FEASIBILITY STUDY REPORT
T-BIRD COUNTRY CLUB
NYSDEC Site #546028

Prepared for:

Tee Bird Country Club, Inc.
North Course
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Moreau, NY 12830

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1.0 INTRODUCTION

Delaware Engineering, P.C. (Delaware) has prepared this Feasibility Study (FS) Report on behalf of Tee Bird Country Club Inc. for the North Course located on Reservoir Road, Town of Moreau, Saratoga County, New York, New York State Department of Environmental Conservation (NYSDEC) Site No. 546028 pursuant to an Order on Consent (#A5-0532-1205) between Tee-Bird and the NYSDEC.

The country club is located on the south side of Reservoir Road, approximately one mile west of the Hudson River. The Site includes a parking lot area that had been impacted by polychlorinated biphenyls (PCBs) applied to the surface of the parking lot for dust control circa 1977 before the parking lot was paved in 1984. Figure 1 is a map showing the location of the property.

The Tee Bird Golf Club consists of a championship 18-hole course (north course) and a 9-hole course (south course). The Club also maintains a bar and grill at both courses as well as banquet facilities for weddings, corporate meetings and parties. Currently, the Club employs approximately 10 to 19 people.

1.1 PURPOSE AND ORGANIZATION OF REPORT

The purpose of this FS is to identify and analyze remedial alternatives that are protective of human health and the environment, attain to the maximum extent practicable the applicable or relevant and appropriate requirements (ARARs), and to evaluate cost effectiveness. Accordingly, the FS is based on objectives, methodologies, and evaluation criteria as generally set forth in the following Federal United States Environmental Protection Agency (USEPA) and NYSDEC regulations and guidelines:

- the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA) and the Superfund Reauthorization Act of 1986 (SARA);
- the National Oil and Hazardous Substances Contingency Plan (NCP);
- Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, October 1988);
- CERCLA Compliance with Other Laws Manual, 1988, OSWER Directive No. 9234.1-01 and -02;
- NYSDEC Draft DER-10, Technical Guidance for site Investigation and Remediation, May 2010.

- NYSDEC 6NYCRR Part 375, Environmental Remediation Program, December 2006.

- NYSDEC Water Quality Regulations for Surface Waters and Ground waters, 6NYCRR Parts 700-705;
- NYSDEC Technical and Administrative Guidance Memorandum (TAGM) #HWR-89-4022 "Records of Decision for Remediation of Class 2 Inactive Hazardous Waste Disposal Sites";

- NYSDEC TAGM #HWR-89-4025 "Guidelines for RI/FS's";

- NYSDEC TAGM #HWR-90-4030 "Selection of Remedial Actions at Inactive Hazardous Waste Sites";

- NYSDEC Strategy for Ground water Remediation Decision Making at Inactive Hazardous Waste Sites and Petroleum Contaminated Sites in New York State, April 1996

- NYSDEC "Technical Guidance for Screening Contaminated Sediments"; and

- NYSDOH Drinking Water Standards.

During the FS, potential remedial alternatives are identified, screened, and evaluated in accordance with EPA and NYSDEC guidance. The FS focuses on the remedial alternatives that can be readily implemented and can achieve the remedial action objectives effectively. Technologies that could prove to be difficult to implement or may not be appropriate based on site specific conditions are eliminated from further consideration. The objective of the FS is to select an alternative that will cost effectively eliminate, to the extent possible, off-site migration of contaminants and the potential for exposure to site related chemistry.

1.2 SITE DESCRIPTION

The country club consists of a public, 18-hole championship golf course (north course), with a club house building, a maintenance building, a small open-air food stand, and a cart shed. The buildings are situated around paved and unpaved parking areas located in the north-central part of the property, near Reservoir Road. The paved parking area between the clubhouse and Reservoir Road constitutes the capped PCB area. Refer to Figure 1. Based on current soil boring logs and field reconnaissance, it is estimated that the cap consists of approximately 6 inches comprised of approximately 2 to 3 inches of asphalt underlain by 3 to 4 inches of gravel. A layer of medium to coarse sand fill and natural clay exists immediately beneath the asphalt and gravel sub-base.

1.3 SITE HISTORY

The country club parking lot has been impacted by PCBs applied to the surface of the parking lot for dust control circa 1977. A remedy approved by the NYSDEC, consisting of an asphalt cap placed over the parking lot, was implemented in 1984 in accordance with an agreement between Tee Bird and the NYSDEC.

It is reported that the property was purchased in 1960 and at that time, the property was an inactive farm, with a farm house. The club house and golf course were opened in 1962 as a nine-hole course. Subsequently, the golf course was expanded to eighteen holes and operated as an active golf course through the years to the present.

1.3.1 PRIOR REMEDIAL ACTION

In the early 1980's soil sampling by the NYSDEC detected the presence of PCBs in the parking lot at the Site, which was unpaved at the time. The NYSDEC entered into an agreement, dated July 2, 1984, with Tee Bird in which Tee Bird agreed to install an engineered cap over the parking lot as a final remedial measure to address the presence of PCBs. NYSDEC personnel conducted periodic inspections of the existing engineered cap and collected and analyzed soil samples adjacent to the parking area in 1983, 1984, 1989, and 1990. In 1991, as the site remained a Class 3 site, Tee Bird extended the cap with the NYSDEC's consent. No further investigation or remedial measures were required as a result of the inspections or soil sampling.

The NYSDEC issued a letter dated June 27, 2005 indicating that it was reclassifying the Site from a Class 3 Inactive Hazardous Waste Site to a Class 2 Site and that a Remedial Investigation and Feasibility Study (RI/FS) would be required. Tee Bird and the NYSDEC entered into Order on Consent and Administrative Settlement #A5-0532-1205 (the "Order"). The remedial investigation (RI) was conducted and finalized in August 2011 in accordance with the Order and the September 26, 2008 Remedial Investigation and Feasibility Study Work Plan. The NYSDEC approved the work plan, with modifications, in a letter dated June 8, 2009.

1.4 PRIOR INVESTIGATION ACTIVITIES

1983 through 1990

NYSDEC collected samples at the site between 1983 and 1990. The data suggest that the lateral extent of PCBs at the Site is quite limited beyond the asphalt cap.

May 2006

A Phase I Environmental Site Assessment (ESA) of the property was conducted in May 2006 by Alpha Geoscience. In addition to the presence of PCBs in soils at or near the parking lot, petroleum storage tanks, and stored chemicals (fertilizers, pesticides, and paint) were identified in the vicinity of the maintenance building. These materials are used during the course of normal operations. No indications of significant spills or releases were observed near the maintenance building during the Phase I ESA.

August 2011

A Remedial Investigation (RI) was performed and finalized in August 2011 by Alpha Geoscience, in accordance with the NYSDEC approved September 26, 2008 Remedial Investigation and Feasibility Study Work Plan.

The objective of the RI was to define the lateral and vertical extent of impacts of potential contaminants of concern (COCs) on soil, ground water, and sediment. The data from this investigation is presented in the Remedial Investigation Report, Tee Bird Country Club-North Course, August 12, 2011 by Alpha Geoscience. The results are summarized in subsequent sections of this Report and provide the basis for this feasibility study.

1.5 SUMMARY OF REMEDIAL INVESTIGATION FINDINGS

Soil, ground water, drinking water, and pond and stream sediment samples were collected and analyzed during the RI. The following sections summarize site investigation data.

1.5.1 Soil Data

Historic soil sampling conducted by the NYSDEC indicates that the highest concentrations of PCBs are found on the southern portion of the parking lot.The maximum concentrations of PCBs detected at all locations during the RI were found below the asphalt cap in the 0 to 1 foot interval (544 ppm at SS-1, 39.4 ppm at SS-2, 553 ppm at SS-3, and 0.15 ppm at SS-4). Concentrations of PCBs decrease with depth at each location to no more than 1.18 ppm at SS-2 in the 1 to 2 feet interval (SS-2) and 0.04 ppm in the 2 to 3 feet interval (SS-2 and SS-3). The pattern of decreasing PCB concentrations with depth at each location is consistent with surface application of waste oils used for dust control.

The soil analytical data show that concentrations of PCBs above the NYSDEC's SCOs are limited to beneath or immediately adjacent to the asphalt cap. The depth of impacts is generally limited to one foot below the base of the asphalt cap, with two notable exceptions:

- beneath the south central portion of the parking lot, where concentrations range up to 3.07 mg/kg in the 2-3 ft interval, and

- along the edge of the asphalt on the driveway to the former trailer foundation area, where PCBs were found at 30.4 mg/kg in the 2-3 ft interval.

The distribution pattern and decreasing concentration with depth is consistent with surface application of waste oils used for dust control. The analytical data for samples collected along the cart paths, on the golf course, and on unpaved portions of the parking lot indicate that significant transport or spreading of PCBs from the paved portion of the parking, where the oil was formerly used for dust control, has not occurred.

1.5.2 Ground Water Data

The analytical results for the water samples collected from the three ground water monitoring wells (MW-1 through MW-3) and the drinking Clubhouse water supply well indicate that no PCBs are present in any of the water samples. These results indicate that the PCBs found in Site soils do not impact ground water quality.

1.5.3 Sediment Data

The analytical results for the sediment samples were compared to the NYSDEC's sediment screening criteria for Benthic Aquatic Toxicity (acute and chronic) and Wildlife Bioaccumulation (NYSDEC, 1999b). The human health bioaccumulation criteria were not used because the pond is not used for fishing or recreation. The sediment screening criteria (SSC) for non-polar organic contaminants, such as PCBs, are expressed in terms of mass of contaminant in milligrams per kilogram of organic carbon (mg/kgoc).

No PCBs were detected in the sediment samples collected upstream (SED-1) and downstream (SED-5) of the pond. PCBs were only detected in one sample (SED-4 [0-0.5 ft]) at a concentration of 0.0448 mg/kg. Based on a total organic carbon content of 25,000 mg/kg 0.0448 mg/kg is equal to 1.79 mg/kgoc and is less than the benthic aquatic acute (2,760 mg/kgoc) and chronic (19.3 mg/kgoc) toxicity SSC, but slightly above the wildlife bioaccumulation SSC (1.4 mg/kgoc). SED-4 is on the south (downstream) end of the pond. PCBs were not detected in any of the remaining sediment samples in the pond indicating that the lateral and vertical extent of PCBs in sediment is limited.

1.5.4 Data Summary

The results of the RI demonstrate that PCBs are the only contaminant of concern for the Site. The soil analytical data show that concentrations of PCBs above the NYSDEC's

SCOs are limited to beneath or immediately adjacent to the asphalt cap. The RI also indicates that PCBs were not detected in any of the ground water samples demonstrating that PCBs found in Site soils do not impact ground water quality. Furthermore, PCBs were not detected in the stream upstream or downstream of the pond. PCBs were only detected in one sample in the pond at a low concentration indicating that the lateral and vertical extent of PCBs in sediment is limited.

2.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Section 121(d) of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA P.L. 96-510), as amended by Superfund Amendments and Reauthorization Act (SARA P.L. 99-499), specifies that Superfund remedial actions must meet any Federal standard, requirement, criteria, or limitation that is a legally applicable or relevant and appropriate requirement (ARAR) under the circumstances of the contaminant release or threatened release. It also specifies that State ARARs must be met if they are more stringent than Federal requirements. The selected remedial measure must attain a level or standard of control that satisfies the ARARs except under certain conditions.

New York State does not have ARARs in its statute and uses Standards, Criteria and Guidelines (SCGs), which are equivalent to ARARs. New York State, in 6 NYCRR Part 375, has developed rules for selecting and designing remedial programs for inactive hazardous waste Sites, which are consistent with the CERCLA requirements. A remedial alternative must conform to NYS standards and criteria that are generally applicable, consistently applied, and officially promulgated, that are either directly applicable, or that are not directly applicable but are relevant and appropriate. The remedial program must conform to Federal Toxic Substances Control Act (TSCA) and Resource Conservation and Recovery Act (RCRA) regulations for waste disposal and treatment.

The site remedial program should also be selected with consideration given to NYS guidance, which is determined to be applicable on a case-specific basis. The Federal equivalent of NYS guidance is “To Be Considered” (TBC) guidance and advisories.

The potentially applicable standards, criteria and guidance (SCG) are identified in the sections below and the associated tables. Standards, criteria and guidance may be specific to the site location, the contaminants present, or the remedial actions planned.

2.1 LOCATION-SPECIFIC SCGS

Location-specific SCGs, which relate to requirements for wetland protection, floodplain management, fish and wildlife conservation, and historic preservation, apply to remedial alternatives within specific geographical locations. A list of potential location-specific SCGs are identified in Table 1.

2.2 CHEMICAL-SPECIFIC SCGS

Chemical-specific SCGs are Federal or State standards or health/risk-based numerical values that are used to establish acceptable amounts or concentrations of constituents in the environment. A list of potential chemical-specific SCGs are identified on Table 2.

2.3 ACTION-SPECIFIC SCGS

Action-specific SCGs apply to specific treatment and disposal activities, and may set controls or restrictions on the design, performance and implementation of the remedial actions taken at a site. For example, RCRA requirements will be applicable if the remediation constitutes treatment, storage or disposal of a hazardous waste as defined under RCRA. Other examples of action-specific requirements are Clean Water Act standards for discharge of treated ground water and New York State regulations at 6 NYCRR Part 703, which establish surface water and ground water quality standards and ground water effluent standards.

Table 3 identifies the action-specific SCGs that are potentially applicable to the site. Since action-specific SCGs apply to discrete remedial activities, their evaluation is presented with the detailed analysis of alternatives for each retained alternative.

2.4 POTENTIAL GUIDANCE

There are instances when SCGs do not exist for a particular chemical or remedial action. In these instances, other State and Federal advisories and guidance may be used to aid in the evaluation and selection of a remedial alternative for a site. The guidance or advisories that may be relevant to the site are identified on Table 4.

3.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

This section identifies the remedial action objectives, general response actions, and remedial technologies for the site. Several remedial technologies are identified as potentially capable of meeting the remedial action objectives. Each remedial technology is evaluated, and the most appropriate technologies are retained for use in developing remedial action alternatives.

3.1 REMEDIAL ACTION OBJECTIVES

Remedial action objectives for the site have been developed based on the constituents of concern, media of concern, identified exposure pathways, and potential receptors. The remedial action objectives, which are media-specific, provide for protection of human health and the environment. They have been selected to minimize or reduce to target levels, the potential for human exposure or environmental damage due to the

presence or migration of site-related contaminants. Table 5 presents Federal and State cleanup objectives for the contaminants of concern at the site. The site-specific remedial action objectives are as follows:

On-Site Impacted Soils:

- Prevent human exposure (ingestion and direct contact) to soils that exhibit PCB concentrations above the NYSDEC Part 375 Commercial Use Soil Cleanup Objective.

- Prevent, to the extent practicable, the contaminants from serving as a potential source of ground water contamination at concentrations in excess of current NYSDOH drinking water standards or, if more stringent, New York State ground water standards.

- Eliminate, to the extent practicable, the migration of site related contaminants off-site via ground water or stormwater runoff.

3.2 GENERAL RESPONSE ACTIONS

General response actions are actions that will satisfy the remedial action objectives. They may include treatment, containment, excavation, extraction, disposal, institutional controls, or monitoring, individually or in combination. The general response actions selected are identified below.

- no action
- institutional controls
- removal
- disposal
- containment/isolation
- treatment

3.3 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

USEPA program guidance recommends screening alternative remedial technologies using the criteria of effectiveness, implementability, and cost (USEPA 1988). In this section, remedial technologies are identified and screened to eliminate from further consideration those technologies and processes that may be of limited effectiveness, may not be able to be implemented at the site, or may be cost-prohibitive. The purpose of this screening is to better focus the FS on those technologies that offer the greatest potential of being effective and that can be implemented at the site.

The general response actions, remedial technologies and screening comments are presented in Table 6. These remedial technologies are evaluated based on site-specific

information and are screened initially for technical applicability. Technologies are considered applicable if, individually or in combination, they would achieve the remedial action objectives. Technologies are not retained for further analysis if the area or volume estimates for the media of concern are such that these technologies can be presumed infeasible.

Furthermore, the technologies are screened for effectiveness, implementability, and cost. The anticipated effectiveness of a technology refers to the ability of that technology to contribute to a remedial program that is protective of human health and the environment, and capable of meeting the stated remedial action objectives. Implementability is the feasibility and the ease with which the technology can be applied at the site and takes into consideration such practical factors as:

- Are the hazardous substances present at the site compatible with the technology?
- Is there sufficient room at the site to implement the technology?
- Is the technology compatible with site physical conditions?
- Is the use of the technology compatible with surrounding land uses?
- Will application of the technology unacceptably interfere with other ongoing uses of the site?
- What permitting and other regulatory requirements apply to use of the technology?
- Does the technology require resources of a type or in a quantity that is not readily available at the site?
- Are there experienced contractors that can provide, install, and operate the technology?

4.0 DEVELOPMENT OF REMEDIAL ALTERNATIVES

In this section, the remedial technologies selected for further consideration are assembled into appropriate remedial alternatives that address the media and areas of concern, and achieve the remedial objectives. As required by the National Contingency Plan (NCP), the "No Action" remedial alternative is included. Other non-technology-based alternatives such as institutional controls and deed restrictions are also considered. The no action alternative has been listed only once and is presented in Section 4.1. The soil remedial alternatives are presented in Section 4.2.

4.1 REMEDIAL ACTION ALTERNATIVE 1: NO ACTION

Under this alternative, no action would be taken. The contaminated soil would remain in place under cover of the prior remedial action discussed in Section 1.3.1, no treatment or monitoring of constituent concentrations would be implemented and no groundwater monitoring would be conducted. Soil containing PCBs would remain in place and it is anticipated that these substances would remain immobile to the extent they are now as indicated by the down gradient monitoring wells and the pond sediment data.

4.2 SOIL REMEDIAL ACTION ALTERNATIVE 2: INSTALLATION OF ENGINEERED ASPHALT CAP

This alternative would utilize institutional and engineering controls to eliminate human exposure to surface and sub-surface soils with contaminant concentrations above the NYSDEC Part 375 SCOs. An environmental easement that restricts use of the site to commercial uses and requires long term maintenance and monitoring, and that includes a Site Management Plan will be incorporated into the deed of the property owner.

The portion of the site impacted by PCB contamination above any of the NYSDEC Part 375 SCOs would be covered with an engineered asphalt paving cap. The asphalt cap would be installed over the area to eliminate precipitation infiltration and significantly reduce the potential for leaching of PCBs. This area generally consists of the existing paved area at the site and is shown on Figure 3.

Prior to placing the asphalt cap, the top surface would be prepared by sweeping the surface to remove loose material prior to applying a tack coat. The surface would then receive an asphalt cap that consists of a 2 inch binder course and a 1 ½ inch top course. A geo-grid or orange construction fencing could be used to provide a physical visual barrier demarking the existing site soils beneath the proposed asphalt cap. The new cap would serve to further isolate and immobilize the contaminants and would eliminate direct and indirect exposure to contaminated soils.

Groundwater monitoring would be implemented to evaluate the long-term effectiveness of the remedial alternative and document that there is no impact on ground water quality. A semi-annual monitoring program would be implemented for a period of 5 years and all samples will be analyzed for PCBs. An annual cap maintenance program will be implemented to monitor for overall cap integrity, cracking, heaving etc.

A Site Management Plan (SMP) would be developed that includes procedures for protection of human health and handling and disposal of soil. The SMP will specify institutional controls and engineering controls for the post remedial management of the site. These controls will include but not be limited to; procedures for breaching the site

cover system if necessary for construction purposes; operation, maintenance and monitoring procedures to ensure the remedy remains effective; and reporting requirements.

4.3 SOIL REMEDIAL ACTION ALTERNATIVE 3: EXCAVATION OF SOILS ≥50 PPM, TRANSPORTATION, DISPOSAL AND INSTALLATION OF ENGINEERED ASPHALT CAP

This alternative would remove all soils where PCB concentrations are ≥ 50 ppm. The RI Report identifies an isolated area generally located in front (north) of the clubhouse, where two adjacent soil samples were found to have concentrations > 500 ppm at a depth of 0 to 1 foot (Sample No. SS-1 and SS-3). The RI also identifies a second isolated area in the central portion of the parking area of 74.4 ppm at a depth of 0 to 1 foot (Sample No. SS-5). Herein, these areas are referred to as "hotspots".

Both the vertical and horizontal extent of these hotspots is limited. Data indicates that PCB concentrations in samples SS-1 and SS-3 at a depth of 1 to 2 feet are < 1 ppm, and in SS-5 is 3.7 ppm. Excavation of the hotspots at SS-1 and SS-3 to a depth of 2 feet comprising a 15 foot diameter area at sample locations SS-1 and SS-3 and 30 foot diameter area at sample location SS-5 would effectively meet the proposed <50 ppm criteria. All other areas of the site would remain undisturbed at concentrations <50 ppm. Refer to Figure 4.

Since contamination levels of the excavation spoils would be ≥ 50 ppm, all soils would be required to be disposed of in a permitted hazardous waste facility such as CWM Chemical Services located in Model City, New York. It is estimated that approximately 40 cubic yards (cy) or 56 tons of soil with PCB concentrations ≥ 50 ppm would be excavated, transported off-site and disposed of at a permitted hazardous waste facility.

Confirmatory sampling would be performed to confirm that soils with PCB concentrations above 50 ppm have been removed. At sample locations SS-1 and SS-3 one sample on the floor and two samples along each wall would be collected at each location to ensure the horizontal and vertical extent of contamination is removed. At sample location SS-5 one sample on the floor and four samples along each wall would be collected. Clean soil would be placed to restore the site to its original grades.

Although impacted soils with PCB levels above the NYSDEC Part 375 Commercial Use SCO would remain in place, this alternative would meet the USEPA Federal TSCA Guidelines set forth in 40 CFR Part 761. Under these guidelines, PCBs may remain in place at concentrations >25 and ≥100 ppm if the site is covered with a cap meeting certain requirements.

The entire site would be covered with an engineered asphalt paving cap. The asphalt cap would be installed over the area to eliminate precipitation infiltration, significantly

reduce the potential for leaching of PCBs and eliminate human exposure to soils with PCB concentrations above the NYSDEC Part 375 Commercial Use SCO. Prior to placing the asphalt cap, the top surface would be prepared by sweeping the surface to remove loose material prior to applying a tack coat. The surface would then receive an asphalt cap that consists of a 2 inch binder course and a 1 ½ inch top course. A geo-grid or orange construction fencing could be used to provide a physical visual barrier demarking the existing site soils beneath the proposed asphalt cap. The new cap would serve to further isolate and immobilize the contaminants and would eliminate direct and indirect exposure to contaminated soils. Refer to Figure 4.

Groundwater monitoring would be implemented to evaluate the long-term effectiveness of the remedial alternative and document that there is no impact on ground water quality. A semi-annual monitoring program would be implemented for a period of 5 years and all samples will be analyzed for PCBs. An annual cap maintenance program will be implemented to monitor for overall cap integrity, cracking, heaving etc.

A Site Management Plan (SMP) would be developed that includes procedures for protection of human health and handling and disposal of soil. The SMP will specify institutional controls and engineering controls for the post remedial management of the site. These controls will include but not be limited to; procedures for breaching the site cover system if necessary for construction purposes; operation, maintenance and monitoring procedures to ensure the remedy remains effective; and reporting requirements.

This alternative would utilize institutional and engineering controls to eliminate human exposure to surface and sub-surface soils with contaminant concentrations above the NYSDEC Part 375 SCOs. An environmental easement that restricts use of the site to commercial uses, requires long term maintenance and monitoring, and that includes a Site Management Plan will be incorporated into the deed of the property owner.

4.4 SOIL REMEDIAL ACTION ALTERNATIVE 4: EXCAVATION OF SOILS ≥0.10 PPM, TRANSPORTATION AND DISPOSAL

This alternative proposes to remove all soils where PCB concentrations are above the NYSDEC Part 375 SCO for Un-Restricted Use of 0.10 ppm. This area is essentially comprised of the entire parking area. Excavation to a depth of 1 foot would be required across the entire area. Excavation to a depth of 2 feet and 3 feet would be required to a much lesser extent to reach the < 0.10 ppm requirement. Refer to Figure 5.

All soils with contamination levels of ≥ 50 ppm, would be required to be transported and disposed of in a permitted hazardous waste facility such as CWM Chemical Services located in Model City, New York, while soils with contamination levels <50 ppm can be disposed of at a permitted or licensed non-hazardous facility such as Seneca Meadows

located in Waterloo, New York. It is estimated that approximately 40 cy or 56 tons of soil with PCB concentrations ≥ 50 ppm would be excavated, transported off-site and disposed of at a permitted hazardous waste facility and 2,331 cy or 3,264 tons of soils with PCB concentrations <50 ppm would be excavated, transported off-site and disposed of at a non-hazardous federal sub-title "D" New York State permitted solid waste landfill.

Confirmatory sampling would be performed on a 25 foot grid across the excavation which would result in approximately 71 samples. Samples would be collected to ensure the horizontal and vertical extent of contamination is removed. Clean soil would be placed to restore the site to its original grades.

Under this alternative, the parking area would paved in the same manner as with Alternatives 2 and 3 with the exception of the geo-grid or orange construction fencing used for demarcation. Asphalt paving under this Alternative is necessary to restore the property to its original condition, maintain property aesthetics as well as for dust control and maintenance.

5.0 PRELIMINARY SCREENING OF REMEDIAL ALTERNATIVES

The preliminary screening of alternatives is performed to potentially narrow the range of alternatives that will be carried forward for the detailed evaluation. Alternatives are screened on the basis of effectiveness (ability to meet medium-specific remedial action objectives, implementability (both technical and administrative), and their short-term and long-term effectiveness, which are described below:

- Effectiveness: Each alternative is evaluated in terms of its protectiveness of human health and the environment through reduction in toxicity, mobility and volume. Short-term effectiveness refers to the benefits derived during or immediately after implementation and considers the increased risks resulting from implementation of an alternative. Long-term effectiveness refers to the performance of a remedial measure and the certainty that this performance will be maintained.

- Implementability: Each alternative is evaluated with respect to its technical and administrative implementability. Technical implementability relates to the feasibility of constructing the remedial measures, taking into account the availability of equipment and materials, experienced contractors and the overall difficulty of construction. Long-term technical implementability considers the ability to reliably maintain and monitor the remedial system. Administrative implementability refers to compliance with applicable rules, regulations, and statutes; the ability to obtain approvals; and the availability of treatment, storage, and disposal services and capacity.

The screening matrix for the remedial alternatives is presented in Table 7. All of the remedial alternatives are considered reasonably effective and implementable and are retained for detailed analysis.

6.0 DETAILED ANALYSIS OF ALTERNATIVES

This section describes the evaluation criteria for the detailed analysis of the alternatives retained after the preliminary screening of alternatives. Section 6.1, 6.3 and Section 6.4 present the detailed analysis of the soil, sediment and ground water remedial alternatives, respectively, and systematically and individually assess each alternative based on the evaluation criteria. The no action alternative is discussed in Section 6.1.

Evaluation Criteria

USEPA guidance on selection of remedial actions (USEPA, 1988 and 1989) presents seven criteria to be used for evaluating remedial alternatives that have passed the preliminary screening process. New York State does not have ARARs in its statute and evaluates alternatives following the criteria in Title 6 NYCRR Part 375, which replaces ARARs with the equivalent SCGs. These criteria are as follows:

- Overall protection of human health and the environment;
- Compliance with SCGs;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility or volume through treatment;
- Short-term effectiveness;
- Implementability; and
- Costs (capital, annual operation and maintenance, present worth).

There are two tiers to the above seven criteria. The first two are threshold factors; the next five are primary balancing factors. These two tiers are reflected in the detailed analysis. Descriptions of the criteria are provided below.

Overall Protection of Human Health and the Environment

This evaluation criterion is designed to determine whether a proposed remedial alternative is adequate with respect to protection of human health and the environment. The evaluation focuses on how each proposed alternative achieves protection over time, how site risks are eliminated, reduced, or controlled, and whether any unacceptable short-term impacts would result from implementation of the alternative. The overall protection of human health and the environment evaluation draws on the assessments for long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

Compliance With ARARs/SCGs

This evaluation criterion is used to assess compliance with chemical-specific, action-specific, and location-specific ARARs/SCGs, and with other potential guidance, criteria, and advisories. ARARs/SCGs for the site are discussed in Section 2.0. Proposed remedial alternatives are analyzed to assess whether they achieve ARARs/SCGs under Federal and State environmental laws, public health laws, and State facility siting laws.

Long-term Effectiveness and Permanence

This criterion addresses the long-term effectiveness and permanence of the remedial alternative with respect to the quantity of residual chemicals remaining at a site after response goals have been met. The principal focus of this analysis is the adequacy and reliability of controls necessary to manage any untreated media and treatment residuals. Characteristics of the residual chemicals such as volume, toxicity, mobility, degree to which they remain hazardous and permanence of each remedial alternative must also be examined. Specifically, these considerations are:

- Magnitude of residual risk;
- Adequacy of controls;
- Reliability of controls; and,
- Permanence.

Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion assesses the degree to which the remedial alternative utilizes recycling and/or treatment technologies that permanently decrease toxicity, mobility, or volume of the chemicals as their primary element. It also assesses the effectiveness of the treatment in addressing the predominant health and environmental threats presented by the site. The specific factors considered under this evaluation criterion include:

- Treatment process the remedy would employ and the materials it would treat;
- Quantity of contaminants that would be treated or destroyed;
- Degree of expected reduction in toxicity, mobility, or volume (expressed as a percentage of reduction or order of magnitude);
- Degree to which the treatment will be irreversible;
- Type and quantity of treatment residuals that would remain following treatment accounting for persistence, toxicity, mobility; and

- Whether the alternative would satisfy the statutory preference for treatment as a primary element.

Short-Term Effectiveness

This evaluation criterion is used to assess short-term potential impacts associated with the construction and implementation phase of remediation. Alternatives are evaluated with regard to their effects on human health and the environment. These considerations include:

- Protection of the community during implementation of the proposed remedial action (i.e., dust, inhalation of volatile gases);

- Protection of workers during implementation;

- Environmental impacts that may result from the implementation of the remedial alternative and the reliability of mitigative measures to prevent or reduce these impacts; and;

- Times until remedial response objectives are met, including the estimated time required to achieve protection.

Implementability

This criterion assesses the technical and administrative feasibility of implementing a remedial alternative and the availability of various services and materials that would be required during its implementation. Factors considered include the following:

- Technical feasibility: includes the difficulties and unknowns relating to construction and operation of a technology, the reliability of the technology (including problems resulting in schedule delays), the ease of performing additional remedial actions, and the ability to monitor the effectiveness of the remedy.

- Administrative feasibility: involves coordinating with governmental agencies to obtain necessary permits or approvals.

- Availability of services and materials: includes sufficiency of off-site treatment, storage and disposal capacity; access to necessary equipment, specialists and additional resources; potential for obtaining competitive bids especially for new and innovative technologies, and availability of state-of-the-art technologies.

Costs

This criterion assesses the costs associated with a remedial action. It can be divided into capital costs, direct costs or expenses, annual operation and maintenance (O&M) costs, and net present worth costs.

Capital costs include:

- Construction and equipment costs: materials, labor, and equipment required to install/perform a remedial action that result in a physical asset;

- Land and site-development costs: land purchase and associated expenses, site preparation of existing property; and

- Building and service costs: process and non-process buildings, utility connections, and purchased services.

Direct costs/Expenses include:

- Engineering expenses: administration, design, construction, supervision, drafting, and treatability testing;

- Legal fees and license or permit costs: administrative and technical costs expended to obtain licenses and permits for installation and operation;

- Start-up costs incurred during initiation of remedial action;

- Contingency allowances: costs resulting from unpredicted circumstances (i.e., adverse weather, strikes, etc.); and

- Disposal costs: transporting and disposing of materials.

- Annual O&M costs are post-construction costs expended to maintain and ensure the effectiveness of a remedial action. The following annual O&M costs are evaluated:

Labor costs: wages, salaries, training, overhead, and fringe benefits for operational labor;

Maintenance materials and maintenance labor costs: labor and parts, etc. necessary for routine maintenance of facilities and equipment;

Auxiliary materials and utilities: chemicals and electricity needed for treatment plant operations, water and sewer services;

Disposal of residue: disposal or treatment and disposal of residues such as sludge from treatment processes;

Purchased services: sampling costs, laboratory fees, and professional fees as necessary;

Administrative costs: costs associated with the administration of O&M that have not already been accounted for elsewhere;

Insurance, taxes, and licensing costs: liability and sudden and accidental insurance, real estate taxes on purchased land or rights-of-way, licensing fees for certain technologies, permit renewal and reporting costs;

Replacement costs: maintenance of equipment or structures that wear out over time; and cost of periodic site reviews if a remedial action leaves residual contamination.

Net present worth consists of capital and O&M costs calculated over the lifetime of the remedial action and expressed in present day value. The lifetime of the remedial alternative varies depending on the alternative. Backup documentation for costs are presented in Appendix A.

6.1 ALTERNATIVE 1: NO ACTION

6.1.1 Description

Under this alternative, no action would be taken. The contaminated soil would remain in place under cover of the prior remedial action discussed in Section 1.3.1, therefore, no treatment or monitoring of constituent concentrations would be implemented and no groundwater monitoring would be conducted. Soil containing PCBs would remain in place and it is anticipated that these substances would remain immobile to the extent they are now as indicated by the down gradient monitoring wells and pond sediment data.

6.1.2 Evaluation of the No Action Alternative

Overall Protection of Human Health and the Environment

The no action alternative would maintain the current conditions and PCB contamination levels would remain above NYSDEC Part 375 Commercial Use SCO. Although it is

anticipated that contaminant constituents would remain immobile to the extent they are now as indicated by groundwater data from the on-site down gradient monitoring wells (MW-1 through MW-3), there would be no long-term mechanism to monitor the extent of the mobility or the attenuation of the contamination.

Compliance with ARARs/SCGs

Under this alternative, PCB concentrations would remain above the NYSDEC SCGs and would exceed the NYSDEC Part 375 SCOs for Commercial Use Restricted and Un-Restricted Uses.

Long-Term Effectiveness and Permanence

Since the existing remedial action has been protective of human health and the environment, no additional controls are implemented under this alternative, assessment of the adequacy or reliability of these controls does not apply. This alternative does not provide protection of human and environmental receptors from on-site residuals.

Reduction of Toxicity, Mobility, or Volume through Treatment

No further reduction of toxicity, mobility, or volume would occur under this alternative. However, sampling and analysis of the down gradient wells has indicated that the groundwater and pond sediment quality has not been significantly impacted.

Short Term Effectiveness

Since no construction activities are proposed for the No Action Alternative, no short-term risks to the community or the environment would be imposed.

Implementability

No remedial activities are proposed for this alternative and therefore, implementability does not apply.

Cost

There are no costs associated with this alternative.

6.2 ALTERNATIVE 2: INSTALLATION OF ENGINEERED ASPHALT CAP

6.2.1 Description

This alternative would utilize institutional and engineering controls to eliminate human exposure to surface and sub-surface soils with contaminant concentrations above the NYSDEC Part 375 SCOs. An environmental easement that restricts use of the parking lot area to commercial uses, requires long term maintenance and monitoring, and that includes a Site Management Plan will be incorporated into the deed of the property owner.

The portion of the site impacted by PCB contamination above any of the NYSDEC Part 375 SCOs would be covered with an engineered asphalt paving cap. The asphalt cap would be installed over the area to eliminate precipitation infiltration and significantly reduce the potential for leaching of PCBs. This area generally consists of the existing paved area at the site and is approximately 45,027 square feet (sf) or 5,003 square yards (sy). Refer to Figure 3.

Prior to placing the asphalt cap, the top surface would be prepared by sweeping the surface to remove loose material prior to applying a tack coat. The surface would then receive an asphalt cap that consists of a 2 inch binder course and a 1 ½ inch top course. A geo-grid or orange construction fencing could be used to provide a physical visual barrier demarking the existing site soils beneath the proposed asphalt cap. The new cap would serve to further isolate and immobilize the contaminants and would eliminate direct and indirect exposure to contaminated soils.

Groundwater monitoring would be implemented to evaluate the long-term effectiveness of the remedial alternative and document that there is no impact on ground water quality. A semi-annual monitoring program would be implemented for a period of 5 years and all samples will be analyzed for PCBs. An annual cap maintenance program will be implemented to monitor for overall cap integrity, cracking, heaving etc.

A Site Management Plan (SMP) would be developed that includes procedures for protection of human health and handling and disposal of soil. The SMP will specify institutional controls and engineering controls for the post remedial management of the site. These controls will include but not be limited to; procedures for breaching the site cover system if necessary for construction purposes; operation, maintenance and monitoring procedures to ensure the remedy remains effective; and reporting requirements.

6.2.2 Evaluation

Overall protection of Human Health and the Environment

This alternative would provide a high level of protection to human health and the environment. Installation of a new asphalt cap would further reduce the potential for exposure to contaminated soils. The cap would provide an effective infiltration barrier,

would eliminate the potential for erosion and transport of contaminated soil and would minimize leaching of PCBs. The existing and the proposed cap would prevent uptake of constituents in vegetation thereby reducing risks to higher order receptors in the food chain, and provide a high level of protection of human health and the environment.

To further protect public health and the environment, an environmental easement would be used to restrict the use of a property to commercial uses, require long term maintenance and monitoring of engineering controls, and require a Site Management Plan. The environmental easement would be incorporated into the deed of the property owner.

Compliance with ARARs/SCGs

The NYSDEC Part 375 regulations provide an SCO for PCBs of 1 ppm for commercial use. The USEPA TSCA regulations for PCB disposal (40 CFR 761.61) states that bulk PCB remediation wastes may stay at a site at concentrations greater than 25 ppm and less than or equal to 100 ppm provided that a cap is placed over the site and the cap conforms to the requirements of 40CFR 761.61(a)(7) and (a)(8) which includes placement of 6 inches of asphalt cover. Together, the existing in-place cap and the proposed cap meet the intent of this requirement.

While this Alternative does not meet the NYSDEC Part 375 SCOs for a Restricted Commercial Use of 1 ppm, it does meet the Federal TSCA Guideline of 25 to 100 ppm provided a conforming cap is utilized, with the exception of the isolated hotspot at sample locations SS-1 and SS-3.

Long-Term Effectiveness and Permanence

Residual Risk: The long-term risk of exposure for this alternative is low. Although the contaminated soil would remain in place, installation of an engineered asphalt cap would provide a long term effectiveness and an environmental easement incorporated into the property deed would ensure permanence.

Assuming that the cap is maintained, the risks to potential future receptors due to direct dermal contact or incidental ingestion of contaminated soils is effectively mitigated. Migration of constituents below the cap would be negligible since contaminants would be immobilized since infiltration of precipitation would be prevented by the asphalt cap and drainage controls. Appropriate land use restrictions would be implemented to assure that the cap is not breached.

Adequacy and reliability of controls: Installation of an asphalt cap would achieve the performance requirement of immobilizing contaminants and preventing direct contact by future potential receptors. Implementation of and compliance with land use

restrictions and long-term maintenance obligations would aid in preserving cap integrity and limiting exposure. Long-term maintenance activities including annual visual inspection of the cap and crack and surface repair would ensure cap integrity.

Permanence: Long-term maintenance activities including annual visual inspection of the cap and crack and surface repair would ensure cap integrity. Appropriate land use restrictions would be implemented to assure that the cap is not breached.

Reduction of Toxicity, Mobility and Volume Through Treatment

Since contaminated soils would remain in place, there is no reduction of toxicity or volume through treatment. However, installation of a new cap would continue to provide an impervious barrier that would effectively immobilize constituents below the cap since infiltration of precipitation would be prevented by the asphalt cap and drainage controls.

Short-Term Effectiveness

Installation of the asphalt cap would provide no immediate risks to workers, the community or the environment. All work-associated safety practices would be outlined in a Health and Safety Plan, including a description of the control measures that would be implemented at the site.

Implementability

Ability to Construct and Operate: Alternative 2 will utilize common construction equipment, materials and routine construction procedures. A new asphalt cap could be installed with little or no difficulty.

Reliability: This Alternative would be highly reliable in achieving the remedial action objectives, as the alternative involves proven technologies. Installation of a new asphalt cap would provide added reliability, provided long-term maintenance activities and deed restrictions are implemented.

Availability of Materials and Services: All equipment and materials are available locally and have been demonstrated sufficiently for the purpose for which they are intended. It is anticipated, once the contractor is mobilized to the site, that installation of the asphalt cap would be completed within a 3 day time frame.

Cost

The costs associated with Alternative 2 have been estimated as shown on Table 8. A summary of these costs and a comparison with the costs associated with other

alternatives is provided on Table 11. The estimated total costs associated with this alternative are $ 247,364.

6.3 ALTERNATIVE 3: Excavation of Soils ≥50 ppm, Transportation, Disposal and Installation of Engineered Asphalt Cap

6.3.1 Description

This alternative would remove all soils where PCB concentrations are ≥ 50 ppm. The RI Report identifies an isolated area generally located in front (north) of the clubhouse, where two adjacent soil samples were found to have concentrations > 500 ppm at a depth of 0 to 1 foot (Sample No. SS-1 and SS-3). The RI also identifies a second isolated area in the central portion of the parking area of 74.4 ppm at a depth of 0 to 1 foot (Sample No. SS-5). Herein, these areas are referred to as "hotspots".

Both the vertical and horizontal extent of these hotspots is limited. Data indicates that PCB concentrations in samples SS-1 and SS-3 at a depth of 1 to 2 feet are < 1 ppm and PCB concentrations in sample SS-5 is 3.7 ppm. Excavation of the hotspots at SS-1, SS-3 and SS-5 to a depth of 2 feet would meet the proposed <50 ppm criteria. All other areas of the site would remain undisturbed at concentrations <50 ppm. Refer to Figure 4.

Since contamination levels of the excavation spoils would be ≥ 50 ppm, all soils would be required to be disposed of in a permitted hazardous waste facility such as CWM Chemical Services located in Model City, New York. It is estimated that approximately 40 cy or 56 tons of soil with levels ≥ 50 ppm would be excavated, transported off-site and disposed of at a permitted hazardous waste facility.

Confirmatory sampling would be performed in the areas of excavation. At sample locations SS-1 and SS-3 one sample on the floor and two samples along each wall would be collected at each location to ensure the horizontal and vertical extent of contamination is removed. At sample location SS-5 one sample on the floor and four samples along the walls would be collected. Clean soil would be placed to restore the site to its original grades.

Although impacted soils with PCB levels above the NYSDEC Part 375 SCOs would remain in place, this alternative would meet the USEPA Federal TSCA Guidelines set forth in 40 CFR Part 761. Under these guidelines, PCBs may remain in place at concentrations >25 and ≤100 ppm if the site is covered with a cap meeting certain requirements.

The entire site would be covered with an engineered asphalt paving cap. The asphalt cap would be installed over the area to eliminate precipitation infiltration and significantly reduce the potential for leaching of PCBs. This area generally consists of

the existing paved area at the site and is approximately 45,027 sf or 5,003 sy. Refer to Figure 4.

Prior to placing the asphalt cap, the top surface would be prepared by sweeping the surface to remove loose material prior to applying a tack coat. The surface would then receive an asphalt cap that consists of a 2 inch binder course and a 1 ½ inch top course. A geo-grid or orange construction fencing could be used to provide a physical visual barrier demarking the existing site soils beneath the proposed asphalt cap. The new cap would serve to further isolate and immobilize the contaminants and would eliminate direct and indirect exposure to contaminated soils.

Groundwater monitoring would be implemented to evaluate the long-term effectiveness of the remedial alternative and document that there is no impact on ground water quality. A semi-annual monitoring program would be implemented for a period of 5 years and all samples will be analyzed for PCBs. An annual cap maintenance program will be implemented to monitor for overall cap integrity, cracking, heaving etc.

A Site Management Plan (SMP) would be developed to include procedures for protection of human health and handling and disposal of soil. The SMP will specify institutional controls and engineering controls for the post remedial management of the site. These controls will include but not be limited to; procedures for breaching the site cover system if necessary for construction purposes; operation, maintenance and monitoring procedures to ensure the remedy remains effective; and reporting requirements.

This alternative would utilize institutional and engineering controls to eliminate human exposure to surface and sub-surface soils with contaminant concentrations above the NYSDEC Part 375 SCOs. An environmental easement that restricts use of the site to commercial uses, requires long term maintenance and monitoring, and that includes a Site Management Plan will be incorporated into the deed of the property owner.

6.3.2 Evaluation

Overall protection of Human Health and the Environment

This alternative would provide a high level of protection to human health and the environment by removing soils contaminated with PCBs above 50 ppm. Installation of a new asphalt cap would further reduce the potential for exposure to contaminated soils. The cap would provide an effective infiltration barrier, would eliminate the potential for erosion and transport of contaminated soil and would minimize leaching of PCBs. The proposed cap would prevent uptake of constituents in vegetation thereby reducing risks to higher order receptors in the food chain, and provide a high level of protection of human health and the environment.

As with Alternative 2, to further protect public health and the environment, an environmental easement would be used to restrict the use of a property to commercial uses, require long term maintenance and monitoring of engineering controls, and require a Site Management Plan. The environmental easement would be incorporated into the deed of the property owner.

Compliance with ARARs/SCGs

The NYSDEC Part 375 regulations provide a SCO for PCBs of 1 ppm for commercial use. The USEPA TSCA regulations for PCB disposal (40 CFR 761.61) states that bulk PCB remediation wastes may stay at a site at concentrations greater than 25 ppm and less than or equal to 100 ppm provided that a cap is placed over the site and the cap conforms to the requirements of 40CFR 761.61(a)(7) and (a)(8) which includes placement of 6 inches of asphalt cover. Together, the existing in-place cap and the proposed cap meet the intent of this requirement.

As with Alternative 2, this Alternative does not meet the NYSDEC Part 375 SCOs for a Restricted Commercial Use of 1 ppm, but it does meet the Federal TSCA Guideline of 25 to 100 ppm provided a conforming cap is utilized. Unlike Alternative 2, this alternative includes the removal of all contaminated soils with PCB concentrations ≥ 50 ppm inclusive of hotspots at sample locations SS-1, SS-3 and SS-5.

Given the low level of PCBs in most of the soil data gathered at the site, the concentration is less than 50 parts per million with the exception of three limited and isolated hot spots that exceed this level, probably because it was a low lying area before installation of the engineered cap. The parking lot was remediated with a substantial layer of fresh gravel that was rolled in place, prior to placement of the asphalt cap in 1984.

As such, the used oil applied at the site constituted an "excluded PCB product under TSCA. See generally, 40 CFR Part 761.3 Subsection 4 for the definition of "excluded PCB product".

In addition, 40 CFR Part 761 generally addresses "PCB remediation waste" which is defined as waste that is currently at concentrations in excess of 50 ppm. If the preferred remedy, Alternative 3 is chosen, none of the remaining waste on site is within the definition of PCB remediation waste.

The parking lot is within the definition of a "low occupancy area," since no individual spends more than a short period of time in the parking lot prior to and after playing golf. Refer to 40 CFR Part 761.3 (definition of "low occupancy area"). Given these exclusions, definitions and regulatory risk-based criteria, the PCBs may remain at the site at

concentrations up to 100 ppm if the site is covered with a cap meeting the requirements of 40 CFR Part 761.61(a)(7) and (a)(8). *See* 40 CFR Part 761.61(a)(4)(i)(A)(2). Subsection (7) states that the referenced asphalt cap shall have a minimum thickness of 6 inches and Subsection (8) sets forth the details of the deed restrictions that must be met within 60 days of completion of the cleanup activity. The cap and deed restrictions set forth in Alternative 3 meet all federal requirements as well as the institutional control and engineering control required of 6 NYCRR Part 375.

Long-Term Effectiveness and Permanence

Residual Risk: The long-term risk of exposure for this alternative is low. Although the contaminated soil at concentrations below 50 ppm would remain in place, installation of an engineered asphalt cap would provide a long term effectiveness and an environmental easement incorporated into the property deed would ensure permanence.

Assuming that the cap is maintained, the risks to potential future receptors due to direct dermal contact or incidental ingestion of contaminated soils is effectively mitigated. Migration of constituents below the cap would be negligible since contaminants would be immobilized since infiltration of precipitation would be prevented by the asphalt cap and drainage controls. Appropriate land use restrictions would be implemented to assure that the cap is not breached.

Adequacy and reliability of controls: Installation of an asphalt cap would achieve the performance requirement of immobilizing contaminants and preventing direct contact by future potential receptors. Implementation of and compliance with land use restrictions and long-term maintenance obligations would aid in preserving cap integrity and limiting exposure. Long-term maintenance activities including annual visual inspection of the cap and crack and surface repair would ensure cap integrity.

Permanence: Long-term maintenance activities including annual visual inspection of the cap and crack and surface repair would ensure cap integrity. Appropriate land use restrictions would be implemented to assure that the cap is not breached.

Reduction of Toxicity, Mobility and Volume Through Treatment

Since contaminated soils would be excavated and removed from the site, contaminant mobility is greatly reduced. This is achieved by encapsulation of the removed soils within a controlled landfill environment. However, placement of the soils in a controlled landfill environment to eliminate leaching will not directly reduce the potential toxicity of the soil, but since these remedies eliminate exposure, toxicity is not a concern.

Short-Term Effectiveness

Workers involved with the soil disturbing activities could be exposed to the risks associated with dermal contact with contaminated soil and inhalation of dust particulate. Risks would be mitigated by properly outfitting workers with appropriate personal protection equipment, following proper industrial hygiene procedures, using controlled excavations, and monitoring air quality during soil excavation activities. All work associated safety practices would be outlined in a Health and Safety Plan, including a description of the control measures that would be implemented at the site.

The impact to the community and the environment would be minimal since residences are scarce in the surrounding area and controls would be implemented to minimize fugitive dust. Traffic increases due to transportation of soil would have minimal impact on the community, as this is a one-time occurrence with an approximate duration of 1 week.

Installation of the asphalt cap would provide no immediate risks to workers, the community or the environment.

Implementability

Ability to Construct and Operate: Alternative 3 will utilize common construction equipment, materials and routine construction procedures. Excavation activities and installation of a new asphalt cap could be achieved with little or no difficulty.

Reliability: This alternative would be highly reliable in achieving the remedial action objectives, as the alternative involves proven technologies. Excavation activities and installation of a new asphalt cap would provide added reliability, provided long-term maintenance activities and deed restrictions are implemented.

Availability of Materials and Services: All equipment and materials are available locally and have been demonstrated sufficiently for the purpose for which they are intended. It is anticipated, once the contractor is mobilized to the site, that installation of the asphalt cap would be completed within a 1 week time frame.

Cost

The costs associated with Alternative 3 have been estimated as shown on Table 9. A summary of these costs and a comparison with the costs associated with other alternatives is provided on Table 11. The estimated total costs associated with this alternative are $ 270,140.

6.4 ALTERNATIVE 4: Excavation of Soils ≥0.10 ppm, Transportation and Disposal

6.4.1 Description

This alternative proposes to remove all soils where PCB concentrations are above the NYSDEC Part 375 SCO for Un-Restricted Use of 0.10 ppm. This area is essentially comprised of the entire parking area. Excavation to a depth of 1 foot would be required across the entire area. Excavation to a depth of 2 feet and 3 feet would be required to a much lesser extent to reach the ≤ 0.10 ppm requirement. Refer to Figure 5.

All soils with contamination levels of ≥ 50 ppm, would be required to be transported and disposed of in a permitted hazardous waste facility such as CWM Chemical Services located in Model City, New York, while soils with contamination levels <50 ppm can be disposed of at a permitted or licensed non-hazardous facility such as Seneca Meadows located in Waterloo, New York. It is estimated that approximately 40 cy or 56 tons of soil with levels ≥ 50 ppm would be excavated, transported off-site and disposed of at a permitted hazardous waste facility and 2,331 cy or 3,264 tons of soils <50 ppm would be transported to a non-hazardous permitted solid waste facility.

Confirmatory sampling would be performed on a 25 foot grid across the excavation which would result in approximately 71 samples. Samples would be collected to ensure the horizontal and vertical extent of contamination is removed. Clean soil would be placed to restore the site to its original grades.

Under this alternative, the parking area would be paved in the same manner as with Alternatives 2 and 3 with the exception of the geo-grid or orange construction fencing used for demarcation. Asphalt paving under this alternative is necessary to restore the property to its original condition, maintain property aesthetics as well as for dust control and maintenance. This area is approximately 4,860 sy.

6.4.2 Evaluation

Overall protection of Human Health and the Environment

This alternative would provide a high level of protection to human health and the environment by removing all soils contaminated with PCBs above 0.10 ppm. This would eliminate the potential for uptake of constituents in vegetation thereby eliminating risks to higher order receptors in the food chain. This alternative would also eliminate the potential for erosion and transport of contaminated soil and leaching of PCBs.

This alternative would not require an environmental easement to limit the property uses, require long term maintenance and monitoring of engineering controls, or require a Site Management Plan.

Compliance with ARARs/SCGs

The NYSDEC Part 375 regulations provide an SCO for PCBs of 0.10 ppm for Un-Restricted Use. This alternative would meet the SCO for both the Restricted and Un-Restricted Uses.

Long-Term Effectiveness and Permanence

Residual Risk: The long-term risk of exposure for this alternative is negligible. This alternative would provide long term effectiveness and ensure permanence.

Adequacy and reliability of controls: There are no controls under this alternative that would be implemented at the site since SCOs for Un-Restricted Use would be achieved.It is reasonable to assume that a permitted hazardous waste facility would provide an adequate and reliable control for the soils disposed of at an off-site location.

Permanence: Long-term maintenance activities including annual visual inspection of the cap and crack and surface repair would ensure cap integrity. Appropriate land use restrictions would be implemented to assure that the cap is not breached.

Reduction of Toxicity, Mobility and Volume Through Treatment

Since contaminated soils would be excavated and removed from the site, contaminant mobility is greatly reduced. This is achieved by encapsulation of the removed soils within a controlled landfill environment. However, placement of the soils in a controlled landfill to eliminate leaching will not directly reduce the potential toxicity of the soil, but since this remedy eliminates exposure at the site, toxicity is not a concern.

Short-Term Effectiveness

Workers involved with the soil disturbing activities could be exposed to the risks associated with dermal contact with contaminated soil and inhalation of dust particulate. Risks would be mitigated by properly outfitting workers with appropriate personal protection equipment, following proper industrial hygiene procedures, using controlled excavations, and monitoring air quality during soil excavation activities. All work associated safety practices would be outlined in a Health and Safety Plan, including a description of the control measures that would be implemented at the site.

The impact to the community and the environment would be minimal since residences are scarce in the surrounding area and controls would be implemented to minimize fugitive dust. Traffic increases due to transportation of soil would have minimal impact on the community, as this is a one-time occurrence with an approximate duration of 1 week.

Implementability

Ability to Construct and Operate: Alternative 4 will utilize common construction equipment, materials and routine construction procedures. Excavation activities could be achieved with little or no difficulty.

Reliability: This alternative would be highly reliable in achieving the remedial action objectives, as the alternative involves proven technologies that are common and easily implemented.

Availability of Materials and Services: All equipment and materials are available locally and have been demonstrated sufficiently for the purpose for which they are intended. It is anticipated, once the contractor is mobilized to the site, that activities associated with this alternative would be completed within a 2 week time frame.

Cost

The costs associated with Alternative 4 have been estimated as shown on Table 10. A summary of these costs and a comparison with the costs associated with other alternatives is provided on Table 11. The estimated total costs associated with this alternative are $ 807,923.

7.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

This analysis provides a comparative assessment of the remedial alternatives to evaluate the relative performance of each in relation to the specific evaluation criteria. The results of the individual analyses presented in Section 6.0 are used in this evaluation to determine which alternative best satisfies the evaluation criteria. The purpose is to identify the advantages and disadvantages of each alternative relative to one another so that cost, health and environmental risk factors can be identified.

The comparative analysis focuses mainly on those aspects of the alternatives that are unique for each. A comparison of the alternatives is provided in Table 7 and are discussed in the following sections. A summary of costs associated with each remedial alternative is presented in Table 11.

7.1 Protection of Human Health and the Environment

Alternative 1, the No Action Alternative, is the least protective of human health and the environment, as it does not prevent exposure or further reduce potential risks to human health and the environment.

Alternative 2 would provide a high level of protection to human health and the environment and involves the installation of an asphalt cap, institutional controls and long-term monitoring. The asphalt cap would be installed over the area to eliminate precipitation infiltration and significantly reduce the potential for leaching of PCBs. The cap would also serve to isolate the contaminants and would eliminate direct and indirect exposure to contaminated soils.

Alternative 3 would essentially provide the same level of protection to human health and the environment as Alternative 2 but involves partial excavation and disposal of soils with contamination levels ≥ 50 ppm. As with Alternative 2, this alternative also includes installation of an asphalt cap, institutional controls and long-term monitoring. Since contaminated soils would be removed from the site, this alternative does provide a slightly higher level of protection than Alternative 2, but the asphalt cap in both alternatives would eliminate direct and indirect exposure to contaminated soils.

Alternative 4 would provide the highest level of protection to human health and the environment by removing all soils contaminated with PCBs above 0.10 ppm. This would eliminate the potential for uptake of constituents in vegetation thereby eliminating risks to higher order receptors in the food chain. This alternative would also eliminate the potential for erosion and transport of contaminated soil and leaching of PCBs.

7.2 Compliance With ARARS/SCGs

Under Alternative 1, the No Action Alternative, compliance with ARARs/SCGs would not be satisfied because contaminated soil would not be treated or removed and an asphalt cap would not be installed to provide a barrier. Under this alternative, PCB concentrations would remain above the NYSDEC SCGs and would exceed the NYSDEC Part 375 SCOs for Commercial Use Restricted and Un-Restricted Uses.

Alternative 2 would not be completely compliant with NYSDEC Part 375. The NYSDEC Part 375 regulations provide an SCO for PCBs of 1 ppm for commercial use and 0.10 ppm for un-restricted use. The USEPA TSCA regulations for PCB disposal states that bulk PCB remediation wastes may stay at a site at concentrations greater than 25 ppm and less than or equal to 100 ppm provided that a cap is placed over the site. However, NYSDEC Part 375 does allow the use of institutional and engineering controls as part of a remedial action to address site contamination.

Because Alternative 2 proposes to leave the isolated hotspots in place at sample locations SS-1 and SS-3 this alternative would not be compliant with any of the SCOs, but provides a compliant asphalt cap. The cap would provide an effective infiltration barrier, would eliminate the potential for erosion and transport of contaminated soil and would minimize leaching of PCBs.

As discussed in Section 6.3.2 of this report, the used oil applied at the site constituted an "excluded PCB product under TSCA. See generally, 40 CFR Part 761.3 Subsection 4 for the definition of "excluded PCB product".

In addition, 40 CFR Part 761 generally addresses "PCB remediation waste" which is defined as waste that is currently at concentrations in excess of 50 ppm. If the preferred remedy, Alternative 3 is chosen, none of the remaining waste on site is within the definition of PCB remediation waste.

The parking lot is within the definition of a "low occupancy area," since no individual spends more than a short period of time in the parking lot prior to and after playing golf. Refer t*o* 40 CFR Part 761.3 (definition of "low occupancy area"). Given these exclusions, definitions and regulatory risk-based criteria, the PCBs may remain at the site at concentrations up to 100 ppm if the site is covered with a cap meeting the requirements of 40 CFR Part 761.61(a)(7) and (a)(8). *See* 40 CFR Part 761.61(a)(4)(i)(A)(2). Subsection (7) states that the referenced asphalt cap shall have a minimum thickness of 6 inches and Subsection (8) sets forth the details of the deed restrictions that must be met within 60 days of completion of the cleanup activity. The cap and deed restrictions set forth in Alternative 3 meet all federal requirements as well as the institutional control and engineering control required of 6 NYCRR Part 375.

Since Alternative 4 proposes to remove all soils with PCB concentrations ≥ 0.10 ppm, this alternative would meet the NYSDEC Part 375 SCO for both the Restricted and Un-Restricted Uses.

7.3 Short-Term Effectiveness

No short-term impacts to human health or the environment would result from the Alternative 1 the no action alternative since no construction, treatment, removal or transport of affected soils would take place. Similarly, Alternative 2 would have no short term impacts since soils would remain in place. Installation of an asphalt cap is a common construction activity and does not pose any impacts to human health or the environment.

Alternatives 3 and 4 pose similar and only minimal risks to the community, since off-site transport of affected soils would be limited to a one time occurrence for a short duration. Properly trained workers utilizing appropriate personal protective equipment during excavation, transport, and disposal mitigate exposure risks. Dust would be controlled as necessary using engineering technologies. Dust levels would be monitored pursuant to the NYSDOH Community Air Monitoring Plan requirements.

7.4 Long-Term Effectiveness and Permanence

Alternative 1, the no action alternative, imposes theoretical long-term risk for exposure to contaminated soils since removal, treatment or capping would not be implemented. Alternatives 2, 3 and 4 are significantly more effective and eliminate long-term residual risks since soils are either isolated below an asphalt cap or removed from the site.

Alternatives 2 and 3 involve installation of an asphalt cap to isolate contaminated soils and rely on land use restrictions and long-term maintenance obligations to aid in preserving cap integrity and limiting exposure. Long-term maintenance activities include annual visual inspection of the cap and crack and surface repair.

Alternative 4 provides the most long term effectiveness and is the most permanent alternative since all soils above the un-restricted SCO would be removed from the site.

7.5 Reduction in Toxicity, Mobility and Volume

Alternative 1 does not involve any type of treatment or removal for affected soils at the site, and therefore would not reduce the toxicity, mobility or volume of affected soils.

Alternatives 2 and 3 significantly reduce mobility of PCBs since an asphalt cap would be installed to isolate the contaminated soils. Alternative 3 would reduce the mobility of contaminants as well as reduce the volume more than Alternative 2 since Alternative 3 involves removal of soils from the site.

Alternative 4 significantly reduces the mobility and volume of contaminated soil since all contaminated soils above the SCOs would be removed from the site and transported to a controlled landfill environment. However, placement of the soils in a controlled landfill to eliminate leaching will not directly reduce the potential toxicity of the soil, but since these remedies eliminate exposure, toxicity is not a concern.

7.6 Implementability

Alternative 1 is readily implementable since no construction or site activities are part of this alternative.

Alternatives 2, 3 and 4 could be implemented using readily available materials, equipment, and construction practices. These alternatives utilize common construction equipment and materials. The principle difference between the alternatives is the volume of soil excavated and removed from the site.

7.7 Costs

There are no costs associated with Alternative 1 since it involves no action. The costs associated with Alternatives 2, 3 and 4 are presented in Tables 8, 9 and 10, respectively and summarized in Table 11. The cost for implementation of Alternative 2 is estimated at $247,364, Alternative 3 is estimated at $270,140 and the estimated cost for Alternative 4 is $807,923.

The higher cost for Alternative 3 and 4 is associated with the excavation and disposal of contaminated soils and the significant cost difference between Alternative 3 and Alternative 4 is associated with the volume of excavation.

While Alternative 4 removes all contaminated soils above the un-restricted SCOs, it is extremely cost prohibitive and is nearly three times the cost of Alternative 3.

8.0 SELECTED ALTERNATIVE

It is important to consider recommendations that provide environmentally responsible solutions that are financially feasible for the owner to attain, and preserve the economic base of a business that both provides employment and serves as a viable community business member.

Imposing overly stringent regulatory requirements on the owner may be financially unattainable and if imposed, could put the operation out-of-business. The recommended solution discussed herein meets reasonable SCOs, meets the regulatory intent and is economically feasible for the owner to install and maintain.

NYSDEC guidance states that the remedial goal for remedial actions is the restoration of a site to pre-disposal/pre-release conditions, to the extent feasible. At a minimum, the remedy should eliminate or mitigate all significant threats to public health and the environment presented by the contaminants disposed at the site through the proper application of scientific and engineering principles. The remedy that is proposed should remove the contamination and/or reduce or eliminate exposure to the contaminants above the SCGs. At a minimum, this should include removal of the source of the contamination, including but not limited to, any free product and any grossly contaminated soils, to the extent technically and practically feasible.

Based on the information presented in the preceding sections of the FS and the data collected during the RI, the selected alternative is Alternative 3: Excavation of Soils ≥50 ppm, Disposal and Installation of Engineered Asphalt Cap. This report demonstrates that this alternative is protective of human health and the environment.

This alternative addresses short term effectiveness and provides long-term effectiveness and permanence through engineering controls, monitoring and maintenance. This alternative also effectively reduces mobility and volume of contaminated soil by

removing contaminated soils from the site with concentrations ≥ 50 ppm. This alternative is easily implemented and is cost effective.

Although Alternative 4: Excavation of Soils ≥ 0.10 ppm, Transportation and Disposal effectively removes all contaminated soils ≥ 0.10 ppm which is the SCO for an un-restricted use, it is highly cost prohibitive. Alternative 3 is equally protective of human health and the environment and is economically feasible.

Groundwater monitoring would be implemented to evaluate the long-term effectiveness of the remedial alternative and document that there is no impact on groundwater quality. An annual cap maintenance program implemented to monitor for overall cap integrity, cracking, heaving etc., would ensure long term effectiveness and permanence as well as protection of human health and the environment.

9.0 REFERENCES

Remedial Investigation Report, Tee Bird Country Club – North Course, Moreau, New York, August 12, 2011, Alpha Geoscience.

TABLES

TEE BIRD COUNTRY CLUB
MOREAU, NEW YORK

TABLE 1
LOCATION-SPECIFIC ARARs/SCGs

REQUIREMENT	SYNOPSIS
STATE:	
New York State Title 6 NYCRR Part 375	Inactive Hazardous Waste Disposal Sites
New York State Ambient Water Quality Standards (6NYCRR Parts 700-705)	Defines surface water and aquifer classification and lists specific chemical standards for groundwater and surface water.
Endangered and Threatened Species of Wildlife (6NYCRR Part 182)	Site activities must minimize impact on identified endangered or threatened species of fish or wildlife.
FEDERAL:	
Endangered Species Act (50 CFR 200, 402)	Site activities must minimize impacts on identified endangered plant and animal species.

TEE BIRD COUNTRY CLUB
MOREAU, NEW YORK

TABLE 2
CHEMICAL-SPECIFIC ARARs/SCGs

REQUIREMENT	SYNOPSIS
STATE:	
New York State DEC Water Quality Regulations for Surface Waters and Groundwaters (6NYCRR Parts 700-705)	Establishes Standards for surface water and groundwater quality.
New York State DEC Identification and Listing of Hazardous Waste (6NYCRR Part 371)	Defines and regulates PCB's in New York State.
New York State DOH Drinking Water Standards (10NYCRR Part 5)	Enforceable drinking water standards.
FEDERAL:	
Toxic Substance Control Act; TSCA (40 CFR 761)	Regulates management and disposal of material containing PCB's.
Resource Conservation and Recovery Act, Land Disposal Restrictions (40 CFR 268)	Regulates management and disposal of hazardous wastes.

TEE BIRD COUNTRY CLUB
MOREAU, NEW YORK

TABLE 3
ACTION-SPECIFIC ARARs/SCGs

REQUIREMENT
STATE:
TAGM #HWR 4022 "Records of Decision for Remediation of Class 2 Inactive Hazardous Waste Disposal Sites"
TAGM #HWR 4025 "Guidelines for Remedial Investigations and Feasibility Studies"
TAGM #HWR 4030 "Selection of Remedial Actions at Inactive Hazardous Waste Site"
6 NYCRR PART 375 Environmental Remediation Programs Subparts 375-1 to 375- 4 & 375-6
DER-10 / Technical Guidance for Site Investigation and Remediation
FEDERAL:
Polychlorinated biphenyls (PCB's) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions (40 CFR 761)
Clean Water Act (CWA) NPDES Permitting Requirements for Discharge of Treatment System Effluent
Occupational Safety and Health Standards for Hazardous Response and General Construction Activites (29 CFR 1904, 1910, 1926)

TEE BIRD COUNTRY CLUB
MOREAU, NEW YORK

TABLE 4
POTENTIAL GUIDANCE

REQUIREMENT
STATE:
New York State Ambient Water Quality Standards (6NYCRR Parts 700-705)
Endangered and Threatened Species of Wildlife (6NYCRR Part 182)
FEDERAL:
United States EPA Health Effects Assessment (HEA's)
Toxicity Substance Control Act (TSCA) Health Data
Toxicological Profiles, Agency for Toxic Substances and Disease Registry, US Public Health Service
Policy for the Development of Water Quality Based Permit Limitations for Toxic Pollutants (49 Federal Register 9016)
Cancer Assessment Group (National Academy of Science Guidance)
United States EPA Soil Screening Guidance (EPA/540/R-94/101)
United States EPA PCB Spill Policy Fish and Wildlife Coordination Act Advisories

TEE BIRD COUNTRY CLUB
MOREAU, NEW YORK

TABLE 5
STATE AND FEDERAL CLEAN UP OBJECTIVES

COMPOUND	NYSDEC Part 375 Soil Cleanup Objectives				USEPA FEDERAL TSCA GUIDELINE (mg/Kg)	NYSDEC GROUNDWATER STANDARDS 6NYCRR PART 5 (ug/L)	NYSDOH DRINKING WATER STANDARDS 10 NYCRR PART 5 (ug/L)	USEPA DRINKING WATER STANDARDS (ug/L)	NYSDEC Surface Water Standards 6NYCRR Part 703 (ug/L)	NYSDEC Sediment Criteria "Technical Guidance For Screening Contaminated Sediment" LEL/SEL
	Un-Restricted Use	Restricted Use								
		Restricted Use (commercial)	Protection of Ecological Resources	Protection of Groundwater						
Total PCB's	0.1	1.0	1.0	3.2	25 - 100 **	0.09 ***	0.5	0.5	0.09 *	69,000/483/35 ****

Notes:
1. All units for groundwater and surface water are reported in ug/L.
2. All units for soil and sediment are reported in mg/kg.
3. "NA" designates not applicable.
4. "SB" designates Site Background.
5. * Human Health Water Supply based standard.
6. **Restricted access sites with a cap.
7. *** Applies to the sum of the isomers.
8.****Aquatic life acute toxicity / Aquatic life chronic toxicity / Wildlife bioaccumulation criteria based on a total organic carbon content of 25,000 mg/kgoc.

TEE BIRD COUNTRY CLUB
MOREAU, NEW YORK

TABLE 6
GENERAL RESPONSE ACTIONS REMEDIAL TECHNOLOGY SCREENING

GENERAL RESPONSE ACTION	TECHNOLOGY	DESCRIPTION	SCREENING COMMENTS
NO ACTION	Non-technology based	No action is taken to control or remove the affected soils, treat or capture ground water or remove affected sediment areas from Tributary D-1-7	**Retained**
INSTITUTIONAL CONTROLS	Access restriction. Contracts	Restrictions to future use of selected areas are specified in the property deed.	**Retained**
SOIL CONTAINMENT	Cap	Soils exceeding the clean up objectives are covered with asphalt or concrete.	**Retained**
SOIL REMOVAL	Excavation	Affected areas are excavated to remove contamination.	**Retained**
SOIL DISPOSAL	On-site disposal	Excavated soils are disposed of on-site in a designated area. Soils may be treated prior to disposal.	**Retained**
	Off-site disposal	Excavated soils are transported to an appropriate permitted off-site facility for final disposition.	**Retained**
SOIL TREATMENT	Chemical extraction	Similar to soil washing except solvents are used instead of water to extract contaminants.	**Not Retained** due to the limited amount of soil to be treated and due to high project costs. Process also generates waste solvents.
	Soil washing	Excavated soil is mechanically mixed and rinsed with water to remove contaminants.	**Not Retained** due to the limited amount of soil to be treated and due to high project costs.
	Stabilization/Solidification	Soils are treated on-site to limit the contamination solubility and mobility through the addition of additives.	**Not Retained** due to the limited amount of soil to be treated and due to high project costs.

TEE BIRD COUNTRY CLUB
MOREAU, NEW YORK

TABLE 7
REMEDIAL ALTERNATIVE SCREENING

REMEDIAL ALTERNATIVE	DESCRIPTION	SCREENING COMMENTS
ALTERNATIVE 1:	No action is taken to remove, treat, control or monitor the site	Would not provide for protection of environment or exposure to impacted soils.
ALTERNATIVE 2:	This alternative would utilize institutional and engineering controls, an environmental easement that restricts use of the site to commercial uses and requires long term maintenance and monitoring. An asphalt cap would be installed over the area to eliminate precipitation infiltration and reduce potential for leaching of PCBs. Groundwater monitoring and an annual cap maintenance program would be implemented.	Although all contaminated soils would remain in place, the cap would encapsulate remaining soils and prevent infiltration which would reduce contaminant mobility. Long term monitoring and cap maintenance would be required.
ALTERNATIVE 3:	This alternative is similar to alternative 2 and would utilize institutional and engineering controls, an environmental easement and would require long term maintenance and monitoring. Soils with PCB concentrations ≥50 ppm would be excavated and transported off site. An asphalt cap would be installed over the area. Groundwater monitoring and an annual cap maintenance program would be implemented.	Would remove all hazardous soils from the site ≥50 ppm. The cap would encapsulate remaining soils and prevent infiltration which would reduce contaminant mobility. Long term monitoring and cap maintenance would be required.
ALTERNATIVE 4:	This alternative proposes to excavate, transport and dispose of all contaminated soils with PCB concentrations ≥0.10 ppm. Soils would be transported and disposed of in an appropriately permitted facility depending on PCB concentrations.	Would remove all contaminated soils from the site ≥0.10 ppm to attain un-restricted use SCOs. Long term monitoring or maintenance would not be required.

TEE BIRD COUNTRY CLUB
MOREAU, NEW YORK

TABLE 8
ALTERNATIVE 2
PART 375 RESTRICTED USE-COMMERCIAL
ASPHALT CAP, INSTITUTIONAL CONTROLS AND LONG TERM MONITORING

ITEM	QUANTITY	UNIT COST	UNIT	COST
Direct Capital Costs				
Mobilization & Demobilization	1	$5,685	ls	$5,685
Installation of Asphalt Paving Cap				
NYSDOT Superpave Binder Course	600	$115	ton	$69,000
NYSDEC Superpave Top Course	430	$90	ton	$38,700
Deed Restrictions	1	$6,000	ls	$6,000
Total Direct Capital Costs:				**$119,385**
Direct Expenses				
Field Oversight	24	$80	hrs	$1,920
Total Direct Expenses				**$1,920**
Indirect Capital Costs				
Engineering (10% of total direct capital costs)				$11,939
Contingency (20% total direct capital costs)				$23,877
Total Indirect Capital Costs:				**$35,816**
TOTAL DIRECT & INDIRECT CAPITAL COSTS:				**$157,121**
Annual O & M Costs				
Maintenance of Asphalt Cap	1	$5,003	ls	$5,003
Semi-Annual Groundwater Monitoring Sampling and Analysis (5 year period)	1	$2,480	ls	$2,480
Monitoring Well Maintenance (5 year period)	3	$200	ea	$600
Total Annual O & M Costs:				**$8,083**
Present Worth Costs				
Present Worth of Annual Cap Maintenance Costs (5.0% discount rate, 30 years)				**$76,908**
Present Worth of Annual Monitoring Well Maintenance, Sampling and Analysis Costs (5.0% discount rate, 5 years)				**$13,335**
TOTAL CAPITAL AND O&M PRESENT WORTH:				**$247,364**

TEE BIRD COUNTRY CLUB
MOREAU, NEW YORK

TABLE 9
ALTERNATIVE 3
EXCAVATION OF SOILS WITH PCBS ≥ 50 PPM
PART 375 RESTRICTED USE-COMMERCIAL
ASPHALT CAP, INSTITUTIONAL CONTROLS AND LONG TERM MONITORING

ITEM	QUANTITY	UNIT COST	UNIT	COST
Direct Capital Costs				
Mobilization & Demobilization	1	$6,205	ls	$6,205
Excavation and Handling of Contaminated Soils for Disposal	40	$25	cy	$1,000
Transportation/Disposal of Contaminated Soils ≥50 ppm	56	$150	ton	$8,400
Placement of Clean Fill and Compaction	40	$25	cy	$1,000
Installation of Asphalt Paving Cap				
NYSDOT Superpave Binder Course	600	$115	ton	$69,000
NYSDEC Superpave Top Course	430	$90	ton	$38,700
Deed Restrictions	1	$6,000	ls	$6,000
Total Direct Capital Costs:				**$130,305**
Direct Expenses				
Confirmatory Sampling & Health & Safety Sampling	1	$6,300	ls	$6,300
Field Oversight	40	$80	hrs	$3,200
Health & Saftey Monitoring	1	$1,000	ls	$1,000
Total Direct Expenses				**$10,500**
Indirect Capital Costs				
Engineering (10% of total direct capital costs)				$13,031
Contingency (20% total direct capital costs)				$26,061
Total Indirect Capital Costs:				**$39,092**
TOTAL DIRECT & INDIRECT CAPITAL COSTS:				**$179,897**
Annual O & M Costs				
Maintenance of Asphalt Cap	1	$5,003	ls	$5,003
Semi-Annual Groundwater Monitoring Sampling and Analysis (5 year period)	1	$2,480	ls	$2,480
Monitoring Well Maintenance (5 year period)	3	$200	ea	$600
Total Annual O & M Costs:				**$8,083**
Present Worth Costs				
Present Worth of Annual Cap Maintenance Costs (5.0% discount rate, 30 years)				**$76,908**
Present Worth of Annual Monitoring Well Maintenance, Sampling and Analysis Costs (5.0% discount rate, 5 years)				**$13,335**
TOTAL CAPITAL AND O&M PRESENT WORTH:				**$270,140**

TEE BIRD COUNTRY CLUB
MOREAU, NEW YORK

TABLE 10
ALTERNATIVE 4
EXCAVATION OF SOILS WITH PCBS ≥ 0.10 PPM
PART 375 UN-RESTRICTED USE

ITEM	QUANTITY	UNIT COST	UNIT	COST
Direct Capital Costs				
Mobilization & Demobilization	1	$28,068	ls	$28,068
Excavation and Handling of Contaminated Soils for Disposal	2,370	$25	cy	$59,250
Transportation/Disposal of Contaminated Soils ≥50 ppm (hazardous)	56	$150	ton	$8,400
Transportation/Disposal of Contaminated Soils ≤50 ppm (non-hazardous)	3,264	$85	ton	$277,440
Placement of Clean Fill and Compaction	2,370	$25	cy	$59,250
Installation of Asphalt Paving Cap				
NYSDOT Superpave Binder Course	875	$115	ton	$100,625
NYSDEC Superpave Top Course	560	$90	ton	$50,400
Deed Restrictions	1	$6,000	ls	$6,000
Total Direct Capital Costs:				**$589,433**
Direct Expenses				
Confirmatory Sampling & Health & Safety Sampling	1	$29,700	ls	$29,700
Field Oversight	112	$80	hrs	$8,960
Health & Saftey Monitoring	1	$3,000	ls	$3,000
Total Direct Expenses				**$41,660**
Indirect Capital Costs				
Engineering (10% of total direct capital costs)				$58,943
Contingency (20% total direct capital costs)				$117,887
Total Indirect Capital Costs:				**$176,830**
TOTAL DIRECT & INDIRECT CAPITAL COSTS:				**$807,923**
Annual O & M Costs				
Total Annual O & M Costs:				**$0**
Present Worth Costs				
Present Worth of Annual Cap Maintenance Costs (5.0% discount rate, 30 years)				**$0**
Present Worth of Annual Monitoring Well Maintenance, Sampling and Analysis Costs (5.0% discount rate, 5 years)				**$0**
TOTAL CAPITAL AND O&M PRESENT WORTH:				**$807,923**

Notes:
1. Since the proposed paving would NOT be underlain by the exising pavement cap, paving for this alternative would consist of a 3-inch binder and a 2-inch top course for structural integrity and longevity.

TABLE 11
TEE BIRD COUNTRY CLUB
SUMMARY OF ESTIMATED COSTS FOR THE REMEDIAL ALTERNATIVES

COSTS	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4
DIRECT & INDIRECT COSTS	$0	$157,121	$179,897	$807,923
ANNUAL O&M COSTS	$0	$8,083	$8,083	$0
PRESENT WORTH OF O&M COSTS	$0	$90,243	$90,243	$0
TOTAL CAPITAL AND O&M PRESENT WORTH	**$0**	**$247,364**	**$270,140**	**$807,923**

FIGURES

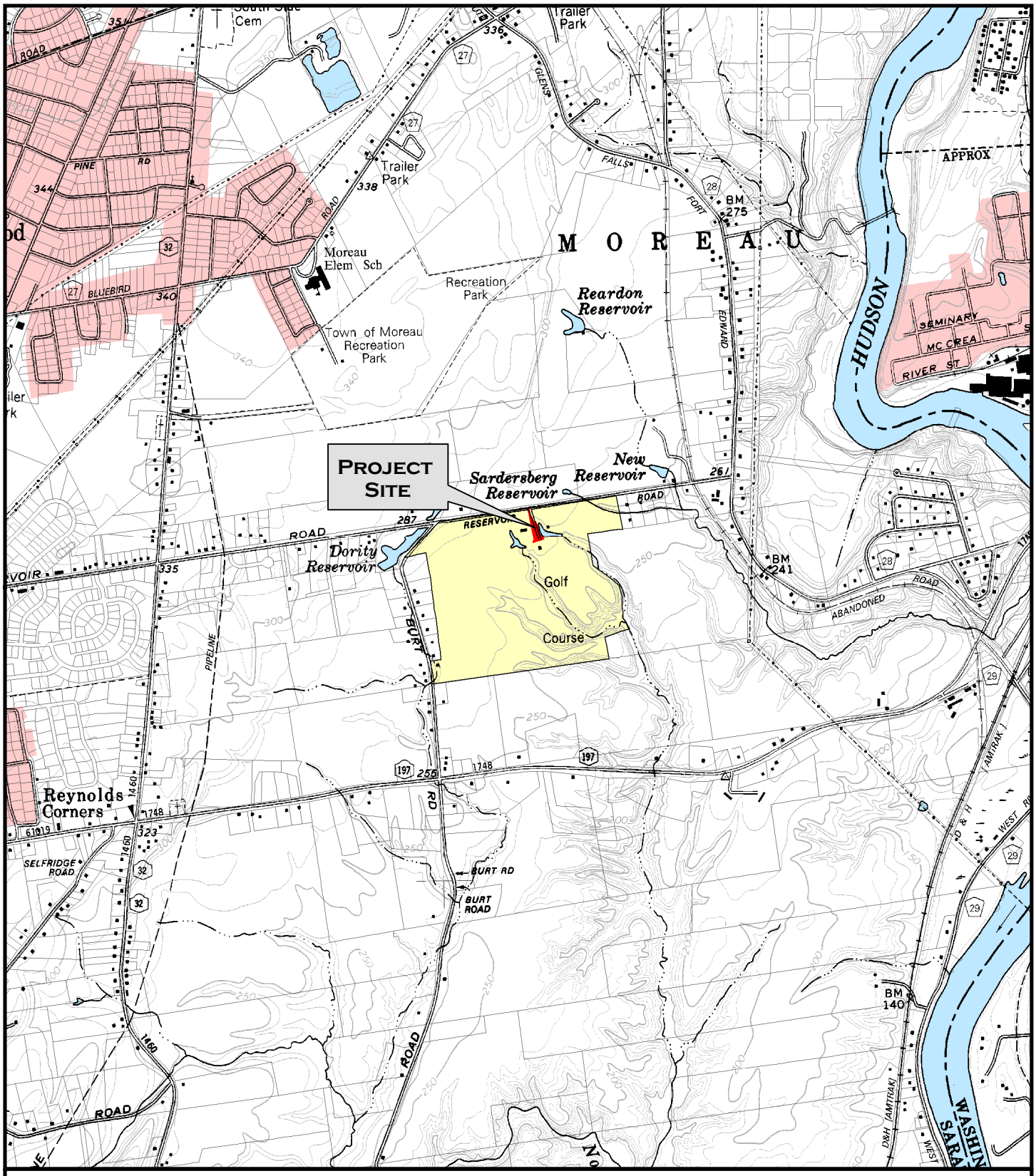

Figure 1
Site Location Map
Tee Bird Country Club

Town of Moreau
Saratoga County, New York

N

2,000 1,000 0 2,000

Feet

Prepared by: Delaware Engineering, P.C., December 2011
Source: NYS DOT 7.5' Digital Ortho Quads:
Glens Falls (N49), Hudson Falls (N50), Gansevoort (O49) and Fort Miller (O50)
Saratoga County Digital Tax Parcels, 2011

Total PCBs (mg/kg)

ID	SAMPLE DEPTH					
	0-1'		1-2'		2-3'	
	0-0.5'	0.5-1'	1-1.5'	1.5-2'	2-2.5'	2.5-3'
SS-01	544		0.71		0	
SS-02	39.4		1.18		0.04	0.1
SS-03	553		0.41		0.04	
SS-04	0.15		0		0	
SS-05	74.4		3.07		0.25	
SS-06	5.28		0		0	
SS-07	8.38		0.17		0	
SS-08	38		0.04		0	
SS-09	44.6		0		0	
SS-10	7.47		0	0		
SS-11	0		0		0	
SS-12	0.05		0		0	
SS-13	0		0		0	
SS-14	0		0		0	
SS-15	0		0	0		
SS-16	0		0	0		
SS-17	0		0		0	
SS-18	0	0	0			
SS-19	0		0		0	
SS-20	0		0	0		
SS-21	13.1		36.4		30.4	
SS-22	0		0		0	
SS-23	0.12		0		0	
SS-24	0.43		0			
SS-25	10.2		1.63		0.2	
SS-26	0.16		0		0	
SS-27	0		0		0	
SS-28	0		0.05		0	
SS-29	0		0		0	
SS-30	0		0		0	

Tee Bird Country Club

Town of Moreau, New York

Figure 2
Remedial Alternative 1

No Action

Ex. Conditions and Sample Locations

Legend

- Monitoring Well and Soil Boring
- Water Supply Well
- Shallow Soil Core
- Approximate limit of existing paving

N

0 30 60 120 180

Feet

Prepared by: Delaware Engineering, P.C., November 2011

Sources: NYS Digital Ortho Imagery, Spring 2007
Remedial Investigation Report, Tee Bird Country Club, prepared by Alpha GeoScience, 2011

Tee Bird Country Club

Town of Moreau, New York

Figure 3
Remedial Alternative 2

Installation of Asphalt Paving Cap

Legend

- Monitoring Well and Soil Boring
- Water Supply Well
- Shallow Soil Core - Total PCBs (mg/kg at 0-1' below surface)
- Approximate limit of existing paving
- New asphalt paving cap

NOTES:
- PCB Concentrations are in milligrams per kilogram (mg/kg)
- ND indicates PCBs were not detected
- Sample depth is 0-1 feet below pavement or vegetative cover

N

0 30 60 120 180 Feet

Prepared by: Delaware Engineering, P.C., November 2011
Sources: NYS Digital Ortho Imagery, Spring 2007
Remedial Investigation Report, Tee Bird Country Club, prepared by Alpha GeoScience, 2011

Tee Bird Country Club

Town of Moreau, New York

Figure 4
Remedial Alternative 3

Excavation of Soils w/PCBs ≥ 50 ppm
& Installation of Asphalt Paving Cap

Legend

- Monitoring Well and Soil Boring
- Water Supply Well
- Shallow Soil Core - Total PCBs (mg/kg at 0-1' below surface)
- Approximate limit of existing paving
- New asphalt paving cap
- Limit of excavation down to 1 foot

NOTES:
- PCB Concentrations are in milligrams per kilogram (mg/kg)
- ND indicates PCBs were not detected
- Sample depth is 0-1 feet below pavement or vegetative cover

N

0 30 60 120 180 Feet

Prepared by: Delaware Engineering, P.C., November 2011
Sources: NYS Digital Ortho Imagery, Spring 2007
Remedial Investigation Report, Tee Bird Country Club, prepared by Alpha GeoScience, 2011

Tee Bird Country Club

Town of Moreau, New York

Figure 5
Remedial Alternative 4

Excavation of Soils w/PCBs ≥ 0.1 ppm
& Installation of Asphalt Paving Cap

Total PCBs (mg/kg)

ID	SAMPLE DEPTH					
	0-1'		1-2'		2-3'	
	0-0.5'	0.5-1'	1-1.5'	1.5-2'	2-2.5'	2.5-3'
SS-01	544		0.71		0	
SS-02	39.4		1.18		0.04	0.1
SS-03	553		0.41		0.04	
SS-04	0.15		0		0	
SS-05	74.4		3.07		0.25	
SS-06	5.28		0		0	
SS-07	8.38		0.17		0	
SS-08	38		0.04		0	
SS-09	44.6		0		0	
SS-10	7.47		0	0		
SS-11	0		0		0	
SS-12	0.05		0		0	
SS-13	0		0		0	
SS-14	0		0		0	
SS-15	0		0	0		
SS-16	0		0	0		
SS-17	0		0		0	
SS-18	0	0	0			
SS-19	0		0		0	
SS-20	0		0	0		
SS-21	13.1		36.4		30.4	
SS-22	0		0		0	
SS-23	0.12		0		0	
SS-24	0.43		0			
SS-25	10.2		1.63		0.2	
SS-26	0.16		0		0	
SS-27	0		0		0	
SS-28	0		0.05		0	
SS-29	0		0		0	
SS-30	0		0		0	

Legend

- Monitoring Well and Soil Boring
- Water Supply Well
- Shallow Soil Core
- Approximate limit of existing paving
- New asphalt paving cap (follows limit of existing paving)
- Limit of excavation down to 1 foot
- Limit of excavation down to 2 feet
- Limit of excavation down to 3 feet

N

0 30 60 120 180 Feet

Prepared by: Delaware Engineering, P.C., November 2011
Sources: NYS Digital Ortho Imagery, Spring 2007
Remedial Investigation Report, Tee Bird Country Club, prepared by Alpha GeoScience, 2011

APPENDIX A

FEASIBILILTY COSTS BACKUP

DELAWARE ENGINEERING, P.C.
CIVIL AND ENVIRONMENTAL ENGINEERING
28 MADISON AVENUE EXTENSION, ALBANY, NY 12203
PHONE: 518.452.1290 FAX: 518.452.1335

PROJECT Tee Bird JOB
SHEET NO. 1/10 OF
DRAWN BY DATE Nov 2011
CHECKED BY DATE
SCALE

Alternative No. 2 - Asphalt paving cap

2-inch binder course = 120 lb/sy/inch

1 1/2-inch top course = 115 lb/sy/inch

Area to be paved = 5,003 sy (see attached back up)

Top course = $90/TON

Binder course = $115/TON

Area = 5,003 sy

Binder: 120 lb/sy/in = 5,003 x 120 x 2 in ÷ 2,000 lb/ton
= 600 TON

Top course: 115 lb/sy/in = 5,003 x 115 x 1 1/2 in ÷ 2,000 lb/ton
= 430 TON

600 ton ($115/ton) + 430 ton ($90/ton)
= $107,700

Field oversight

5 days x 8 hrs/day x $80/hr = $3,200

DELAWARE ENGINEERING, P.C.
CIVIL AND ENVIRONMENTAL ENGINEERING
28 MADISON AVENUE EXTENSION, ALBANY, NY 12203
PHONE: 518.452.1290 FAX: 518.452.1335

PROJECT _____ JOB _____
SHEET NO. 2/10 OF _____
DRAWN BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____

Annual O&M (FOR Alt# 2 and Alt #3)

(1) annual cap Maintenance:

sealing every two years (includes crack filling)

= $0.20/SF = $1.80/SY VSE $2/SY

5,003 SY x $2/SY ÷ 2 yrs = $5,003 per yr.

(2) annual well maintenance:

3 wells @ $200/yr = $600/yr.

(3) semi annual monitoring well sampling & analysis:

one technician 1 day x 8 hrs x $80/hr

= $640

laboratory analysis:

3 samples for PCB analysis x $200/sample

3 x 200 $600

$640 + $600 x 2 times per year

TOTAL = $2480

DELAWARE ENGINEERING, P.C.
CIVIL AND ENVIRONMENTAL ENGINEERING
28 MADISON AVENUE EXTENSION, ALBANY, NY 12203
PHONE: 518.452.1290 FAX: 518.452.1335

PROJECT _____ JOB _____
SHEET NO. 3/10 OF _____
DRAWN BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____

Alternative No. 3 - Excavate Soils ≥ 50 ppm transport and dispose with Asphalt cap (Restricted use - commercial)

Total area of Hotspots = 1,060 SF

excavation down to 1 foot

1,060 SF x 1 ft = 1,060 CF = 40 cy

40 cy x 1.4 ton/cy = 56 TON

CWM Model City Facility

Waste disposal of soils ≥ 50 ppm

$70/TON - disposal (quoted) see attached
$60/TON - transp (estimated)

Fees/taxes/fuel surcharge ± 20% of disposal

Disposal = $70/TON x 56 TON = $3,920

Fees = 20% x 3,920 = $800

Transpo = $60/TON x 56 TON = $3,360

Total T & D = $8,080

$8,080/56 TON = $144/TON

USE: $150/TON

DELAWARE ENGINEERING, P.C.
CIVIL AND ENVIRONMENTAL ENGINEERING
28 MADISON AVENUE EXTENSION, ALBANY, NY 12203
PHONE: 518.452.1290 FAX: 518.452.1335

PROJECT _____ JOB _____
SHEET NO. 4/10 OF _____
DRAWN BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____

Replace excavated soils w/ select granular Fill:

40 cy | x $25 cy

= $1,000 (includes compaction)

Asphalt paving cap: Area = 5,003 sy

2-inch binder 1½-inch top course

(see Alternative No. 2 Estimate)

= $107,700

Annual O & M (see backup for Alt #2)

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PROJECT _____ JOB _____
SHEET NO. 5/10 OF _____
DRAWN BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____

Confirmatory sampling (2 day turnaround)

Alternate 3:

@ SS-05 (30' diameter) collect samples on a 25' grid

(1) sample - floor
(4) samples - walls $C = \pi d = 95/25 = 4$ samples

5 total for PCB analysis $300 2 day turnaround

$5 \times \$300 = \$1,500$

@ SS-01 and SS-03 (15' diameter)

(1) sample - floor
(2) samples - walls

3×2 locations $= 6$ samples

$6 \times \$300 = \$1,800$

$3,300

Health & safety Monitoring and Sampling

equipment rental (5days) $1,000

Samples for PCB/particulate; 2 samples/day

2×5 days $= 10$ samples $\times \$300$

$10 \times 300 = \$3,000$

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PROJECT _____ JOB _____
SHEET NO. 6/10 OF _____
DRAWN BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____

Alternative No. 4 - Excavate soil ≥ 0.10 ppm transport and dispose (un restricted use)

Transportation & disposal ≥ 50 ppm 40cy = 56 ton
(see Alt #3 cost estimate)

$150/ton x 56 ton = $8,400

Transpo & disposal < 50 ppm
Disposal @ Seneca Meadows, Waterloo NY

price quoted 11/16/11 $25-$50/TON
USE $35/TON

Transportation assume $50/TON

TOTAL T&D: $85/TON

USE 3,264 TON soil @ < 50 ppm
(see attached back up)

3,264 TON x $85/TON = $277,440

Asphalt Cap: (SF of cap slightly less than Alt #2 & 3) = 43,740 SF = 4860 SY

Binder: 120lb/sy/in x 4860 x 2 inch ÷ 2000 lb/TON
= 585 TON x $115/TON

= $67,275
3 inch binder = $100,602

* Alt 4 should utilize a thicker cap for structural and longevity since it is NOT underlain by existing cap rather new subbase (use: 3" binder 2" top)

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PROJECT _____ JOB _____
SHEET NO. 7/10 OF _____
DRAWN BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____

Top course: 115 lb/sy/in x 4860 x 1½ in ÷ 2000 lb/TON

1½" binder = 420 TON

2" binder = 560 TON

Confirmatory Sampling & H&S Monitoring

2 day turnaround

Assume sample collection @ equivalent of 25 foot grid or one sample per 625 SF

Total excavated area = 44,369 SF

44,369 / 625 = 71 samples

71 samples x $300 = $21,300

Health and safety air monitoring

3 week equipment rental $3,000

2 samples per day x 14 days = 28 samples

28 x $300 = $8,400

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PROJECT _____ JOB _____
SHEET NO. 3 | 10 OF _____
DRAWN BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____

COMPLETION TIME FRAME:

ALT #1:	No Action	N/A
ALT #2:	CAP	3 days
ALT #3:	CAP W/ ECAVATION ≥ 50ppm	5 days
ALT #4:	CAP W/ ECAVATION ≥ 0.10ppm	14 days

ALTERNATE 2

Paving Cap (New edge):
45,025.76

ALTERNATE 3

Excavation:

Depth	SF
1	176.59
1	176.59
1	706.34
	1,059.51

Paving Cap (New edge):
45,025.76

ALTERNATE 4

Excavation:

Depth	SF
1	**27,974.67**
2	1,517.36
2	13,934.52
	15,451.88
3	78.45
3	78.45
3	78.45
3	706.05
	941.40

Paving Cap (Existing edge):
43,739.53

ALTERNATE 2

Paving Cap (New edge):
45,025.76 USE 45,030SF = 5003 SY

ALTERNATE 3 ≥ 50 ppm

Excavation:

Depth	SF
1	176.59
1	176.59
1	706.34
	1,059.51 SF x 1Ft = 1,060CF = 39.25cy = 40cy

Paving Cap (New edge):
45,025.76

ALTERNATE 4 ≥ 0.10 ppm

Excavation: 44,369SF TOTAL

Depth	SF
1	**27,974.67** x 1FT = 27,975CF = 1,036cy = 1,040cy
2	1,517.36
2	13,934.52
	15,451.88 x 2Ft = 32,974CF = 1,221cy = 1,225cy
3	78.45
3	78.45
3	78.45
3	706.05
	941.40 x 3Ft = 2,826CF = 105cy

Paving Cap (Existing edge):
43,739.53

TOTAL = 2,370 cy

Soils ≥ 50ppm = 40cy x 1.4ton/cy = 56 ton

≥ 0.10ppm = 2,370cy x 1.4ton/cy = 3,320 ton

Alternate 4 disposal

TOTAL: 3,320 ton (2,370cy)

≥50ppm: 56 ton (40cy)

<50ppm: 3,264 ton (2,331cy)