to confine the heat, sparks and slag.
- No welding, cutting or heating shall be done where the application of flammable paints or the presence of other flammable compounds or heavy concentrations create a hazard.

- Suitable fire extinguishing equipment shall be immediately available in the work area and shall be maintained in a state of readiness for instant use.
- When the welding, cutting or heating operation is such that normal fire prevention precautions are not sufficient, additional personnel shall be assigned to guard against fire while the actual welding, cutting or heating operation is being performed and for a sufficient period of time after completion of the work to ensure that no possibility of fire exists. Such personnel shall be instructed as to the specific anticipated fire hazards and how the fire-fighting equipment provided is to be used.
- When welding, cutting or heating is performed on walls, floors and ceilings, the same precautions that are taken on the side that the work is being performed shall be taken on the opposite side since direct penetration of sparks or heat transfer may introduce a fire hazard to an adjacent area.
- For the elimination of possible fire in enclosed spaces as a result of gas escaping through leaking or improperly closed torch valves, the gas supply to the torch shall be positively shut off at some point outside the enclosed space whenever the torch is not to be used or whenever the torch is left unattended for a substantial period of time, such as during lunch. Overnight and at the change of shifts, the torch and hose shall be removed from the confined space. Open end fuel gas and oxygen hoses shall be immediately removed from enclosed spaces when they are disconnected from the torch or other gas-consuming device.
- Except when the contents are being removed or transferred, drums, pails and other containers that contain or have contained flammable liquids shall be kept closed. Empty containers shall be removed to a safe area apart from hot work operations or open flames.
- Drums, containers or hollow structures that have contained toxic or flammable substances shall either be filled with water, or thoroughly cleaned, and ventilated before welding, cutting or heating is undertaken on them.
- Before heat is applied to a drum, container or hollow structure, a vent or opening shall be provided for the release of any built-up pressure during the application of heat.

<u>Mechanical Ventilation</u>

- Mechanical ventilation shall consist of either general mechanical ventilation systems or local exhaust systems.
- Ventilation shall be deemed adequate if it is of sufficient capacity and so arranged as to remove fumes and smoke at the source and keep their concentration in the breathing zone within safe limits as defined in Subpart D of Part 1926 Occupational Health and Environmental Controls.
- Contaminated air exhausted from a working space shall be discharged clear of the source of air intake.
- All air replacing that withdrawn shall be clean and restorable.
- Oxygen shall not be used for ventilation purposes, blowing dust from clothing, or cleaning the work area.

Welding, Cutting or Heating of Metals of Toxic Significance

- Welding, cutting or heating in any enclosed spaces involving the following metals shall be performed with adequate mechanical ventilation as described above:
  - Zinc-bearing base or filler metals coated with zinc-bearing materials
  - Lead-base metals
  - Cadmium-bearing filler materials
  - Chromium-bearing metals or metals coated with chromium-bearing materials
- Welding, cutting or heating in any enclosed spaces involving the following metals shall be performed with adequate local exhaust ventilation as described above or employees shall be protected by air line respirators in accordance with the requirements of Subpart E: CFR 1926.353:
  - Metals containing lead, other than as an impurity, or metals coated with lead-bearing materials
  - Cadmium-bearing or cadmium-coated base metals
  - Metal coated with mercury-bearing metals
  - Beryllium-containing base or filler metals; because of its high toxicity, work involving beryllium shall be done with both local exhaust ventilation and air line respirators
- Employees performing such operations in the open air shall be protected by filter-type respirators in accordance with the requirements of Subpart E, except that employees performing such operations on beryllium-containing base or filler metals shall be protected by air line respirators in accordance with the requirements of Subpart E.
- Other employees exposed to the same atmosphere as the welders or burners shall be protected in the same manner as the welder or burner.

Inert-Gas Metal-Arc Welding

- Since the inert-gas metal-arc welding process involves the production of ultraviolet radiation of intensities of 5–30 times of that produced during shielded metal-arc welding, the decomposition of chlorinated solvents by ultraviolet rays, and the liberation of toxic fumes and gases, employees shall not be permitted to engage in or be exposed to the process until the following special precautions have been taken:
  - The use of chlorinated solvents shall be kept at least 200 feet from the exposed arc (unless shielded), and surfaces prepared with chlorinated solvents shall be thoroughly dry before welding is permitted on such surfaces.
  - Employees in the area not protected from the arc by screening shall be protected by filter lenses meeting the requirements of Subpart E. When two or more welders are exposed to each other's arc, filter lens goggles or a suitable type, meeting the requirements of Subpart E, should be worn under welding helmets. Hand shields to protect the welder against flashes and radiant energy shall be used when either the helmet is lifted or the shield is removed.
  - Welders and other employees exposed to radiation shall be suitably protected so that the skin is covered completely to prevent burns and other damage by

ultraviolet rays. Welding helmets and hand shields shall be free of leaks and openings.

- When inert-gas metal-arc welding is being performed on stainless steel, adequate local exhaust ventilation as described above or air line respirators in accordance with the requirements of Subpart E shall be used to protect against dangerous concentrations of nitrogen dioxide.

General Welding, Cutting and Heating

- Welding, cutting or heating, not involving conditions or toxic materials described above, may normally be done without mechanical ventilation or respiratory protective equipment. However, these protections shall be provided where an unsafe accumulation of contaminants exists because of unusual physical or atmospheric conditions.
- Employees performing any type of welding, cutting or heating shall be protected by suitable eye protective equipment in accordance with the requirements of Subpart E.

Welding, Cutting and Heating in Way of Preservative Coatings

- Before welding, cutting or heating is commenced on any surface covered by a preservative coating whose flammability is not known, a test shall be made by a competent person to determine its flammability. Preservative coatings shall be considered to be highly flammable when scrapings burn with extreme rapidity.
- When coatings are determined to be highly flammable, they shall be stripped from the area to be heated to prevent ignition.
- Protection against toxic preservative coatings:
  - In enclosed spaces, all surfaces covered with toxic preservatives shall be stripped of all toxic coatings for a distance of at least 4 inches from the area of heat application or the employees shall be protected by air line respirators meeting the requirements of Subpart E.
  - In the open air, employees shall be protected by a respirator in accordance with the requirements of Subpart E.
- The preservative coatings shall be moved a sufficient distance from the area to be heated to ensure that the temperature of the unstripped metal will not be appreciably raised. Artificial cooling of the metal surrounding the heating area may be used to limit the size of the area required to be cleaned.

4.29 Burning Permits

Purpose
The purpose is to prevent starting fires within the construction project, the adjacent mill or plant.

Scope
This protocol will apply to all personnel working at all sites.

Expectations
Greenpac project team members and contractor/subcontractor management teams will rigidly enforce this hot work permit rule throughout the life of the project. All employees will be trained in the program and will be expected to abide by it.

Guidelines
Guidelines are as follows:

- This rule will be strictly enforced throughout the life of the project.
- Greenpac's hot work permit system will be followed.
- In all areas where hot work is to be carried out, a hot work or burn permit must be completed and signed by the contractor superintendent or designee, safety representative, person performing the hot work, and the fire watch.
- The permit must identify the type of work to be performed, the location of the work, a list of all hazards, the location of fire suppression equipment, and the date of the work.
- Appropriate fire suppression equipment must be readily available (within 20 feet of hot work).
- Hot work areas will be clear of all flammable and combustible materials. Where materials cannot be removed, they must be protected with fire-resistant material.
- An employee, wearing an orange vest for identification, must be designated to act as fire watch. The fire watch must remain in the work area at all times the hot work is being performed and at least 30 minutes after the work is complete.
- Employees involved in hot work must be trained in the use of fire protection equipment.
- The project manager or project safety manager must approve hot work inside any confined space. Confined space permit and hot work permit must be completed and signed.

4.30 Hazard Communication

Purpose
The purpose is to prevent injuries resulting from exposure to chemicals and hazardous materials.

Scope
All contractors will participate in and enforce the project program as part of the total site safety program.

Expectations
All contractors will participate in and enforce the site hazard communication program, which will include: An ongoing list of hazardous materials; a discussion of material safety data sheets; proper control mechanisms; employee training; container labeling; and special task controls will all be completed to ensure that this rule is carefully followed. All potentially exposed personnel will be trained in this program, and all such training will be documented.

Guidelines
Guidelines are as follows:

- Site and contractor supervision will enforce the hazard communication program throughout the life of the project.
- All chemicals must be approved by Greenpac management prior to being brought on site.
- All site-specific mill and/or plant hazard communication policies must be followed.
- All employees potentially exposed to hazardous chemicals must be trained in the potential exposures and how to protect themselves.
- All training must be documented. Initial hazard communication training must be completed during the new hire orientation.
- Material safety data sheets (MSDSs) must be maintained in a central location and available to all personnel on site.
- The project safety manager will be responsible for collecting, cataloging and maintaining MSDSs. Request for MSDSs must accompany all purchase orders for materials purchased for the project.
- Hazardous materials will be brought onto the site through normal distribution chains rather than employee retail acquisition so that inventories and MSDSs can be kept current.
- All containers of hazardous materials (even if decanted to smaller containers) must be labeled with the name of the contents, the hazard warning, and the name and address of the manufacturer.
- Chemical work permits must be utilized on projects that may involve extremely hazardous materials to ensure the proper control of the work in and around these chemicals.

Asbestos

- Intact and undisturbed asbestos materials do not pose a health risk. When asbestos containing material is properly managed, release of asbestos fibers into the air is prevented or minimized. Do not disturb any material that could possibly contain asbestos (insulation, floor coverings, ceiling tile, etc.) unless you are properly trained and qualified.
- If the insulation or other material is not marked or identified, you must treat it as if contains asbestos until it is determined by a qualified person that it is asbestos free.
- Once a material has been identified as containing asbestos, it should be labeled immediately.
- Positive identification of asbestos requires laboratory analysis.
- The bottom line is; if you suspect that a material could possibly contain asbestos, stay away until it has been properly abated by qualified personnel.

Lead Paint

- Never grind, cut, or weld on any structure that could possibly contain lead paint.
- Paint will be tested by a qualified person, prior to beginning work, to determine the existence of lead. If it is shown to contain lead, it must be properly abated by trained and qualified personnel.

4.31 Tools and Equipment

Purpose
To promote safety by ensuring that the proper tool is used for the job and that all tools and equipment are properly maintained and used in the proper manner.

Scope
The scope includes all employees on the job site.

Expectations
All employees shall choose the proper tool for the job, use them in the proper manner, and be responsible for the care and maintenance of tools and equipment.

Guidelines

Hand Tools (General)

- Use hand tools only for the purpose for which they were intended.
- Use tools that are in good condition. Tools that are worn or broken must be replaced or repaired. Take damaged tools to tool room.
- Ensure the use of proper personal protective equipment recommended by the manufacturer.
- When tools are not in use, they will be stored in proper storage, such as tool boxes, tool cribs, tool racks, or gang boxes.
- Do not leave tools in elevated areas where they may become dislodged and/or fall.

Hand Tools (Specific)

- Tools with wooden handles shall be kept in good repair. Handles that are cracked, split or broken shall be replaced.
- Tools, such as chisels and punches, must be kept sharp and in good condition.
- When chisels, punches or beaters become mushroomed, they must be ground down to keep from spalling.
- All hand tools, such as wrenches, pliers, screwdrivers, and the like, shall be kept in good repair and replaced when sprung, worn or damaged. The use of “cheaters” to increase leverage is prohibited.
- Tools, such as hand saws and hack saws, shall be kept sharp or have the blades replaced when damaged or worn out.
- Store sharp tools in proper storage locations and containers to prevent possible damage, cuts and punctures.

Power Tools (General)

- Follow all manufacturers’ instructions for the safe storage, operation and maintenance.

- Do not use power tools unless you have been trained to use them safely.
- Never remove or deactivate tool guards.
- Disconnect, lock and tag out hard-wired power tools before doing repair work.
- Never leave power tools running when not attended.
- Power tools must be double-insulated or have a three-prong cord.

Power Tools (Specific)

- Power saws
  - Do not use power saws with dull blades.
  - Do not jam or force saws into the work.
  - Portable saws must have a spring-loaded switch.
  - Do not alter guards or operate saws with damaged or missing guards.
  - Disconnect saws before changing blades or making repairs.
  - Wear hearing protection when combined tool noise and background noise exceed 85 dBA.
- Grinders
  - Standing and bench grinders must have all guards in place, and the tool rest must be no more than 1/8 inch from the wheel. Keep stones in good repair.
  - Grinders shall be so located as to protect other workers from airborne debris and away from combustible and flammable materials.
  - Employees must wear face shields and safety glasses when using grinders.
  - Side grinders must have guards in place before use.
  - Hearing protection is required while operating grinders.

Powder-Actuated Tools

- General precautions (applicable to all types of powder-actuated tools)
  - The explosive powder-actuated tool and ammunition must be kept in a locked box at all times, other than when being used, to prevent unauthorized use.
  - Storage of the tool, ammunition and studs shall be controlled to the point that only AUTHORIZED, TRAINED* personnel can withdraw them for use.
  - Manufacturer's recommendations shall be followed as to inspection, maintenance, replacement parts, and ammunition.
  - The tools shall not be used where the stud is to be driven into surface-hardened steel, cast iron, glazed brick or tile, marble, granite, live rock, or similar brittle materials.
  - Tools must not be used in any location where explosives, flammable gases, vapors, or dusts are present.
  - Existing and applicable local laws governing the use of explosive tools shall be followed.
  - The tool operator and any nearby workers must wear appropriate eye protection when the tool is being used.

- Hearing protection is required for tool users and other workers in close proximity exposed to noise levels above 85 dBA.

  NOTE: Care must be exercised to ensure that ammunition (studs, nails, etc.) are of the proper specification. The tool operator shall be protected against ricochet.

- High-velocity guns
  - Only the "captive stud" type gun should be used. Guns capable of firing a stud into free flight at high velocity are prohibited.
  - No stud is to be driven closer than 3 inches to the edge of brick, concrete or masonry surfaces because of their tendency to split or crack. Exceptions to this rule may be made where steel safety shields are placed on the sides of the surfaces, as in the case of concrete curbs, to prevent flying spalls.
  - In case of misfire, the tool shall be kept in operating position for one full minute and then placed in vertical position with the muzzle down while the charge is removed.
  - The tools shall never be pointed at anyone. The line of fire, whether up, down or across, must be cleared of personnel.
  - Studs shall never be driven through predrilled or pre-punched holes in fixtures or material without a special guard designed for this type of operation.
- Low-velocity high-inertia guns (stud or fastener velocity not to exceed 300 FPS at 6.5 feet from muzzle)*
  - This type gun employs the principle of a powder-actuated captive piston (high mass) driving a free stud at low velocity. Stud-driving energy is derived from piston inertia. Once free from the piston, stud alone has insufficient inertia to produce free flight, ricochets, penetration, etc. This type gun is recommended from both safety and productivity standpoints. Adherence to all above will afford adequate protection.
  - Manufacturer of the type stud gun to be used should train, qualify and license site employees in use and maintenance of the gun. A current certification card for the powder-actuated tool being used must be in the operator's possession while tool is in use.

*See *"Powder-Actuated Tool Manufacturers Institute, Inc."* code.

<u>Air Pressure Regulatory Device</u>

- General precautions
  - All pneumatic power tools utilizing air hoses exceeding 1/2 inch inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.

<u>Fuel-Powered Equipment</u>

- General precautions

- All fuel-powered equipment, such as generators, compressors, welders, compactors, chainsaws, etc, shall be inspected by a qualified person for defects or damage upon its arrival on site.
- Fuel-powered equipment will be shut off while being fueled, maintained, or adjusted.
- Fire extinguishers must be located on or in the immediate area (within 25 feet) of fuel-powered equipment.
- Fuel-powered equipment shall not be located in enclosed areas/buildings without venting exhaust to the outside.
- Fuel-powered equipment will not be located around fuel storage or combustible material storage.

- Chainsaws
  - Employees operating chainsaws must use protective chaps, hearing protection, safety glasses, and a face shield.
  - Most chainsaws are made of materials that require special fire extinguishers. Check the manufacturer's recommendations and supply the appropriate extinguisher (usually Class D).

4.32 Barricades

Purpose
The purpose is to warn employees of abnormal situations or temporary hazards; to prevent employees from entering into a dangerous area.

Scope
All employees on Greenpac projects must be knowledgeable in the identification of hazards that may require barricades and be familiar with the barricade system.

Expectations
Workers will assess all jobs and determine the appropriate barricade to be used, then erect, tag and maintain the barricade as long as the hazard exists. Barricades will be removed as soon as hazard is eliminated.

Guidelines

- Barricades may include, but are not limited to, the following items: chains, ropes, signs, flashing lights, screens, and barricade tape.
- Erect barricades to protect workers from falling objects, hot or corrosive liquids, radiation, excavations, floor openings, overhead work, equipment, etc.
- After assessing the job, the appropriate barricade must be used.
- The barricade must be erected properly (entire hazard area isolated), and the barricade is to be maintained.
- All barricades must be labeled identifying the person who placed it, the contractor, the date, and the reason for the barricade.
- Red barricade tape indicates “DANGER – DO NOT ENTER.”
- Do not cross a red barricade unless authorized by the individual whose name appears on the tag. Violation of this is grounds for termination.
- Yellow barricade tape indicates “CAUTION.” When special conditions, abnormal situations or temporary hazards exist, employees must be made aware of them by means of the tag identifying “open manhole,” “acid leak,” etc. Workers may proceed through the area with caution.
- At no time will an employee walk away from a hazard without taking action to correct the problem or taking measures to guard it properly. Remove barricades as soon as possible.

4.33 Pneumatic Testing Procedure

Purpose
The purpose is to conduct a safe and efficient pneumatic test in the shop or in the field while assuring maximum protection to personnel and property.

Scope
The scope includes all contractors and employees that are involved in any capacity in pneumatic testing; applies to testing of piping or pressure vessels, either singularly or as a common system.

Expectations
These guidelines are intended to provide advice on precautions that may be necessary during pneumatic testing. The wide range of conditions that may arise may not be covered. Special attention shall always be given to the test system volume, test pressure, type of components, test temperature, and materials of construction. There will be no accidents caused by unexpected release of energy.

Guidelines

- Under no circumstances or conditions shall a pneumatic test be conducted without prior approval of the project safety manager and/or project management.
- Pneumatic pressure testing may be carried out by using dry, oil-free air or dry nitrogen. At pressures most frequently encountered on our projects, the amount of energy contained in air is more than 1000 times the energy contained in water at the same pressure and volume. For this reason, hydraulic pressure testing is by far the safer method and should be used whenever practical. Pneumatic pressure testing is potentially dangerous and should only be carried out in circumstances where the use of this method is unavoidable.
- Where practical, steps should be taken to reduce to a minimum the internal volume of the system to be tested. This has the effect of reducing the energy stored in the system while under pressure, thereby reducing the consequences in the event of component failure. This can often be achieved by breaking a large system down into smaller systems and by placing metal or dense hardwood cores inside the test units. Care should be taken to ensure that openings in the test unit or system are adequately secured and sealed before starting a test.
- All PPE must be available and utilized.
- Approval for pneumatic testing by the Greenpac Construction Safety Manager will be based on a review of the submitted test documents to determine the dangers involved in each test. In most cases, the Greenpac Construction Safety Manager will need to examine the proposed test installation before approving a pneumatic test.
- The Greenpac Construction Safety Manager may stipulate additional safety requirements, which are not covered by this procedure, for a test.

4.34 Emergency Plans

Purpose
To ensure that effective control or protection plans are in place prior to a potential emergency; the potential for serious impact is greatly reduced through this preparedness.

Scope
This requirement applies to all Greenpac projects, all contractors and all subcontractors. Preparedness plans will be in place for all reasonably anticipated occurrences for the site in question.

Expectations
Greenpac project staff is expected to ensure that the site has coordinated emergency plans for all anticipated emergencies.

All contractors/subcontractors on the site will be expected to fully participate in all emergency preparedness activities. “Implementation” means that all Greenpac staff, contractors and subcontractors have read and understand the plans, have written copies at the site for easy access and initiation, and have explained these plans to their crews during toolbox safety talks.

Guidelines
Guidelines are as follows:

- All projects will have written emergency plans in place to cover all anticipated emergencies for that site.
- All project management and contractors must be familiar with any emergency plans at an existing facility.
- All contractors or subcontractors are expected to participate fully in all emergency preparedness activities on the site. This would at least include being knowledgeable in all program facets, keeping a copy of the program readily available so it can be initiated if necessary, and training all employees in the requirements of the plan prior to an emergency through toolbox safety talks.
- Emergency plans should at least include the following topics: Fire; tornado; hurricane; earthquake; bomb threat; strikes; noxious gas releases; terrorist activity; high winds; medical emergencies; crane, excavation or structure collapse; and lightning storms. Projects located in Oregon, Washington and California may want to consider volcanic eruption as well.
- Plans should include designated meeting sites for all crews, a crisis management team, and a search and rescue process. Meeting sites (with an alternative) should include probable wind direction, type of threat and probable warning times.
- Shutdown procedures will be activated whenever a tornado, a hurricane, high winds, or lightning storms are imminent. The plan will incorporate reactive measures for other potentials.
- The earthquake guidelines will be included in the plan (see *Earthquake Preparedness Process* at the end of this document).

- In the case of a bomb threat (see *Bomb Threat by Phone Checklist* at the end of this document), the aforementioned checklist will be used whenever possible about the threat and the caller. Project management and contractors will have the option to review the information and, along with law enforcement assistance, determine if the site should be evacuated. Personnel will be made aware of the exposure and given the option to evacuate. If the threat is deemed credible, the area in question will be evacuated, and a search will be carried out with any found explosive removed ONLY by law enforcement authorities. Security personnel will be trained in handling bomb threat calls and how to respond to potential explosives found on site during regular rounds.
- A specific procedure will be developed and communicated to all personnel for the announcement of such emergencies to site personnel in the future.
- Security personnel will be trained in strike control procedures.
- Site personnel will work with the local plant or mill to develop proper response protocols for a potential noxious gas release.
- Local emergency response authorities should be summoned whenever there is a serious medical emergency, fire, bomb threat, or terrorist activity.
- Project and contractor management will determine shutdown protocols for inclement weather, such as severe snow and ice storms that materialize while crews are working.

4.35 Fire Protection

Purpose
To provide fire protection/fire suppression procedures and equipment that adequately protects the work in progress and the property on site.

Scope
The scope applies to all Greenpac projects.

Expectations
All sites will provide adequate fire protection and fire suppression equipment to prevent any accident or property damage due to fires.

Guidelines

- Greenpac shall provide adequate fire protection/fire suppression procedures and equipment to adequately protect the work in progress and the property on site. This includes trailers, offices, equipment tools, and construction materials furnished by Greenpac Company or by the owner. The project safety manager is responsible to audit compliance and shall be the approving authority with input from the owner for the type of extinguisher to be provided.
- When possible, a project alarm system will be established to provide notification of an emergency to all employees. The alarm system should include lights, horns, sirens, etc., as needed to adequately notify employees.
- To prevent electrical ignition hazards, all electrical wiring and equipment will be installed in accordance with the National Electric Code and the National Fire Protection Association code 70.
- Some projects (production areas) will be nonsmoking, except in designated areas. The construction manager will be responsible for designating smoking areas with emphasis on fire protection and second-hand smoke. Smoking areas will be defined, well-marked and provided with an ash can and fire extinguisher. Smoking areas shall be cleaned on a regular basis.
- A fire extinguisher rated not less than 2A will be provided for each 3000 square feet of building area and storage area. Travel distance from any point of the protected area to the nearest fire extinguisher shall not exceed 100 feet. One or more fire extinguishers rated not less than 2A shall be located on each floor of a multi-storied building. At least one 2A rated extinguisher will be located adjacent to a stairway in a multi-storied building.
- A fire extinguisher rated not less than 10B will be provided between 25 feet and 75 feet of any area in which more than 5 gallons of flammable liquids, combustible liquids or flammable gases are stored.
- All mobile equipment that uses hydrocarbon fuels must be equipped with a BC rated fire extinguisher. (Minimum size: 5 pounds.)
- All site-specific hot work permit requirements must be followed. Failure to follow the Hot Work Permit Procedure should result in disciplinary action, up to and including discharge, with a minimum of a written warning.

Fire Extinguisher (General)

- A fire extinguisher shall be conspicuously located where they will be readily accessible and immediately available in the event of a fire. The location of the extinguisher shall be well-marked, and the extinguisher shall not be obstructed or obscured from view.
- All extinguishers shall be on the hangers or in the brackets provided. Discharged extinguishers must be replaced or refilled.
- The following extinguisher will be used where applicable:
  - Dry Powder: Use on either A, B or C Class fires (more effective on Class B or C)
  - CO_2: Use on A, B or C Class fires (most effective on Class B or C)
  - Water Extinguisher: Use on Class A fires only (not for use on Class B or C)

Classes of Fires

- Class A: Ordinary combustion materials, such as wood, cloth, paper, and rubber.
- Class B: Flammable liquids, gases and greases.
- Class C: Energized electrical equipment where the electrical conductivity of the extinguishing material is of importance.

Procedure for Reporting Fires

- Call site-specific telephone number, give required information, and ask if you should stay on the line. The required information may include your name, the exact location of the fire, your telephone extension, and directions to the location of the fire.
- If help is available, have someone meet the fire truck at a specified point to direct trucks to the fire. Get the proper extinguisher and try to contain the fire until the fire department arrives.

4.36 Explosives

Purpose
The purpose is to prevent injury due to improper use of explosives.

Scope
Any project that must use explosives to complete the work will develop, implement and enforce a program of explosives handling, transportation and storage in order to prevent employee injury or equipment damage resulting from improper practices.

Expectations
Every project and involved contractor will establish an explosives handling, transportation and storage protocol. This will address vendor responsibilities, magazines, inventory, handling procedures, blasting signals and controls, and misfires. Explosives will be handled and stored using Occupational Safety and Health Administration (OSHA); United States Department of Transportation (USDOT); Alcohol, Tobacco, and Firearms (ATF U.S. Treasury Department); and United States (U.S. Treasury Department) Explosives Manufacturers' guidelines and regulations.

Guidelines
Guidelines are as follows:

- Contractor management will ensure that an explosives management program is in place and enforced.
- Wherever possible, only the amount of explosives needed for the day's work will be brought on site by the vendor and kept in a day box. The vendor will remove any unused explosives at the end of the day.
- When explosives must be stored in greater quantities than one day's use or for longer periods of time than a single day, explosives will be stored in approved, secured magazines.
- Explosives will be set and detonated only by licensed blasters.
- Proper warning signals and site clearance procedures will be developed and enforced. Whenever possible, explosives will be detonated before the normal shift, during lunch or at some other time when personnel are not on the main site.
- A procedure will be established and enforced whereby the blast site is inspected for misfires and all such misfires properly addressed prior to sounding the "all clear."
- Inventory will be rotated on a regular basis and will be used on the basis of oldest first.
- Blasting caps and general explosives will be stored and transported separately.
- Where necessary, precautions will be taken to control both the energy and the fly rock generated by the blast.

4.37 Abrasive Blasting

Purpose
To provide guidance for the protection of personnel engaged in shot, sand or other abrasive blasting operations.

Scope
All contractors and employees performing blasting operations that involve air contaminated with high concentrations of rapidly moving abrasive particles.

Expectations
All abrasive blasting operations are conducted with the proper amount of preparation to ensure the safety of all involved

Guidelines

- All abrasive blasting operations must be covered or shielded to prevent airborne contaminants or particles from contacting other employees or equipment. All blasting materials must be contained.

Protective Equipment

- All job site required PPE must be worn along with the following PPE required for blasting operations:
  - An air line respirator of the continuous-flow type in a protective hood to cover the head (protective helmet), neck, shoulders, and chest
  - An air purifier and filter for removal of oil, water, and any other organic matter contaminant that might be discharged from the compressor
  - A pressure regulator with an attached gauge if the pressure in the compressor exceeds 25 psi
  - Hood-view ports made of impact-resistant safety glass or plastic covered by a metal screen
  - Gauntlet-type leather gloves
  - Regular leather shoes or laced boots (safety toes required)
  - Clothing made of strong fiber material to resist flying abrasive material, wear or damage
  - An alarm system that is part of the system, which will automatically signal both the audio and visual alarms should the carbon monoxide (CO) level become dangerous
  - The sand-blasting system shall have an automatic shut-off device under the control of the operator

Inspection and Care of Protective Equipment

- Interior masks should be cleaned daily. If masks are worn by other than one person, the masks will be sterilized. All valves and regulators must be checked before each use. The “petcock” valve at the bottom of the purifier should be opened daily to remove excess water.

- The air supply head will be cleaned and stored, as required for other respirators, on a daily basis.
- The “dead man” switch shall be functional and checked daily. The use of silica containing blast media is discouraged.

4.38 Tunneling

Purpose
The purpose is to prevent injuries resulting from tunneling accidents.

Scope
All projects involving tunneling will adhere to these guidelines.

Expectations
Projects and contractors involved in tunneling operation will use maximum precautions to prevent accidents throughout the life of the tunneling process. Special attention will be devoted to structural controls and potential gas exposures (e.g., hydrogen sulfide, methane).

Guidelines
Guidelines are as follows:

- A written ventilation plan will be developed for the tunneling work to be done. It will consider potential gas exposures, such as hydrogen sulfide and methane. Diesel vapors will also be addressed.
- Constant monitoring will take place for hydrogen sulfide and methane gas. Alarms will be set to 10 percent of the lower explosive limit and will sound to alert all to evacuate.
- Means will be developed to remove excessive water buildup if it should occur.
- Proper lighting will be provided throughout the tunnel.
- If explosives are to be used, procedures outlined under “Explosives” will be followed.
- Excessive dust will be controlled.
- The tunnel constructed to date will be inspected daily at the beginning of the shift to ensure that structural controls are operating properly. Any needed remedies will be applied before further tunneling work continues.
- A means for recording who is in the tunnel at any one time will be developed, implemented and enforced.
- If a vertical shaft is needed for entry, a personnel hoist will be provided, inspected and maintained.

4.39 Demolition

Purpose
To prevent accidents resulting from demolition work associated with a project.

Scope
All projects involving demolition work will develop a demolition plan to include all potential hazards involved in the process.

Expectations
Project management will work closely with involved contractors to develop a site-specific demolition plan. This plan will include employee safety issues, environmental protection, surrounding property protection, and any exposures to non-project personnel and property.

Guidelines
Guidelines are as follows:

- All electrical power and utilities must be shut off unless necessary to decommission the building. If some must remain on, they must be clearly marked with all personnel being made aware of their presence.
- Purge existing lines and tanks to avoid personnel contamination.
- Identify any environmental hazards and remove them with specialty contractors licensed and trained to perform such work.
- Provide all potentially exposed personnel the necessary PPE to include at least gloves, eye protection and respirators (if needed).
- Contractors must understand the building system so that the building can be dismantled without providing added exposure to personnel.
- Track hoes and other heavy equipment will be used where feasible to minimize employee exposure.
- Appropriate dust control methods will be implemented as long as demolition work continues.

4.40 Diving

Purpose
The purpose is to prevent injuries resulting from diving accidents.

Scope
All projects involving diving activities will develop a diving safety plan.

Expectations
Project management will ensure that the involved contractor will conduct a crew briefing prior to each dive, that the proper diving and work equipment is on site, that certified divers are used, that breathing systems are properly arranged and maintained, and that the proper retrieval and first-aid equipment is provided.

Guidelines
Guidelines are as follows:

- Specialty diving contractors will be used for such assignments.
- The contractor will hold a crew briefing before each dive to ensure all involved know what their roles are and exactly what the routine will be.
- Only certified divers will be used.
- Diving equipment will be in excellent condition and properly inspected and maintained before each dive.
- Breathing systems must be properly arranged and tested prior to each dive.
- Proper retrieval and first-aid equipment will be on site and ready to be activated, if needed.

4.41 Over-Water Work

Purpose
The purpose is to prevent drowning incidents as the result of accidents over water.

Scope
All projects involving over-water work will develop protocols for safe activities.

Expectations
Over-water work will be preplanned to ensure that the proper PPE, floating work surfaces and material controls are in place prior to starting work. All personnel will be trained in the use of PPE and personnel recovery methods.

Guidelines
Guidelines are as follows:

- Contractors are expected to plan over-water operations carefully to ensure optimum employee safety and environmental protection.
- Floating work platforms will be serviceable and equipped with approved fire extinguishers.
- All personnel working on or over water will wear a life preserver designed to provide head support if the wearer were to fall into the water.
- Lifelines and harnesses will be provided and used if work is to take place at elevation or on water where a current or undertow is involved.
- All personnel will be trained in personnel recovery methods should an employee fall into the water.
- If powered vessels are to be used, they will meet U.S. Coast Guard certification requirements. “Man overboard drills” will be run to ensure crews know how to address such a situation.

4.42 Helicopter Use

Purpose
To prevent accidents involving helicopters used for a project.

Scope
This protocol applies to all projects using helicopters.

Expectations
Only licensed helicopter pilots and contractors will be used. An extensive maintenance program will be provided for all helicopters. A proper landing site will be developed, and personnel will be trained in the precautions associated with helicopter usage and in proper helicopter loading.

Guidelines
Guidelines are as follows:

- Only licensed helicopter pilots will be used. All aircraft will meet all FAA regulations.
- An approved landing site will be built before helicopter traffic begins.
- Ground crew training will be conducted to address such issues as working around a helicopter, housekeeping near the heli-pad, fuel and fire protection, ground crew assistance to the pilot, and proper loading techniques.
- The helicopter pilot will always have the final decision-making power with respect to load size and configuration, and weather conditions.
- For consistent traffic beyond medical flights, radio contact between helicopter and ground crew will be developed.

4.43 Office Safety

Purpose
The office safety rules are designed to ensure a safe and healthy work environment for all employees.

Scope
These rules apply to Greenpac and contractor offices.

Expectations
It is expected that all residents of this facility will obey these rules and that managers will enforce them. This applies to:

- Full-time/part-time/temporary Greenpac employees
- Outside temporary employees
- Contractors
- Visitors

Guidelines

- Unsafe behaviors that may lead to personal injury or injury to others (including horseplay and running in the building) will not be tolerated.
- All warning signs and barriers, including traffic signs, pavement markings and posted speed limits, will be obeyed.
- All emergencies (including fires, chemical spills and medical) will be reported immediately.
- Office and work station layout should be established by following the guidelines for efficiency, convenience and safety as listed below:
- Office machines:
  - Machines should not be placed near the edge of tables or desks.
  - Machines that creep or vibrate during operation should be secured in a manner to prevent movement.
- Heavy equipment/files:
  - Equipment or files should be placed against walls or columns.
  - File cabinets should be bolted together or fastened to the floor or wall.
- All floor finishes and/or carpets should be selected for anti-slip qualities. Well-maintained floors/carpets will provide protection against slips and falls. Defective tile or carpet should be repaired immediately.
- A minimum width of 36 inches should be established for aisles. Obstructions, such as waste baskets, telephone and electrical outlets, low tables, and office equipment, must be kept where they do not present tripping hazards. Stairways should be protected with anti-slip material. Doors should not open into the path of employee travel.

- Electrically operated machines and extension cords require that outlets and extension cords be arranged to avoid tripping hazards. If extension cords are required, they must be secured and covered to eliminate tripping hazards.
- Materials should be stored so that normal office traffic does not have to be crossed when gaining access to these materials. Materials should be stored neatly so that they will not fall or cause a tripping hazard.
- Adequate lighting and ventilation must be provided in accordance with applicable standards.
- Ladders and stools used for reaching high storage should have either non-skid safety feet attached or be equipped with brakes that automatically lock when weight is applied.
- Good housekeeping is essential in preventing fires. Portable fire extinguishers must be conspicuously located and kept in fully operable condition. A fire emergency procedure and a basic emergency plan must be developed for each office complex. Emergency phone numbers for fire, police or medical emergencies must be posted on each telephone.

4.44 Travel Safety

Purpose

To establish general safety guidelines for Greenpac staff members traveling in the course of their work.

Scope

This section applies to all Greenpac staff members who travel. Guidelines address travel concerns encountered in planes, rental cars, hotels, and other offices.

Expectations

It is expected that all traveling staff members will adhere to the described emergency guidelines (see the "Supporting Safety Process and Procedures" section) for hotels, transportation, mills and other offices, and the safety precautions for rental cars.

Guidelines

Guidelines are as follows:

- Leave plenty of time to reach the airport or train station safely.
- When boarding the plane or train, be sure to locate the two nearest exits and determine how to get to them.
- When renting a car, make sure critical items are operational prior to leaving the rental company's lot. Adjust mirrors, seats and steering wheel before leaving.
- Be sure all rental car occupants are belted in prior to moving the vehicle.
- Use cell phones only when your vehicle is parked and you can devote full attention to the call.
- Use the following guidelines if involved in a road rage incident:
  - Do not establish or maintain eye contact with the other driver.
  - Do not attempt to engage the other driver or retaliate in any way.
  - Do not honk you horn or flash your lights.
  - As soon as possible, leave the highway and proceed to a police station or area where people are present. Notify police immediately.
  - If it is not possible to leave the highway or street, stop your vehicle, lock all doors and contact law enforcement via cell phone.
- The following guidelines apply when staying in a hotel or motel:
  - Determine two means of exit from your room area. Do not use elevators during fire emergencies. Do this as soon as you settle into your room the first time.
  - Determine the telephone numbers for contacting the front desk and to reach an outside emergency operator (usually 0 and 9-911, respectively). The numbers can vary with hotel, so it is good to determine this while all is calm.
  - Locate the nearest fire extinguisher to your room.
  - When retiring for the night, place keys, valuables and some exterior clothing that can be slipped on quickly in an easily accessible spot in case an alarm is sounded during the night.

- If an alarm should sound, quickly pull on the exterior clothing, pick up the keys and check the door for temperature.
- If it is not warm and there is no smoke coming under the door, carefully open the door a crack to check conditions in the hall. If the hall is not engulfed in smoke or flames, proceed toward a predetermined exit.
- If the door is hot and/or smoke is coming from under it, do not open the door or enter the hall. Notify the front desk and hang a towel or sheet in the window to signal rescue personnel. Place damp towels at the base of the door to prevent smoke from entering the room.
- Each time you enter your room (especially when retiring for the night), secure the deadbolt on the door and push the button in the center of the doorknob or apply the restraining chain. Do not admit anyone without viewing them through the door “peephole” and requesting verbal identification while the door is still locked.

- Greenpac staff must familiarize themselves with building exits, smoking policies and general building conditions while visiting office of contractors, architects and other involved in Greenpac projects.

4.45 Site Security

Purpose
To ensure that access to the site is properly controlled; this will further control safety, theft, equipment and structure damage, and plant or mill access.

Scope
This requirement applies to all projects and personnel/companies operating on them.

Expectations
Project management will establish a security force for the entire project. This force will control all entries and exits and will be versed in the emergency plan, safety requirements for visitors, etc. Greenpac project staff will confirm that such a force is installed at the outset of the project and that proper security is maintained.

These activities will be coordinated with the plant or mill to ensure continuity in providers and security effectiveness.

Guidelines
Guidelines are as follows:

- The site will be properly secured through installation of a sturdy, 6-foot high fence and the enlistment of a security force.
- Security force must be trained and knowledgeable in the field of site security.
- The security force will be capable of providing security controls at all entrances and exits to the site. They will also assist with visitor safety requirements, emergency plan implementation and employee/visitor badge assignment.
- Security forces will be unarmed.
- Security will be provided on a 24-7 basis and will be under the direction of the project manager and/or project safety manager.

4.46 Enforcement and Recognition

Purpose
The purpose is to establish consequences for noncompliance with project safety rules and to acknowledge safe work performance.

Scope
This enforcement and recognition policy applies to all contractor and subcontractor personnel on all projects.

Expectations
Greenpac project staff will enforce the safety program throughout the life of the project. When other means fail to result in compliance with the project safety program, enforcement standards and disciplinary action will be invoked. All individuals and/or contractors will be recognized and rewarded for safe job performance.

Guidelines
Guidelines are as follows:

- All contractors will enforce the safety program and establish appropriate disciplinary procedures for failure to comply.
- Contractors and safety professionals should always be fair, impartial and consistent with enforcement and discipline.
- Greenpac management may deny access to the work site to any individual that fails to comply with established safety rules.
- All employees will be advised during “new hire” orientation of the disciplinary action available (verbal reprimand, written reprimand, suspension, or termination).
- All disciplinary action must be reported to the project safety director and to project management.
- Project and contractor management shall implement procedures to acknowledge safe work performance and recognize and reward those involved.
- The “site performance safety recognition program” should be implemented in such a way as to provide incentive for safe performance to all employees on the project.

4.47 Incident Investigation Process

Purpose
The purpose is to establish a reporting, investigation and follow-up system for all incidents, accidents and near-misses on every Greenpac project.

Scope
All accidents, incidents and near-misses will be reported, investigated and followed-up, as necessary, on every project.

Expectations
All project management teams and their contractors will work together to develop a consistent system of reporting, investigation and follow-up for every incident, accident and near miss. Every accident reportable under the laws of the respective state or province will be reported on the chosen form of that governmental entity. OSHA recordable accidents will be recorded on the OSHA log. All incidents, near-misses and accidents will be investigated with a sincere effort made to determine causes and appropriate control measures. As appropriate, each situation will be followed up through return-to-work programs, employee training or other corrective action to assist in preventing such an occurrence in the future. All investigations and corrective action will be documented.

Guidelines
The following incident investigation guidelines will be followed:

- ALL incidents involving employee injury, property damage or any form of near-miss incident will be reported and investigated. Greenpac project director will be notified on any recordable or lost-time injury IMMEDIATELY.
- All reportable accidents will be documented on the appropriate state or province form and on the OSHA log.
- All incident investigations will be documented using the Greenpac Safety Incident Investigation Report.
- In every case, a genuine effort will be made to identify the causes of the incident and to prevent the incident from occurring again. Such corrective action will be tracked to ensure that it takes place.

Purpose
To provide a program that allows employees injured on the job to return to light duty work as soon as medically possible.

Scope
All contractors involved in work on Greenpac projects.

Expectations
All contractors will manage work-related injury cases so as to minimize lost-time days by providing light duty work to employees that have been released by a licensed health care professional to perform light or restricted duty.

Guidelines

- All contractors will participate in the light duty/return-to-work program
- Contractors must provide light duty work that meets the requirements and conditions imposed by a licensed health care provider.
- The light duty program applies only to employees that have sustained work-related injuries.
- Employees are required to return to work and only perform work that meets the conditions imposed by the licensed health care provider.

Safety Start-up Checklist for New or Modified Equipment

Date: _____

Start-up Inspection Team Members:

_____ _____

_____ _____

_____ _____

_____ _____

Check each item as completed. Complete the checklist prior to production start-up.

☐ 1. All drives, sprockets, pulleys, and gears are guarded with either permanent or temporary guards.

☐ 2. Shielding has been provided to protect against flying or falling materials.

☐ 3. Adequate, safe access is provided for routine maintenance work on all motors, bearings, drives, photocells, and areas that require regular cleaning.

☐ 4. Structures are able to support 300 pounds body weight.

☐ 5. All overhead obstacles are guarded, padded or appropriate marked.

☐ 6. The area has been inspected for sharp objects and could cut or bruise if bumped.

☐ 7. Equipment and personnel are guarded from main rolling stock aisles and roadways with permanent or temporary barriers.

☐ 8. Traffic areas are free of obstacles.

☐ 9. All in-running nips are guarded, barricaded and/or labeled.

☐ 10. All automatic machinery is guarded, barricaded and/or labeled.

☐ 11. All hoists, cranes and lifting devices have been properly testing and labeled for capacity.

☐ 12. All piping has been properly insulated, barricaded and/or labeled.

☐ 13. All lockout energy controls, disconnects and blocking/pinning devices are installed, tested and labeled. This includes all [] electrical, [] hydraulic, [] pneumatic, and [] mechanical energy sources. These devices are located for maximum ease and will accept padlocks to facilitate lockout compliance.

NOTES:
Consider procedure for "Operator to Lockout" during production.
Consider procedure for "Maintenance to Lockout" during maintenance.
Are all needed disconnects provided for lockout? Regardless of what the installing contractor says, key switches do not comply with lockout regulations.

☐ 14. Adequate lighting is in place and properly guarded.

☐ 15. All machinery is properly grounded and has been verified by an electrician.

☐ 16. All equipment has been visually inspected for damage and leaks and is in safe operating condition.

☐ 17. Approved and standard means of access is provided by means of stairs, ladders or ramps for elevation changes of 19 inches are greater.

☐ 18. All elevated platforms, stairs and ladders 4 feet or more above grade level or next to hazardous operations have toe boards and handrails. Fixed ladders more than 20 feet tall have cages.

☐ 19. Necessary warning and hazard signs are in place.

☐ 20. Lockout and energy control ZEP procedures have been written or revised.

☐ 21. JSAs have been written and/or revised or temporary provisions are in place.

☐ 22. All affected employees are trained in applicable energy control procedures (e.g., lockout) and safe work practices (e.g., JSA). All training documentation has been turned in.

☐ 23. A "Personal Protective Equipment Assessment" has been conducted and all required PPE gear has been identified (e.g., eye and face protection, proper footwear, hearing protection, head protection, respiratory protection, hand and arm protection, etc.).

☐ 24. Ergonomic issues are addressed to minimize possible sprains, strains and repetitive motion injuries.

☐ 25. Fire protection systems, such as sprinkler systems, extinguishers and/or alarms, are in place and unobstructed — and all systems are energized.

☐ 26. Operator considerations have been taken into account for safety, ergonomics and efficiency, such as closed-circuit TV monitoring, mirrors, visual contact, hand placement, and head, arm, leg, and foot movement.

☐ 27. Material safety data sheets (MSDSs) are available for all chemicals used or to be used with the new equipment.

☐ 28. Adequate eyewashes or other emergency or safety equipment are in place, unobstructed and operational.

All hazards identified by the start-up inspection team shall be listed and attached to the checklist report, and all recognized hazards shall be addressed prior to start-up.

Project Team Leader Signature: **Date:**

Comments:

Process
Please see the following table for stages in this process.

- Prior to the earthquake

Stage	Description	Who
1	Secure filing cabinets, bookshelves, hot water heaters, and other free-standing equipment.	
2	Ensure shelves have a vertical border on the front edge to prevent materials from falling off.	
3	Store enough food and equipment to sustain all employees for 72 hours. This list should include at least the following (or an equivalent version): • Canned meats, vegetables and fruits that can be eaten without heating • Energy bars, bottled/canned fruit juices and crackers/cookies • Bottled water, coffee, tea • Manual can opener, small pan to boil water and cooking/eating utensils • Portable radio and flashlights with batteries • Blankets • Personal hygiene items (toilet paper, toothpaste, etc.) • Small Sterno stove (or equivalent) and fuel • First-aid kit and fire extinguishers • Small camera and film/batteries (or disk for digital camera) to facilitate documentation of any damage that may occur • Encourage all on prescription medication to keep a current supply of their medicines on site	
4	Provide brief instructions about what to do during and immediately after an earthquake (see next two sections) in a regular crew or department safety meeting.	
5	Hold a practice drill five minutes before lunch to give personnel a feel for the process. Holding it just before lunch causes minimal production interruption.	
6	Select a company location outside your immediate operating area to use as a telephone contact point. It is often easier to contact an out-of-state number than a local one. This second facility can be used as a contact point for corporate and others. As an example, Tukwila operations might select one of the Montana or Alaska locations as their point of contact.	

- During an earthquake

Stage	Description	Who
1	DO NOT PANIC. Most earthquakes are not severe.	
2	If you are indoors, remain indoors. Do not go outside unless fire or building damage forces you to do so.	
3	Take cover under a table, desk, workbench, or other object that will offer protection from flying glass and falling objects. Stay away from windows, outside doors, bookshelves, mobile tool chests, etc. If substantial cover is not available, cover your head with a coat, blanket or newspapers to shield against flying glass or debris.	
4	DO NOT USE OPEN FLAMES of any kind and extinguish all smoking materials. Disconnect electrical equipment if there is no danger in doing so. Shut off operating equipment if this can be done safely.	
5	If you are outdoors, stay outdoors and move away from structures that could fall, including buildings and overhead power lines. Because of the danger of falling debris is greatest near doorways and outer walls, do not attempt to enter a building immediately after a quake.	
6	Give fallen electrical lines a wide berth. DO NOT CONTACT such lines and always assume that they are energized and very dangerous.	
7	If you are driving when an earthquake occurs, stop as quickly as safety permits in the best available space away from buildings, overhead power lines, trees, or cliffs where material may fall on your vehicle. Don't park on a bridge or overpass because they are more likely to fail. STAY in the vehicle; it is usually a safe haven from debris and will insulate you from any fallen power lines.	

- After the earthquake

Stage	Description	Who
1	Remain calm and expect potential aftershocks.	
2	Perform a headcount; perform a search for any that are missing.	
3	Provide first-aid for any that are injured. Summon paramedics (9-1-1) or the appropriate emergency response number only for those who are severely injured and need additional assistance. Emergency agencies are going to be busy, so they should be called only when necessary. Be sure those on medication are taking their medicine as necessary.	
4	Use caution if you must enter a building. Stay away from severely damaged structures.	

5	Check for damaged utilities, especially gas leaks and downed power lines. Shut off gas and water sources, if possible. Extinguish any fires if you can do so safely. Summon the fire department for those that you cannot control.	
6	Use telephones sparingly. Telephone systems (landlines and cellular telephones) will be burdened with traffic.	
7	Begin to survey the damage WITHOUT exposing personnel to unsafe conditions. Make personnel as comfortable as possible if they must stay at a damaged facility and are unable to carry on operations as usual.	
8	Take photos of any damage before beginning cleanup and repair operations.	
9	When safe to do so and after the damage has been documented, begin salvage operations. IF there is structural damage, the building must be inspected by a licensed structural engineer prior to re-entry.	
10	Report the damage to the corporate office when conditions allow.	

Bomb Threat by Phone Checklist

Remain clam. Do not antagonize the caller.

Time Call Received	Time Ended
Exact Words of Caller (ask caller to repeat)	
Time Bomb is Set to Explode	Where Located Building: Floor/Area:
What Kind of Bomb?	
Description of Bomb	
Reason for Bombing (remind caller that innocent people could be killed or injured)	
Demands (if any)	

Information about Caller

Sex	Age	Speech (accent, impediment)
Any Mannerisms (calm, nervous, frightened, threatening)		
Recognize Voice?		
Background Noise (type)		
What Line Did Call Come In On?		
Additional Information		
Notify		

Greenpac

This document must be signed and returned to the Safety or Purchasing Department before any work commences.

I HAVE RECEIVED AND READ A COPY OF THE GREENPAC CONSTRUCTION SAFETY POLICIES AND PROCEDURES. I UNDERSTAND AND AGREE TO COMPLY WITH THESE POLICIES AND ALL FEDERAL, STATE AND LOCAL GOVERNMENT SAFETY REGULATIONS.

_____

COMPANY NAME

_____

AUTHORIZED SIGNATURE

_____

DATE

Attachment B
Job Hazard Analyses

North America Job Hazard Analysis
ERM Actions During Subsurface Clearance and Drilling

Project Name:	Former No.2 Mill facility
Project Number:	0128439
Job / Task Name:	Excavation of soil
JHA No.: 6	

Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.

Instructions:	**This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork. site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA should be reviewed regularly with site personnel who will be performing this task.**

Task Description:

General guidelines for working safely when performing any ground penetrating activities (excluding surface soil sampling) and ERM personnel activities during overseeing drilling.

Hazard Analysis:

Task Step	Hazard	Control Measures
Identify a Client Contact Person	Client contacts that are not familiar with the site layout could cause critical information to be missed during safety planning.	Determine degree of knowledge of our client contact by evaluating their current job duties at the site, length of time they have worked at the site, and time in their current job. If the ERM team does not feel comfortable with the level of experience of our client contact, take additional measures to ensure all pertinent subsurface utilities and services information is gathered.
Engage Subcontractors	Subcontractors who have not been evaluated against ERM minimum safety standards or who do not meet minimum safety standards may pose more risk.	Use only ERM subcontractors who are identified as having met our minimum safety standards. In cases where using an already-qualified subcontractor is not possible, ensure extra precautions are taken to provide safety oversight to the work.
Appoint an ERM Subsurface Clearance "Experienced Person" to the project	ERM employees who are not experienced with SSC issues may not recognize critical zones or clues to other site utilities/services.	Ensure a "SSC Experienced Person" is assigned to the project to provide oversight of ground penetrations and to mentor less experienced ERM employees.

North America Job Hazard Analysis
ERM Actions During Subsurface Clearance and Drilling

Project Name:	Former No.2 Mill facility
Project Number:	0128439
Job / Task Name:	Excavation of soil
JHA No.: 6	

Task Step	Hazard	Control Measures
Gather site-specific subsurface information	Incomplete or inaccurate site utility/service drawings may lead the ERM project team to incorrect conclusions regarding what utilities/services are onsite.	Obtain the most recent "as-built" drawings and additional site information such as easements, rights-of-way, historical plot plans, etc. to assist making decisions about other actions that will be required at the site.
Develop the HASP	Using incorrect documents in safety planning may lead to not considering all pertinent information.	A Level 2 WARN HASP for Intrusive Work (minimum) must be used when performing any ground penetrations, with the exception of surface soil sampling. The Level 2 HASP contains a "Site Services Model" that ERM uses to evaluate SSC hazards.
Develop the Site Services Model	Critical zones and a whole-site view of utilities and services at the site are more difficult to do if not put into the Site Services Model.	Use the Site Services Model to identify gaps in knowledge from all drawings and other verbal information from our client contact. Identify locations of key isolation and shutoffs closest to the work area for each type of utility/service.
Make Preliminary Determinations	Not recognizing or identifying critical zones poses great hazard to ERM employees in the field from contact with electricity or other utilities.	Establish critical zones and excavation buffers (if needed) for the work. Initial critical zone determinations may change in the field but are a good starting point in hazard identification.
Identify Preliminary Ground Disturbance Locations	Planning ground disturbance locations inside critical zones poses great hazard to ERM employees in the field from contact with electricity or other utilities.	Ensure critical zones have been identified using the Site Services Model and then identify locations outside those critical zones up-front, if possible. If a ground disturbance inside a critical zone is absolutely necessary, notify the site PIC and obtain guidance from him/her before proceeding.
Public and/or Private Utility Markout	Not having utilities marked may lead to a subsurface clearance strike.	Contact public and private utility markout services giving them enough time to respond. A minimum of 24-hour notification to utility locators is required in most states, and may vary higher in some states.
Conduct the Site Walk	Inexperienced people conducting the site walk may miss pertinent information regarding utilities and/or services.	The "SSC Experienced Person" must lead the site walk and should be accompanied by our client contact. Each ground disturbance location should be approved by our client contact (written approval preferred, verbal approval acceptable).

North America Job Hazard Analysis
ERM Actions During Subsurface Clearance and Drilling

Project Name:	Former No.2 Mill facility
Project Number:	0128439
Job / Task Name:	Excavation of soil
JHA No.: 6	

Task Step	Hazard	Control Measures
Inspect Each Ground Disturbance Location	Inexperienced people conducting inspection may miss pertinent information regarding utilities and/or services.	The "SSC Experienced Person" must lead inspection of each Ground Disturbance Location. Any visual clues of subsurface obstruction/utilities should be documented. Critical zones may have to be reassessed at this point. Use the SSC Checklist to document this inspection for each point inside a critical zone, at a minimum.
Finalize Critical Zone Determinations	Not performing this verification step in the field may lead to a SSC strike.	Use information gathered during pre-planning, utility markout, and site walk/inspection to verify critical zones that have been previously established. Revise critical zones as necessary. Use the SSC Checklist to document points inside critical zones. If points are confirmed inside critical zones, either step out and relocate the ground disturbance location, or contact the PIC for additional guidance.
Oversee setup of drilling equipment	Overhead electrical/other lines may come in contact with drill rigs. Materials stored in the vicinity of drill rigs may pose various hazards to employees.	Ensure drill rigs are set up in areas where they will not contact overhead lines when being positioned. The minimum distance for drill rig clearance is 25 feet unless special permission is granted by the utility company. When a drill rig must be maneuvered in tight quarters, the presence of a second person is required to ensure adequate clearance. If backing-up is required, two ground guides will be used: one in the direction the rig is moving and the other in the operator's normal field of vision. Move tools, materials, cords, hoses, and debris to prevent trip hazards and contact with moving drill rig parts. Secure tools and equipment subject to displacement or falling. Store any flammable materials away from ignition sources and in approved containers.

North America Job Hazard Analysis
ERM Actions During Subsurface Clearance and Drilling

Project Name:	Former No.2 Mill facility
Project Number:	0128439
Job / Task Name:	Excavation of soil
JHA No.: 6	

Task Step	Hazard	Control Measures
Physically Clear all Ground Disturbance Locations	Employees performing physical clearance could contact underground utility/service lines.	Use cable avoidance tools at each location that must be physically cleared (OSHA requirement). If using a hand-auger, ensure insulated handles are in-place before their use.
	Drill rig could damage electrical/utility/service lines if not physically cleared first.	Mechanical ground penetration should not commence until a ground disturbance location is physically cleared. In certain situations drilling may occur without physical clearance – consult with the project PIC prior to making this determination.
Commence Drilling Operations	Rotating equipment could pull employees into equipment.	Do not wear loose or frayed clothing, loose long hair, or loose jewelry while working around rotating equipment. Tuck shirt-tails into pants. Never walk directly behind or beside drill rigs without the drill rig operator's knowledge. Keep all non-essential personnel out of the drill rig work area.
	Poorly functioning drill-rig equipment could expose employees to hazardous conditions.	Ensure drill rigs and other machinery used is inspected daily by competent, qualified individuals. Instruct drill rig operators to report any abnormalities such as equipment failure, oozing liquids or unusual odors so they can be dealt with before proceeding with work. Do not eat, drink, or smoke near the drill rig.
	Noisy environments may make it difficult to communicate by vocal means.	Wear hearing protection at all times when in the vicinity of the drill rig, or when you must raise your voice to be heard by co-workers. Maintain visual contact with the drill rig operator at all times and establish hand-signal communications for use when verbal communication is difficult.

North America Job Hazard Analysis
ERM Actions During Subsurface Clearance and Drilling

Project Name:	Former No.2 Mill facility
Project Number:	0128439
Job / Task Name:	Excavation of soil
JHA No.: 6	

Task Step	Hazard	Control Measures
Complete Drilling Operations	Equipment allowed to remain running poses pinch-point and potential explosion hazards to employees.	Shut down drill rigs before repairing or lubricating parts (except those that must be in motion for lubrication). Shut down mechanical equipment prior to and during fueling operations. When refueling or transferring fuel, containers and equipment must be bonded to prevent the buildup of static electricity.

Personal Protective Equipment Required for this Task:

Type	Description
Insulated hand-augers	Hand-augers fitted with rubber handles, or other non-conductive material.

Training Required for this Task:

Type	Description
SSC Classroom Training	Initial classroom training detailing the ERM subsurface clearance process, tools, and forms.
SSC Experienced Person	At least one must be present on all sites involving SSC. The Experienced Person will both give SSC expertise in project execution and mentor less experienced employees.

Forms Associated with this Task:

Type	Description
SSC Checklist	Checklist detailing the ERM SSC process, and providing tools to ensure critical zones and excavation buffers are properly identified and validated in the field.
SSC Mentorship Card	The SSC Mentorship Card provides Experienced Persons with topics to be covered with less experienced employees on SSC sites, and also documents mentoring of the less experienced employees.
Daily Drill Rig Inspection Form	Form required to be used by ERM subcontractors to document daily inspection of drill rigs. This form should be provided by the drill rig operating company. Completed forms should be kept with the

North America Job Hazard Analysis
ERM Actions During Subsurface Clearance and Drilling

Project Name:	Former No.2 Mill facility
Project Number:	0128439
Job / Task Name:	Excavation of soil
JHA No.: 6	

	HASP and filed in project files.

Site-Specific Job Hazard Analysis Completed by:

Name	Date

North America Job Hazard Analysis
ERM Actions During Subsurface Clearance and Excavations

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 7	

Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.

Instructions:	**This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork. site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA should be reviewed regularly with site personnel who will be performing this task.**

Task Description:

General guidelines for working safely when performing any ground penetrating activities (excluding surface soil sampling) and ERM personnel activities during overseeing excavations.

Hazard Analysis:

Task Step	Hazard	Control Measures
Identify a Client Contact Person	Client contacts that are not familiar with the site layout could cause critical information to be missed during safety planning.	Determine degree of knowledge of our client contact by evaluating their current job duties at the site, length of time they have worked at the site, and time in their current job. If the ERM team does not feel comfortable with the level of experience of our client contact, take additional measures to ensure all pertinent subsurface utilities and services information is gathered.
Engage Subcontractors	Subcontractors who have not been evaluated against ERM minimum safety standards or who do not meet minimum safety standards may pose more risk.	Use only ERM subcontractors who are identified as having met our minimum safety standards. In cases where using an already-qualified subcontractor is not possible, ensure extra precautions are taken to provide safety oversight to the work.
Appoint an ERM Subsurface Clearance "Experienced Person" to the project	ERM employees who are not experienced with SSC issues may not recognize critical zones or clues to other site utilities/services.	Ensure a "SSC Experienced Person" is assigned to the project to provide oversight of ground penetrations and to mentor less experienced ERM employees.

North America Job Hazard Analysis
ERM Actions During Subsurface Clearance and Excavations

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 7	

Task Step	Hazard	Control Measures
Gather site-specific subsurface information	Incomplete or inaccurate site utility/service drawings may lead the ERM project team to incorrect conclusions regarding what utilities/services are onsite.	Obtain the most recent "as-built" drawings and additional site information such as easements, rights-of-way, historical plot plans, etc. to assist making decisions about other actions that will be required at the site.
Develop the HASP	Using incorrect documents in safety planning may lead to not considering all pertinent information.	A Level 2 WARN HASP for Intrusive Work (minimum) must be used when performing any ground penetrations, with the exception of surface soil sampling. The Level 2 HASP contains a "Site Services Model" that ERM uses to evaluate SSC hazards.
Develop the Site Services Model	Critical zones and a whole-site view of utilities and services at the site are more difficult to do if not put into the Site Services Model.	Use the Site Services Model to identify gaps in knowledge from all drawings and other verbal information from our client contact. Identify locations of key isolation and shutoffs closest to the work area for each type of utility/service.
Make Preliminary Determinations	Not recognizing or identifying critical zones poses great hazard to ERM employees in the field from contact with electricity or other utilities.	Establish critical zones and excavation buffers for the work. Initial critical zone determinations may change in the field but are a good starting point in hazard identification.
Identify Preliminary Ground Disturbance Locations	Planning ground disturbance locations inside critical zones poses great hazard to ERM employees in the field from contact with electricity or other utilities.	Ensure excavation buffers have been identified using the Site Services Model and then identify locations outside those critical zones up-front, if possible. If a ground disturbance inside a critical zone is absolutely necessary, notify the site PIC and obtain guidance from him/her before proceeding.
Public and/or Private Utility Markout	Not having utilities marked may lead to a subsurface clearance strike.	Contact public and private utility markout services giving them enough time to respond. A minimum of 24-hour notification to utility locators is required in most states, and may vary higher in some states.
Conduct the Site Walk	Inexperienced people conducting the site walk may miss pertinent information regarding utilities and/or services.	The "SSC Experienced Person" must lead the site walk and should be accompanied by our client contact. Each ground disturbance location should be approved by our client contact (written approval preferred, verbal approval acceptable).

North America Job Hazard Analysis
ERM Actions During Subsurface Clearance and Excavations

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 7	

Task Step	Hazard	Control Measures
Inspect Each Ground Disturbance Location	Inexperienced people conducting inspection may miss pertinent information regarding utilities and/or services.	The "SSC Experienced Person" must lead inspection of each Ground Disturbance Location. Any visual clues of subsurface obstruction/utilities should be documented. Critical zones may have to be reassessed at this point. Use the SSC Checklist to document this inspection for each point inside a critical zone, at a minimum.
Finalize Critical Zone Determinations	Not performing this verification step in the field may lead to a SSC strike.	Use information gathered during pre-planning, utility markout, and site walk/inspection to verify critical zones that have been previously established. Revise critical zones as necessary. Use the SSC Checklist to document points inside critical zones. If points are confirmed inside critical zones, either step out and relocate the ground disturbance location, or contact the PIC for additional guidance.
Establish Excavation Buffers	Mechanical digging near subsurface structures not already designated for removal can expose employees to electrical or other serious hazards.	For at least 2 feet in all directions from an identified subsurface structure, use non-conductive tools and physically remove soil.
Notify Equipment Operators where Excavation Buffers are Located	Mechanical digging near subsurface structures not already designated for removal can expose employees to electrical or other serious hazards.	If physically clearing is performed, use cable avoidance tools at each location that must be physically cleared (OSHA requirement). If using a hand-auger, ensure insulated handles are in-place before their use. DO NOT DIG INSIDE AN EXCAVATION BUFFER WITH MECHANICAL EQUIPMENT.

Personal Protective Equipment Required for this Task:

Type	Description
Insulated hand-augers	Hand-augers fitted with rubber handles, or other non-conductive material.

North America Job Hazard Analysis
ERM Actions During Subsurface Clearance and Excavations

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 7	

Training Required for this Task:

Type	Description
SSC Classroom Training	Initial classroom training detailing the ERM subsurface clearance process, tools, and forms.
SSC Experienced Person	At least one must be present on all sites involving SSC. The Experienced Person will both give SSC expertise in project execution and mentor less experienced employees.

Forms Associated with this Task:

Type	Description
SSC Checklist	Checklist detailing the ERM SSC process, and providing tools to ensure critical zones and excavation buffers are properly identified and validated in the field.
SSC Mentorship Card	The SSC Mentorship Card provides Experienced Persons with topics to be covered with less experienced employees on SSC sites, and also documents mentoring of the less experienced employees.
Daily Excavation Inspection Form	Form required to be used by ERM subcontractors to document daily inspection of excavations. Completed forms should be kept with the HASP and filed in project files.

Site-Specific Job Hazard Analysis Completed by:

Name	Date

North America Job Hazard Analysis
Work in High Noise Environments

Project Name:	Former No. Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 8	

Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.

Instructions:	**This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork. site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA should be reviewed regularly with site personnel who will be performing this task.**

Task Description:

Guidelines for safe work in any environment with elevated noise levels.

Hazard Analysis:

Task Step	Hazard	Control Measures
Prepare for Work	Not having hearing protection or noise monitoring equipment could expose employees to unknown levels of elevated noise.	For work environments known or suspected to present elevated noise hazards, ensure hearing protection is procured and available at the jobsite. For any employee working on the site who has not attended hearing conservation training within the past year, review this JHA with them and document their training. Determine whether noise monitoring has been done on other projects with similar scopes of work by contacting your Safety Team representative. If work on the project will last 30 days or more, procure a noise dosimeter and perform personnel monitoring at the site to document noise levels.
Conduct the Work	Damage to hearing from sustained elevated noise or intermittent impact noise.	If noise dosimetry is not being conducted at the project, use the following rule of thumb to determine whether hearing protection is required: If you are standing within 3 feet of another person and have to raise your voice to be understood by them when talking, hearing protection must be worn.

North America Job Hazard Analysis
Work in High Noise Environments

Project Name:	Former No. Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 8	

Task Step	Hazard	Control Measures
Report Dosimetry Monitoring Results	Lack of consolidated noise dosimetry monitoring results can result in other employees on different projects not being aware of typical noise levels.	OSHA allows noise dosimetry monitoring results collected when working with specific equipment to be used on any other project site where the same equipment is in-use. Report dosimetry monitoring results to your Safety Team representative so they can be included in a North America-wide listing of typical noise levels.

Personal Protective Equipment Required for this Task:

Type	Description
Hearing Protection	

Training Required for this Task:

Type	Description
Hearing Conservation	

Forms Associated with this Task:

Type	Description
None	

Site-Specific Job Hazard Analysis Completed by:

Name	Date

North America Job Hazard Analysis
Engaging and Managing Subcontractors

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 9	

Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.

Instructions:	**This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork. site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA should be reviewed regularly with site personnel who will be performing this task.**

Task Description:

Guidelines for managing safety of ERM-hired subcontractors to ensure they work safely and ERM liability is minimized.

Hazard Analysis:

Task Step	Hazard	Control Measures
Choose Subcontractor to Perform Work	Lack of executed contractual documentation may increase ERM liability.	The project PIC and/or PM must ensure a signed, executed contract is in-place prior to subcontractors performing work on the jobsite for ERM.
	Insurance documents collected during the safety prequalification process may not be sufficient to meet specific client contractual requirements.	The project PIC and/or PM must ensure that insurance certificates on-file for subcontractors meet or exceed contractual insurance requirements mandated by ERM clients. If the insurance certificate on-file is out-of-date or does not represent sufficient coverage, the project PIC and/or PM must obtain an updated insurance certificate from the subcontractor prior to the subcontractor performing work on the jobsite for ERM.
	Selecting subcontractors that do not meet ERM minimum safety criteria can result in poor safety performance on ERM projects.	Consult the North America "Subcontractor Information" page and select a subcontractor that meets ERM minimum safety criteria. If selection of an already-prequalified subcontractor is not possible due to business considerations or client wishes, provide enhanced subcontractor oversight on the jobsite.

North America Job Hazard Analysis
Engaging and Managing Subcontractors

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 9	

Task Step	Hazard	Control Measures
Prepare Site HASP Documents	Not informing ERM-hired subcontractors of ERM safety requirements for their work may expose employees to hazardous conditions and cause unnecessary project delays.	The project PIC and/or PM must ensure the subcontractor has received a copy of the ERM HASP and supporting documentation prior to mobilization to the jobsite. The subcontractor must be made aware that their personnel must follow provisions in the ERM HASP at a minimum, but that they may not rely on ERM documents for their employee's health and safety protection.
	Not obtaining authorized subcontractor signatures on ERM HASPs may expose ERM to additional liability.	Prior to any jobsite work proceeding, obtain the signature of an authorized representative for the subcontractor on the ERM HASP. Also, have the subcontractor's authorized representative designate one of their employees, by name, to serve as the jobsite contact for ERM safety concerns. List the jobsite safety contact in the ERM HASP.
	The lack of a specific scope of work for an ERM subcontractor opens the possibility of whether ERM or the subcontractor is responsible for certain aspects of jobsite work.	Specify both the ERM and the subcontractor's scope of work in the ERM HASP document. Ensure that any subcontractor personnel on-site has reviewed and signed the site HASP.
	Any ERM attempt to author safety documents for use during completion of tasks on jobsites by subcontractors may not be sufficient to fully control site safety hazards posed by subcontractor work.	In all cases, require the ERM subcontractor to either develop their own site-specific HASP, or develop Job Hazard Analyses (JHA) for the specific tasks they will perform. Attach these documents to the ERM HASP as appendices.

North America Job Hazard Analysis
Engaging and Managing Subcontractors

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 9	

Task Step	Hazard	Control Measures
Conduct the Work	On jobsites where ERM uses subcontracted services, additional liability arising from the OSHA "Multi-Employer Worksite Rule" may be present.	Ensure subcontractor work is overseen by ERM personnel at all times. Whenever subcontractor personnel are present on a jobsite performing work, an ERM employee should be present and engaged in the work being performed. Always include subcontractor personnel in daily jobsite tailgate safety meetings and have them indicate their presence and understanding of the information presented by signing the ERM form documenting the meeting. ERM personnel at the jobsite should perform regular safety inspections of the site, including subcontractor activities. Any deficiencies noted during inspections should be forwarded to the subcontractor's jobsite safety contact for resolution and report-back to ERM. For imminent danger situations (those that may cause loss of life or limb), the ERM inspector should stop the subcontractor's work and ensure all on site retreat until the imminent danger hazard is abated. Do not supply subcontractor personnel with personal protective equipment (PPE). If PPE must be provided to subcontractors, ERM personnel must inspect the PPE and document the inspection prior to providing it to subcontractor personnel. If ERM is performing air monitoring for the subcontractor, ensure calibration of air monitoring equipment is done before and after each use. At a minimum, air monitoring equipment must be calibrated at least once per day. Document equipment calibration and file with the site HASP.

North America Job Hazard Analysis
Engaging and Managing Subcontractors

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 9	

Task Step	Hazard	Control Measures
After Job Completion, Forward Comments to ERM North America Safety Team	Obtaining services from subcontractors who have met ERM minimum safety criteria but have performed poorly on jobsites poses risk to ERM employees on future jobsites.	Submit any comments about the subcontractor's safety performance while working on the ERM jobsite to the ERM North America Safety Team. These comments will be stored in our database and provided to ERM PICs and/or PMs seeking quality subcontractors for future work.

Personal Protective Equipment Required for this Task:

Type	Description
None	

Training Required for this Task:

Type	Description
None	

Forms Associated with this Task:

Type	Description
Subcontractor Safety Prequalification Checklist	ERM form given to subcontractors that collects information necessary to determine whether the subcontractor meets ERM's minimum safety criteria.
Subcontractor Insurance Certificate	Subcontractor-supplied form issued by the subcontractor's insurance carrier or broker evidencing current insurance coverage.

Site-Specific Job Hazard Analysis Completed by:

Name	Date

North America Job Hazard Analysis
Engaging and Managing Subcontractors

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 9	

North America Job Hazard Analysis
Hazard Communication

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 10	

Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.

Instructions:	**This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork. site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA should be reviewed regularly with site personnel who will be performing this task.**

Task Description:

Guidelines for communicating hazards posed by the storage and/or use of chemicals.

Hazard Analysis:

Task Step	Hazard	Control Measures
Storing Chemicals in the Office Setting	Chemicals stored in ERM offices or Field Project Offices may lead to employee chemical exposure, chemical spills, or fires from flammable materials.	If at all possible, do not store chemicals in the office environment. For each chemical product used by ERM employees or stored in an ERM field or office location, a MSDS sheet must be obtained and kept on-file. A chemical inventory list must be prepared and updated as new or different chemicals are procured. Chemical containers must be labeled in accordance with OSHA regulations. Train all employees who will use or be present in the general vicinity of chemicals annually about hazard communication. If new or updated chemicals are procured, hazard communication training must be given to affected employees prior to using or storing the chemical.

North America Job Hazard Analysis
Hazard Communication

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 10	

Task Step	Hazard	Control Measures
Using Chemicals	Employees may be exposed to chemical hazards via skin contact, ingestion, inhalation, or punctures in the skin.	Before using any chemical, make sure a jobsite WARN Health and Safety Plan (HASP) has been prepared and taken the chemical being used into account. Wear protective equipment as specified in the HASP. If chemicals are being used by subcontractors, ensure all employees on the jobsite have been told about the chemical in-use and are protected. If chemical exposure occurs, even if medical symptoms are not present, inform the Field Safety Office or Office H&S Contact.
Large Chemical Spills	Large chemicals spills may expose employees to significant health hazards.	For large chemical spills (generally anything larger than 1 gallon in size), HAZWOPER training is required to perform any action other than retreating from the area and contacting appropriately-trained personnel to mitigate the spill. Do not attempt to stop or clean-up a spill without current HAZWOPER training, current medical clearance, current respirator training, and a current respirator fit-test.

Personal Protective Equipment Required for this Task:

Type	Description
None	

Training Required for this Task:

Type	Description
Hazard Communication	An annually-required training discussing general chemical hazards, MSDS sheets, and how to respond to general chemical emergency situations.

North America Job Hazard Analysis
Hazard Communication

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 10	

Forms Associated with this Task:

Type	Description
Material Safety Data Sheet (MSDS)	An informational document containing information about chemical composition, hazardous properties, and steps to take in emergency situations involving chemicals.
International Chemical Safety Card	A chemical-specific document developed by the National Institute of Occupational Safety and Health providing abbreviated information similar to a MSDS.

Site-Specific Job Hazard Analysis Completed by:

Name	Date

North America Job Hazard Analysis
Airborne Contaminants and Reproductive Hazards

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 11	

Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.

Instructions:	**This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork. site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA should be reviewed regularly with site personnel who will be performing this task.**

Task Description:

Description of specific chemical air contaminants requiring additional regulatory actions.

Hazard Analysis:

Task Step	Hazard	Control Measures

North America Job Hazard Analysis
Airborne Contaminants and Reproductive Hazards

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 11	

Task Step	Hazard	Control Measures
Exposure to specific OSHA-regulated chemical hazards during work	Certain chemicals have been found to present more significant long-term health hazards to employees when they are exposed to them, including sensitization, development of certain cancers, and others.	If the following chemicals are being used on a jobsite, and work will occur for more than 30 consecutive days, OSHA regulations generally require a plan to mitigate exposures, additional training, and medical monitoring in some cases. • 13 carcinogens (see 29 CFR 1910. • Asbestos • Vinyl chloride • Inorganic arsenic • Lead • Hexavalent chromium • Cadmium • Benzene • Coke oven emissions • 1,2-dibromo-3-chloropropane • Acrylonitrile • Ethylene oxide • Formaldehyde • Methylenedianiline • 1,3-butadiene • Methylene chloride
Exposure to reproductive chemical hazards during work	Certain chemicals have been found to affect the reproductive systems in males and females and require additional personnel protection if used.	Chemicals posing reproductive hazards will be specified in site-specific HASPs. Follow all provisions of the HASP to minimize or eliminate exposure to reproductive hazards.

Personal Protective Equipment Required for this Task:

Type	Description
Varies	PPE varies depending on the specific chemical being used. Consult the HASP for jobsite-specific guidance.

North America Job Hazard Analysis
Airborne Contaminants and Reproductive Hazards

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 11	

Training Required for this Task:

Type	Description
Varies	Training that must be given to employees varies on the specific chemical being used. Consult the HASP for jobsite-specific guidance.

Forms Associated with this Task:

Type	Description
None	

Site-Specific Job Hazard Analysis Completed by:

Name	Date

North America Job Hazard Analysis
Heavy Equipment Operations

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 19	

Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.

Instructions:	**This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork. site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA should be reviewed regularly with site personnel who will be performing this task.**

Task Description:

Guidelines for working around heavy equipment.

Hazard Analysis:

Task Step	Hazard	Control Measures
Offsite Preparation	Untrained workers operating heavy equipment pose potential life-threatening hazards to employees.	ERM policy and practice is that our employees do not operate heavy equipment except in unusual circumstances. If ERM personnel are to operate heavy equipment, this must be stated in the health and safety plan for the project. Only employees with training and/or demonstrated experience operating heavy equipment may do so. Subcontractor personnel operating heavy equipment must be trained and/or have demonstrated experience operating such equipment. ERM must be in possession of evidence of training and/or experience prior to Subcontractor personnel operating such equipment. All heavy equipment must meet applicable design standards (ANSI, etc.). A copy of the operating manual must be carried on all heavy equipment, including a load-rating chart and any special operating considerations.

North America Job Hazard Analysis
Heavy Equipment Operations

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 19	

Task Step	Hazard	Control Measures
Heavy Equipment Operation	Injury to operator and those in immediate vicinity.	Before starting operations, operators must ensure no one is working on or near machinery. If equipment is to be operated in close proximity to other workers, a spotter must be working in tandem with the operator. All heavy equipment must be inspected daily to ensure good working order. Critical safety items, such as brakes, backup alarms, horns, etc. must be in working order. Machinery with critical safety items in disrepair may not be used until they are fixed. Operators must operate equipment while wearing seatbelts, if provided, and at reasonable speeds. Mounting/dismounting a moving machine is prohibited. Do not transport personnel or equipment in machinery not designed for this purpose. Overhead obstructions must be assessed before operating machinery. If equipment is to be operated in close proximity to overhead obstructions, a spotter must be working in tandem with the operator. Safe working distances must be specified in the health and safety plan or JHA supplied by the subcontractor.
Ending Heavy Equipment Operations	Leaving equipment in a non-neutral position poses contact hazards.	All heavy equipment must be placed in a neutral position when not in operation. Dump truck beds must be lowered, buckets must be at ground level, forklift tines must be at ground level, etc. Keys must be removed from all heavy equipment when not in use4.

North America Job Hazard Analysis
Heavy Equipment Operations

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 19	

Personal Protective Equipment Required for this Task:

Type	Description
High-visibility safety vest	Vest worn by equipment operators and those working in the area impacted by moving machinery

Training Required for this Task:

Type	Description
Heavy Equipment Operation	Operators must be trained and/or have demonstrated experience for each type of heavy equipment they will operate.

Forms Associated with this Task:

Type	Description
Heavy Equipment Inspection form	Form for documenting daily heavy equipment inspections

Site-Specific Job Hazard Analysis Completed by:

Name	Date

North America Job Hazard Analysis
Heavy Equipment Operations

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 19	

Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.

Instructions:	**This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork. site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA should be reviewed regularly with site personnel who will be performing this task.**

Task Description:

Guidelines for working around heavy equipment.

Hazard Analysis:

Task Step	Hazard	Control Measures
Offsite Preparation	Untrained workers operating heavy equipment pose potential life-threatening hazards to employees.	ERM policy and practice is that our employees do not operate heavy equipment except in unusual circumstances. If ERM personnel are to operate heavy equipment, this must be stated in the health and safety plan for the project. Only employees with training and/or demonstrated experience operating heavy equipment may do so. Subcontractor personnel operating heavy equipment must be trained and/or have demonstrated experience operating such equipment. ERM must be in possession of evidence of training and/or experience prior to Subcontractor personnel operating such equipment. All heavy equipment must meet applicable design standards (ANSI, etc.). A copy of the operating manual must be carried on all heavy equipment, including a load-rating chart and any special operating considerations.

North America Job Hazard Analysis
Heavy Equipment Operations

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 19	

Task Step	Hazard	Control Measures
Heavy Equipment Operation	Injury to operator and those in immediate vicinity.	Before starting operations, operators must ensure no one is working on or near machinery. If equipment is to be operated in close proximity to other workers, a spotter must be working in tandem with the operator. All heavy equipment must be inspected daily to ensure good working order. Critical safety items, such as brakes, backup alarms, horns, etc. must be in working order. Machinery with critical safety items in disrepair may not be used until they are fixed. Operators must operate equipment while wearing seatbelts, if provided, and at reasonable speeds. Mounting/dismounting a moving machine is prohibited. Do not transport personnel or equipment in machinery not designed for this purpose. Overhead obstructions must be assessed before operating machinery. If equipment is to be operated in close proximity to overhead obstructions, a spotter must be working in tandem with the operator. Safe working distances must be specified in the health and safety plan or JHA supplied by the subcontractor.
Ending Heavy Equipment Operations	Leaving equipment in a non-neutral position poses contact hazards.	All heavy equipment must be placed in a neutral position when not in operation. Dump truck beds must be lowered, buckets must be at ground level, forklift tines must be at ground level, etc. Keys must be removed from all heavy equipment when not in use4.

North America Job Hazard Analysis
Heavy Equipment Operations

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 19	

Personal Protective Equipment Required for this Task:

Type	Description
High-visibility safety vest	Vest worn by equipment operators and those working in the area impacted by moving machinery

Training Required for this Task:

Type	Description
Heavy Equipment Operation	Operators must be trained and/or have demonstrated experience for each type of heavy equipment they will operate.

Forms Associated with this Task:

Type	Description
Heavy Equipment Inspection form	Form for documenting daily heavy equipment inspections

Site-Specific Job Hazard Analysis Completed by:

Name	Date

North America Job Hazard Analysis
Energized Equipment and Lockout-Tagout

Project Name:	Former No. Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 22	

Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.

Instructions:	**This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork. site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA should be reviewed regularly with site personnel who will be performing this task.**

Task Description:

Guidelines for working on or around electrically energized equipment.

Hazard Analysis:

Task Step	Hazard	Control Measures
Offsite Preparation	Locks, tags, and trained personnel may not be present at the jobsite when needed.	The health and safety plan for projects involving work on or oversight of work on electrical equipment must include provisions for lockout. Locks and tags must be on-hand at the at the location where lockout is being pertformed. Personnel performing lockout operations must have received documented lockout training. Staff these projects with personnel who have attended this training. Collect training certificates from subcontractors who will perform this work.

North America Job Hazard Analysis
Energized Equipment and Lockout-Tagout

Project Name:	Former No. Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 22	

Task Step	Hazard	Control Measures
Work on Energized Equipment	Electrocution may occur if lockout is not performed correctly.	Before working on electrically-energized equipment, it should be brought to a "zero-energy state". This may involve turning the equipment's power source off, or turning specific electrical breakers to the off position. "Zero-energy" is not attained until the individual working on the machinery attempts to turn the machine on and is unsuccessful. The individual(s) performing lockout-tagout must inform other personnel in the area that work on equipment is about to occur, and to not attempt to turn equipment on for any reason. Locks AND tags must be placed on equipment power sources by each individual performing work on the equipment using personally-identifiable locks. Tags must read "DANGER – DO NOT OPERATE" and be resistant to wear and tear by the environment they are being used in. In certain situations, the use of locks may not be possible (machinery must be kept energized to perform required work). In these cases the Project Manager and Field Safety Officer must be directly involved when tagout is taking place.
Remove locks and tags	Removing locks and/or tags prematurely may lead to electrocution.	Do not allow anyone other than the individual who placed a lock/tag in-place to remove it. If the individual who placed the lock/tag is not immediately available to remove it, work must be suspended until he/she becomes available. If the individual who placed the lock/tag has left the jobsite, use the contact information located in the health and safety plan to attempt to contact them. If they are unable to be contacted, their lock/tag may only be removed through a joint decision from the PM, FSO, and Subcontractor supervisor.

North America Job Hazard Analysis
Energized Equipment and Lockout-Tagout

Project Name:	Former No. Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 22	

Task Step	Hazard	Control Measures
Lockout Tagout Process Inspection on Sites Longer than 1 Year	Changes to electrically-energized equipment may cause lockout procedures to become obsolete.	For all sites where work extends beyond 1 year, a lockout process inspection must occur. The inspection will verify, for each piece of electrically-energized equipment normally worked on, that lockout procedures in-place are still valid. These process inspections must be documented.

Personal Protective Equipment Required for this Task:

Type	Description
None	

Training Required for this Task:

Type	Description
Lockout	Lockout training describes the process of de-energizing electrical equipment prior to performing work or maintenance on the equipment, and the safeguards that must be used to ensure electrical hazards to employees are controlled.

Forms Associated with this Task:

Type	Description
None	

Site-Specific Job Hazard Analysis Completed by:

Name	Date

North America Job Hazard Analysis
Hazardous Waste Operations and Emergency Response

Project Name:	Former No. 2 Mill facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 27	

Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.

Instructions:	**This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork. site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA should be reviewed regularly with site personnel who will be performing this task.**

Task Description:

Guidelines for working on jobsites requiring compliance with the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) standard.

Hazard Analysis:

Task Step	Hazard	Control Measures

Personal Protective Equipment Required for this Task:

Type	Description

Training Required for this Task:

Type	Description
None	

Forms Associated with this Task:

North America Job Hazard Analysis
Hazardous Waste Operations and Emergency Response

Project Name:	Former No. 2 Mill facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 27	

Type	Description
None	

Site-Specific Job Hazard Analysis Completed by:

Name	Date

North America Job Hazard Analysis
Portable Hand and Power Tools

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 20	

Document Routing	
FSO	Retain copy in site health & safety file, amend to HASP as necessary.
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.

Instructions:	**This JHA has been developed and approved by the North America Safety Team. Prior to conducting fieldwork. site-specific hazards related to this task must be incorporated by the project team. Once completed, the JHA should be reviewed regularly with site personnel who will be performing this task.**

Task Description:

Guidelines for working with portable hand and power tools.

Hazard Analysis:

Task Step	Hazard	Control Measures
Gather tools to take to jobsite	An improper tool available at jobsites encourages unsafe behaviors and could lead to injury.	Ensure tools taken to jobsites are kept in optimal condition (sharp, clean, oiled, etc.) to ensure efficient operation. Tools must only be used for their intended purposes – tools should not be used as pry-bars. Ensure power cords attached to powered-equipment are not damaged. Any damaged tool or electrical cord must be tagged and taken out of service.
Using cutting tools	Major and/or minor cuts to personnel	Fixed open-blade knives (such as pocket knives) may not be used on ERM jobsites, with few exceptions. If their use is required, cut-resistant gloves must be worn while using them and the PM or FSO must be informed prior to their use. Employees performing significant amounts of cutting tool use should must high-visibility gloves to encourage awareness of where hands are being placed.

North America Job Hazard Analysis
Portable Hand and Power Tools

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 20	

Task Step	Hazard	Control Measures
Using screwdrivers	Puncture injuries	Do not hold objects in the palm of your hand and press a screwdriver into it – these objects should be placed on a flat surface. Do not use screwdrivers as hammers, or use screwdrivers with broken handles. Use insulated screwdrivers for work on electrical equipment.
Using hammers	Creation of sparks	Use brass hammers in areas where creating sparks would pose ignition hazards.
	Particles may lodge in employee's eyes	Always use safety glasses when striking any object with a hammer. If hammer-head shows signs of mushrooming, replace it immediately.
	Loose handles may create a projectile hazard	Replace any hammer with a loose handle so the hammer-head does not detach and cause injuries.

Personal Protective Equipment Required for this Task:

Type	Description
High-visibility glove	Gloves typically in fluorescent green, orange, or yellow.
Cut-resistant glove	Limited protection is afforded by leather gloves from cuts. Kevlar gloves provide more protection when significant cut/puncture hazards exist.

Training Required for this Task:

Type	Description
None	

North America Job Hazard Analysis
Portable Hand and Power Tools

Project Name:	Former No. 2 Mill Facility
Project Number:	0128439
Job / Task Name:	Soil Excavation
JHA No.: 20	

Forms Associated with this Task:

Type	Description
None	

Site-Specific Job Hazard Analysis Completed by:

Name	Date

Attachment C
Job Analyses Form

RCM
ERM Remediation & Construction Management

Job Hazard Analysis Form
(Note: One Form per Job / Task)

Project Name:	BCP RI Implementation
Project Number:	0128439
Job / Task Name:	
Project JHA No.:	

Document Routing	
SSO	Retain copy in site health & safety file, amend to HASP as necessary.
Project Manager	Retain copy in the office health & safety file, amend to HASP as necessary.

1. Job / Task Description:

2. Hazard Analysis

Hazard	Reference SOPs	Mitigation Measures

Job Hazard Analysis Completed by:

Name	Company

Date: _____

Attachment D
Applicable Standard Operating Procedures

4.0 DRILL RIG SAFETY

4.1 Potential Hazards

4.1.1 Noise

Always wear hearing protection when near a drill rig.

4.1.2 Fire

Methane in well holes can and do ignite. Lanchester landfill is one example. Another example is a Site in New Jersey where the methane was under so much pressure that the drill rig operators helmet blew. In that case, the crew had to quickly shut down and resume operations the next day. The explosimeter pegged to the right.

Casings are welded together. If there is a flammable atmosphere, there will be a fire. This is how the Lanchester landfill flamed up.

Use threaded casing if this is an appropriate option. Threaded casings are more expensive then welding non-threaded casings.

4.1.3 Electricity

A typical air-rotary rig is approximately 35-feet high when raised and 13.5-feet when lowered. The most frequent cause of job-related death in the water well drilling industry is electrocution caused by contacting overhead power lines while raising a portable drilling rig's derrick. The problem of working near power lines is an old one. There is a pattern to the types of accidents which occur with power lines, and the following usually are true:

- almost everyone on the drill Site knew the power lines were there;
- almost everyone involved in the accident admitted they recognized the consequences of contacting the power lines;
- there were laws governing the clearance distance to remain away from these power lines, and in effect, this distance was violated;
- the rig derricks were 40 to 60-feet tall;

- there was usually no designated signal man; and
- the power company or owner of the lines was not contacted for help or advice.

To avoid these situations, follow these guides:

- Always consider electric wires to be alive and dangerous. Electric current always flows to ground when a suitable path is provided. When the derrick of a drilling rig touches an overhead wire, the rig becomes completely electrified. Although it may appear safe because it is insulated from the ground by rubber tires, anyone touching it while standing on the ground furnishes a path to ground for the deadly current.
- Always maintain at least 20-feet of clearance from electric wire. Distances aloft are hard to estimate and wires swing in the wind and sag. Allow at least 20-feet of clearance from your rig to the wires for safe operation.
- Never locate a well under or near overhead wires. With proper location, electric wire hazards can be eliminated. It is up to the driller to advise the property owner of this consideration.
- Your power company can be called upon for free assistance. Call your local power company if you are drilling near overhead wires. They will usually be happy to send an expert to advise you at no cost.
- Insulate all of the handles that are used to operate the rig. Do this with rubber grips or with heavy wrapping of electrical tape. This reduces the severity of the accident when gripping the controls.
- The rig driver should make it a habit to jump clear and not swing from the cab whenever getting out of the truck cab. When a high line is touched, the operator in the cab is generally not aware of it. Jumping clear will prevent him from grounding the rig.

If a rig does come into contact with overhead electric wires, following these safety tips could prevent injury or death:

- Do not touch any part of the equipment or attempt to enter or leave it. Keep others away from the rig.

- Have someone call the local power company and local fire rescue squad immediately for their assistance.
- Do not touch any person who may be in contact with the electrical current.
- Only when life is at stake should a rescue be attempted. If a rescue is attempted, use a dry, clean rope or a dry, unpainted wood pole to remove the victim. Keep as far away as possible. Do not touch the victim until he is fully removed.

4.1.4 Hydraulic Lines

Hydraulic lines may have between 2800 and 3000-pounds per square inch (psi) of pressure when pressurized. If a line ruptures, high velocity hydraulic oil could blow on a worker, causing injury to the eyes. A ruptured line could also whip wildly during pressure release, causing severe injury and even decapitation. If there is no reason to be around a rig, don't be there!

4.1.5 Inhalation Hazards

When drill crews grout, much dust is generated. Portland cement is one ingredient of grout. Read the warning labels of the Portland cement. Use respirators.

4.1.6 Ergonomics

Backs/lifting techniques; nice to help but be selective.

4.1.7 Miscellaneous

- Steep slopes are especially hazardous; cribbing must be level and solid. Ensure proper jacking and leveling techniques.
- Chain could break on air rotary; chain whips straight out the back.
- Drill rods can fall out of carousel on air rotary rig if rod is riding high and the small diameter section of rod is in line with the holding mechanism.
- Wire rope can fail, causing the rope to snap and cause serious injury.

- There are many pinch points on a drill rig; serious injury to fingers and hands can result.
- Wet rope grips tight on cat head.
- Check valve on hydraulic line to jacks fail, causing rig to fall on that side.
- Weight of rig, combined with unstable soil/rock may cause cave in and rig to fall in hole.
- Loose clothing, such as draw strings on jackets and hood can get caught in machinery.
- Drugs.

Prescription drugs, over-the-counter drugs, illegal drugs, and alcohol have an effect on our bodies. They can effect our motor coordination, concentration, and temper. It is extremely important to avoid using any type of drug while engaged in such a dangerous operation as drilling. Any safety officer or supervisor should not permit anyone to work on a Site when someone is under the influence of drugs.

- Other under ground utilities
  - Propane
  - Sewer
  - Telephone
  - Cable
  - Gas

4.1.8 Carelessness

Mondays, Fridays, late Site departures, schedule short falls, drill crew/consultant/client animosity, when there is a new helper, and inclement weather are all times when safe drilling is most likely to be compromised. Be aware of these danger times and make a conscious and concerted effort to have a safe Site.

4.2 PREVENTATIVE AND CORRECTIVE ACTIONS

4.2.1 Rig Emergency Shut Down

On all rigs you will find at least one emergency shut down switch, commonly referred to as a "kill switch". The drill rig crew should test this switch at the beginning of each day. All personnel should know at least where this switch is and how to use it. Do not ever touch levers except in emergencies; use the "kill switch" when an injury has occurred.

4.2.2 Tailgate Meetings

4.2.2.1 Proper monitoring techniques

- How long on this particular rig?
- Awareness of rig exhaust; shut down rig if needed.
- Helper – BZ is low to the ground.
- Ensure Operator sees you.
- Type of Site and weather - work environment.

4.2.2.2 Expectations and Standards

- Their health and safety equipment.
- They are responsible to inform you of their observances.

4.2.2.3 Coordination of Cooperation

- Teamwork concept.
- Decrease confusion and chance of an accident by establishing a perimeter and zones. Use caution tape, stakes, and cones to delineate these perimeters and zones.

SCOPE

This procedure provides work practices to minimize the impact of heat stress caused by exposure to hot environments or working conditions.

DEFINITIONS

- **Acclimatization –** The ability to adjust to hot working conditions. This adjustment to heat, under normal circumstances, usually takes about 5 to 7 days, during which time the body will undergo a series of changes that will make continued exposure to heat more endurable.

- **Heat Index –** An accurate measure of how hot it really feels when relative humidity (RH) is added to the actual air temperature.

PROCEDURE

A. The Site Safety Officer will implement techniques for preventing heat stress-related health issues. Prevention techniques include:
   1. Provide shaded areas with cross-ventilation, if possible, for lunch and breaks.
   2. Schedule physically demanding and strenuous tasks, or tasks requiring full-body chemical protection, for early in the day, if possible.
   3. Drink at least 6-8 ounces of cool water every 60 minutes.
   4. Use the buddy system and look for signs of heat stress. Any employee with signs of heat stress must immediately proceed to the break area. Signs and symptoms for various heat stress disorders and recommended first aid are listed in the following table.

Disorder	*Symptoms*	*Cause*	*Prevention/First Aid*
Heat Rash or Prickly Heat	♦ Rash ♦ Itching	♦ Hot, humid conditions ♦ Sweat doesn't evaporate easily ♦ Sweat ducts become clogged	♦ Ointments ♦ Keep skin clean and dry ♦ Good daily personal hygiene
Heat Cramps	♦ Sudden onset of muscle cramps usually in legs or arms ♦ Hot, moist skin ♦ Normal pulse ♦ Normal or slightly elevated temperature	♦ Loss of water (sweating) ♦ Loss of electrolytes ♦ Replacing water but not electrolytes	♦ Move into shade ♦ Loosen clothing ♦ Drink tepid electrolyte drinks or water ♦ Seek medical assistance if conditions persist
Heat Exhaustion	♦ Pale, clammy skin ♦ Profuse perspiration ♦ Thirst from dehydration ♦ Weakness ♦ Headache ♦ Nausea ♦ Loss of coordination	♦ Overexertion ♦ Excessive loss of water and electrolytes	♦ Move into shade ♦ Remove PPE ♦ Loosen street clothing ♦ Cool by applying damp cool compresses or ice packs ♦ Drink tepid electrolyte drinks or water ♦ Summon medical assistance
Heat Stroke	♦ Elevated temperature (>103F) ♦ Flushed, hot, dry skin ♦ Absence of sweating ♦ Delirious ♦ Rapid pulse ♦ Nausea ♦ Headache ♦ Dizziness ♦ Unconsciousness	♦ Failure of body's cooling (sweating) mechanism	♦ Summon medical assistance ♦ Move to shade ♦ Remove PPE ♦ Loosen street clothing ♦ Cool by fanning or applying damp compress or ice packs

5. The Site Safety Officer must verify that a work-rest cycle based on the heat index is implemented for site workers as applicable. Refer to the following three tables. To use the chart, read the temperature at the left and humidity across the top, the heat index is where the two intersect. For example, with a temperature of 96 and a humidity of 50%, the Heat Index is 108. Determine what the associated risk level is, based on the heat index. Use the risk level and heat index to determine the appropriate work-rest cycle.

Heat Index Chart

Relative Humidity (%)													
Temperature (F)		**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**	**100**
	110	136												
	108	130	137											
	106	124	130	137										
	104	119	124	131	137									
	102	114	119	124	130	137								
	100	109	114	118	124	129	136							
	98	105	109	113	117	123	128	134						
	96	101	104	108	112	116	121	126	132					
	94	97	100	102	106	110	114	119	124	129	136			
	92	94	96	99	101	105	108	112	116	121	126	131		
	90	91	93	95	97	100	103	106	109	113	117	122	127	132
	88	88	89	91	93	95	98	100	103	106	110	113	117	121
	86	85	87	88	89	91	93	95	97	100	102	106	108	112
	84	83	84	85	86	88	89	90	92	94	96	98	100	103
	82	81	82	83	84	84	85	86	88	89	90	91	93	95
	80	80	80	81	81	82	82	83	84	84	85	86	86	87

Heat Index Risk Level and Associated Health Effects

Heat Index	*Associated Risk*
>130	*Extreme Danger* Heat stroke highly likely with continued exposure
105-130	*Danger* Heat exhaustion and heat cramps likely and heat stroke possible with prolonged exposure and/or physical activity
90-105	*Extreme Caution* Heat cramps and heat exhaustion possible with prolonged exposure and/or physical activity
80-90	*Caution* Fatigue possible with prolonged exposure and/or physical activity

NOTES:

- Heat Index values were devised for shady, light wind conditions. Exposure to full sun may increase these values by up to 15^{o}.
- Heat Index values were devised for the general public wearing typical lightweight summer clothing. Acclimatized workers may be able to work under conditions with a slightly higher Heat Index.
- The use of personal protective equipment, including clothing increases the heat stress load on the body.

The work-rest cycle outlined below should be implemented based on the professional judgment of the Site Safety Officer and/or the Project Health and Safety Consultant. Workers must drink 8 ounces of cool water at each break.

Heat Index	*Risk Level*	*Work-Rest Cycle*
> 130	Extreme Danger	15 minute break every 30 minutes
105-130	Danger	15 minute break every 60 minutes
90-105	Extreme Caution	15 minute break every 90 minutes
80-90	Caution	15 minute break every 120 minutes

B. The Site Safety Officer and the Construction Manager will observe workers to verify compliance with and effectiveness of prevention techniques.

C. The Site Safety Officer should provide first aid treatment for heat stress related health issues.

D. In the event a heat stress related incident occurs, the Site Safety Officer will report the incident following guidelines in the HASP.

REFERENCES

Regulatory References
None

Technical References
- NOAA – National Weather Service, Heat Index, Measure of How Hot it Feels

Procedural References
None

REVISION LOG

DATE	REV. #	APV'D	COMMENTS
12/31/07	0	ELG	Issued for use

SCOPE

This procedure provides guidance for determining appropriate means for handling natural hazards that may be encountered while conducting fieldwork.

DEFINITIONS

None.

PROCEDURE

Potential exposure natural hazards during performance of this project is believed to be minimal. However since the work is performed outside some precautions should be taken to guard against the following hazards. Keep in mind that the hazards may vary depending on the time of year or geographical region. Infrequent hard freezes may allow insects and snakes to be active all year round in some parts of the United States. Refer to Attachments 1 through 3 for photos and more thorough descriptions of the more common natural hazards, which might be encountered.

A. Identify type of natural hazard present.

B. When a natural hazard (such as poisonous plants, feral animals, insects and snakes) is encountered, back away and evaluate the situation.

C. Develop a plan which may include any of the following:

1. Remove the natural hazard if it can be done safely.
2. Avoid the natural hazard if it cannot be removed. Additionally, use appropriate PPE or outer clothing for protection from the hazard. Refer to SOP – 8, Personal Protective Equipment.
3. Get assistance in removing or working around the natural hazard. In some instances, this may require professional help from animal control or an insect expert.

D. In the event there is contact with the natural hazard, if it appears to be a life threatening situation, such as anaphylactic shock or a snake bite, seek medical attention immediately.

- OR -

A. POISONOUS PLANTS

1. Poison ivy is in the form of a vine, while oak and sumac are bush-like.
2. All produce a delayed allergic hypersensitivity.
3. The plant tissues have an oleoresin, which is active in live, dead, and dried parts and may be carried through dust, contaminated articles, and the hair of animals.
4. Symptoms usually occur 24 to 48 hours after exposure resulting in burning or stinging, and weeping and/or crusted blisters.
5. The best antidote for poisonous plants is recognition and avoidance.
6. Should exposure to any of these plants occur, notify the Site Safety Officer and wash the affected area with a mild soap and water, but do not scrub the area.

B. TICKS

1. Ticks attach to their host's skin and intravenously feed on its blood creating an opportunity for disease transmission.
2. Covering exposed areas of the body and the use of tick repellent are two ways to prevent tick bites.
3. Periodically during the workday employees should inspect themselves for the presence of ticks.
4. Notify the Site Safety Officer of any tick bites as soon as possible, medical attention may be required.

C. SPIDERS

1. Black Widow
   a. The black widow is a common venomous spider found in vacant rodent burrows, under stones, logs and long grass, and in hollow stumps and brush piles.
   b. If disturbed, they typically will retreat to a corner of their web but can be induced to bite only if pressed against the skin.
   c. Notify the Site Safety Officer if bitten, because neurotoxins are injected, it is important to seek immediate medical attention.
2. Brown Recluse
   a. The brown recluse or Fiddle Back Spider is another common venomous spider.

b. It hides in dark niches and corners, where it may spin a poorly organized, irregular web.

c. It is shy and will try to run from a threatening situation but will bite if cornered.

d. Check boots and protective clothing for spiders prior to putting them.

e. The bite of the brown recluse is usually painless until 3 to 8 hours later when it may become red, swollen, and tender. Notify the Site Safety Officer if bitten.

f. Prompt medical attention can reduce the extent of ulceration and alleviate other complications that may develop.

D. FIRE ANTS

1. One sure sign of the presence of fire ants is their conical mounds, which are a result of the digging of their chambers.

2. The sting of a fire ant results in localized reddening of the bite area, accompanied by sharp burning sensations.

3. The first ant sting releases a chemical substance that triggers other ants of the colony to sting.

4. Anyone seeing fire ant mounds present at the work site should notify the Site Safety Officer, who will then notify the rest of the crew so the mounds may be avoided if possible.

E. CHIGGERS

1. Chiggers, also known as "red-bugs" or "harvest mites", are the immature stages of a tiny red mite.

2. They inhabit areas of tall grass, associated with low, wet spots, ponds and stream banks, wild berry patches, and forest underbrush.

3. The larvae attach themselves to the clothing of people or to the fur of passing animals.

4. Wear loose-fitting clothing (if possible) when working outdoors. Apply a repellent containing DEET (N,N-diethyl-meta-toluamide), to shoes, socks, and trousers before entering chigger-infested areas. Caution: some individuals may be sensitive to DEET – always read and follow label directions

5. Vehicles should be frequently vacuumed to reduce the number of chiggers that may have been deposited.

6. Flowers of sulfur is another repellant of chiggers. Sulfur may be more benign to use than DEET on some body parts. Avoid breathing dust during application.

F. FLYING INSECTS

1. Flying insects such as mosquitoes, wasps, hornets, and bees may be encountered while site activities occur.
2. Wear long-sleeved clothes and long pants treated with repellent. Do not treat unexposed skin. Use the repellent according to the manufacturer's recommendations provided on the container.
3. Personnel should report flu-like symptoms to the Site Safety Officer, medical attention may be needed.

G. SNAKES

1. The most effective way to prevent snakebites is to avoid snakes.
2. Personnel should avoid walking in high grass and underbrush.
3. Visual inspection of work areas should be performed prior to activities taking place.
4. The use of leather boots and long pants will be required, since more than half of all bites are on the lower part of the leg.
5. No attempts at killing snakes should be made; many people are bitten in such an attempt.
6. If a snake bites someone, Notify the Site Safety Officer and seek medical services.

H. ALLIGATORS

1. Never approach an alligator. Always stay at least 30 yards away. Never wade or swim in areas that could contain large alligators.
2. Do not dump food or scraps into or near the water. This can attract alligators.
3. Always be aware of your surroundings and use caution and common sense.
4. If at any time personnel observe alligators at the site they will immediately inform the Site Safety Officer or Construction Manager, who will then notify the rest of the employees and local wildlife personnel.

I. FERAL ANIMALS

1. Feral animals such as rats or other wildlife may be encountered during fieldwork.
2. If an animal is diseased, injured or tending a nest, they may become aggressive.
3. Notify the Site Safety Officer or Construction Manager if feral animals are at the site, who will then notify the rest of the employees and local wildlife personnel.

ATTACHMENTS

Attachment 1, Poisonous Plants
Attachment 2, Insects
Attachment 3, Snakes
Attachment 4, Other Natural Hazards

REFERENCES

Regulatory References

None

Technical References

None

Procedural References

SOP – 8, Personal Protective Equipment

REVISION LOG

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Attachment 1

Poisonous Plants

Most species of poison ivy, oak, and sumac have three leaflets; hence, the saying, "Leaves of three, let it be." These plants vary significantly in appearance in different regions of the country, but in most species the flower and fruit structures arise in the angle between the leaf and the twig, the flowers are greenish in spring, and the plant's mature fruit is off-white or pale yellow-green.

Several varieties, including two species each of poison ivy, poison oak, and poison sumac and six subspecies of poison ivy (*Toxicodendron radicans*), are found in the United States. Poison ivy (see figure A below) generally grows east of the Rocky Mountains and poison oak in the West. Both poison ivy and poison sumac are found along the Gulf Coast. Poison oak prefers swampy areas in the Southeast.

Figures A1, A2: Courtesy of Lisa A. Gamer, MD; figure A3: staff photo; figure A4: Janet Robidoux

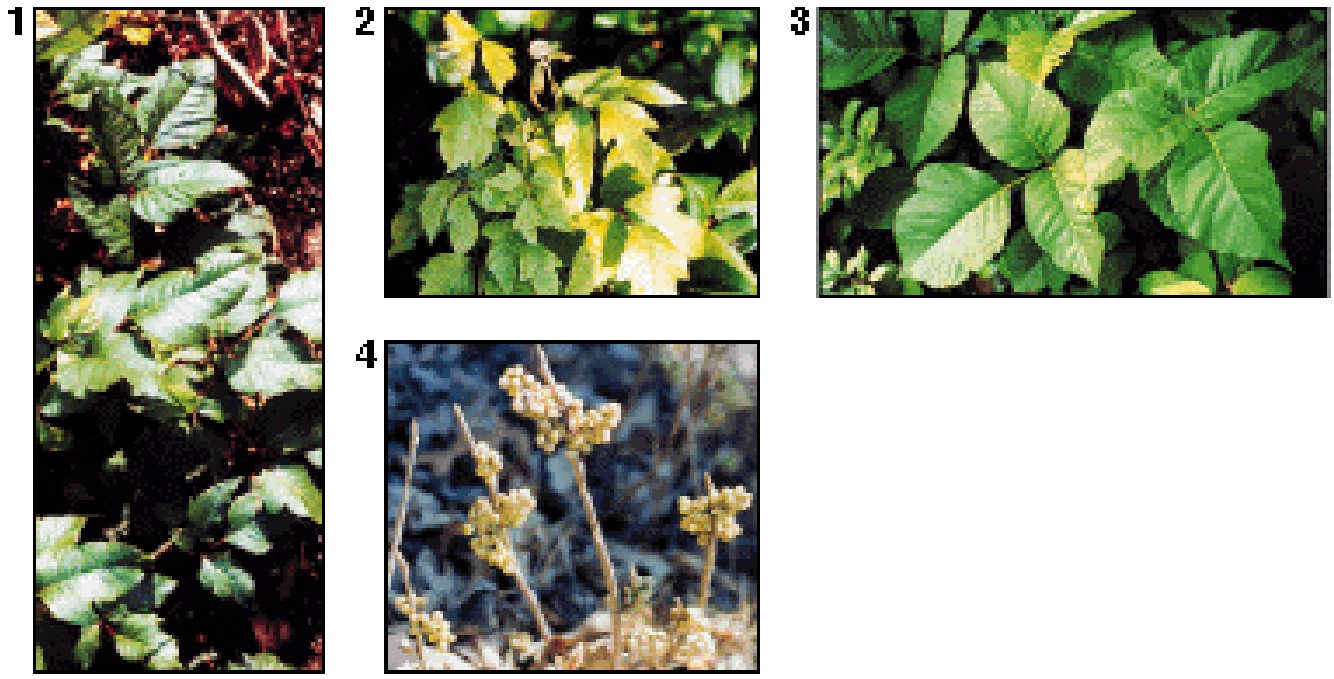


Figure A. Poison ivy (Toxicodendron radicans) can grow as a shrub or vine, but all varieties are characterized by glossy leaves that grow in clusters of three leaflets. The varieties shown here are found in Texas (1,2) and Minnesota (3). The off-white or pale yellow-green berries of poison ivy (4) often remain on the plant through the winter.

Poison Ivy



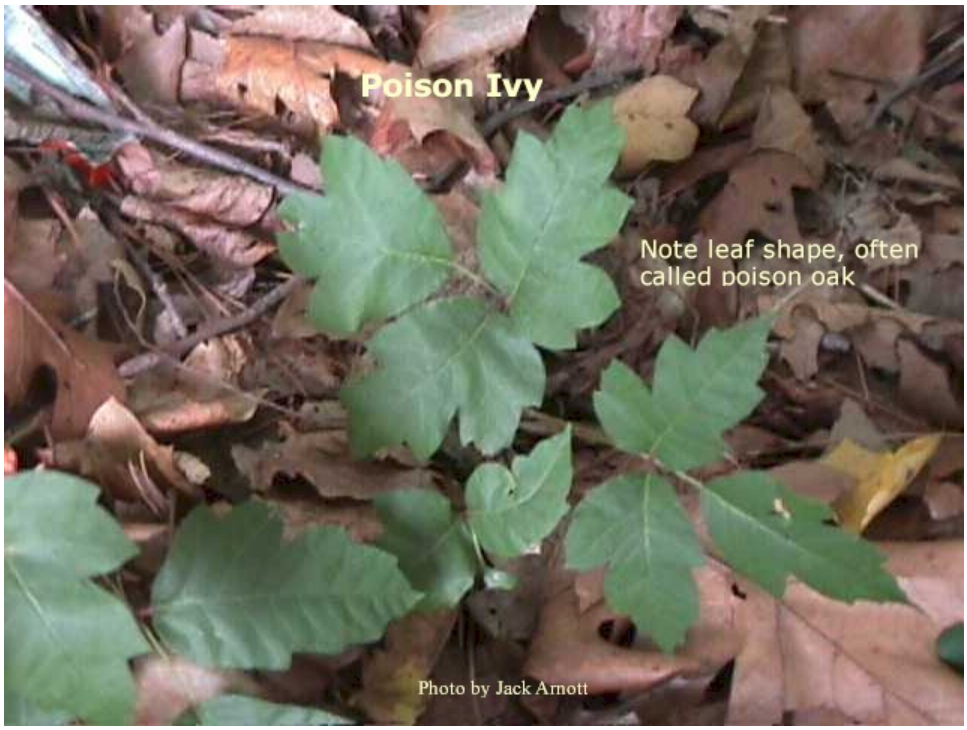
A climbing vine with three serrated-edge, pointed leaves grows in the East, Midwest and South. In the northern and western states, poison ivy grows as a non-climbing shrub.

The appearance of these plants is variable. Leaves are alternate and normally consist of three leaflets with the stalk of the central leaflet being longer than those of the other two are but can be found with five or even seven leaflets. The leaflets are two to four inches long, dull or glossy green with pointed tips. The middle leaflet is generally larger than the two laterals. The edges of the leaflets may be toothed, lobed, or smooth. Virginia Creeper (*Parthenocissus quinquefolia*) is non-poisonous vine with five leaflets that is often mistaken for poison ivy.

Poison ivy can be a shrub or a woody vine. Yellowish-green flowers occur in compact clusters in leaf axils, in June or July followed by waxy, gray-white berries about three-sixteenths of an inch in diameter in late summer.




Virginia Creeper
Parthenocissus quinquefolia
Poison Ivy
Toxicodendron radicans
Photo by Jack Arnott


Poison Ivy
Note leaf shape, often called poison oak
Photo by Jack Arnott



Poison Oak



Poison oak also has three leaves. It grows in the sandy soil of the Southeast as a small shrub. In the western United States poison oak is a very large plant that grows as a standing shrub or climbing vine. Eastern poison oak has the most "oak-looking" leaves of any of the species. It usually has multi-lobed leaves, no aerial roots on the stems, and fuzzy fruits and leaves. It loves sandy soils. Western poison oak is found only along the Pacific coast and into the mountains and it usually has aerial roots extending from the main stem.

Poison Sumac



A shrub or bush with two rows of 7-13 leaflets, most common in the peat bogs of the Northern United States and in swampy Southern regions of the country. A water loving swamp shrub (dendritic) or bush with two rows of 7-13 leaflets; growing from 6 to 20 feet in height, the Poison Sumac is found in the east from Quebec to Florida and westward along the coast to far west Texas between Shelby and Hardin counties.



Listed below are recommended actions to take to reduce the potential exposure to poisonous plant:

- Determine what types of poisonous plants may be present at the specific site.
- Use repellant sprays and coatings.
- Use netting or long sleeves with cuffs and long pants.
- Regularly inspect skin.
- Maintain a first aid kit on hand.

Attachment 2
Insects

Chiggers



Chiggers, also known as "red-bugs" or "harvest mites", are the immature stages of a tiny red mite. They inhabit areas of tall grass, associated with low, wet spots, ponds and stream banks, wild berry patches, and forest underbrush. The larvae attach themselves to the clothing of people or to the fur of passing animals. Before settling down to feed, chiggers move to a constriction, such as sock tops, waistbands, or armpits. Feeding chiggers inject a salivary fluid, which dissolves the host's cells, and then they suck up the liquefied tissue. Within a few hours, small, reddish, intensely itching welts appear. These bites may continue to itch for several days up to two weeks after the chigger is dislodged. Following are suggestions that should provide some protection from chiggers:

- Stay out of areas where chiggers are likely to be present including wood lots, pastures, roadside ditches, or other areas with tall grasses and weeds. Chiggers are especially common in moist low-lying areas.
- Wear loose-fitting clothing (if possible) when working outdoors. Vehicles should be frequently vacuumed to reduce the number of chiggers that may have been deposited.
- Apply a repellent containing DEET to shoes, socks, and trousers before entering chigger-infested areas. Caution: some individuals may be sensitive to DEET – always read and follow label directions.
- Another repellant of chiggers is flowers of sulfur. Flowers of sulfur is powdered elemental sulfur available at a drug store or pharmacy as an over-the-counter preparation. It has a slight, rotten egg smell. Areas on the body that have tight clothing up against them such as socks, waistbands, etc. may be dusted with sulfur powder. Surveyors and other field personnel state that they fill a sock with sulfur and are able to dust these areas efficiently.

Sulfur may be more benign to use than DEET on some body parts. Avoid breathing dust during application.

- Immediately after possible exposure to chiggers, take a bath, thoroughly scrubbing the body with hot soapy water. This will kill or dislodge many of the chiggers. The clothes that were worn when the bite(s) occurred should be placed in a plastic bag for temporary storage until they can be laundered.
- When bites begin to itch, one course of treatment is to apply rubbing alcohol, followed by one of the nonprescription local anesthetics. A baking soda paste, calamine lotion, or product such as "After-Bite" also will help reduce discomfort. Avoid scratching bites since this only increases irritation and may lead to a secondary infection of the bite.

Ticks

Ticks are vectors of many different diseases including Rocky Mountain spotted fever, Q fever, tularemia, Colorado tick fever, and Lyme disease. They attach to their host's skin and intravenously feed on its blood creating an opportunity for disease transmission. Covering exposed areas of the body and the use of tick repellent are two ways to prevent tick bites. Periodically during the workday employees will inspect themselves for the presence of ticks. If a tick is discovered, the following procedure should be used to remove it:

- Do not try to detach a tick with your bare fingers; bacteria from a crushed tick may be able to penetrate even unbroken skin. Fine-tipped tweezers should be used.
- Grip the tick as close to your skin as possible and gently pull it straight away from you until it releases its hold.
- Do not twist the tick as you pull and do not squeeze its bloated body. That may actually inject bacteria into your skin.
- Thoroughly wash your hands and the bite area with soap and water. Then apply an antiseptic to the bite area.
- Save the tick in a small container with the date, the body location of the bite, and where you think the tick came from.
- Notify the SSO of any tick bites as soon as possible.

Recently, Lyme disease has been the most prevalent type of disease transmitted by ticks in the United States.

Spiders



A common venomous spider is the Black Widow. The adult female is glossy black with short, almost microscopic hairs and a crimson hourglass marking on the underside of the abdomen. They are found in dark corners of barns, stables, garages and piles of boxes and crates. They have also been known to reside in vacant rodent burrows, under stones, logs and long grass, and in hollow stumps and brush piles. Generally, Black Widows are not aggressive and usually can be induced to bite only if pressed against the skin. If disturbed, they typically will retreat to a corner of their web. However, these spiders are more aggressive if they are protecting an egg sac. After a bite, a dull numbing pain in the affected extremity occurs. In addition, pain and some muscular rigidity in the abdomen or the shoulder, back, and chest may occur. The bite may also produce headache, dizziness, skin rash, nausea, vomiting, anxiety and weakness, and increased skin temperature over the affected area may be observed. Ice may be placed over the bite to reduce the pain. Bites are rarely fatal to adults, but because the black widow spider injects neurotoxins, it is important to seek immediate medical attention.



Another venomous spider common in the southern United States is the Brown Recluse or Fiddle Back Spider. The Brown Recluse is about 1/4 to 1/2 inches in body length (most adults are about the size of a United States dime to a US quarter with legs extended). Coloration ranges from tan to dark brown, with the abdomen often darker than the rest of the body. The feature that most distinguishes the brown recluse from many other harmless spiders is a

somewhat darker violin-shaped marking on top of the leg-bearing section of the body. The neck of the violin "silhouette" points towards the rear (abdomen) of the spider. The brown recluse roams at night seeking its prey. During the day, it hides in dark niches and corners, where it may spin a poorly organized, irregular web. Eggs are deposited in 1/2 inch long off-white silken egg sacs, often appearing flattened beneath and convex above. It is shy and will try to run from a threatening situation but will bite if cornered. People are sometimes bitten while they are asleep because they roll onto a brown recluse spider while it is hunting in the bed. More often the victim is bitten while putting on a shoe or piece of clothing that a spider has selected for its daytime hiding place. The bite of the brown recluse is usually painless until 3 to 8 hours later when it may become red, swollen, and tender. Later the area around the bite site may develop into an ulcerous sore from 1/2 to 10 inches in diameter. Healing often requires a month or longer, and the victim may be left with a deep scar. Prompt medical attention can reduce the extent of ulceration and alleviate other complications that may develop. It should be noted that not all brown recluse bites result in ulcerations or scarring.[1]

Fire Ants

Fire ants are approximately 1/4-inch long and live in underground chambers that typically contain over 1,000 ants. One sure sign of the presence of fire ants is their conical mounds, which are a result of the digging of their chambers. The sting of a fire ant results in localized reddening of the bite area, accompanied by sharp burning sensations. The first ant sting releases a chemical substance that triggers other ants of the colony to sting. Anyone seeing fire ant mounds present at the work site should notify the SSHO, who will then notify the rest of the crew so the mounds may be avoided if possible.

Flying Insects

Flying insects such as mosquitoes, wasps, hornets, and bees may be encountered while site activities occur. Section 3.4.4 discusses problems associated with them. Mosquitoes can be the vectors for diseases such as the West Nile Virus and Saint Louis Encephalitis, reports of which appear in the media periodically. Avoiding mosquito bites is the best way to avoid potential exposure to mosquito-borne disease. Apply insect repellant containing DEET (N,N-diethyl-meta-toluamide), wear long-sleeved clothes and long pants treated with repellent and stay indoors during peak mosquito feeding hours (dusk until dawn) to further reduce your risk.

There is currently no vaccine to protect humans against Saint Louis Encephalitis or West Nile Virus. Individuals at project sites can reduce their risk from being infected with West Nile Virus by taking the following actions to protect against mosquito bites:

- Review the hazards of West Nile Virus periodically in morning safety meetings.
- Increase protective measures when working at dawn, dusk, and in the early evening.
- Reduce the area of exposed skin when working outdoors. Long-sleeved shirts with sleeves rolled down are recommended. Understand that mosquitoes may bite through thin clothing, so personnel should evaluate the actual Level D clothing worn, for example, heavy, long

sleeve work shirts and heavy dungarees/jeans may be indicated. Activity at projects where disposable coverall use (i.e., Tyvek®) is specified, further reduces the risk of mosquito bites.

- For activities where only Level D PPE is specified, consider using disposable coveralls when working in wooded, highly vegetated, or swampy areas.
- Use an insect repellent containing approximately 30 percent DEET. In concentrations greater than 35 percent, DEET provides no additional protection. Use the repellent according to the manufacturer's directions provided on the container. Use just enough repellent to cover exposed skin and clothing. Do not treat unexposed skin. Frequent reapplication or saturation is unnecessary for effectiveness. Avoid prolonged and excessive use of DEET.
- When additional protection against mosquitoes is necessary, commercially prepared "clothing and gear" insect repellants containing 0.5 percent permethrin may be used. These repellants, such as Repel Permanone™ are available in the sporting goods departments at major retailers. Clothing and gear insect repellants are not for use on skin. Use the repellent according to the manufacturer's recommendations provided on the container.
- After returning from outdoor field activities, wash treated skin with soap and water.
- Personnel should report flu-like symptoms to the SSO.

West Nile Virus

The Centers for Disease Control and Prevention report that human illness from West Nile virus is rare, even in areas where the virus has been reported. The chance that any one person is going to become ill from a mosquito bite is low. West Nile virus is spread by the bite of an infected mosquito, and can infect people, horses, many types of birds, and some other animals. Most people who become infected with West Nile virus will have either no symptoms or only mild ones. On rare occasions, West Nile virus infection can result in a severe and sometimes fatal illness known as West Nile encephalitis (an inflammation of the brain). The risk of severe disease is higher for persons 50 years of age and older. There is no evidence to suggest that West Nile virus can be spread from person to person or from animal to person.

Saint Louis Encephalitis

The Centers for Disease Control and Prevention report mild infections occur without apparent symptoms other than fever with headache. More severe infection is marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, occasional convulsions (especially in infants) and spastic paralysis. There is no evidence to suggest that Saint Louis encephalitis can be spread from person to person or from animal to person.

Table 1

Flying Insect Information

Organism	Description	Habitat	Problem	Severity	Protection
Hornet	One inch long with some body hair. Abdomen is mostly black.	Round, paper like nest hanging from trees, shrubs, or under eaves of buildings.	One nest may contain up to 100,000 hornets that will attack in force at the slightest provocation.	Severe pain, allergic reactions similar to bees.	Do not come near or disturb nest. If a hornet investigates you, do not move.
Mosquito	Small, dark, fragile body with transparent wings. From 1/8 to 1/4 inch long.	Where water is available for breeding.	Bites and sucks blood. Itching and swelling result.	Can transmit encephalitis and other diseases. Scratching causes secondary infections.	Use plenty of insect repellant and wear gloves. Stay in windy areas.
Wasp	Very thin waist. Color can be black, yellow or orange with stripes.	Underground nest. Paper-like honeycomb nest in abandoned buildings hollow trees, etc.	Stings. Some species will attack if you get too close to the nest.	Severe pain, allergic reactions similar to bees. Can be fatal.	Avoid Nest. Do not swat at them.
Bee	Generally have yellow and black stripes and two pair of wings.	Hollow logs, underground nest, old buildings,	Stings when annoyed. Leaves venom sac in victim.	If person is allergic, nausea, shock, constriction of the airway can result. Death may result.	Be careful and watch where you walk. Cover exposed skin. Avoid areas where bees are swarming. Avoid wearing sweet fragrances and bright clothing. Move slowly or stand still when bees are swarming about you.

Attachment 3
Snakes

Copperhead




Coral



Cottonmouth




Diamondback Rattlesnake




Water Moccasin

The most effective way to prevent snakebites is to avoid snakes in the first place. Personnel should avoid walking at night or in high grass and underbrush. Visual inspection of work areas should be performed prior to activities taking place. The use of leather boots and long pants will be required, since more than half of all bites are on the lower part of the leg. No attempts at killing snakes should be made; many people are bitten in such an attempt.

If a snake bites someone, the following treatment should be initiated:

- Keep patient calm

- Notify emergency medical services
- Wash the wound and keep the affected body part still
- Apply direct pressure to site of bite if bleeding is extreme
- Keep the affected area lower than the heart
- Carry a victim who must be transported, or have him/her walk slowly
- Transport to closest medical facility

Attachment 4
Other Natural Hazards

Alligators

Alligators live in nearly all Louisiana parishes but are most common in the major river drainage basins and large lakes in the southern portion of the state. Most attacks involve animals over six feet long. Alligators become more active in the beginning of March, peaking in May, which is their mating season. Females will nest in June - July, and the eggs will hatch in August and September. Even a small amount of impounded water may contain a large alligator. Twilight and night are prime times for alligator attacks. Never approach an alligator. Always stay at least 30 yards away. Never wade or swim in areas that could contain large alligators. Do not dump food or scraps into or near the water. This can attract alligators. Always be aware of your surroundings and use caution and common sense. If at any time personnel observe alligators at the site they will immediately inform the SSO, who will then notify the rest of the crew and local wildlife personnel.

Feral Animals

Feral animals such as rats or other wildlife may be encountered during fieldwork. Typically, feral animals are as afraid or more afraid of humans and when encountered will run away from human contact. However, if an animal is diseased, injured or tending a nest, they may become aggressive. The most common disease encountered with feral animals is rabies. Signs of a rabies-infected animal include:

- Changes in an animal's behavior;
- General sickness;
- Difficulty swallowing;
- An increase in drool or saliva;
- Wild animals that appear abnormally tame or sick;
- Animals that may bite at everything if excited;
- Difficulty moving or paralysis; and
- Death.

Animals in the early stage of rabies may not have any signs, although they can still infect you if they bite you. The incubation period is the time from the animal bite to when signs appear. In rabies, it is usually 1-3 months. However, it can last as long as several years. Once the virus reaches the brain or spinal cord, signs of the disease appear. **In the event**

an animal is encountered on the site, do not approach it. If it exhibits one or more of the signs listed above, call local wildlife personnel to get as

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SCOPE

This procedure provides guidance for determining appropriate Personal Protective Equipment (PPE) to be worn at the job site, based on new tasks and chemical or physical agents identified in the field. The initial determination for proper PPE is completed as part of development of the HASP.

DEFINITIONS

None.

PROCEDURE

A. The Site Safety Officer will complete a hazard assessment of the tasks involved and identify the appropriate PPE based on the task and the chemical or physical agents involved. The written hazard assessment certification must be documented in the HASP.

B. The Site Safety Officer will communicate to employees the PPE requirements for the tasks involved.

C. The Site Safety Officer will provide PPE that properly fits the employee(s).

D. The site Safety Officer will conduct daily site walks to verify appropriate use of PPE.

E. RCM Health & Safety Coordinator or the Site Safety Officer will provide training to the employees which includes at least the following:

1. When PPE is necessary;
2. What PPE is necessary;
3. How to properly don, doff, adjust and wear PPE;
4. The limitations of the PPE; and
5. The proper care, maintenance, useful life and disposal of the PPE.

F. Re-training by the Site Safety Officer may be required if:

1. Changes at the job site make previous training obsolete.
2. Changes in the types of PPE make previous training obsolete.
3. Inadequacies in an affected employee's knowledge or use of PPE indicate the employee requires additional training.

G. Types of PPE include the following:

1. Eye and Face Protection

a. All eye and face protection must comply with ANSI Z87.1-1989.
b. Safety glasses
   - Side shields must be worn when there is a hazard of flying objects.
   - Prescription glasses must meet the ANSI Z87.1-1989 requirements or must have eye protection over them meeting the ANSI standard requirements.
c. Chemical goggles
d. Face shield

2. Head Protection
   a. All head protection (hard hats) must comply with ANSI Z89.1-1989.

3. Foot Protection

   All foot protection must comply with ANSI Z41-1991.
   a. Safety-toed shoes
   b. Rubber boots or rubber safety-toed boots

4. Hand Protection

   Hand protection must be selected based on the performance characteristics of the hand protection relative to the task(s) to be performed, conditions present, duration of use and the hazards and potential hazards identified. The RCM Health and Safety Coordinator must verify and document selection of appropriate chemical resistant gloves.
   a. Work gloves, such as leather or cotton
   b. Chemical gloves, such as nitrile, neoprene, Viton, butyl rubber
   c. Cut-resistant gloves, such as Kevlar

5. Hearing Protection
   a. Ear plugs
   b. Ear muffs

6. Respiratory Protection (Refer to SOP – 9)

7. Other PPE
   a. Disposable Coveralls
   b. Fire Resistant Clothing

REFERENCES

Regulatory References

- 29 CFR 1910.132, Personal Protective Equipment, General Requirements
- 29 CFR 1910.133, Eye and Face Protection
- 29 CFR 1910.135, Head Protection

- 29 CFR 1910.136, Foot Protection
- 29 CFR 1910.138, Hand Protection

Technical References

- ANSI Z87.1-1989, American National Standard Practice for Occupational and Educational Eye and Face Protection
- ANSI Z89.1-1989, American National Standard for Personal Protection – Protective headwear for Industrial Workers – Requirements
- ANSI Z41-1991, American National Standard for Personal Protection – Protective Footwear

Procedural References

- SOP – 9, Respiratory Protection

REVISION LOG

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SCOPE

This procedure identifies the work practices and regulatory requirements with regard to respiratory protection.

DEFINITIONS

- **Escape Respirators** – Respiratory devices providing protection only during escape from hazardous atmospheres.

- **Hazardous Atmosphere** - (1) Any atmosphere containing a toxic or disease-producing gas, vapor, dust, fume, or mist, either immediately or not immediately dangerous to life or health; or (2) Any oxygen-deficient atmosphere.

- **Immediately Dangerous to Life or Health (IDLH)** – A condition that poses a threat of exposure to airborne contaminants when that exposure is likely to cause death or immediate, or delayed, permanent adverse healths effects, or prevent escape from such an environment.

- **Oxygen Deficient Atmosphere** – An atmosphere containing less than 19.5 percent oxygen by volume.

PROCEDURE

A. The Site Safety Officer must verify that all employees required to wear respiratory protection at the jobsite are qualified (i.e., have completed a medical evaluation, been fit-tested and are trained.)

B. The RCM Health and Safety Coordinator will select respiratory protection based on the hazards at the jobsite. Selection of respiratory protection will be completed as part of the hazard assessment when completing the HASP. If unanticipated conditions are encountered at the jobsite requiring a change in respiratory protection, follow the respiratory protection upgrade process defined Section 5 of in the site specific HASP. Additionally , the Site Safety Officer should contact the RCM Health and Safety Coordinator to re-evaluate PPE requirements

C. Inspection

1. All workers must inspect all non-emergency respirators before each use and during cleaning.
2. The Site Safety Officer must inspect respirators used for emergency use, at least monthly and in accordance with the manufacturer's recommendations, and must check for proper function before and after each use. See Section G of this SOP for situations requiring emergency use respirators.

3. Respirator inspection shall include:
   - Check for tightness of connections.
   - Check condition of inlet coverings, head harness, valves, connecting tubes, harness assembly, hoses, filter, cartridges, canisters, end-of-service-life indicator, electrical components, and shelf-life date(s).
   - Check all rubber and elastomeric parts.
   - Check all air cylinders for proper charge.
   - For respirators maintained for emergency use, the inspection must be documented with the date of the inspection, the name of the inspector, the findings, remedial action taken, and a serial number or other means if identifying the respirator. A tag or label must be affixed to the storage compartment and replaced with a subsequent inspection tag/label.
4. Any respirator that does not pass inspection shall be immediately removed from service to be repaired or replaced.

D. Use

1. No facial hair is allowed which could come between the sealing surface of the face piece and the face, or interfere with the valve function.
2. Eye protection must be worn such that it does not interfere with the face piece seal.
3. Conduct a seal-check (positive and negative pressure) every time the respirator is donned.
4. The Site Safety Officer must evaluate continuing respirator effectiveness
   - Maintain surveillance of work area to assess jobsite conditions and respirator wearer(s) exposure or stress levels have not changed;
   - Direct respirator wearers to leave the work area:
     - to wash their faces and face pieces to prevent eye or face irritation associated with respirator use;
     - if a respirator wearer detects vapor or gas breakthrough, changes in breathing resistance or leakage of the face piece;
     - to replace the respirator filter, cartridge or canister elements.
   - If a respirator wearer detects breakthrough, changes in breathing resistance or leakage, they must replace or repair the respirator before returning to the work area. Change schedules for substances other than particulates will be addressed in the HASP or Job Hazard Analysis.

E. Maintenance

1. Clean and sanitize respirator after each use.
2. If respirators are not assigned, each respirator must be cleaned and sanitized before being used by a different employee.

3. Respirators being used for emergency use shall be cleaned after being used. These respirators must contain a tag or label on them telling the last date they were inspected and who inspected them.
4. Each respirator shall be cleaned in warm water (not exceeding 110^0F or 43^0C) with sanitizers that effectively clean the respirator and contain an antibacterial agent. For additional cleaning procedures, refer to 29 CFR 1910.134, Appendix B-2, Respirator Cleaning Procedures (Mandatory).
5. Replacement of parts or repairs may be done only by persons trained in proper respirator maintenance and assembly.
6. Replacement parts used shall be only those designated specifically for the respirator being repaired.
7. Any respiratory equipment not repairable, must be destroyed and discarded.

F. Site workers must store respirators to protect them from:

1. physical damage including face piece or valve deformation;
2. contamination;
3. dust;
4. sunlight;
5. extreme temperatures;
6. excessive moisture; and
7. damaging chemicals.

G. Special Circumstances (including but not limited to Immediately Dangerous to Life and Health (IDLH) or unknown concentrations)

If the Site Safety Officer or Construction Manager encounters special circumstances in the field which were not anticipated in the HASP, such as an IDLH atmosphere or an atmosphere with unknown concentrations or unknown constituents, contact your RCM Health and Safety Coordinator for assistance. Conditions requiring Self-Contained Breathing Apparatus (SCBA) or airline respiratory protection may require additional medical evaluation, fit-test of a different face piece and additional training. Additionally, when using supplied air, additional criteria apply regarding breathing air quality, quantity and flow. For additional information, refer to 29 CFR 1910.134(i).

REFERENCES

Regulatory References

- 29 CFR 1910.134, Respiratory Protection

Technical References

None

Procedural References

- RCM Health and Safety Program, Appendix B, Section 1

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SCOPE

This procedure identifies the work practices and regulatory requirements regarding drum handling at the jobsite.

DEFINITIONS

None.

PROCEDURE

A. When handling drums, follow the general drum handling requirements listed below:

1. Hazardous substances and contaminated, liquids and other residues must be handled, transported, labeled, and disposed of in accordance with 29 CFR 1910.120(j).
2. When practical, drums and containers must be inspected and their integrity must be assured prior to being moved.
3. Unlabeled drums and containers must be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled.
4. Drums must be handled only if necessary. Prior to handling, all personnel should be warned about the hazards of handling and instructed to minimize handling as much as possible.
5. Drums and containers that cannot be moved without rupture, leakage, or spillage must be emptied into a sound container using a device classified for the material being transferred.
6. A ground-penetrating system or other type of detection system or device will be used to estimate the location and depth of buried drums or containers.
7. Soil or covering material must be removed with caution to prevent drum or container rupture.
8. Fire extinguishing equipment meeting the requirements of 29 CFR Part 1910, Subpart L, must be on hand and ready for use to control incipient fires.

B. When opening drums and containers, such as for sampling or waste characterization purposes, handling shock sensitive wastes, radioactive wastes, or when shipping drums, the RCM Health and Safety Coordinator must develop a site specific drum handling plan to be included in the HASP

REFERENCES

Regulatory References

- 29 CFR 1910.120(j), Handling Drums and Containers

- 29 CFR 1926.65(j), Handling Drums and Containers

Technical References
None

Procedural References
- ERM Corporate Health and Safety Program, Drum/Container/Cylinder Handling Procedures

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19.0 PROCEDURES FOR THE COLLECTION OF ENVIRONMENTAL SAMPLES

The following discussion of procedures for the collection of environmental samples is divided into seven subsections. The first subsection discusses discrete and composite samples. The other subsection includes procedures for the sample collection of the following media: ground water, surface water, soils, sediment, biological and non-routine media.

19.1.1 TWO TYPES OF ENVIRONMENTAL SAMPLES

There are two general types of samples that can be collected: discrete (grab samples and composite samples. These types apply to all different sampling media. Discrete samples are collected at a single point in time, from a single location or over a discrete depth interval. Composite samples are taken from several different locations and depths, at several different times, or over a certain amount of water flow.

19.1.1 Discrete (Grab) Samples

Discrete samples must be collected under the same conditions for all constituents. All the water volume needed for a discrete monitoring well sample must be collected from the same depth in a well.

- If more than one bailer full of water is necessary to fill the appropriate sample containers, then care must be exercised that the bailer is lowered to the same level in the well each time.

- Discrete soil samples must, likewise, be collected from the same depth and location at each sampling point.

- Discrete surface water samples must be collected from the same location and at one depth, to fill all the necessary sample containers.

19.1.2 Composite Samples

Samples can be composited based on sample volume, sample depth, sample weight, flow rates or time. Regardless of the criteria

determining the frequency of sample collection and the media being sampled, basic rules apply to all composite samples.

- Samples to be analyzed for volatile organic compounds (VOCs) cannot be composited. Because compositing involves combining of the individual sub sample and this usually involves extra exposure to the air. Volatile organic constituents are lost in the compositing process.
- Regardless of the media, equal parcels of sub-sample must be combined to form the composite. This may mean equal volumes of water from each sub-sample or equal weights of soil or sediment. For composites based on time or flow rates, equal volumes must be collected over constant intervals between sub samples.
- Care must be exercised to insure that any sample implements used in the compositing process are thoroughly decontaminated, so that the representatives of each sub-sample are maintained.

The above guidelines can be applied to the collection of any of the six types of samples that are described in the following sections.

19.2 GROUND WATER SAMPLING

There are three types of wells from which ground water samples may be obtained; temporary wells, monitoring wells or residential wells, and municipal wells. Sampling from each of these will require the collection of different types of pre-sampling information and sampling equipment, as well as different sampling procedures. The sampling of monitoring wells is further divided into three subsections: (1) preparation for sampling; (2) well evacuation (purging); and (3) sample collection.

19.3 MONITORING WELLS

19.3.1 Preparation of Sampling

Prior to going to a Site, it is important to know the specifics of well construction, including:

- well construction logs (if available);
- inside diameter of the well casting;

- total depth of well;
- depth to the screened portion of the well;
- screen length; and
- the material used in the construction of the well and well screen.

Prior to sampling, it is imperative to locate all the wells on a Site map and determine the order in which each well will be sampled. If water quality information is available, the sampling order should proceed from the least contaminated to most contaminated well. Direction of anticipated or known ground water flow can be used to determine sampling order where no water quality information is available. Wells up-gradient of the source area should be sampled first, then proceed from the wells farthest down-gradient and work towards the source area.

The following is a list of equipment which may be needed when evacuating and sampling monitoring wells:

- Sampling and Health & Safety Plans, and other Site specific documentation and information.
- Appropriate sample containers.
- Coolers and ice for sample preservation**.**
- Meters, probes and standards for field measurements.
- Pumps and/or bailers and associated tubing. The type of pump should be selected based on type of groundwater sampling (standard or low-flow sampling).
- Water quality meter with flow cell and separate turbidity meter (for low flow-sampling only).
- Proper PPE.
- Appropriate quality control blanks. The type and number of blanks should be established with the project manager.
- Chain-of-Custody labels, tags, and traffic report forms.
- Decontamination solutions/water. These will be used for decontaminating all equipment that comes into contact with the monitoring well and samples.

- Keys. Many monitoring wells will have locking caps and keys will be necessary to gain access. In addition, some Sites may be secured or may have a guard on duty, in which case keys and/or permission may be necessary.
- Tools to assist in well access. These may include a turkey baster, screw drivers, hammers, chisels, pipe wrenches, bolt cutters, or possibly a propane torch. These may be necessary for removing standing water within the well protective casing or removing steel security caps on wells which have not been recently opened.
- Tape measure graduated in tenths and hundredths of feet. A tape measure may be useful for measuring the diameter of the well casing and the elevation of the well casing above ground level.
- Electronic water level indicator/graduated depth sounder and/or Interface Probe. These may be necessary for determining the static water level, thickness of floating product and the total depth of the well, if it is unknown.
- Pocket calculator. This may be used for determining the volume of water within the well which, in turn, will be used for calculating the volume of water to be evacuated.
- Five gallon buckets for purge water containment.
- Log book and permanent ink marker. This is for recording information pertinent to the sampling procedures used and observations on the environmental conditions at the time of sampling.
- Appropriate Groundwater Sampling Forms.
- Thermally insulated cooler meters, photo-ionization detector (PID), etc.
- Thermally insulated cooler.

19.3.2 Well Evacuation (Purging)

For standard groundwater sampling, it will be necessary to determine the volume of water being held in the well casing, prior to evacuating the well. The calculation of the well volume should be conducted as follows:

- Measure well casing inside diameter.

- Determine the static water level. This should be measured to the nearest one-hundredth of a foot below the measuring point evaluation. The top of the casing should be used as the measuring point and marked to standardize its location. (Note: The water level indicator must be cleaned before use in each well).
- Determine the total depth of the well from the measuring point.
- Calculate the number of linear feet of static water (total depth of the well minus the static water level.)
- Calculate the static volume in gallons ($\pi x r^2 x h x 7.48$ gal/ft^3).

  Where:
  π = 3.14
  r = radius of well in feet
  h = number of linear feet in static water

- Refer to Groundwater Sampling Record form for well volume conversion.

It is ERM's policy that three well volumes be evacuated prior to sample collection or the stabilizing of low flow parameters. In most cases, removal of three well volumes should ensure the collection of a representative sample not influenced by stagnant water remaining in the well casing, and yet not result in over-pumping of the well. The latter can cause diluted or more concentrated ground water from another area within the aquifer to be pulled into the well. If the well goes dry during evacuation, allow it to recover and re-evacuate, if possible, until at least one and one-half volume's are purged.

For low flow sampling, the following parameters should be recorded on the Groundwater Sampling Record at 5-minute intervals from within the flow cell during the purging process:

- depth to static water;
- flow rate;
- temperature;
- pH;
- specific conductivity;
- dissolved oxygen (DO);

- oxidation reduction potential (ORP); and
- turbidity (measured with a separate turbidity meter).

During the purging process, the flow rate should be adjusted as to not lower the static water level (between 100 and 500 ml/minute). The groundwater sample can be collected when the following conditions are met over three consecutive measurements:

- the static water is stable (drawdown is less than 0.10-meters or 0.30-feet);
- pH (± 0.1 standard units);
- specific conductivity (± 3% µs/second);
- DO (± 10% mg/l);
- ORP (± 10 mv); and
- turbidity (± 10% NTU).

19.3.3 Sample Acquisition

The following procedure is recommended for obtaining ground water samples from monitoring wells:

- If a pump has been used to purge the well, the tubing and pump must be removed from the well and decontaminated and/or stored in an appropriately labeled container if each is to be dedicated to the particular well. The pump used for evacuation must be dismantled and cleaned, if necessary.
- If a bailer has been used to purge the well, a previously cleaned or new second bailer must be used to obtain the sample.
- Whenever possible, before any samples are collected, the well must be allowed to recover so that there is enough water in it to collect all the necessary sample volume. It is extremely important that whatever instrument is used to check the depth to water be thoroughly decontaminated before being used in the well between purging and sampling.
- The bailer used for collecting the sample should be lowered into the well, retrieved, and emptied once to ensure that the bailer has been rinsed of any decontamination fluids.

- When collecting the ground water needed for filling the sample bottles, the bailer should be gently lowered sufficiently into the water column to collect a sample unaffected by equilibration with the atmosphere (approximately ten feet, if possible), jerked gently to insure the ball valve is closed, and retrieved at a steady rate to the surface.
- When transferring the water from the bailer to the sample containers, care must be taken to avoid agitation to the sample which will promote the loss of volatile constituents, and promote chemical oxidation. Sample bottles for volatile constituents should be collected first.
- If a Teflon® or Stainless Steel bailer is not dedicated to a specific well, it must be thoroughly decontaminated between wells. Again, all equipment and materials coming into the contact with the inside casing of the wells or the ground water must be decontaminated between use. PVC bailers should not be used to sample more than one well, regardless of the decontamination procedure.

The geochemistry of ground water is such that exposure of ground water samples to atmospheric conditions can results in substantial loss of sample integrity. Therefore, it is necessary that upon collection, the samples are prepared, preserved, and stored in such a manner as to prevent any changes in sample chemistry.

19.4 SURFACE WATER SAMPLING

Surface water sampling may include the sampling of streams, rivers, ponds or lakes. Prior to sampling, the surface water drainage in and around the area to be studied should be characterized using all available background information, including topographic maps and aerial photographs. As with all sampling procedures, an initial survey of the Site should be conducted to verify sampling locations. This Site survey will help to identify any special equipment, personnel safety or other factors specific to the Site. Needed background information includes the depth of the surface water body, flow rate, and overall position of the sampling point and/or stream or tributary in the stream basin. Also, it is recommended that stream characteristics, such as stagnation zones or mixing zones which might affect the distribution or volatilization of constituents in the water, be noted.

The following is a recommended list of surface water sampling equipment and accessories:

- Sampling and HASP, and other Site specific documentation and information.
- Appropriate sample containers.
- Log book and permanent ink marker.
- Meters, probes, and standards for in situ measurements.
- Appropriate quality control blanks. The type and number of blanks should be established with the project manager
- Chain-of-Custody labels, tags, and traffic report forms.
- Flow and velocity estimation devices.
- Proper sampling devices.
- Decontamination solutions/water. These will be used for decontaminating all equipment that comes into contact with the sample.
- Buckets, plastic wash basins, scrub brushes, and sponges for cleaning.
- Camera, for use in documenting sampling procedure and sample location.
- Surface water sampling form.
- Proper PPE (boots, hip boots, waders, gloves, etc.).
- Thermally insulated cooler.

Surface water sampling involves immersing the sample container into the body of water. The following suggestions are made to help ensure that the samples obtained are representative of the body of water being sampled.

- Generally, the most representative samples of streams or rivers are obtained at mid-channel, and one-half of the stream depth.
- Stagnated areas in streams or rivers might contain zones of contaminant concentration, depending upon the physical/chemical properties of the contaminants and the position of these stagnated waters relative to the source of contamination.

- When sampling a stream, proceed from downstream to upstream stations to avoid releasing contaminants into the water from bottom sediments.
- For unpreserved sample containers, rinse them three times with water to be sampled before the sample is taken. Fill preserved sample containers using one which was not preserved. Do not collect surface water samples directly into preserved containers.
- Sampling must begin at the suspected zones of lowest contamination and proceed towards to the zones of highest contamination (except in streams).
- When sampling a pond or other large standing body of water, the surface area may be divided into grids. A series of samples may be taken from each grid and combined into one sample (a composite) or separate samples may be obtained from several grid locations at random.
- A composite sampler may be used to collect a composite sample at a specific location over time or proportional to flow.
- Sample bottles for volatile constituents should be collected first. Care should be taken to avoid excessive agitation of the water which can result in the loss of volatile constituents.
- Do not take a surface water sample at the surface/water interface unless sampling specifically for a know constituent which is immiscible with water. Instead, the sample collection device should be inverted, lowered to one-half the water depth, and held at a 45-degree angle with the mouth of the bottle facing upstream.

19.5 SEDIMENT SAMPLING

Caution must be taken to obtain samples which will be representative of the contaminants of interest versus the sediment materials present. A review of background information may give an indication of the type of constituents present in the sediments and the type of sediments to be collected. It is important to consider the following:

- Constituents which may have affinities for particular sediment types.

- Hydrogeological information which may help establish a relationship between the contaminant source and the contaminants in the sediment.
- Several sediment samples should be obtained from the area nearest the suspected contaminant point source. The samples should also be collected from various types of materials near the source to determine the relationship of the contaminants to the sediment material.
- Samples should be collected progressing from downstream to upstream to prevent the release of potentially contaminated sediments from one sampling station to another further downstream.

When developing a sampling plan for the collection of sediments from small streams or surface drainage ways. It is important to address possible effects of runoff which my have occurred many years prior to the time of sampling. Consequently, it is often insufficient to test only the surface sediments because erosion and deposition of additional stream bed sediments in the intervening years could have formed a cover of uncontaminated surface sediments over potentially contaminated sediments.

The following procedures are recommended for the collection of sediment samples from small streams:

- Assess which side of the stream received contaminated sediments from overland flow and collect samples on that side of the stream from mid-stream to the stream bank.
- Using a shovel, trowel, core or bucket sampler, collect a surface grab or composite sample of the top six inches of sediment.
- At these same locations, collect another grab or composite sample at an approximate depth of 6 to 12-inches.
- When collecting composite samples, the number of samples collected at each location should be proportionate to the stream width (i.e., three samples from a six-foot wide stream should be sufficient to characterize sediment quality).

When sampling from large rivers, ponds or lakes, it may be necessary to lay out a visual or surveyed grid, if possible, and collect grab, composite samples or collect grab samples from either random or regular locations within the grid.

The following is a list of recommended sediment sampling equipment:

- Sampling and HASP, and other Site specific documentation and information.
- Appropriate sample containers.
- Log book and permanent-ink marker. This is for recording information pertinent to the sampling procedures used and observations on the environmental conditions at the time of sampling.
- Sediment sample form and appropriate figures, maps, etc.
- Sampling devices. Sample devices may range from the sample container and a trowel, to more elaborate power-driven devices.
- Decontamination solutions/water. These will be used for decontamination all equipment that comes into contact with the sediment and the sampling devices.
- Proper PPE.
- Buckets, wash bins, scrub brushes, and sponges. These will be used for cleaning of all contaminated materials.
- Camera. For use in documenting sampling procedures and sample locations.
- Meters, PID, etc.
- Thermally insulated cooler.

Very simple techniques can usually be employed in collecting sediment samples. Below are some suggested techniques for sediment sampling.

- As previously mentioned, in small, low-flowing streams or surface water drains near the stream bank, a hand operated bucket auger may be used to scrape up sediments. The sediment must be dewatered as much as possible so as not to reflect soluble concentrations in the water.
- To obtain sediments from larger streams or further from the shore of a pond or lake, a beaker attached to a telescoping aluminum pole means of a clamp may be used to dredge sediments.

- To obtain sediments from rivers or in deeper lakes and ponds, a spring-loaded sediment dredge or benthic sampler may be used. Several types of sediment core samplers exist for specialized sampling of sediments.

All of the equipment used should be decontaminated between the sampling stations using the procedures described in the following section.

19.6 SOIL SAMPLING

There are two types of soil samples; surface and subsurface. In most cases, both types will be collected as grab samples. In some cases composite sampling may be useful for obtaining data about contamination over a wide area. This provides a rough estimate of the overall extent and magnitude of contamination, while reducing the analytical costs. However, when composite sampling, it is important that extreme care be taken in documenting the location and depth of the composites. Samples for VOC analysis cannot be composited, they must be collected as grab samples.

19.6.1 Surface Soil

There are three possible scenarios for the collection of surface soil samples over a large area:

- The total area may be divided by a grid system to identify specific sampling locations.
- If the area is large and if complete characterization is required, a random sampling approach may be used to reduce the number of samples. In this instance the area is laid out in a grid and sample locations determined randomly.
- An extremely large study area can also be divided by grids with soil samples being compostied from several locations within the grid.

The list of equipment necessary for the collection of surface soil samples may be minimal, depending upon the analytical parameters to be determined. The sampling devices may be constructed of PVC or linear polyethylene, Teflon, or stainless steel, depending upon the parameters of interest. The following is a list of equipment necessary for the collection of surface soil samples:

- Sampling and HASP, and other Site specific documentation and information.
- Appropriate sample containers
- Log book and permanent-ink marker. This is for recording information pertinent to the sampling procedures used and information on environmental conditions at the time of sampling.
- Chain-of-custody, labels, tags and traffic report forms.
- Sampling devices. Generally, these include a scoop or hand trowel constructed of appropriate material. However, in some cases, shovels, picks, hoes, and/or hand augers may be necessary.
- Decontamination solutions/water. These will be used for decontamination equipment.
- Buckets, plastics wash basins, scrub brushes, and sponges. These will be used in the cleaning of contaminated equipment.
- Camera, for use in documenting sampling procedures and sample locations.
- Meters, PID, etc.
- Thermally insulated cooler.

Grab samples of surface soils are collected by placing the scooped or troweled sample into an appropriately sized sample bottle. Composite soil sampling requires considerably more caution. Depending upon the number of samples to be collected and the area to be covered, the soil samples from various areas should be placed into appropriately sized aliquot taken. It is important that the volume of soil from each location be as identical as possible. When possible, it is recommended that composite soil sampling only be conducted when the solids are relatively dry. Wet soils are very difficult to work with, thus making the collection of a representative composite sample difficult. Since it is necessary to split the samples and expose them to the atmosphere prior to storage, it is impossible to collect representative composite soil samples for volatile organic analysis. For volatile organic samples, the soil must be taken from the ground and immediately place in a four ounce jar, with no headspace, and the lid must be screwed on tightly. All samples must be cooled immediately after collection.

19.6.2 Subsurface Soil

Subsurface soils can be collected either as grab or composite samples. The same precautions for composite sampling of surface soils apply to the compositing of subsurface soils. Although this document does not generally discuss safety factors involved in the collection of samples, it is important at this point to note that the collection of subsurface soil samples can constitute a substantial safety hazard. The most important safety factor involved is the avoidance of buried containers, pockets of highly contaminated material, and underground utilities such as electric lines, gas pipelines, water mains, etc. A thorough background information search should be completed before obtaining subsurface samples including implementing ERM's subsurface utility policy. Utilities must be also cleared through DigSafe or an equivalent agency.

Generally, the problems encountered in the collection of subsurface soil samples are similar to those encountered in the collection of surface soil samples. Additionally, subsurface sampling must also address the depths from which the samples will be obtained. The overall approach is similar to that discussed previously for surface sampling, considering the aspects of grid systems and random versus specific sampling locations. The depths at which samples are to be taken will depend upon the suspected contaminants, their general mobility's, and the method by which they have entered the subsurface environment. Generally, subsurface samples by hand-operated equipment and deep subsurface samples by use of a drilling rig or backhoe.

The following is a list of recommended equipment for sampling subsurface soils:

- sampling health and safety plans, and other Site specific documentation and information;
- appropriate sample containers;
- chain-of-custody labels, tags, and traffic report forms;
- log book and indelible ink marker - this is for recording observations on the environmental conditions at the time of sampling and the location;
- soil sample record, boring logs, etc.;

- sampling devices (depending upon the sampling methods);
- decontamination solutions/water - these will be used for decontamination all equipment that comes into contact with the solids and the inside of the casing or auger flights;
- buckets, wash basins, scrub brushes, and sponges - these will be used for equipment decontamination;
- steam cleaner – this should be used when attempting to decontamination large pieces of equipment such as auger flights;
- camera - this will be used for use in documenting sampling procedures and sample locations;
- proper PPE;
- meters, (PID, etc.); and
- thermally insulated cooler.

Depending upon the depth and type of samples to be collected, a variety of methods are available for sampling subsurface soils. These include:

- A shovel which may be used to depths of several inches or several feet, depending on soil types.
- A hand auger may be used to collect subsurface samples at depths up to 4 to 5-feet; however, it mixes and thus destroys the cohesive structure and stratigraphic character of the solid preventing detailed soil description. A hand-driven soil probe (ESP) provides a means to obtain somewhat undistributed core samples. The depth will again be limited by the soil type.
- Drill rig-operated sampling devices. These may be placed into two categories; hollow stem augers or Geoprobe. With hollow stem augers, either split spoon or Shelby tube can be used for sample collection. With a Geoprobe, a macro core sample can be obtained within a disposable acetate liner.
- Soil samples may be collected from a backhoe trench or excavation. To collect samples from the pit, a long handled bucket auger or the backhoe bucket may be used to collect the soil from the desired depth interval. Although it should be avoided whenever possible for safety reasons, samples could also be collected by hand, with a trowel, directly from the sides of the pit.

Proper decontamination procedures should be used in cleaning all the soil sampling equipment.

19.7 Biological Sampling

19.7.1 Sample Collection

The collection of biological specimens from aquatic and terrestrial habitats may require local, state or federal licenses and/or permit. The presence of any rare, threatened, endangered species or species of special concern may also impose sampling restrictions as to types of organisms which may be harvested; the methods used to collect the samples; the area where the sampling can be conducted; and the time of the year sampling can be conducted. At the minimum, the appropriate state and/or federal agencies should be contacted to determine if any permits or licenses are required as well as to determine any restrictions which may apply.

The collection of biological samples may range from hand collection of specimens to synoptic deep sea surveys. Caution must be taken in many cases in transit to the sampling Site or in harvesting the organism in that dangerous organisms may be encountered en-route or be contained in the sample. Some types of animals (such as snapping turtles, snakes, and stingrays) can react in an unpleasant manner when threatened or trapped.

Collection in deep aquatic habitats requires appropriate personal safety equipment and adherence to the practice of safe seamanship. The use of untended equipment such as gill nets and trap nets may require the use of marking buoys to prevent boating mishaps. The use of untended equipment may require permission from the Coast Guard or marine police, especially in high traffic areas or where the deployed equipment may restrict passage. The local waterway authority should be made aware of the use of any fixed, untended sampling equipment.

A review of the Site background information may give an indication of the types of conditions which will be encountered. This will be incorporated into the sampling plan. A reconnaissance survey prior to the completion of the sampling plan generally has merit by more clearly defining Site specific restrictions, unique habitats, or habitats of special concern, accessibility, and other

features which could be considered in formulating the sampling plan.

Sampling station locations have to be determined. In terrestrial situations and in some aquatic situations, it may be necessary to lay out a visual or surveyed tract of grid. Open ocean or large lake sampling may require the use of electronic navigation equipment. For repeat sampling at the same location(s), the use of unobtrusive markers will facilitate station locations. All markers are to be removed upon completion of the final round of sampling.

After determining the objectives of the biological sampling program, Site conditions, types of organisms to be collected, specimen use, statistical considerations and access to sampling locations, a sampling plan can be prepared. In tidal aquatic systems, tidal stage may be an important component of the sampling plan. The following is a generic list of recommended biological sampling equipment. In some cases, collection in a contaminated environment will require decontamination of the equipment.

- sampling health and safety plans, and other Site specific documentation and information;
- appropriate sample containers;
- chain-of-custody labels, tags, and traffic report forms;
- waterproof labels;
- log book and permanent ink marker - this is for recording information pertinent to the sampling procedures used and observation on the environmental conditions at the time of sampling;
- sampling forms;
- topographic sheet or map of the study area to locate stations;
- sampling devices - may range from the sample container and a clean pair of forceps, to more elaborate devices;
- decontamination solutions/water - these will be used for decontaminating all equipment that comes in contact with contaminated soils, sediment or water;
- buckets, wash basins, scrub brushes, and sponges - these will be used for cleaning of all contaminated materials;

- camera - for use in documenting sampling procedures and sample locations; and
- proper PPE.

The sampling techniques that are employed depend on the type of material to be collected. Following are some suggested techniques:

- Terrestrial plants – For annual plants, the entire aerial portion may be harvested using shears or a knife. Larger plants may require, in addition to shears and knife, a saw or increment borer. Collection of fruits and nuts generally will be done by hand.
- Terrestrial animals – For small animals several types of traps can be used including live traps and museum traps. Larger animals may require the use of a gun for capture.
- Aquatic plants – Rooted aquatic plants generally are found in shallow water where they can be harvested by hand. Phytoplankton may be concentrated from water column samples by sedimentation, centrifugation or filtration.
- Benthos – In shallow aquatic environments, the benthos may be sampled by using a Surber sampler, excavation and screening of a measured area of bottom, or by hand in rocky bottoms where the individual stones can be picked up slowly and the attached organisms dislodged with a stream of water. Deeper water sampling is generally done using various types of dredges such as an Ekman dredge, or with small biological trawl (SBT) which is towed by a vessel.

After a dredge sample has been secured, the sediments sample should be inspected carefully before accepted. The following acceptability criteria should be satisfied.

- Sediment is not extruded from the upper surface of the sampler such that organisms may have been lost.
- Overlying water is present indicating minimal leakage.
- The sediment surface is relatively flat, indicating minimal disturbance on winnowing.
- The entire surface of the sample is included in the sampler.
- The following penetration depths are achieved:
    - 4 to 5-centimeters (cm) for medium-coarse sand;
    - 6 to 7-cm for fine sand; and

- less than 10-cm for muddy sediment.

Nekton – Fish can be captured using a number of gear types ranging from rod and reel towed trawls. Active sampling techniques are generally less selective and more efficient, but usually require more equipment and man power. Active sampling techniques include the use of seines, trawls, electro fishing, chemical fishing and rod and reel. Passive sampling techniques are generally less labor intensive and generally more selective in the size and types of organisms captured and as such may not obtain a representative sample of the total population. Passive techniques include entanglement nets (gill and trammel nets) and entrapment devices (hoop nets, fyke nets and various types of traps). The appropriate gear type(s), and collection/development protocols will be determined by the fisheries biologist.

Zooplankton – Zooplankton are generally collects by filtering water through and appropriately sized plankton net. The net may by towed through the water or water pumped through the net. The use of a metered pump provides a more accurate estimation of the population. While towing generally provides a semi-quantitative estimate in that the volume of water passing through the net is not as well quantified. Several towing methods can be used. The speed of the craft should be adjusted and held constant so that a constant wire angle is maintained. The sample depth equals the amount of wire extended times the cosine of the wire angle. Oblique tows (more than one depth during a single tow) provide a composite of the zooplankton population in the water column. Horizontal tows sample the zooplankton in a particular water column. Horizontal tows sample the zooplankton in a particular layer of the water column. At the minimum, duplicate samples should be collected.

Net size(s) will be selected by the fisheries biologist. The following sizes are routinely used:

- No. 6 (0.239-millimeters (mm)) adult copepods, ichthyoplankton;
- No. 10 (0.158-mm) copepodites, microcrustanceans; and
- No. 20 (0.076-mm) rotifers, nauplii.

19.7.2 Biologic Sample Preservation

Special considerations must be used in the preservation of biologic samples. Generally, ten percent buffered (sodium tetra borate) formalin is the most commonly used chemical preservative. To prepare a ten percent buffered formalin solution, add 4-ounces (oz) of borax to each gallon of one-hundred percent formalin (i.e., a fourty-percent solution of formaldehyde in water). Allow the borax to settle and use the clear supernatant (one-hundred percent formalin) to make the nine (water): one (one-hundred percent formalin) dilution. Formalin solutions should not be exposed to freezing temperature because the formalin will degrade into paraformaldehyde and will have to be discarded.

Larger specimens may require injection of perfusion (opening of the abdominal cavity to allow for quick preservative penetration of deep organs and tissues). The fisheries biologist or wildlife biologist will indicate a minimum size of specimen where special preservative methods will be required.

Certain types of samples such as phytoplankton may require alternate preservation techniques. In some cases, the specimen(s) may have to be narcotized or relaxed prior to fixation to facilitate taxonomic identification by reducing the tendency of organisms to distort their shape or automize when exposed to the preservative. The appropriate safety precautions are to be followed during the use of any preservative, relaxant or narcotic.

Any specimen/sample to be subject to chemical analysis should only come in contact with analytically clean surfaces and instruments during all stages of handling, transport, and sample preparation (such as removal of target tissue or organ). Any surface used in analytical sample preparation or storage should be pre-cleaned with pesticide grade acetone or other appropriate solvents and air dried prior to coming in contact with the sample.

19.8 DRUM SAMPLING

Drum sampling involves the sampling of a wide variety of sampling media including water, solids, oil and sludge. The method of sample collection should be adjusted as appropriate. Sampling is usually associated with waste characterization. There are two types of drum samples; grab and composite. In most cases, samples will be grab samples. In some cases, composite sampling may be useful for obtaining data about contamination for the entire

contents of the drum. However, when composite sampling, it is important that extreme care be taken in documenting the location and depth of the composites. Samples for VOC analysis cannot be composited, they must be collected as grab samples.

19.8.1 Water

If the drum contains water, the procedures for sampling a surface water body should be followed; however, the use of a drum sampler is recommended.

19.8.2 Solids

If the drum contains solid material, the procedures for sampling surficial soil should be followed.

19.8.3 Oil

If the drum contains oil, the procedures for sampling a surface water body should be followed; however, the use of a drum sampler is recommended.

19.8.4 Sludge

If the drum contains sludge, the procedures for sampling a surface water body should be followed.

The following is a list of recommended equipment for sampling drums:

- Sampling Health and safety plans, and other Site specific documentation and information.
- Appropriate sample containers.
- Chain-of-custody, labels, tags and traffic report forms.
- Log book and permanent ink marker. This is for recording observations on the environmental conditions at the time of the sampling and the location.
- Drum sample record.
- Sampling devices (depending upon the sampling methods).

- Decontamination solutions/water. These will be used for decontamination of all equipment that comes into contact with the solids and the inside of the casing or auger flights.
- Buckets, wash basins, scrub brushes and sponges. These will be used for equipment decontamination.
- Steam cleaner. A steam clean should be used when attempting to decontaminate large pieces of equipment such as auger flights.

Attachment E
Excavation Policy and Procedures

EXCAVATION, TRENCHING, SHORING AND PERMIT-REQUIRED CONFINED SPACE ENTRY

The main concerns of trenching and excavation are ground control and fall prevention. Before an excavation is made, a thorough effort shall be made to determine whether underground utilities (such as sewer, telephone, gas, fuel, water or electrical conductors) or aboveground hazards may be encountered. Underground utility lines shall be properly supported during excavation. Where appropriate, the respective utility companies shall be informed of the proposed Site Work and consulted to receive any additional advice based on their experience. Natural hazards, such as boulders and trees, shall be removed or controlled before excavation begins if there is a potential hazard to workers.

Very specific guidelines exist to protect employees from uncontrolled ground movement during excavation. The guidelines are based on ground type and excavation depth. The walls and faces of all excavations to which employees are exposed shall be guarded by a shoring system or sloping of the ground. All slopes shall be excavated to the degree required in Table P-1, which is based on soil type and the ground's unique ability to slide (see Table P-1).

TABLE P-1
Maximum Allowable Sloping Requirements*

Type	Maximum Allowable Slope
Stable Rock	Vertical (90˚)
Type A	3/4:1 (53˚)
Type B	1:1 (45˚)
Type C	1-1/2:1 (34˚)

* Sloping for excavations greater than twenty feet in depth shall be designed by a New York State registered professional engineer.

Soil types are based on cohesiveness (exhibiting cohesion). A cohesive soil is one which is hard to break up when dry and exhibits significant cohesion when submerged. Soil types may be defined as:

Stable Rock - natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

Type A soil - Soil which has an unconfined compressive strength of 1.5 tons per square foot (tsf). This includes cohesive soils such as clay, silty clay, sandy clay and clay loam. No cohesive soil is Type A if:

- soil is fissured;
- subject to vibration;
- has been previously disturbed;
- part of a sloped, layered system which dips into the excavation on a slope of four horizontal to one vertical; and
- other factors require it to be classified otherwise.

3. Type B Soil - Soil which is a cohesive soil with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf. This includes all soils classified as silt, angular gravel, silt loam, sand loam and all type A soils previously disturbed. Dry rock that is not stable will be considered type B soil. Soil as well as material that is part of a layered system where the layers dip into the excavation on a slope less than four horizontal to one vertical, but only if material is classified as type B.

4. Type C Soil - Soil which has an unconfined compressive strength of 0.5 tsf or less.

   Type C soil includes:

   - Granular soils including gravel, sand or loamy sand.
   - Submerged soil or soil from which water is freely seeping.
   - Submerged rock, which is not stable.

- Material in a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical or steeper.

Each soil and rock deposit shall be classified by a competent person as stable rock or one of the soil types described above.

The Contractor shall ensure that a competent person is assigned to the Site during all excavating activities, i.e., sloping, shoring or working within excavations. A competent person is defined as one who is capable of identifying existing and predictable hazards, or working conditions which are unsanitary, hazardous or dangerous to employees and has authorization to take prompt corrective measures to eliminate them. The Contractor shall identify the competent person and submit the competent person's qualifications to the Engineer. A competent person shall perform daily inspection of excavations and adjacent areas. Inspections shall be concerned with possible cave in, failure of protective systems, hazardous atmospheres or other hazardous conditions. Where a competent person finds evidence of such hazards, Contractor employees shall be evacuated from the excavation until the unsafe condition is corrected.

A vibration from nearby railroad, highway traffic or heavy equipment requires the side of the excavation to be braced to resist the additional force from such loads. A warning system shall be in place when movable equipment is operated next to an edge of an excavation and the operator does not have clear or direct view of the edge. Warning systems may be barricades, hand or mechanical signals or stop logs.

No entry into an excavation in which there is accumulated water will be allowed unless adequate precautions are taken. Safety harness with attached line shall be worn at all times in excavations over four feet. Precautions include the removal of water by pumps and the diversion of any surface water by berms, dikes, ditches or plastic sheeting.

If excavations are to be performed near a wall or building and may compromise its stability, a registered professional engineer shall evaluate the wall or building and ensure its stability accordingly. Stability may be achieved by designing a bracing system if necessary. If bracing is not necessary, the registered professional engineer shall indicate in writing a bracing system is not required.

Excavated material shall be kept at least two feet from the edges of all excavations.

Excavations less than 20 feet in depth occurring in type C soil may be sloped at an angle no greater than 34 degrees measured from the horizontal plane. Excavations less than 20 feet in depth occurring in type B soil may be sloped 45 degrees measured from the horizontal plane. A registered professional engineer must approve sloping of excavations greater than 20 feet in depth.

The Contractor may use tabulated data for slope design. The tabulated data must be in written form and shall include identification of the parameters, limits of use, and identify the New York State-registered professional engineer (PE) who approved the data. A copy of the tabulated data identifying the New York State registered PE will remain on-Site during construction activities. A sloping system designed and approved by a New York State registered PE may be utilized. The written design must illustrate the magnitude of the slope considered safe based on the project. A copy of the approved written design must remain on the job Site until final completion.

Shoring systems, support systems, shield systems and other proactive systems may be used providing such systems are approved by the manufacturer, or by a New York State registered PE using the manufacturer's tabulated data. Deviations from those specifications outlined by the manufacturer or New York State registered PE shall only be made following specific written approval.

If initiated, shoring systems shall be utilized for type B soils at a depth of 5 feet or greater and immediately for type C soils. Shoring systems shall be designed by a manufacturer, New York State-registered PE or be consistent with Attachment 1 of this Appendix (OSHA Minimum Timber Shoring Requirements). All shoring systems used at a depth of 20 feet or greater require approval from a New York State-registered PE.

In excavations greater than 4 feet in depth, ladders must be located every 25 feet and extend three feet over the surface.

Any excavation activities below the ground water table shall be examined and approved in writing by a New York State registered PE.

Attachment F
Map and Directions for Hospital

Google maps

To see all the details that are visible on the screen, use the "Print" link next to the map.



Driving directions to 5300 Military Rd, Lewiston, NY 14092

4001 Packard Rd
Niagara Falls, NY 14303

1. Head **northeast** on **Packard Rd** toward **Ferry Ave**	0.3 mi
2. Take the 1st right onto **Niagara Falls Blvd**	1.1 mi
3. Turn left to merge onto **I-190 N**	5.3 mi
4. Take exit **25A** for **NY-265** toward **Lewiston**	0.1 mi
5. Turn left at **NY-265 N/Military Rd**	0.3 mi

5300 Military Rd
Lewiston, NY 14092

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Map data ©2011 Google

Report a problem

Attachment G
Daily Safety Meeting Form

Daily Safety Meeting Documentation Form

Project Name:	Former No. 2 Mill Facility Soil Excavation
Project Number:0128439	0128439
Meeting Date & Time:	

Document Routing	
SSO	Retain copy in site health & safety file.

1. Who lead the meeting today?

2. What work will be conducted on site today by whom?

Work Task	Conducted By

3. What overlapping operations will occur today?

4. Any follow-up from previous Major Incidents, Near Misses, Unsafe Acts or Unsafe Conditions discussed today?

5. What additional safety topics were covered?

6. Are there any new / short-service personnel on site today?

Daily Safety Meeting Documentation Form

Project Name:	Former No. 2 Mill Facility Soil Excavation
Project Number:0128439	0128439
Meeting Date & Time:	

7. Who attended the safety meeting today?

Name	Company	Signature

Meeting documented by…

Name: _____

Signature: _____

Attachment H
Unsafe Act, and Unsafe Condition Report Form

Unsafe Act / Unsafe Condtion Report Form

Report Type (Check One):	☐ Unsafe Act	☐ Unsafe Condition
Project Name:		
Project Number:		
Report Number:		

Document Routing	
SSO	To PM and RCM Coordinator 24 hours after observance / follow-up. Retain copy in site health & safety file.
PM	After completion to office health & safety file

Name of person who observed event: _____

Observer's employer: _____

1. When did the observation occur?

Date: _____ Time of Day: _____

2. What was observed?

3. Which event categories apply?

☐ Traffic-related	☐ Travel-related	☐ Falls from height	☐ Slips or trips
☐ Bodily Reaction and Exertion	☐ Equipment-operation related	☐ Aggressive and Violent Acts	☐ Fires or Explosions
☐ Impact or contact with objects or equipment	☐ Exposure to the release of chemicals, substances or environments	☐ Vandalism, theft or site control breach	☐ Electrocution

☐ Other (specify): _____

4. Event Principal(s)

☐ ERM or RCM	☐ Subcontractor	☐ Third Party

5. What were the corrective actions taken, by whom, and when were they completed?

Corrective Action	Assigned to…	Completion Date

Unsafe Act / Unsafe Condtion Report Form

Report Type (Check One):	☐ Unsafe Act	☐ Unsafe Condition
Project Name:		
Project Number:		
Report Number:		

Report Completed by…

Name: _____

Signature: _____

Project Role: _____

Date: _____

Attachment I
Near Reporting and Investigation Form

Near Miss Observation Report Form

Project Name: Project Number: Report Number:

Document Routing	
SSO	To PM and RCM Coordinator 24 hours after observance / follow-up. Retain copy in site health & safety file.
PM	After completion to office health & safety file

Name of person preparing Part I: _____

Name of person who observed event: _____

Date Part I was prepared: _____

PART I: ABOUT THE NEAR MISS

1. When did the observation occur?

Date: _____ Time of Day: _____

2. What were the weather conditions at the time?

Light Conditions at Incident Location	If Outdoor: ☐ Sunny ☐ Cloudy ☐ Night / Artificial Light ☐ Dawn / Dusk		If Indoor: ☐ Low Light ☐ Normal Light
Precipitation	☐ None ☐ Sleet	☐ Drizzle ☐ Snow	☐ Rain

Temperature (F) _____ Relative Humidity (%) _____ Wind Speed (mph) _____

3. What was observed?

Near Miss Observation Report Form

Project Name: Project Number: Report Number:

4. Which event categories apply?

☐ Traffic-related	☐ Travel-related	☐ Falls from height	☐ Slips or trips
☐ Bodily Reaction and Exertion	☐ Equipment-operation related	☐ Aggressive and Violent Acts	☐ Fires or Explosions
☐ Impact or contact with objects or equipment	☐ Exposure to the release of chemicals, substances or environments	☐ Vandalism, theft or site control breach	☐ Electrocution

☐ Other (specify): _____

5. Where was the observation made?

PART II: FOLLOW-UP

6. Actions leading to Observation. Check all that apply and explain.

☐ Failure to observe warning	☐ Failure to use PPE	☐ Failure to warn
☐ Delayed discovery	☐ Procedure not followed	☐ Abuse / misuse of equip.
☐ Lack of site awareness		
☐ Other: _____		

Explanation:

7. Conditions leading to Observation. Check all that apply and explain.

☐ Temperature / weather	☐ Inadequate maintenance	☐ Nature (animals, plants)
☐ Time pressure / constraints	☐ Improper design / engin.	☐ Construction deficiencies
☐ Other: _____		

Explanation:

Near Miss Observation Report Form

Project Name: Project Number: Report Number:

8. Job factors leading to Observation. Check all that apply and explain.

☐ Leadership / supervision	☐ Lack of / inadequate PPE	☐ Inadequate inspections
☐ Inadequate communication	☐ Inadequate training	☐ Improper / defective tools / equip.
☐ Inadequate work procedures / practices		
☐ Other: _____		

Explanation:

9. Personnel factors leading to Observation. Check all that apply and explain.

☐ Physical capability	☐ Physical stress / fatigue	☐ Mental stress
☐ Knowledge of task	☐ Employee skills	☐ Attention to details
☐ Other: _____		

Explanation:

10. Event Principal(s)

☐ ERM or RCM	☐ Subcontractor	☐ Third Party

11. What were the corrective actions taken, by whom, and when were they completed?

Corrective Action	Assigned to…	Completion Date

Follow-up Completed by…

Name: _____

Signature: _____

Project Role: _____

Date: _____

Attachment J
Incident Reporting and Investigation Form

Incident Report & Investigation Form

FOR ERM INTERNAL USE ONLY
CONFIDENTIAL - WITHOUT PREJUDICE REPORT

Project Name:GreenPac	Former #2 Mill facility
Project Number:0128439	
Report Number:	

Document Routing	
SSO	After completion to site health & safety file
Project Manager	After completion to office health & safety file

PART I: INCIDENT DATA AND SUMMARY

Instructions: SSO to complete Part I of this form within 24 hours after the occurrence of the Incident or per OpCo instruction in the case of very severe Incidents.

SSO to verbally notify Project Manager and ERM Coordinator as soon as practicable following occurrence of the Incident. Project Manager and ERM Coordinator to continue verbal communication per ERM Health & Safety Management System guidance or per applicable client requirements.

If a piece of information does not apply, put N/A in the block.

1. Where did the Incident occur?

Site Name:
Site Address:
Location Within the Site:

2. When did the Incident occur?

Date: _____ Time of Day: _____

3. What were the weather conditions at the time?

Light Conditions at Incident Location	<u>If Outdoor:</u> ☐ Sunny ☐ Cloudy ☐ Night / Artificial Light ☐ Dawn / Dusk		<u>If Indoor:</u> ☐ Low Light ☐ Normal Light
Precipitation	☐ None ☐ Sleet	☐ Drizzle ☐ Snow	☐ Rain

Temperature (F) _____ Relative Humidity (%) _____ Wind Speed (mph) _____

Incident Report & Investigation Form

FOR ERM INTERNAL USE ONLY
CONFIDENTIAL - WITHOUT PREJUDICE REPORT

Project Name:GreenPac	Former #2 Mill facility
Project Number:0128439	
Report Number:	

4. Which event categories apply?

☐ Traffic-related	☐ Travel-related	☐ Falls from height	☐ Slips or trips
☐ Bodily Reaction and Exertion	☐ Equipment-operation related	☐ Aggressive and Violent Acts	☐ Fires or Explosions
☐ Impact or contact with objects or equipment	☐ Exposure to the release of chemicals, substances or environments	☐ Vandalism, theft or site control breach	☐ Electrocution

☐ Other (specify): _____

5. What type of Incident occurred?

☐ Injury	☐ Illness	☐ Property Damage

6. Who reported and witnessed the Incident?

	Name	Employer
Reported By:		
Witnessed By:		

7. Who was involved in the Incident? What happened to those individuals?

Injured	Suffered Illness	Damaged Property	Name	Employer	Date of Hire	Time Workday Began

Project Name:GreenPac	Former #2 Mill facility
Project Number:0128439	
Report Number:	

8. What activity/task was taking place just prior to the Incident? (Describe the activity/task as well as tools, equipment and material involved that set the stage for the incident. What was the worker doing?)

9. What changed about the situation or task to cause the Incident? How did the incident happen?

10. What was the outcome of the Incident? (e.g., "Injury: 2 cm long cut to left ring finger", "Property Damage: Snapped overhead telephone cable")

11. What object or substance directly harmed the employee? (e.g., Concrete floor, chlorine, H2S, manhole cover. If this question does not apply to the incident, write N/A.)

12. What immediate actions were taken by whom in response to the Incident?

Action Taken	By…	Employer

Project Name:GreenPac	Former #2 Mill facility
Project Number:0128439	
Report Number:	

13. If medical treatment was given away from worksite, state name and mailing address of both the facility and treating health care professional.

	Facility	Professional
Name:		
Address:		

14. If outside medical treatment was received, provide the following details:

Name	Employer	Received prescription for medication?	Treated in an emergency room?	Was employee hospitalized overnight as an in-patient?

15. If there were fatalities resulting from this Incident, provide names and the date of death.

Project Name:GreenPac	Former #2 Mill facility
Project Number:0128439	
Report Number:	

16. Attach the report of any external investigations conducted into this Incident. Also attach any photographs or sketches that help to describe the Incident. Describe attachments below.

Part I Completed by…

Name: _____

Signature: _____

Project Role: _____

Date: _____

Project Name:GreenPac	Former #2 Mill facility
Project Number:0128439	
Report Number:	

PART II: CAUSES AND PLANS TO PREVENT RECURRENCE

Instructions: ERM Health & Safety Coordinator to lead effort to complete Part II of this form with cooperation of Site Safety Officer, Project Manager, and appropriate site personnel

17. Actions leading to Incident. Check all that apply and explain.

☐ Failure to observe warning	☐ Failure to use PPE	☐ Failure to warn
☐ Delayed discovery	☐ Procedure not followed	☐ Abuse / misuse of equip.
☐ Lack of site awareness		
☐ Other: _____		

Explanation:

18. Conditions leading to Incident. Check all that apply and explain.

☐ Temperature / weather	☐ Inadequate maintenance	☐ Nature (animals, plants)
☐ Time pressure / constraints	☐ Improper design / engin.	☐ Construction deficiencies
☐ Other: _____		

Explanation:

19. Job factors leading to Incident. Check all that apply and explain.

☐ Leadership / supervision	☐ Lack of / inadequate PPE	☐ Inadequate inspections
☐ Inadequate communication	☐ Inadequate training	☐ Improper / defective tools / equip.
☐ Inadequate work procedures / practices		
☐ Other: _____		

Explanation:

Incident Report & Investigation Form

FOR ERM INTERNAL USE ONLY
CONFIDENTIAL - WITHOUT PREJUDICE REPORT

Project Name:GreenPac	Former #2 Mill facility
Project Number:0128439	
Report Number:	

20. Personnel factors leading to Incident. Check all that apply and explain.

☐ Physical capability	☐ Physical stress / fatigue	☐ Mental stress
☐ Knowledge of task	☐ Employee skills	☐ Attention to details
☐ Other: _____		

Explanation:

21. Event Principal(s)

☐ ERM or ERM	☐ Subcontractor	☐ Third Party

22. What were the corrective actions taken, by whom, and when were they completed?

Corrective Action	Assigned to…	Completion Date

23. Was this Incident recordable/reportable under any governmental requirement?

☐ Yes Determined By: _____

☐ No Project Role: _____

Part II Completed by…

Name: _____

Signature: _____

Project Role: _____

Date: _____

Attachment K
NYSDEC Community Air Monitoring Program

COMMUNITY AIR MONITORING PLAN
FORMER No.2 MILL FACILITY SITE – NIAGARA FALLS, NEW YORK

A Community Air Monitoring Plan (CAMP) involves real-time monitoring for volatile organic compounds (VOCs) and particulate matter (i.e., dust) at the downwind perimeter of each designated work area when intrusive activities are in progress. Intrusive activities include soil or waste excavation, staging, or handling; test pitting or trenching; and/or the installation of soil borings or ground water wells. The CAMP provides a measure of protection for on-Site workers and the downwind community (i.e., off-Site receptors including residences, parks, businesses, etc.) not directly involved with the subject work activities. Routine monitoring is required to evaluate concentrations and corrective action and/or work stoppage may be required to abate emissions detected at concentrations above specified action levels. Routine data collected during implementation of the CAMP may also help document that work activities did not spread compounds of potential concern off-Site through the air. Reliance on the procedures and action levels described in this CAMP should not preclude simple, common sense measures to keep VOCs, dust, and odors at a minimum around work areas.

COMMUNITY AIR MONITORING PLAN

Compounds of potential concern include several VOCs and particulate matter (i.e., dust). VOC concentrations in air will be measured using a calibrated photoionization detector (PID). Particulate matter concentrations will be measured using a calibrated electronic aerosol monitor.

Relevant weather conditions including wind direction, speed, humidity, temperature, and precipitation will be measured and recorded prior to the initiation of subsurface intrusive activities. Background readings of VOCs and particulate matter will be collected at a minimum of five locations on Site prior to the initiation of field work on each day that subsurface intrusive work will be performed. Additional background measurements may be collected if weather conditions change significantly.

Continuous monitoring for VOCs and particulate matter will be performed downwind of the work area during subsurface intrusive activities. Periodic monitoring for VOCs will be performed during non-intrusive activities if requested by an NYSDEC and/or NYSDOH on-Site representative. Non-intrusive activities include any work activity that does not disturb the subsurface or staged soil piles, including routine Site visits, collection of ground water samples from Site wells, installation of remedial equipment, operations and maintenance, surveying, etc. Periodic monitoring will consist of collecting one reading downwind of the work area at the following intervals:

- upon arrival at a sample location or other work activity location;
- during performance of the relevant work activity;
- during the opening of a well cap (if applicable);
- during well baling or purging procedures (if applicable); and
- prior to leaving a sample location or other work activity location.

VOC RESPONSE LEVELS AND CORRECTIVE ACTIONS

VOCs will be monitored at the downwind perimeter of the immediate work area on a continuous basis during intrusive activities. Upwind concentrations will be measured at the start of each workday, during the work activity, and at the end of each work day to establish background conditions. Monitoring equipment that does not require factory calibration will be calibrated at least once a day. Calibration may be performed more frequently if Site conditions or instrument operating conditions are highly variable. The monitoring equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total VOCs at the downwind perimeter of the work area exceeds 5-parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total VOC concentration readily decreases (per instantaneous readings) below 5-ppm over background, work activities can resume with continued monitoring.

- If total VOC concentrations at the downwind perimeter of the work area persists at concentrations greater than 5-ppm over background but less than 25-ppm, work activities will be halted, the source of the VOCs identified, corrective action will be taken to abate emissions (if the source is related to Site remedial activities), and monitoring will be continued. After these steps, work activities will resume provided that the total VOC concentration 200-feet downwind of the work area, or half the distance to the nearest potential receptor, whichever is less (but in no case less than 20-feet), is below 5-ppm above background for the 15-minute average.

- If the total VOC concentration is greater than 25-ppm above background at the perimeter of the work area, intrusive work activities will be halted and the source of the VOCs will be identified. Work will resume when additional continuous monitoring demonstrates that VOC concentrations have dropped below 25-ppm for a minimum of one-half hour, and the total VOC concentration 200-feet downwind of the work area, or half the distance to the nearest potential receptor, whichever is less (but in no case less than 20-feet), is below five ppm above background for the 15-minute average.

All 15-minute readings will be recorded and will be available for review by NYSDEC and/or NYSDOH personnel. Instantaneous VOC readings (if any) used for decision purposes will also be recorded.

PARTICULATE MATTER RESPONSE LEVELS AND CORRECTIVE ACTIONS

Fugitive dust migration from the work area will be visually assessed during intrusive activities. Particulate concentrations will be monitored continuously at the downwind perimeter of the work area during intrusive activities. Particulate monitoring will be performed using real-time electronic aerosol monitoring equipment capable of measuring particulate matter less than 10-micrometers in size (PM-10) and capable of integrating over a period of 15 minutes for comparison to the airborne particulate action levels referenced below. The monitoring equipment will be equipped with an audible alarm to indicate an exceedance of a specified action level.

If the downwind PM-10 concentration is 100-micrograms per cubic meter ($\mu g/m^3$) greater than background for the 15-minute period, or if airborne dust is observed leaving the work area, dust suppression techniques will be employed. Work may continue with dust suppression techniques provided that downwind PM-10 concentration does not exceed 150-$\mu g/m^3$ above background and provided that significant visible dust is not migrating from the work area.

If downwind PM-10 concentrations are greater than 150-$\mu g/m^3$ above background, intrusive activities will be stopped and a re-evaluation of the intrusive activities will be initiated. Work can resume provided that dust suppression measures and/or other engineering controls are successful in reducing the downwind PM-10 concentration to within 150-mcg/m^3 of background and in preventing significant visible dust migration.

All 15-minute readings will be recorded and will be available for review by NYSDEC and/or NYSDOH personnel. Instantaneous readings (if any) used for decision purposes will also be recorded.

SITE SPECIFIC RADIOLOGICAL SAFETY PLAN
for the
Radiologically Impacted Materials Removal for Greenpac Mill, LLC at 4400 Royal Avenue, Niagara Falls, NY

Prepared for
Greenpac Mill, LLC
4400 Royal Avenue
Niagara Falls, New York 14303

Prepared by:

Los Alamos Technical Associates, Inc.
756 Park Meadow Road
Westerville, OH 43081

Prepared By: Joseph P. Shuman, CFPS CSP CHMM	**Signature:**	**Date:** 9/2/11	**Title:** LATA Sr. Environmental Engineer
Approved By: Ron Voorheis	**Signature:**	**Date:** 9/2/11	**Title:** LATA Project Manager
Approved By: Jason Brydges, PE	**Signature:**	**Date:** 9/2/11	**Title:** LATA Program Manager

Los Alamos Technical Associates, Inc.
Site Specific Radiological Safety Plan for the
Radiological Remediation for Greenpac Mill, LLC
At 4400 Royal Avenue, Niagara Falls, NY

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1.0 PURPOSE AND SCOPE

This Site-Specific Radiological Safety Plan (RSP) provides detail on the work practices necessary to fully implement Los Alamos Technical Associates (LATA) Radiological Safety practices at the Greenpac Mill, LLC (Greenpac) property located at 4400 Royal Avenue, Niagara Falls, New York (Site) to achieve:

- Sound radiological practices implemented during activities at the Site where the potential for exposure to ionizing radiation exists;,
- Radiological exposure to the public, site personnel, and the environment that are maintained As Low as Reasonably Achievable (ALARA), and
- Performance of activities at the Site in a manner consistent with applicable local, state, and federal regulations.

2.0 APPLICABILITY

The work practices specified in this site specific RSP apply to work conducted by site personnel that have a potential to result in the exposure of employees to ionizing radiation. All Site visitors and employees working in a radiation area or a radioactive materials area are responsible for following this RSP. The Project Manager (PM) and the Site Radiation Safety Officer (RSO) are responsible for ensuring that the Site Specific RSP is implemented at the Greenpac Site.

3.0 GENERAL

3.1 REFERENCES

- DOT 49 CFR 171-177, Transportation – Hazardous Materials Regulations.
- 6 NYCRR 380 Prevention and Control of Environmental Pollution by Radioactive Materials
- 10 NYCRR 16 Ionizing Radiation
- 10 NYCRR Part 16, Standards for Protection Against Radiation
- OSHA 29 CFR 1910.1096, Ionizing Radiation
- OSHA 29 CFR 1926.53, Ionizing Radiation
- NRC Regulatory Guide 8.25, Air Sampling in the Workplace
- LATA Corporate Respiratory Protection Program
- Federal Guidance Report No. 12, entitled External Exposure To Radionuclides In Air, Water, And Soil (EPA-402-R-93-081

3.2 DEFINITIONS

Airborne Radioactivity Area – Area where the measured concentration of airborne radioactivity above natural background exceeds a peak concentration of 1 derived air concentration (DAC) or 12 DAC-hours during the hours a worker is present during one week.
As Low As Reasonably Achievable (ALARA) – An approach to radiological control or a process to manage and control exposures to the work force and to the general public at levels as low as is reasonable, taking into account social, technical, economic, practical, and public policy considerations.
Bioassay – Measurement of radioactive material deposited within or excreted from the body. This process may include whole body and organ counting as well as collection of urine and fecal samples.
Contaminated Area – An area in which radioactive contamination is present that exceeds removable levels presented in Table 3.

Controlled Area – An area to which access is controlled in order to protect personnel from exposure to radiation and radioactive materials. An area in which the existing or potential radiation and radioactivity levels are above normal background but are less than that designating a radiological area or a restricted area.

Derived Air Concentration (DAC) – The concentration of a radionuclide in air that, if breathed over the period of a work year (2000 hours), would result in the annual limit on intake being reached.

Disintegration per Minute (dpm) – The rate of emission by radioactive material as determined by correcting the counts per minute observed by a detector for background, efficiency, and counting geometry associated with the instrument.

Dose – A generic term for the amount of energy deposited in body tissue due to radiation exposure. Technical definitions for dose terms necessary for various exposure calculations and recordkeeping purposes include the following:

Absorbed Dose (D) – Energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest in that material. The units of absorbed dose are the rad and the gray (Gy).

Dose Equivalent (H_T) – The product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the rem and Sievert (Sv).

Effective Dose Equivalent (H_E) – The sum of the products of the dose equivalent to the organ or tissue (H_T) and the weighting factors (W_T) applicable to each of the body organs or tissues that are irradiated (H_E= SWTxHT).

Committed Dose Equivalent ($H_{T,50}$) – The dose equivalent to organs or tissues of reference (T) that will be received from an intake of radioactive material by a person during the 50-year period following the intake.

Committed Effective Dose Equivalent ($H_{E,50}$) – The sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues ($H_{E,50}=\Sigma w_T x H_{T,50}$).

Total Effective Dose Equivalent (TEDE) – The sum of the deep dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

Total Organ Dose Equivalent (TODE) – The sum of the deep dose equivalent (for external exposures) and the committed dose equivalent to an individual organ or tissue (for internal exposures).

Fixed Contamination – Radioactive material that cannot readily be removed from surfaces by nondestructive means such as causal contact, wiping, brushing, or washing.

Frisking – Process of monitoring personnel for contamination.

Hazardous Work Permit (HWP) – Permit that identifies Hazardous conditions and health and safety hazards, establishes worker protection and monitoring requirements, and also contains specific approvals for radiological work activities. The HWP serves as an administrative process for planning and controlling radiological work where a Hazardous and informing the worker of the radiological, health, and safety issues.

Health Physics – The practice of radiological protection or radiation safety.

High Radiation Area – An area, accessible to personnel, in which radiation levels could result in a person receiving a dose equivalent to or in excess of 100 mrem in 1 hour at 30 cm from the radiation source or from any surface that the radiation penetrates.

Internal Dose – The portion of the dose equivalent received from radioactive material taken into the body.

Occupational Dose – The dose received by a person during employment in which the person's assigned duties involve exposure to radiation and to radioactive material. Occupational dose does not include dose received from background radiation, as a patient from medical practices, from voluntary participation in medical research plans, or as a member of the public.

Optically Stimulated Luminescence Dosimeter (OSL) – Radiation detection and measuring device used to record the radiological exposure of personnel or area to certain types of radiation.
Personnel Dosimetry – Devices designed to be worn by a single person for the assessment of dose equivalent such as film badges, optically stimulated luminescence dosimeters, thermoluminescent dosimeters, and pocket ionization chambers.
Personnel Monitoring – Systematic and periodic estimate of radiation dose received by personnel during work hours.
Radiological Work Permit (RWP) – Permit that identifies radiological conditions, establishes worker protection and monitoring requirements, and contains specific approvals for radiological work activities. The RWP serves as an administrative process for planning and controlling radiological work and informing the worker of the radiological, health and safety issues.
Radioactive Material Area – A controlled area or structure where radioactive material is used, handled, or stored.
Radiation – Ionizing radiation that includes alpha particulate, beta particulate, X-rays, gamma rays, neutrons, and other particulates capable of producing ions.
Radiation Area – An area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent or in excess of 5 mrem in 1 hour at 30 cm from the source of radiation or from any surface that the radiation penetrates.
Radiological Controlled Areas (RCA)- Includes Radioactive Materials Areas, Radiation Areas, Contamination Areas, or Airborne Radioactivity Areas.
Radiological Worker – Worker whose job assignment requires work on, with, or in the proximity of radiation-producing machines or radioactive materials. A radiological worker has the potential of being exposed to more than 100 mrem per year, which is the sum of the dose equivalent from external irradiation and the committed effective dose equivalent from internal irradiation.
Removable Contamination – Radioactive material that can be removed from surfaces by nondestructive means, such as casual contact, wiping, brushing, or washing.
Survey – An evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other source of radiation. When appropriate, such an evaluation includes a physical survey of the location of radioactive material and measurements or calculations of levels of radiation, or concentrations or quantities of radioactive material present.
Unrestricted Area – An area designated by the Nuclear Regulatory Commission (NRC) or Agreement State as being an area to which access is neither limited nor controlled by an NRC or Agreement State licensee.

3.3 RESPONSIBILITIES

3.3.1 LATA Project Manager

The LATA Project Manager (PM) will be responsible for:

- Overall radiological safety of the public and occupational workers.
- Reviewing each scope of work to identify potential radiation risks and hazards.
- Designating a Site Radiation Safety Officer (RSO) and arranging for employees on the project to receive appropriate radiation safety training.
- Ensuring that employees working on the project are monitored for radiation exposures as is required by applicable regulation(s).
- Assessing and controlling risks to employee and public health and safety from site activities.
- Maintaining routine housekeeping at the site to ensure safe and efficient working conditions and environment.

The PM will ensure that all employees are knowledgeable of applicable radiological safety requirements for their work area and compliance with these requirements. PMs emphasize the need for high standards for radiological control through direct communication, support of radiation control goals and a presence in the workplace.

3.3.2 Site Radiation Safety Officer/Health Physicist

The Site Radiation Safety Officer/Health Physicist (RSO) will be responsible for:

- Coordinating implementation of the Radiological Safety Plan (RSP).
- Developing and administering the RSP incorporated into the Interim Remedial Measures (IRM) HASP and associated standard operating procedures.
- Conducting appropriate radiation safety training for employees.
- Evaluating potential site/employee radiation exposure.
- Recommending necessary workplace and administrative controls.
- Issuing Radiation Work Permits, as necessary(see Section 6.2).
- Administrating the personnel monitoring program.
- Arranging for each individual's monitoring results to be sent to the individual and employers as appropriate.

3.3.3 Radiation Technicians

Radiation Technicians provided by Greater Radiological Dimensions, Inc. GRD will be responsible for assisting the RSO in the implementation of radiological controls on each site. Specific responsibilities will include:

- Performing radiological surveys.
- Collecting samples and smears.
- In conjunction with the RSO, assessing radiological hazards during work evolutions and making adjustments to ensure that worker radiological exposures and potential releases to the environment are maintained ALARA.

Qualifications of Radiation Technicians will be reviewed by the RSO to ensure that the level of expertise is commensurate with the assigned duties.

3.3.4 Employees

Employees will be responsible for understanding radiological protection requirements for their work areas and for complying with these requirements.

4.0 ALARA

4.1 POLICY STATEMENT

All work with ionizing radiation will be conducted in accordance with established good practices in radiation protection, and in all cases, incorporate radiological criteria to ensure safety and maintain radiation exposures ALARA. The primary method to maintain exposure ALARA will focus on the use of established work practices and engineering controls following the use of administrative and procedural requirements.

4.2 ADMINISTRATIVE IMPLEMENTATION PROCEDURES AND ENGINEERING CONTROLS

The following minimum steps will be implemented for maintaining radiation exposures ALARA.

- Estimate radiation exposure and use the estimate to set project ALARA dose goals.
- Review actual radiation exposures and compare with projected dose values.
- If necessary, make adjustments to the administrative and engineering control in place.

- Implement engineering controls to minimize the spread of activity.
- Radiological training and monitoring requirements.

5.0 EXPOSURE LIMITS

5.1 ADMINISTRATIVE GOALS

Administrative goals for radiological protection performance will be established. These limits are more conservative than regulatory limits, commensurate with the work plan and level of hazard, and in accordance with the ALARA principle. The annual radiological goals include (not to exceed):

- Maximum individual total effective dose equivalent – 100 mrem;
- Maximum embryo/fetus total organ dose equivalent for a declared pregnancy – 100 mrem; and
- Maximum total effective dose equivalent to a member of the public, or visitor (excluding background radon and thoron) – 50 mrem.

5.2 OCCUPATIONAL EXPOSURE LIMITS

The occupational exposure to employees performing the duties of radiological workers will be controlled so that the limits in Table 1 are not exceeded in one year for this project. Measures will be taken to maintain doses as far below these limits as reasonable achievable through use of administrative goals, engineering controls, and application of the ALARA process. Radiation exposure from normal background, therapeutic and diagnostic medical radiation, and voluntary participation in medical research plans will not be included in the determination of occupational exposure. Planned special exposures will not be required.

Table 1. Occupational Dose Limits

Category	Greenpac Administrative Limit		10 NYCRR Part 16 Limit	
	mrem/yr	mSv/yr	mrem/yr	mSv/yr
Total Effective Dose Equivalent	100	1	5,000	50
Total Organ Dose Equivalent	1,000	10	50,000	500
Lens of Eye Dose Equivalent	300	3	15,000	150
Shallow Dose Equivalent	1,000	10	50,000	500
Embryo/Fetus	100/gestation	1/gestation	500/gestation	5/gestation
Minor	Not Allowed	Not Allowed	500	5
General Public (See comment above)	100	1	100	1

5.3 EMBRYO/FETUS EXPOSURE LIMITS

The occupational dose equivalent limits applicable to the embryo/fetus are detailed in Table 1, and apply to a "declared pregnancy." In such a case, a woman may elect to voluntarily declare the pregnancy and limit the dose received by the embryo/fetus as provided in regulatory requirements. In this case, the dose equivalent goal for the embryo/fetus, from the period of conception to birth from occupational exposure, will be no more than 100 mrem, an administrative limit significantly lower than the regulatory limits. The expected duration of the project and relatively low anticipated doses indicate that there will not be a

significant potential dose to a pregnant worker exceeding regulatory limits. If the dose equivalent has exceeded 500 mrem at the time the pregnancy is declared, based on doses from other projects, steps shall be taken to ensure that additional occupational exposure does not occur. The Voluntary Declaration of Pregnancy shall be documented. Occupational exposure to an individual who has declared pregnancy will not be allowed until the RSO documents an embryo/fetus dose of record upon declaration, based on the individual's declaration of the date the pregnancy began. If the dose from prior exposure exceeds the administrative limit, the individual will be restricted from performing work involving exposure to radiation and radioactive materials. Any declared pregnancy may be voluntarily undeclared, in writing, to withdraw a pregnancy declaration.

5.4 MINOR EXPOSURE LIMITS

Individuals under 18 years of age will NOT be allowed to work on site where there is the potential for occupational exposure to radiation. There are no exceptions to this requirement.

5.5 MEMBERS OF THE PUBLIC EXPOSURE LIMITS

The annual exposure limit for any member of the public shall be limited to 100 mrem total effective dose equivalent, regardless of whether the individual is inside or outside of a controlled area. The dose equivalent in any unrestricted area from external sources (other than natural background) will not exceed 2 mrem in any one hour or 50 mrem per year, regardless of occupancy by a member of the public.

5.6 AIR AND LIQUID EFFLUENTS

The release of radioactivity in air or liquid effluents to unrestricted areas will be monitored and controlled in accordance with the requirements of 10 NYCRR Part 16. The Greenpac project will limit air emissions by controlling fugitive dust (see detailed discussion below in section 6.4, *Action Levels*). Liquids from decontamination will be contained to prevent release to off-site waters. Records of air monitoring, radioactive effluent monitoring, and/or modeling will be generated and maintained to demonstrate compliance with effluent limitation requirements.

6.0 CONDUCT OF RADIOLOGICAL WORK

6.1 PLANNING

Engineering controls will be implemented at the Site to minimize the spread of contamination and limit the potential uptake by, and direct exposure to workers. This will principally involve mitigation of dust generation, as discussed in Section 5.6. Contamination reduction and establishment of controlled access zones will also be used to limit radiological exposures.

6.2 RADIOLOGICAL AND HAZARDOUS WORK PERMITS

Radiological Work Permits (RWPs) will be used to inform workers of area radiological conditions and entry requirements, and to provide a mechanism to relate worker exposure to specific work activities. Radiological requirements may be combined with other, non- radiological requirements, into a single Hazardous Work Permit (HWP). Implementation of a work permit plan will have the following requirements:

- RWPs/HWPs will be written based on radiological survey data that characterize the expected work conditions.
- RWPs/HWPs will detail the work area and activity that are within their scope and will specify required conditions for protective measures, including dosimetry, air sampling, PPE, respiratory protection, work area preparation, and health physics oversight.
- RWPs/HWPs will be reviewed and approved by the RSO. Modifications to existing RWPs/HWPs will require the concurrence of the RSO or designee.

- RWPs/HWPs will be posted in a conspicuous area (if possible, they will be posted at the access point to the applicable radiological work area).
- Workers will acknowledge by signature that they have read, understand, and will comply with the RWPs/HWPs prior to initial entry to the area and after any revisions to the RWPs/HWPs.
- RWPs/HWPs will be updated if radiological conditions change to the extent that protective requirements need modification.

6.3 CONTROL ZONES

6.3.1 Access/Egress Procedures

Only appropriately trained, authorized, and qualified personnel will be permitted access to radiological controlled areas. The degree of control will be commensurate with the existing and potential radiological hazards within the area and may include, for example, signs and barricades, entrance ways locked against ingress, control devices or alarms, or administrative controls. The establishment of High or Very High Radiation Areas is not anticipated for this project, however additional access control measures for High and Very High Radiation Areas will be established in accordance with 10 NYCRR Part 16, as appropriate. The controls will be established so that rapid egress from the controlled area in an emergency is not hindered. Control measures and established procedures will incorporate a RWP/HWP system to ensure appropriate planning, control, hazard communication, and documentation of work activities in Radiological Controlled Areas (RCA) that include Radioactive Material Areas, Radiation Areas, Contamination Areas, or Airborne Radioactivity Areas. Task-specific RWP/HWP's will be used for short-term work in these RCAs with the potential for changing radiological conditions. General RWP/HWP s may be used for longer term activities in RCAs with known, stable radiological conditions.

Personnel frisking and/or monitoring will be conducted before exiting radiologically contaminated areas and other areas where contamination is suspect. If the instruments, usually a pancake-type Geiger-Mueller probe and ratemeter with a nominal efficiency of ten percent, indicate greater than 100 cpm above background for beta-gamma radiation emissions, a Radiation Technician will be contacted for evaluation and/or decontamination of personnel.

6.3.2 Posting and Labeling

The standard radiation symbol (ANSI N2.1/12.1) in magenta or black on a yellow background (or alternate as provided by regulations) will be used to warn individuals of the presence of radiation and/or radioactive material. Each access point to a controlled or restricted area will be posted with the appropriate identification and instructions. For controlled or restricted areas, each area will be posted as detailed in Table 2. For the Greenpac Site, only the postings for a Contaminated Area or a Radioactive Material Area are expected to be required.

Table 2. Posting Requirements

Posting Sign	Definition
Caution Radiation Area	5 mrem in 1 hour at 30 cm
Caution or Danger High Radiation Area	100 mrem in 1 hr at 30 cm
Grave Danger Very High Radiation Area	500 rads in 1 hr at 1 m
Caution Contaminated Area	Removable radioactive contamination (Ref. Table 3)
Caution or Danger Airborne Radioactivity Area	>1 DAC or 12 DAC-hours/week

Posting Sign	Definition
Caution or Danger Radioactive Material	Radioactive material handled, used or stored
NY Form DOH-2482, Notice to Employees	Posted in a location visible to all employees

6.4 DOSE ASSESSMENT

The radionuclides of concern and their concentrations at the Site, identified through soil analysis from Analytical Report ARSI-11-01761, are presented in Table 3.

Table 3. Soil Sample Results

Isotope	Concentration (pCi/g)			
	Sample ID			Average
	001	002	003	
K-40	5.644	8.246	5.988	6.626
Tl-208	0.116	0.157	0.102	0.125
Pb-210	2.405	2.752	4.377	3.178
Bi-212	0.336	0.609	0.225	0.390`
Bi-214	2.733	3.959	6.092	4.261
Pb-214	3.396	3.583	6.916	4.632
Ra-226	6.219	6.69	12.574	8.494
Ra-228	0.322	0.587	0.324	0.411
Th-228	0.382	0.44	0.385	0.402
U-235	<MDC (0.179)	0.269	0.427	0.292

For the Site, two methods of exposure have been evaluated. First is the direct exposure from the contaminated soil. The second pathway evaluated is the potential for exposure due to excavation activities creating fugitive soil dust in the work area.

Direct exposure from contaminated soil, using the radionuclide concentration averages in Table 3, has been estimated using the Dose Coefficients for contaminated soil contained in Federal Guidance Report No. 12, entitled EXTERNAL EXPOSURE TO RADIONUCLIDES IN AIR, WATER, AND SOIL (EPA-402-R-93-081, commonly called FGR-12). The coefficients used are for a nominal soil density, taken from FGR-12, of 1.6E3 Kg/m^3 and a conservative assumption was made that the depth of contamination was "infinite" (Table III.7). The infinite depth table is preceded by a table with the depth assumption of contamination to be 15 cm which, based on available site history, was not considered to reflect potential contaminant conditions at the site.

The soil contaminants, conservatively ignoring the fact that, as the remediation proceeds, the available mass of radionuclides contributing to exposure will decrease, will contribute approximately 11 mrem of occupational exposure over the course of a 2080-hour work year. This level will decrease as material is removed, segregated, and controlled for disposal.

Exposure resulting from contaminated soil as fugitive dust in the air was evaluated at a limit of 5 mg/m^3 of dust loading in the breathing zone. The estimate used Dose Coefficients for air immersion contained in FGR-12. A continuous work zone fugitive dust load of 5 mg/m3 will contribute approximately 57 mrem of occupational exposure over the course of a 2080-hour work year.

The total occupational worker exposure estimate over a work year is about 68 mrem which is well below the administrative limit of 100 mrem for this project.

7.0 MONITORING

7.1 PERSONNEL MONITORING

7.1.1 Internal Dosimetry

Personnel are not anticipated to have the potential for significant uptakes of radioactive materials (greater than the personnel monitoring threshold of a committed effective dose equivalent in excess of 500 mrem). Therefore, a radiological bioassay program will not be implemented for this project. Prior to allowing a radiological worker to start work in a controlled area, a 24 hour urine sample will be taken and stored. This will be a baseline sample, if needed. After the project is complete, or at the discretion of the RSO, an additional 24 hour urine sample will be taken. If air sampling results indicate the airborne activity in the work area is or was elevated during the project the urine sample will be analyzed for the appropriate radionuclide(s).

7.1.2 External Dosimetry

Monitoring applies to any individual likely to receive an annual external whole body exposure in excess of ten percent of the occupational limit (500 mrem). Though individual doses are not expected to reach levels of 500 mrem on this project (and the administrative goal is less than 100 mrem), whole body dosimetry will be implemented as a good practice. All personnel dosimetry used will be processed and evaluated by a processor holding a current accreditation under the National Voluntary Laboratory Accreditation Plan (NVLAP) of the National Institute of Standards and Technology (NIST).

7.1.3 Summation of Internal and External Exposures

Internal committed effective dose equivalents and external effective dose equivalents during the year will be combined to determine the annual total effective dose equivalent in accordance with the requirements of federal and state regulations. Generally, summation will be required when intakes exceed ten percent of the annual limit on intake, may result in a total effective dose equivalent of 50 mrem for visitors, or a dose equivalent of 50 mrem to the embryo/fetus for declared pregnant women. The deep dose equivalent to the whole body may be used as the effective dose equivalent for external exposures.

7.1.4 Medical Surveillance

Other than baseline and possible follow up urine sampling as discussed in Section 7.1.1 and medical qualification for respirator use discussed in Section 8.2, no specific medical surveillance requirements exist for exposure to radiation levels at occupational levels. General medical surveillance requirements for all hazardous waste sites are contained in the project HASP.

7.15 Overexposure

All cases of overexposure and suspected ingestion or inhalation of radioactive materials must be reported to the RSO immediately. The LATA Sr. Environmental Engineer, in consultation with the Occupational

Medicine Specialist, will advise the RSO on the type(s) of test(s) required to accurately assess exposure effects if necessary.

7.2 WORKPLACE MONITORING

7.2.1 Surveys

Radiological monitoring and surveys of radiation exposure levels, contamination, and airborne radioactivity will be conducted to:

- Characterize workplace conditions and detect changes in those conditions;
- Verify the effectiveness of physical design features, engineering and process controls, and administrative control procedures;
- Demonstrate regulatory compliance;
- Detect the gradual buildup of radioactive material;
- Identify and control potential sources of personnel exposure; and
- Identify areas requiring postings.

Monitoring will be performed only by trained and qualified personnel and will be conducted as specified by the project RSO.

Minimally, radiological surveys will be conducted:

- Once per shift at entrance or exit points, between contamination areas and clean areas;
- Daily in RCAs;
- Weekly in radiation and/or contamination areas; and
- Weekly in clean areas.

7.2.2 Air Sampling

General area and personal air sampling will be conducted in accordance with the guidance in NRC Regulatory Guide 8.25. Air sampling will be employed when necessary to determine whether confinement or suppression of radioactive material is effective, to determine required workplace administrative controls, to estimate worker intakes, and to determine what personal protective equipment (PPE) is appropriate.

General area and/or perimeter air sampling for airborne radioactivity will be conducted with low-volume air samplers F and J Model LV-1 or equivalent (0-100 lpm). The low-volume samplers will use 47mm filters and will be counted on a Ludlum model 2929 sample counter or equivalent, for alpha and beta immediately to determine any excessive levels. The filters will be changed daily. Following a 5 day hold time for radon decay, where the potential for airborne radioactivity is above background levels, the sample will be counted again to determine the actual activity without radon progeny contribution.

High-volume air samplers are those with sufficient flow rate to achieve a minimum detectable activity (MDA) of 10% of the applicable DAC in an 8-hour shift. Air sample filters will be analyzed on site for gross alpha and gross beta in accordance with written procedures. In work zones with a potential for short-term airborne excursions, representative breathing zone samples will be collected in the immediate vicinity of work being performed to determine whether the area is an airborne radioactivity area requiring additional work controls or to assess the worker's intake of airborne radioactive materials.

When required to estimate worker intakes, representative personal air sampling from a member of each field team working in radiologically contaminated areas will be conducted for airborne radioactivity in the breathing zone. The data will be compared with the DACs that are the most conservative for the

contaminant(s) expected to be present to gauge employee exposure potential. DACs for radioactive contaminants in Appendix C to 10 NYCRR 16 will be used to assess exposure potentials, as appropriate.

7.3 RELEASE OF MATERIALS FROM CONTAMINATION AREAS

Radiological contamination survey, documentation, and labeling requirements will be established for all property/material released from an RCA. All equipment, materials, and property used in an RCA established for contamination control will be considered as potentially contaminated and will not be released to an uncontrolled or unrestricted area until they have been surveyed and meet the unconditional release limits listed in Table 4 below.

Table 4. Surface Radioactivity Release Limits/ Acceptable Surface Contamination Levels				
Application	***Alpha (dpm/cm^2)***		***Beta/Gamma[1]***	
	Total	***Removable***	***Total (mR/hr)***	***Removable (dpm/cm^2)***
Controlled Area				
Basic guide	25,000 Max. 5,000 Av.	500	1.0	5,000
Clean area	1,000	100	0.5	1,000
Non-controlled Area				
Skin, personal clothing	500	ND[2]	0.1	ND[2]
Release of material or facilities	2,500 Max. 500 Av.	100	0.2	1,000

[1]Measured at 1 cm from the surface
[2]ND – Non-Detectable

Source: 10 NYCRR 16, Appendix 16-A, Table 7

7.4 INSTRUMENT CALIBRATION

Radiation detection instrumentation will be provided as appropriate for performing necessary surveys and monitoring. The instrumentation will be selected based upon the type of radiation detected, MDA measurement capability, and range in accordance with the radiological hazards present or anticipated for the project.

Calibration of radiological instruments and equipment will be performed by the manufacturer or a calibration service in accordance with ANSI N323 - 1997 using standards traceable to the NIST primary standards. The calibration certificate will be available at the site and maintained by the RSO.

Field calibration of counting/analysis instrumentation in accordance with approved written procedures is authorized if it meets the above requirements and the source calibration certificate and documented detection efficiency determination are maintained in the site-specific project file. Each instrument or piece of equipment will have a calibration sticker with an expiration date affixed.

At a minimum, performance tests of radiological instruments will be conducted daily before use, and at the end of the day. Satisfactory performance test results will be within ± 10% of the expected response. Instruments that do not meet performance test criteria, are found to be out of calibration, or are defective, will be removed from service until repaired and/or calibrated. The results of these checks will be recorded in a daily source check log by the performer and will be maintained in the project file. All performance tests will be conducted in accordance with approved written procedures.

8.0 PERSONNEL PROTECTIVE EQUIPMENT

8.1 USE AND SELECTION OF PROTECTIVE CLOTHING

PPE will be selected based on the contamination levels in the work area and the anticipated work activity, ALARA and safety considerations, and consideration of non-radiological hazardous materials that may be present. Surfaces are considered radiologically contaminated if above Table 4 levels. PPE provided will be in good condition and free of chemical or radioactive contamination and may include the following items at the discretion of the RSO:

- Full Set Coveralls (Tyvek ® or cotton)
- Cotton glove liners
- Rubber or chemical resistant gloves
- Shoe covers
- Protective overshoes
- Hood (Tyvek ® or cotton)

Protective clothing and equipment selected for project tasks will be described in the HASP, together with procedures for donning and removing PPE without spreading contamination or contaminating the worker. The necessary PPE for a task will be specified by the RWP.

8.2 USE AND SELECTION OF RESPIRATORY PROTECTION DEVICES

LATA's documented respiratory protection program details specific procedures for respiratory usage, fit, cleaning, and so forth.

Engineering control measures will be provided to limit the concentrations of radioactivity in air to levels below those that constitute an airborne radioactivity area to the extent feasible. When this level is not feasible, other methods such as administrative controls and respiratory protection will be employed to limit the potential for intake of radioactive material.

Only respiratory protection equipment that is tested and certified by the National Institute for Occupational Safety and Health (NIOSH) will be used. Protection factors listed in 10 NYCRR Part 16 will be used in the assessment of potential radioactive material intake. Selection of appropriate respiratory protection devices will be designated within either the HASP or the RWP. At a minimum, respiratory protection devices will be selected so that a protection factor greater than the multiple by which peak concentrations or airborne radioactivity exceed the values specified in 10 NYCRR Part 16 is not exceeded.

Only respiratory protection equipment that has been specifically certified for emergency use by NIOSH/Mine Safety and Health Administration (MSHA) will be used as emergency devices.

Whenever respiratory protection will be used at a site, the following additional minimum requirements will be met:

- Air sampling will be performed to identify the potential hazard, permit proper equipment selection, and estimate exposures.
- Surveys and bioassays, as appropriate, will be performed to evaluate actual intakes.
- Respirators will be tested for operability immediately prior to each use.

- Written procedures will be available regarding selection, fitting, issuance, maintenance, medical testing and testing of respirators (including testing for operability prior to each use), supervision and training of personnel, monitoring (including air sampling and bioassays), and recordkeeping.

9.0 RADIOACTIVE MATERIAL ACCOUNTABILITY AND CONTROL

All procurement, receipt, and storage of radioactive material (instrument check sources, analytical calibration standards, etc.) will be coordinated with the individual or organization responsible for radiation protection at the project site. A source custodian and documented inventory record will be established and maintained for radioactive sources. All sources brought on site by external organizations will not be allowed into areas under company control without prior notification and approval by the RSO or organization responsible for radiation protection. Radioactive materials licenses will be required for sources that exceed exempt quantities.

Transportation of radioactive material (specific activity greater than the nuclide-specific values in 49 CFR 173.436) in commerce, generally off site, will be in accordance with Department of Transportation (DOT) requirements in 49 CFR 170 through 180, and other federal, state and local regulations, as applicable.

10.0 DECONTAMINATION

10.1 PERSONNEL

The guideline for determining the presence of skin contamination on personnel is any detectable radiological contamination above background.

If necessary, decontamination of personnel will be performed only under the direct supervision of the RSO. Generally, dry, nonabrasive methods will be attempted first and, if necessary, may be followed by washing with mild soap and warm water. Material generated during decontamination, including wipes, tape, and water, will be collected and disposed as radioactive waste. Specific decontamination procedures and documentation requirements shall be under the direction of the RSO.

10.2 EQUIPMENT

Surface contamination levels presented in Table 4 will be used to determine if a piece of equipment is contaminated with radioactive materials. When decontamination is necessary, decontamination will be performed using techniques that are appropriate based on site-specific conditions. Generally, dry decontamination methods such as high-efficiency particulate air (HEPA) vacuuming or wipe-downs are preferred when facilities for the collection of radiological contaminated wastewater are not in place. If adequate facilities exist for the collection of such fluids, it may be appropriate to use a wet decontamination technique. Additional decontamination methods in extreme conditions include sand or other abrasive blasting. Specific decontamination procedures and decontamination requirements shall be under the direction of the RSO.

11.0 WASTE MANAGEMENT

TENORM is the waste material expected to be generated during this project. Materials suspected of being mixed waste (RCRA/TSCA/etc. hazardous substances combined with radioactive materials) will be identified and segregated as soon as practical to avoid combining mixed waste with other waste forms. While the scope of this waste minimization will be commensurate with the level of radioactive materials present and activities conducted at each site, at a minimum, the following guidelines will be used:

- Removal of excess/unnecessary packaging material prior to bringing materials into radiological controlled areas;
- Restriction of materials entering radiological areas to those materials necessary for performance of work;
- Restriction of the quantities of hazardous materials, such as paints, solvents, chemicals, cleaners, and fuels, entering radiological areas;
- Substitution of reusable items in place of disposable ones, when practical;
- Selection of consumable materials such as PPE that is compatible with waste processing systems, volume reduction, and waste acceptance criteria;
- Survey of potentially contaminated material leaving controlled areas to separate uncontaminated materials from contaminated materials; and
- Emphasis on waste reduction methodologies in training.

Additional waste minimization procedures and/or requirements may be identified in each site specific work plan and will be commensurate with the levels of radioactive materials present and activities being performed. A separate waste management plan shall be prepared for the Site.

12.0 EMERGENCY PROCEDURES

Details on the site-specific emergency procedures are provided in the HASP. All site personnel will be instructed in their emergency responsibilities and the emergency procedures. An emergency hospital is identified in the HASP and maps to this facility are readily available.

13.0 TRAINING

Training will be provided to general employees, radiation workers, and radiological control staff at the project Site. Annual retraining for Radiological Worker qualification is required specific to operations at this Site. All formal training under the RSP will verify individual knowledge by an appropriate examination. Documentation of training will be generated containing the individual's name, date of training, topic(s) covered, pass or fail, and the name of the certifying official. An employee will not be permitted to independently perform tasks inside of a radiological controlled area until the appropriate training and qualification requirements are met.

Additional training requirements will be determined on a site-specific basis and will be commensurate with the radiological hazards present on each site. These additional requirements will be determined and documented by the RSO.

13.1 RADIOLOGICAL WORKER TRAINING

At a minimum, all personnel entering an area where radioactive material or radiation generating devices are used, and where there is a potential for an individual to receive a Total Effective Dose Equivalent (TEDE) of 100 mrem or more in one year, will receive the following training:

- **Radiological Fundamentals** – Atomic Structure, Definitions and Units of Measure, the Four Basic Types of Ionizing Radiation, Units of Measure for Radiation.
- **Biological Effects** – Sources of Radiation, Effects of Radiation on Cells, Acute and Chronic Radiation Dose, Prenatal Radiation Exposure, Risks in Perspective.
- **Radiation Dose Limits** – Basis for and Purpose of Radiation Dose Limits and Administrative Control Levels, Dose Limits and Administrative Control Levels.
- **ALARA Program** – ALARA Program, Responsibilities for the ALARA Program, External and Internal Dose Reduction, Radioactive Waste Minimization.

- **Personnel Monitoring Programs** – External Dosimetry, Internal Monitoring, Methods for Obtaining Radiation Dose Records.
- **Radiological Access Controls and Postings** –Radiological Work Permits, Radiological Postings, Requirements for entering, working and exiting Radiological Control Areas.
- **Radioactive Contamination** – Types & sources of contamination, Contamination control methods, Contamination monitoring equipment, Decontamination.
- **Radiological Emergencies** – Emergency Alarms and Responses, Radiological Emergency Situations, Considerations in Rescue and Recovery Operations.
- **Practical Factors for Radiological Workers** – Review an Appropriate Radiological Work Permit (RWP); Record the Appropriate Information on the RWP; Select and Don, Wear and Remove Required PPE and Dosimeter(s); Enter Simulated Area and Demonstrate ALARA Techniques; Monitor for Contamination; Respond to Emergency Situations or Abnormal Radiological Situations; and Personal Frisking on Exit from Controlled Area.

Evidence of similar training completed within the past year will be accepted in lieu of new training. Site specific training will be provided.

13.2 GENERAL AWARENESS TRAINING

General employees who are not radiological workers but may be involved in an occasional or indirect manner with radioactive material or activities supporting decontamination and decommissioning (D&D) efforts will receive training specific to the Site activities. This training may be similar in content to the Radiological Worker training but will not require a practical exercise.

13.3 VISITORS

Visitors to the site will be provided with a handout that summarizes the necessary radiation training and this will be documented by the RSO or designee. Visitors will not be allowed unescorted access to radiation areas.

14.0 AUDITS

Because of the short duration of this project, the normal requirement for an internal audit of the field implementation of this RSP to be conducted at least once per year by the RSO will not be required. Should conditions at the site change significantly this requirement may be reconsidered by the Site RSO or LATA corporate RSO. Evidence of the annual audit conducted in support of the LATA NRC radioactive materials license is available to the RSO and project personnel. Audit findings are reported in writing to appropriate personnel and agencies.

15.0 RECORDS MANAGEMENT

RSP records will be maintained to document compliance with regulatory requirements and the exercise of due diligence in the control of radiological hazards for the protection of employees, members of the public, and the environment. These records will be transferred to the project file at the conclusion of the project.

At the completion of Site activities, copies of exposure monitoring records will be sent to the individuals monitored and their employers where appropriate. LATA employees will have copies also sent to the LATA Corporate Health Officer for inclusion into each respective employee's medical file. Exposure monitoring records for subcontract personnel will be transferred to each respective subcontract organization. Monitored individuals will be provided with a copy of their radiation monitoring results, consistent with the requirements of to 10 NYCRR 16.13(e). Upon completion of work at a site, exposure

data pursuant to the 10 NYCRR 16.13(e) requirements will be provided for LATA employees only. Subcontract personnel will be required to make requests for exposure records directly to their respective employer.

Exposure records that are maintained by LATA will be maintained in a manner consistent with applicable Privacy Act requirements. The records will be available for retrieval until termination of the LATA license. All quantities used in the records will be in special units of curie, rad, or rem, including multiples and subdivisions of these units.

Records identified with an individual's name or identifying number will be available upon request from that individual.

Records to be maintained include the following (as available):

- Doses received by individuals, for whom monitoring was required, during previous employment;
- Doses received by individuals for whom monitoring was required;
- Dose assessments for individuals for whom bioassay was performed;
- Doses to the embryo/fetus of a declared pregnant employee;
- Written declarations of pregnancy;
- Written withdrawal of declaration of pregnancy;
- Results of surveys for radiation and radioactive material in the workplace and outside of controlled or unrestricted areas as required by regulatory requirements or the radiation protection program;
- Results of surveys for the release of material or equipment to uncontrolled or unrestricted areas;
- Records of effluents and radioactive waste disposal under control;
- Results of calibrations performed on radiological instruments and quality control;
- Checks for radiological instrumentation and personal monitoring devices;
- Records of ALARA evaluations and control actions;
- Records of radiological training completed, including general employee radiological
- training;
- Records of internal reviews and audits with corrective actions closeout; and
- Records of regulatory agency inspections and audits with corrective actions closeout.

Interim storage of the above radiological records will be the responsibility of the RSO and will be maintained in a readily retrievable, controlled manner. Upon completion of each site project, and upon request, copies of all radiation exposure records will be made available to appropriate parties.

Records associated with radiation surveys and measurements performed to support activities associated with D&D of a site and equipment are:

- Name of the person making the evaluation and recording the results;
- Date of the survey;
- Instrument serial number used for surveys and measurements;
- Results obtained; and
- Applicable review.

LATA will record contamination levels observed and procedures followed for incidents involving contamination of individuals. The record should include name of individuals involved, description of work activities, calculated dose, probable causes (including root causes), steps taken to reduce future incidents of contamination, times and dates, and the surveyor’s signature.

Appendix F
Site Inspection Form

Appendix F - Site-Wide Inspection Form
Former Mill No. 2
Niagara Falls, New York
NYSDEC BCP Site No. C932150

Item #	Inspection Item	Yes	No	Inspector Comments	Notes
1	Has a change of ownership occurred?				NYSDEC must be informed 60 days in advance
2	Has there been any change in Site use?				Current Site use is industrial.
3	Have any soil disturbance activities occurred in the past year?				Documentation shall be provided as required by the Excavation Work Plan (Appendix C)
4	Are any soil disturbance activities planned at this time?				NYSDEC must be informed 15 days in advance of any soil disturbance activities
5	Is ground water underlying the Site being used?				Use of Site ground water is prohibited without treatment rendering it safe for intended use. Use of groundwater from the off-Site Norampac well is allowable for process and cooling purposes only.
6	Are there any vegetable gardens or farming at the Site?				These activities are prohibited.
7	Is there any activity that will or may tend to interfere with the completed remedy or the continued ability to implement institutional controls?				

Name of Inspector:
Signature of Inspector:
Date of Inspection:
Date of Last Inspection:
Required Date of Next Inspection (add 12 months to current inspection date):
Identify expected inspector for next inspection:

Additional comments or drawings:

Appendix G
Sampling and Analysis Plan

Sampling and Analysis Plan

for

Brownfield Remedial Investigation

Former Mill No.2
Norampac
4001 Packard Road
Niagara Falls, New York

Site ID # C932150

Prepared by

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499 Colonel Eileen Collins Blvd.
Syracuse, New York 13212

April 2010

Revised August 2010

SAMPLING AND ANALYSIS PLAN

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SECTION 1 INTRODUCTION

This Sampling and Analysis Plan is for the Norampac Brownfield Project in the City of Niagara Falls, Niagara County, New York. The project involves a Remedial Investigation (RI) to further define contamination at the Site and an Alternatives Analysis to determine if further actions are need to reduce the risk that the site contamination poses.

Note that this plan describes procedures for a variety of sampling situations. Not all of these situations may exist at the Norampac site. The Work Plan for the RI details the specific sampling and analyses for the Norampac Brownfield project.

SECTION 2 QUALITY ASSURANCE PROJECT PLAN (QAPP)

2.1 Project Description

This Sampling and Analysis Plan includes identification of sampling locations and media; methods for collection, handling, and preservation; and the protocols to be used for sample analysis. Environmental media to be sampled include soils, groundwater, and miscellaneous materials (e.g., sewer sediments). The data will be utilized to form conclusions as to the presence, transport, and fate of site specific contaminants.

2.2 Project Organization and Responsibilities

The sampling and analysis plan will utilize the following project organization and the associated responsibilities:

Project Manager	Steven M. Vinci
Technical Manager	Thomas Barba
Quality Assurance/Quality Control (QA/QC)	Thomas Barba
Laboratory Coordinator	Rory Woodmansee
Field Investigations	Rory Woodmansee

2.3 Data Quality Objectives

Data Quality Objectives (DQOs) are statements which describe the desired quality of data necessary to meet the objectives of the sampling program. The DQOs for the Norampac Brownfield site sampling program were formulated during the scoping effort and developed as part of this Sample and Analysis Plan. The general steps followed in preparation of the DQOs were as follows:

- *Identification of the media to be sampled* - Identifies the media being investigated (e.g., ground water, surface soil).
- *Identification of the data uses* - Identifies the intended use of the data according to the following:
  - Site Characterization - Data are used to determine the composition, nature, and extent of contamination.
  - Risk Assessment - Data are used to evaluate the actual or potential risks posed by contaminants determined to be present on-site. Particular attention is given to sampling at locations where human exposure is possible.
  - Health and Safety Plan (HSP) - Data are used to establish the level of protection needed for on-site workers during site characterization activities.
  - Monitoring - Data are used during the monitoring of a remedial action to access the effectiveness of such action.
  - Evaluation of Alternatives - Data are used to evaluate various proposed remedial technologies and assist in proper design of alternatives.
- *Identification of the data types* - Identifies what types of analyses are to be performed.
- *Sample Collected* - Describes the sample types to be collected.
  - Environmental - Refers to a specific media sampled such as water, soil, air, or biological.
  - Source - Refers to sampling an actual contamination source.
  - Grab - A discrete sample representative of a specific location.
  - Composite - A sample that represents a mixture of a number of grab samples that represents the average properties over the extent of areas sampled.

- Biased - Sampling that focuses on a specific area of expected contamination or uncontaminated area (background).

- *Identification of the data quality needs* - Identifies the analytical options available to support data collection activities and are identified as follows:
  - Level I: *Field Screening* - portable type instruments which provide real-time data.
  - Level II: *Field Analysis* - portable analytical instruments in an on-site lab or transported to the site.
  - Level III: *Standard Analytical Protocols* - standard analytical protocols or without the New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP) (2005) deliverables/reportables documentation.
  - Level IV: *NYSDEC ASP Reportables/Deliverables* - rigorous QA/QC protocols and reportables/deliverables documentation; NYSDEC ASP (2005) Category B deliverables.
  - Level V: *Non-Standard* - methods which have been modified to meet specific site study or remediation needs or by use of some other specialized analytical methods that cannot be obtained through standard or typical avenues of analytical support.
- *Identification of Data Quality Factors* - Describes factors which influence the quality or quantity of data to be collected. Primary contaminants and associated levels of concern are identified concerning Applicable or Relevant and Appropriate Requirements (ARARs) or potential risks. Required detection limits are also given or referenced.
- *Identification of QA/QC Samples* - Specifies additional samples to be collected to support QA/QC procedures. Additional samples to be collected could include:
  - *Matrix Spike/Matrix Spike Duplicates* - Matrix spike and matrix spike duplicate samples are collected as a duplicate sample to which the analytical laboratory will add known amounts of target analytes. These QA/QC samples are intended to assess the extraction procedure used by the laboratory.
  - *Field Blanks* - Field (equipment) blanks are samples which are obtained by running analyte-free water through the sample collection equipment in a way that is identical to the sample collection procedures. Field blanks may be used during QA/QC

procedures to evaluate if sampling equipment has contributed contaminants to the samples.

- *Trip Blanks* - Trip blanks are samples which are prepared prior to the sampling event in the same type of sample container and are kept with the collected samples throughout the sampling event unit analysis. Trip blank vials are not opened in the field and are analyzed for volatile organics only.

2.4 Sampling Procedures

All sampling objectives, locations, and procedures have been included as the Field Sampling Plan and described in Section 3.0 of this Sampling and Analysis Plan. Items including Field Measurement Techniques, General Field Decontamination, and Sample Management have also been included within the Field Sampling Plan.

2.5 Laboratory Certification and Coordination

All chemical analyses for samples from the site will be completed by a CLP laboratory capable of performing project specific analyses as indicated in this QA/QC plan. The project QA/QC Officer will also be responsible for all project related laboratory coordination.

2.6 Analytical Methodologies

Analysis of samples collected during the RI will be consistent with the NYSDEC ASP 2005, Category B requirements. Sampling and analysis will be performed for the Superfund Target Compound List (TCL) parameters including volatiles, semivolatiles, PCBs/pesticides, and inorganics. The specific analyses will be conducted according to the following methodologies:

Parameter Group	Analysis Method
Volatiles	USEPA 8260
Semivolatiles	USEPA 8270
PCBs/Pesticides	USEPA 8081/8082
Metals	CLP-M-Series/USEPA 6010B (TAL List)
Mercury	CLP M-245.1/USEPA 7470
Cyanide	CLP M-335.2/USEPA 9012

Trip blanks will accompany each shipment of aqueous samples for volatile organic compounds (VOC) analysis. Trip blanks are not necessary for soil samples. If several samples are collected for VOC analysis on any one day, all VOC samples will be packed in the same cooler with the trip blank. All trip blanks will be analyzed according to NYSDEC ASP (2005) protocol for volatile organics. All data will be presented in Category B reportables/deliverables format.

Duplicate samples will be obtained from surface water or groundwater (aqueous) and soil samples (solids). One matrix spike (MS) and one matrix spike duplicate (MSD) sample will be collected and analyzed for each twenty field samples collected for each matrix. MS and MSD samples must be referenced to a specific field sample. The ASP provides the following definitions for MS and MSD samples:

- Matrix spike - An aliquot of a sample (water or soil) spiked with known quantities of specific compounds (target analytes) and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery. The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.
- Matrix spike duplicate - A second aliquot of the same matrix as the Matrix Spike that is spiked with identical concentrations of target analytes as the Matrix Spike, in order to document the precision and bias of the method in a given sample matrix.

With the present sampling schedule and sample quantities, one set of MS/MSD samples will be collected from a water sampling location and two sets of MS/MSD samples will be collected from soil sampling locations.

2.7 Analytical Quality Control

Analytical quality control for this Project will be consistent with the methodology and quality assurance/quality control requirements in the NYSDEC ASP 2005. The following holding times calculated from the verified time of sample receipt (VTSR) at the laboratory will be required from the contracted analytical laboratory, regardless of sample matrix:

Parameter	Task	Holding Time
Volatiles	Analysis	7 days from VTSR
Semivolatiles	Extraction	5 days from VTSR
	Sample clean-up	5 days from VTSR
	Analysis	40 days from VTSR
Pesticides/PCBs	Extraction	5 days from VTSR
	Sample clean-up	5 days from VTSR
	Analysis	40 days from VTSR
Mercury	Analysis	26 days from VTSR
Cyanide	Analysis	12 days from VTSR
Metals	Analysis	180 days from VTSR

2.8 Reportables and Deliverables Documentation

The Remedial Investigation analytical data which will be subjected to data usability review will be presented in NYSDEC ASP (2005) Category B reportables/deliverables format. The RI report will be a stand-alone document that will include the results and an interpretation of the RI sampling, as well as the summary data from previous sampling activities.

2.9 Data Usability Summary Report

A Data Usability Summary Report (DUSR) will be prepared by a certified data validator. The DUSR will be prepared in a manner consistent with the NYSDEC's *Guidance for Data Deliverables and Development of Data Usability Summary Reports* as given in Appendix 2B of the draft DER-10. The main objective of the DUSR is to determine whether the data presented meets the project-specific needs for data quality and data use.

SECTION 3 FIELD SAMPLING PLAN

3.1 Sampling Objectives

Field sampling at the former Mill No. 2 site has been designed to obtain representative samples of environmental media to assess the impact that the site may have upon human health and the environment. The field sampling plan includes media sampling for groundwater, subsurface soils, and sediments.

3.2 Sampling Locations

Subsurface Soil

As discussed and illustrated on Figure 2 and Figure 3 in the RI Work Plan, soil borings will be located based on the following criteria:

- Approximately 42 soil borings will be located based on a 100 foot square grid covering the majority of the property;
- An additional 15 locations in between grid nodes as requested by NYSDEC in June 2010
- Eight borings will be placed at pre-determined monitoring well locations;
- Thirteen borings and two ground water monitoring wells on the "Frank's Vacuum Service Property" only in the event that parcel is added to the current limits of the BCP parcel.
- Additional borings and or test trenches will be placed to assess the areas shown on Figure 3 of the RI work plan. Those locations will be adjusted based on inspection of surface features (pipelines, sumps, etc.) or on research into past uses of the property, are determined to be of greater probability of exhibiting impacts.

Subsurface borings will be implemented using either direct push subsurface investigation techniques or conventional rotary drilling with continuous split spoon sampling in accordance with ASTM D-1586-99. Conventional borings will be advanced using hollow-stem auger without the use of air or drilling fluids. Drilling cuttings will be visually inspected and screened with a photoionization detector (PID) and will be managed consistent with DER-10 May 3, 2010 as described in Section 2.4 of the RI Work Plan. Direct push or continuous split-spoon sampling will be conducted to define the unconsolidated geology. During the continuous sampling process, all soil samples will be field screened for the presence of volatile organic compounds using a PID. Soil samples for laboratory analysis will be selected in the field based on visual/olfactory examination of the samples and the results of PID screening.

When conditions are encountered that indicate excavation would be a more effective way to investigate and sample the subsurface, the Work Plan allows for field decisions to be made to substitute test pitting for the soil borings discussed above.

Groundwater

Eight of the above described boring locations have been pre-selected to be completed as monitoring wells. Section 2.4 of the RI Work Plan describes the manner in which the groundwater monitoring wells will be constructed. One sample of groundwater, plus appropriate QA/QC samples, will be collected from each well. Section 2.4 of the RI Work Plan provides the groundwater monitoring well sampling protocol.

Miscellaneous Media

These samples include surface soil samples from the electrical transformer yard, as well as solid or liquid materials from sumps, pipelines, or catchbasins. These samples will be collected from where they are encountered; specific locations and physical descriptions of the materials will be documented so that any location can be identified via permanent landmarks, measurements, or GPS coordinates.

3.3 Sampling Procedures

The following sections provide procedures for collecting a variety of samples, not all of which will be needed at this site.

3.3.1 Preparation for Sampling

The sample collection technique is of prime importance to assure the integrity of the collected sample. The following techniques include provisions so that:

- A representative sample is obtained;
- Contamination of the sample is minimized;
- The sample is properly preserved; and
- An acceptable Chain-of-Custody record is maintained.

The QA/QC Sampling Component of the Plan includes:

- Incorporation of accepted sampling techniques referenced in the sampling plan;
- Procedures for documenting any field actions contrary to the QA/QC Plan;
- Documentation of all preliminary activities such as equipment check-out, calibrations, and container storage and preparation;

- Documentation of field measurement quality control data (quality control procedures for such measurements shall be equivalent to corresponding QC procedures);
- Documentation of field activities;
- Documentation of post-field activities including sample shipment and receipt, field team debriefing, and equipment check-in;
- Generation of quality control samples including duplicate samples, field blanks, equipment blanks, and trip blanks; and
- The use of these samples in the context of data evaluation with details of the methods employed (including statistical methods) and of the criteria upon which the information generated will be judged.

The personnel responsible for collection of groundwater, soil, and miscellaneous media samples will be familiar with standard sampling procedures and follow the appropriate protocol. Field records will be maintained in bound notebooks with numbered pages to document daily instrument calibration, locations sampled, field observations, and weather conditions. Each page will be dated and signed by the sampler. Each notebook will be numbered and a log of notebooks will be maintained by the project manager.

Prior to sampling, all equipment must be procured and accommodations for sample container delivery, and sample shipment must be made. The following is a list of general equipment that would be on hand for sampling events. Special equipment for each sampling event is presented in the section describing that specific sampling event.

General Field Sampling Equipment

- Field Data Sheets
- Chain-of-Custody forms
- Engineers tape and folding ruler with 0.01 foot intervals
- Field Record Sheets
- Nitrile gloves
- Face-safety shield
- Tyvek coveralls
- Respirators
- Photoionization detector
- Bio-degradable phosphate free detergent
- Coolers (with ice)
- 55 gallon drums
- Sample bottles
- Aluminum foil
- Duct and filament tape
- Tap water

- Distilled water
- Laboratory grade methanol and hexane
- 5 gallon wash buckets
- Decontamination cloths
- Large disposal containers
- Large plastic sheets

3.3.2 Groundwater Sample Collection

Groundwater samples will be collected using dedicated, disposable HDPE bailers following evacuation of three borehole volumes or complete purging of the well. All other related sampling equipment will be properly decontaminated in the field. The following equipment will be available for sampling of monitoring wells in addition to the general sampling equipment list:

- Well Data Sheets
- Bailers
- Electronic water level indicator
- pH meter
- Thermometer
- Photoionization detector (PID)
- ORP Meter
- DO Meter
- Conductivity Meter
- Sample preservatives
- Nitrile gloves

The following activities will be completed before going into the field every day before the start of sampling:

1. Fill out appropriate section on Well Data Sheet for the wells to be sampled;
2. Obtain the sampling schedule for each well to be sampled;
3. Calibrate the Photoionization Detector (PID) with the calibration gas;
4. Determine the amount of sampling to be done for the day and prepare the necessary number of coolers;
5. Each well to be sampled will have designated coolers containing the pre-labeled, certified clean, sample bottles. The groundwater samples will be placed in the cooler labeled for the well from which they were taken. The bottle shall be labeled with large distinguishable letters, so that the groundwater samples will be placed in the proper cooler; and
6. Select the appropriate sample containers for the day's sampling. The containers shall be pre-marked with a sample parameter and preservatives. Reusable glass bottles will have been cleaned and prepared at the laboratory. The containers for the various parameters to be analyzed from each well location will then be placed in a cooler.

The following steps describe the sample collection of groundwater:

1. Unlock and remove the well cap;
2. Test the air at the wellhead with the calibrated PID. If the gases from the well have caused the air in the breathing zone to read greater than 5 ppm, stop work and refer to the Health and Safety Plan. Record the reading on the Well Data Sheet;
3. In order to obtain a representative sample of the formation water, the well must be purged of the static water within the well. Prior to purging, the static water level within the well must be measured and the measurement recorded on the Well Data Sheet. To determine the amount of water necessary to purge, find the liquid column height in the well to determine the total volume (three liquid column borehole volumes) of liquid to be purged;
4. Attach the polypropylene rope to the sample bailer. A different dedicated rope will be used for each well.
5. Purge the well; lower bailer slowly into the well until it is below the water surface. Consistent with NYSDEC Guidance, purge waters will be containerized.
6. Record the amount of water purged in the field logbook and on the Well Data Sheet.
9. If the well goes dry during bailing, allow for full recovery (measure the water level) and then sample. If recovery takes more than twenty minutes, proceed to next well but return to sample within 24 hours.
10. Fill the appropriate sample bottles according to the sampling schedule for each well. While filling the sample bottles, record the well number, type, volume of container, and the preservatives used on the Ground Water Sampling Analyses form.
11. Commence sample collection with the following sample collection order: volatiles, semi-volatiles, PCBs/pesticides, cyanide, mercury, and metals. If the well should go dry during sampling and the well needs to be re-sampled the next day, the second attempt to sample the well will proceed in the following order: volatiles, metals, semi-volatiles, PCBs/pesticides, cyanide, and mercury.

12. The preservatives for the various sampling parameters were previously added to the clean sample bottles by the laboratory. Some parameters may require additional special handling.
    - Volatile organics analyses samples must be free of air bubbles. When a bubble-free sample has been obtained, it must be immediately chilled.
    - All samples collected for metals analysis will be preserved with nitric acid to a pH less than 2.
13. Collect the matrix spike duplicates and trip blanks. Take samples according to sampling schedule presented in the Work Plan. Duplicate samples will include the field splitting of at least one groundwater sample for each sampling visit. This may require the extraction of twice the amount of water needed for duplication purposes. The creation of trip/field blanks and duplicates shall be performed at least once with each field batch with a minimum of once every twenty samples.
14. Record all pertinent information in field logbook and on the Well Data Sheet (include color, odor, sediment content of sample, etc.). Any situations at the site that have the potential to interfere with the analytical results should also be recorded here.
15. Lock well, inspect well site, and note any maintenance required.
16. Dispose of potentially contaminated materials in designated container for contaminated solids.

3.3.3 Soil Sampling

Soil samples from test pit locations will be collected using disposable or dedicated stainless steel spoons or hand trowels from those areas investigated via test pit excavations, or shallow sampling locations and sumps/drains as indicated in the sampling and analysis tables in the RI Work Plan. The use of disposable or dedicated sampling equipment will eliminate the need for collection of field (equipment) blanks. The retrieved soil sample will be placed directly into parameter specific glass containers. Each sample container will be appropriately labeled and transported to the contracted laboratory in appropriate coolers. The following equipment will be required for the sampling of soil samples, in addition to the general sampling equipment list:

- Dedicated or disposable stainless steel spoons or hand trowels; and
- PID instrument.

The following activities will be completed prior to field sampling everyday:

- Fill out appropriate section on Soil Sample Sheet for the sites/trenches to be sampled;
- Determine the amount of sampling to be done for the day and prepare the necessary number of coolers;
- Select the appropriate sample bottles for the day's sampling. Soil samples will be collected within unpreserved glass, parameter specific, containers.

Sampling for matrix spike/matrix spike duplicates shall be performed at least once with each field batch with a minimum of one for each twenty samples.

3.3.4 Miscellaneous Media Samples

Drain, sump, and/or pit sludge/solid residue media samples will be collected using disposable or dedicated stainless steel spoons or hand trowels. The use of disposable or dedicated sampling equipment will eliminate the need for collection of field (equipment) blanks. The retrieved solid/sludge sample will be placed directly into parameter specific glass containers. Each sample container will be appropriately labeled and transported to the contracted laboratory in appropriate coolers. If applicable, liquid miscellaneous media samples will be sampled using an intermediate, disposable, certified clean, glass-pint sampling container. Parameter specific liquid media sample containers will then be filled. Upon filling parameter specific containers, each container will be capped, with a minimum amount of head-space, and placed within specific sample coolers for delivery to the laboratory. Upon completing miscellaneous media sampling, each parameter and location specific sample will be logged within the appropriate sampler's field book and chain-of-custody sheet. Prior to field sampling of miscellaneous media samples, the following activities will be completed:

- Locate each miscellaneous (sump, pit, and/or drain) location within the field using a facility site map and site markers;
- Flag and/or mark, with identification, each sampling location;
- Locate, identify and photograph each sampling location and record such information on field data sheets and field map;
- Plan sampling schedule;

- Calibrate PID instrument (if used for screening); and
- Collect, label, and organize appropriate disposable trowels, spoons, intermediate sample containers, and final laboratory containers.
- Fill out appropriate section on Miscellaneous Media Sample Sheet for the site area/location to be sampled;
- Determine the amount of sampling to be done for the day and prepare the necessary number of coolers;
- Select the appropriate sample bottles for the day's sampling.

The following activities will be completed during the Miscellaneous Media sampling process:

- Collect appropriate media sample from predesignated location at each sampling location using dedicated or disposable spoons/trowels (solids) or certified clean, intermediate sampling containers (liquids);
- For liquid media, transfer each sample to the appropriately labeled container noting observed characteristics on field data sheet;
- Where possible, analyze a subsample of each sample for organic vapors using a PID;
- Cap container and complete proper chain-of-custody sheets and field data sheet; and
- Transport containers and chain-of-custody sheets to laboratory.

3.3.5 IRM Confirmation Samples

If a soil IRM is deemed to be warranted and appropriate, IRM confirmation soil samples from remedial excavations will be collected using disposable or dedicated stainless steel spoons or hand trowels from excavation walls/floor where evidence of potential contaminants were previously removed. To minimize volatilization, confirmation samples will be collected from the soils located two to four inches inside the walls or floor of the excavation. The use of disposable or dedicated sampling equipment will eliminate the need for collection of field (equipment) blanks. The retrieved soil sample will be placed directly into parameter specific glass containers. Each sample container will be appropriately labeled and transported to the contracted laboratory in appropriate coolers. The following equipment will be required for the sampling of soil samples, in addition to the general sampling equipment list:

- dedicated or disposable stainless steel spoons or hand trowels; and
- PID instrument.

The following activities will be completed prior to field sampling everyday:

- Fill out appropriate section on Confirmation Soil Sample Sheet for the excavation wall or floor locations to be sampled;
- Determine the amount of sampling to be done for the day and prepare the necessary number of coolers;
- Select the appropriate sample bottles for the day's sampling. Soil samples will be collected within unpreserved glass, parameter specific, containers.

Duplicate samples shall be collected at least once with each field batch with a minimum of one for each twenty samples. The on-site NYSDEC representative will be allowed the opportunity to split any sample taken.

3.3.6 Background Samples

Based on the industrial nature of the site environs, and on the complexity of on-site and off-site conditions that might affect groundwater and contaminant migration in the area, soil and groundwater samples have not been pre-designated as likely to characterize site background conditions. Instead, monitoring wells will be installed in all cardinal directions on the site perimeter, as well as within the interior of the site, and will be used to determine local groundwater flow directions and should indicate which specific samples might be indicative of background conditions.

3.3.7 QA/QC Samples

Matrix Spike/Matrix Spike Duplicates

Additional samples from each of the following environmental sampling media will be collected as matrix spike/matrix spike duplicates: groundwater, subsurface soils. Matrix spike and matrix spike duplicate samples will be collected at a frequency of one set per twenty samples of each media.

Trip Blanks

Separate trip blanks will be carried into the field on each of the sampling days. The trip blank vials will be prepared by the contracted laboratory and handled in the field similar to the other sampling containers with the exception that the vials will not be opened.

3.4 Field Measurement Techniques

Water Level Measurement - Water elevations will be taken on all wells prior to purging and sampling. All measurements will be taken within a 24-hour period to obtain consistent elevations and recorded on well data sheets. The procedure for measuring water levels in the monitoring wells is:

- Unlock and remove well cap;
- Test the atmosphere of the well with the calibrated PID instrument. If the gases from the well have caused the air in the breathing zone to read greater than 5 ppm, stop work and refer to the Health and Safety Plan
- Measure water level to nearest 0.01 foot with a water level indicator (electronic).
- Water level indicators will be decontaminated before moving to next well. The tape and cable are decontaminated by washing in a bucket of distilled water-biodegradable phosphate free-detergent solution, followed by a rinse with distilled water.

Specific Conductance Measurement - A specific conductance meter will be field calibrated daily, using a 1M KCl reference solution, to 1413 µmhos/cm at 25 degrees centigrade. Sample aliquots for specific conductance and temperature will be obtained directly from the sampling point in 100 ml disposable beakers.

Photoionization Detector (PID) - The PID will be calibrated daily (and more often as required by the manufacturer's data) prior to use in the field, using calibration test gases.

3.5 General Decontamination

The following procedures will be performed for the decontamination of exploration equipment, sampling equipment, and personnel after each drilling/sampling event:

Drill rig, backhoe, and excavator - The drill rig, direct-push rig, backhoe, and/or excavator will be cleaned prior to their entrance and exit of the site. Greases and oils will not be used on any down hole equipment during drilling or exploration activities.

Exploration equipment - To avoid cross contamination, use of a PID meter and cleaning between each sampling site will be employed on backhoe arms, buckets, hollow stem augers, casing drill rods, down-hole tools, and appurtenant equipment.

Split spoon and Direct Push samplers – Sampler tools will be scrubbed, cleaned, and put through a series of rinses between each sampling event. A number of split spoon samplers will be used so that one can be utilized for sampling while the others are being cleaned. Acetate sleeves are expected to be used in direct push samplers. Those sleeves are single use and will be containerized and disposed.

Reusable equipment - The following steps will be employed to decontaminate reusable equipment:

- Rinse equipment of soil or foreign material with potable water;
- Immerse and scrub equipment with bio-degradable phosphate-free detergent and potable water;
- Immerse and scrub in a potable water rinse without detergent;
- Immerse and scrub in deionized/distilled water;
- Air dry and wrap cleaned equipment in foil to carry to next monitoring site to prevent contamination of equipment during transfer; and
- The decontamination wash and rinse water will not be considered hazardous unless visual inspection or monitoring by the PID and other equipment indicate that contaminants may be present. The rinse waters can be discharged on-site if they are not contaminated. If contaminants are expected to be present, the rinsate waters should be placed in 55 gallon drums and stored on-site.

Sample containers - Upon filling and capping sample bottles, the outside of the bottle will be wiped off with a clean paper towel. These towels will be disposed of in a dedicated container for contaminated solids.

Personnel decontamination - The following procedures will be used to decontaminate sampling personnel.

- After each sampling event chemical resistant gloves will be disposed of in a dedicated container for contaminated solids;
- At the end of each sampling day, Tyvek™ coveralls will be disposed of in a dedicated container for contaminated solids;
- Boots will be rinsed off with water to remove mud, clay, or any other contaminants; and
- Personnel will be required to follow procedures outlined in the Health and Safety Plan.

3.6 Sample Management Plan

3.6.1 Sample Management

The Sample Management Plan provides procedures to document and track samples and results obtained during this work effort. A series of pre-printed forms with the appropriate information serves as a vehicle for documentation and tracking. In order to accomplish this task, the documentation materials will include sample labels, sample characterization and Chain-of-Custody sheets, daily field reports, and a sample log.

Sample Label - A sample label will be completed for each sample obtained and will be affixed to the sample container. The label is configured in a way to address various types of mediums. Information on the label includes, at a minimum, client name, location, sample description, sample number, date, time, grab sample, composite sample, notes, and sampler's name.

Sample Characterization & Chain-of-Custody Sheet - All pertinent field information will be entered onto the sample characterization and chain-of-custody sheets including client name, sample ID, sample description, location of sample, sampling method, number of containers, container type, analysis required, and preservation. The monitoring well form has space allotted

for entering information regarding the well including depth to water, well volume, sample pH, temperature, color, etc. The Chain-of-Custody section of the form will document the sample's pathway of sample shipment which will include names of persons delivering/receiving, dates, and times. The reverse side of this form will be used by the laboratory to document analysis performed on the sample. Copies of the completed forms will be retained by the Engineer and the analytical laboratory. The original sample characterization and Chain-of-Custody sheets will be submitted in the Remedial Investigation report along with the laboratory results.

Daily Field Reports - Daily activities will be recorded on the Inspection Report form. The purpose of this form will be to summarize the work performed on the site each day. The completed forms will be submitted to the Project Manager on a daily basis for short term site activity and on a weekly basis for site activities of a longer duration.

Sample Log - The sample log will be utilized to track each individual sample obtained at the site. The upper portion, "Field Identification" will be completed the day the sample is taken. The form will accompany the sample characterization and Chain-of-Custody form to the laboratory. Personnel at the laboratory will complete the middle section of this form and return it to the Engineer, who will use the document to track incoming results. The bottom of the sheet has space allocated to enter "Recommended Actions" based on laboratory results.

3.6.2 Sample Designation

Each sample will have a unique sample code that will include, where appropriate, the sample media, and the sample location. The following codes will be used in the sample designation:

Sample Media	Code	Sample Location	Example
Groundwater	MW	Monitoring well	MW-1, MW-2, etc.
Subsurface Soil	B or TP	Soil Borings or Test trenches	B-1; TP-1, B-2, etc.
Miscellaneous Media			
Liquid	IL	Pit/sump/drain	IL-1, IL-2, etc.
Solid/Residue	SL	Pit/sump/drain, residues, surface soils	SL-1, SL-2, etc.
Field Blank	FB	Any	FB1, FB2, etc.

Sample Media	Code	Sample Location	Example
Matrix Spike, and Matrix Spike Duplicate	MS MSD	Any	MW-1 MS, B-2 MSD, etc.
Trip Blanks	TB	-	TB-1, TB-2, etc.

As an example of a sample designation, sample MW-3 represents a groundwater sample obtained from monitoring well MW-3.

3.6.3 Sample Handling

Each collected sample will be dispensed into the appropriate sample containers for the type of analysis to be performed. Appropriate sample preservatives will be added to the sample containers by the contracted analytical laboratory prior to the delivery into the field, except in cases where the sample preservative must be added after sample collection. All samples that require cool storage will be immediately placed in coolers with appropriate packaging materials so as to protect the breakage of sample containers during shipment. The sample coolers will be filled with cubed ice (no "Blue Ice") prior to leaving the sample collection location. In the instance that a local analytical laboratory is contracted, the samples will be hand delivered to the laboratory each sampling day. The chain-of-custody forms will be signed by the laboratory personnel picking up the samples and placed within the coolers. In the instance that an analytical laboratory is contracted which is not based locally and a common carrier is used for sample shipment, the chain-of-custody forms will be signed by the sampler and the carrier personnel and placed inside of the coolers. Careful packaging techniques will be used to prevent sample containers from breakage during shipment. Materials such as cardboard, foam wrap, or Styrofoam may be used as packaging materials. All samples will be delivered to the contracted analytical laboratory on the day they were collected and will be received by the laboratory within 24 hours of sample collection. The samples will be collected with sufficient time allowed at the end of the day for the analytical laboratory to properly process the sample chain-of-custody form.