VEGETATIVE ORGANIC
WASTE MANAGEMENT FACILITY RESEARCH
NASSAU AND SUFFOLK COUNTIES, NEW YORK

SUMMARY REPORT

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List of Acronyms and Abbreviations

AGWQS	Ambient Groundwater Quality Standards
bgs	Below ground surface
BMP	Best Management Practices
BOD	Biological oxygen demand
CO2	Carbon dioxide
COD	Chemical oxygen demand
CSM	Conceptual Site Model
CY	Cubic yard
DO	Dissolved oxygen
DOC	Dissolved organic carbon
GPR	Ground penetrating radar
GPS	Global positioning system
GWQS	Groundwater Quality Standard
ID	Inner diameter
J Qualifier	Estimated value
LICC	Long Island Compost Company
mM	Millimoles
µg/L	Micrograms per liter
mg/L	Milligrams per liter
mg/kg	Milligrams per kilogram
NMDS	Nonmetric multidimensional scaling
NYSDEC	New York State Department of Environmental Conservation
OM	Organic matter
ORP	Oxidation-reduction potential
%v/v	Percent volume over volume
ppm	Part(s) per million
ppb	Part(s) per billion
PVC	Polyvinyl chloride
SCDHS	Suffolk County Department of Health Services
TCLP	Toxicity Characteristic Leachate Procedure
TAL	Target Analyte List
TWP	Temporary well point
U Qualifier	Analyzed, but not detected
VOW	Vegetative Organic Waste
VOWM	Vegetative Organic Waste Management

EXECUTIVE SUMMARY

In 2013, the New York State Department of Environmental Conservation (NYSDEC) released a report concerning potential groundwater impacts from vegetative organic waste (VOW) management facilities. In 2016, a separate report regarding VOW management facilities was released by the Suffolk County Department of Health Services (SCDHS). These reports indicated elevated detections of metals and other constituents were identified in groundwater downgradient of the VOW facilities.

As a result of these studies, Parsons and OBG were contracted by NYSDEC to further evaluate impacts to groundwater from mulch processing operations, and to develop best management practices for stormwater runoff for these sites, as well as facility monitoring recommendations.

Parsons and OBG conducted four field studies as part of the evaluation:

- Vertical Groundwater Study
- Surface Water Study
- Mulch Percolate Study
- Mulch Pilot Test

Based on research and field study results, the following conclusions were derived:

1. *Wood mulch contains numerous metals, however not at levels that would directly cause the groundwater impacts found (via previous studies).*

Conclusive data indicates that water that contacts mulch before entering the subsurface becomes a transporter of carbon which leads to biogeochemical processes that result in changes to the groundwater, particularly an increase in manganese and other metals.

2. *Movement of water through the mulch piles.*

Based on the field observations and measurements collected, stormwater primarily flows off the sides of mulch piles, rather than through them. The water that percolates through the piles gets absorbed within the first few feet, leaving the pile centers relatively dry. If stormwater is allowed to pond at the base of a pile, the lower level mulch will remain moist. Dense, moist mulch can create an anoxic condition leading to odors.

3. *Pilot Study groundwater findings*

No groundwater impacts were found at the four groundwater monitoring wells that were installed for this pilot study. Based on the earlier reports that showed potential groundwater impacts, this may be an indication that mulch quantity and/or detention time on the site are factors affecting groundwater impacts.

4. Summary of recommendations to control and assess potential groundwater and surface water impacts

- Run-on from areas up-gradient of mulch piles must be diverted to prevent pile contact
- Mulch piles should be placed in a manner that minimizes ponding around the piles, minimizes the movement of precipitation through the piles, and provides a sufficient buffer to groundwater wells.

- Stormwater produced on the site must be managed appropriately
- Movement of organic matter from the surface of the pile and on the ground around the piles must be controlled
- Surface water and groundwater sampling programs should be put in place to assess the effectiveness of prevention measures

5. *Detailed recommendations*

See the following MITIGATION APPROACHES AND BEST MANAGEMENT PRACTICES and FACILITY MONITORING RECOMMENDATIONS

MITIGATION APPROACHES AND BEST MANAGEMENT PRACTICES

SITE PLANNING

The following site planning approaches may be considered to mitigate the impacts of stormwater runoff from mulch piles on water quality:

REDUCE RUNOFF

This study demonstrated two key findings on the migration of precipitation through the pilot mulch piles:

1. Vertical movement of precipitation into mulch piles is relatively limited, particularly for finely ground mulch, and
2. Precipitation generally runs off from outer limits of mulch piles.

Based on these findings, a combination of the following approaches should be considered to reduce runoff from mulch piles:

1. **Cover**. Covering mulch piles with an approved breathable liner will negate precipitation from contacting and running off the piles. Piles of unprocessed materials should also be covered to the extent practicable as they may also be a source of dissolved organic carbon based on the literature. It is noted that covering and/or lining piles will not prevent the conveyance or ponding of stormwater at the base of piles.
2. **Layout**. To the extent practicable, mulch piles (or other piles of organic materials) should not be placed in topographic depressions that act as either stormwater conveyance channels to adjacent resources or where runoff accumulates. Flowing or standing water that contacts mulch piles allows leaching resulting in surface water with elevated concentrations of dissolved organic carbon.
3. **Slope**. Similar to the Layout recommendation, mulch piles should be placed in locations where (or the landform should be graded such that) the ground surface is crowned or otherwise sloped sufficiently to avoid ponding of water at the bases of piles.

SUBSTRATE CONSIDERATIONS AND INFILTRATION PREVENTION

Placement of piles on paved surfaces (i.e., asphalt or concrete) or impermeable liners either in combination with the above approaches to reduce runoff from mulch piles, or with impacted runoff collection and treatment may be considered. Additional considerations include:

1. **Buffers from sensitive resources (e.g., streams, wells)** – A minimum 200-ft buffer should be established between the compost facility and the nearest downgradient sensitive resource (i.e., stream or wetland). Where possible this buffer should be maintained with a dense mixture of grasses, forbs, and shrubs to promote:
   a. Evapotranspiration of stormwater

b. Settling of sediments and sediment-bound compounds.

c. Vegetative uptake of nutrients and pollutants so that they are bound within the biomass.

Trees that grow within these buffers should be cut when they reach a maximum height of 6-ft such that sunlight can continuously reach the ground and avoid shading that could diminish ground vegetation.

Where stormwater runoff is flowing directly off-site, the adjacent buffer should be graded so that runoff is in the form of even sheet flow to maximize even contact across the buffer and minimize the formation of rill erosion.

2. **Windrow alternatives**

   a. *Spacing* – As described above, it is recommended that covered windrows be placed on crowned surfaces to prevent accumulation of stormwater under the piles. The area between windrows can be graded to be slightly concave so that stormwater can be collected and managed. The spacing should be sufficient to achieve both the crowning and swale formation while also providing sufficient space for vehicle movements.

   b. *Orientation* – Covered windrows should be oriented parallel to the slope, so that precipitation landing between the windrows can move freely off the composting area. Windrows and the associated conveyance swales should also be oriented so that stormwater runoff is directed either directly to the stormwater management facility or to a receiving swale that is sized to convey the collected stormwater to the management facility.

   c. *Shape* – In lieu of covering, windrows may be formed to maximize retention of stormwater to minimize runoff and to maintain optimal moisture content provided that doing so is shown to not accelerate infiltration beneath the piles. Considerations should include creation of flat or concave tops that maximize retention and prevent runoff. During periods of prolonged rain, the piles could be reshaped to form peaked tops to avoid over-saturation within the windrows.

3. **Control of surface water run-on**- It is critical to minimize the amount of off-site stormwater that flows onto and through the facility to avoid generation of additional contact stormwater and to minimize the size of the management facility needed to treat it. The primary BMPs to achieve this objective are:

   - *Diversion swales* – Stormwater swales should be constructed on the site perimeter to collect runoff associated with the one-hour duration and a 10-year return period. These swales should be routed to engineered outlet structures (e.g., riprap aprons) that prevent negative impacts to those resources.

   - *Berms* – Similar to the diversion swales, earthen berms should be sized to prevent runoff associated with the one-hour duration and a 10-year return period from the off- site contributing watershed from entering the site. Berms should be built from finely graded material that can be compacted sufficiently and vegetated with a mix of grasses and forbs to prevent washout. Trees should be cut once they grow taller than 6-ft to minimize the chance for blowdowns which would compromise the integrity of the berms. No pulling of trees or grubbing of stumps should be performed.

As with the diversion swales, berms should route flow to engineered outlet structures (e.g., riprap aprons) that prevent negative impacts to resources.

4. Site Operations

a. Staging

i. Material – Material should be placed in designated windrow locations per the recommended dimensions as soon as practicable to maximize the stormwater management benefits outlined herein. If temporary material staging is required, it shall be in designated areas where stormwater runoff feeds into the stormwater management facilities described herein.

ii. Vehicles and equipment – A designated staging area should be established a minimum of 50-ft from either on-site stormwater management facilities or off-site sensitive resources (e.g., streams and wetlands).

b. *Washing of vehicles and equipment* – Washing of vehicles and equipment shall be performed in designated areas only that are a minimum of 50-ft from either on-site stormwater management facilities or off-site sensitive resources (e.g., streams and wetlands). Cleaning water will be directed into on-site stormwater management facilities prior to discharge off-site.

c. *Recirculation/Water harvesting for reuse* – Stormwater collected in a stormwater management facility can be used for site dust suppression. Water can be drawn from the facility and reapplied using hoses, water trucks, or other acceptable means, in a manner that does not result in erosion. This limits the amount of water that must be managed within the facility.

d. Surface water runoff controls

i. Vegetative filters – As stated above, vegetative filter strips should be a minimum of 200-ft wide vegetated with a dense mix of grasses, forbs, and shrubs that receive sheet flow from the adjacent site. These filters should be monitored periodically to:

1. Remove accumulated sediment or organic matter that affects flow patterns into or through the filter.
2. Identify rill erosion that occurs. Strategic regrading of these areas may be needed to maintain sheet flow through the filter.
3. Identify vegetative species with low survival rates and replace them with more successful species to maintain dense vegetative coverage.

ii. Stormwater Management Facilities - Stormwater runoff potentially impacted with mulch constituents should be discharged to a treatment pond/wetland consisting of two cells. The combination of two cells would allow for individual cells to be temporarily taken off-line for service while maintaining treatment within the second cell. Design features should include:

1. Key Components

   a. Lined conveyance – An impermeable liner should be installed within the facility to minimize infiltration of concentrated effluent from influencing local groundwater. The bottom of any surface impoundment must be a minimum of five feet above both the seasonal high groundwater table.

   b. Stormwater management facilities should include sediment forebays sized to hold a minimum of 10% of the design capacity of the facility and shall be configured to allow for ease in removing sediment and organic material once ½ of the design capacity of the forebay is reached. It may be necessary for the liner within the forebay to be concrete or asphalt pavement to avoid damage during periodic cleanout.

   c. Stormwater management facilities shall not be sited within jurisdictional wetlands or within designated floodways.

   d. The perimeter of the facilities should be bermed to prevent non-contact runoff from entering the system.

   e. Managed outflow to aquatic resources – As with the swales and berms discussed above, the discharge point from the facility should be engineered with features (e.g., riprap aprons) that prevent negative impacts to those resources.

FACILITY MONITORING RECOMMENDATIONS

This appendix provides a general framework and options for developing a monitoring program for VOW Facilities in New York State with the overall purpose of protecting surface water and groundwater. The impact of VOW facilities on groundwater quality in Long Island is well established as summarized in this report. Future monitoring will be needed to determine where mitigation against impacts to surface and groundwater is required, to aid the design of the mitigation approaches outlined in Appendix B, and to evaluate their effectiveness.

Overall recommendations include:

- Integrated sampling of surface water, groundwater, and treated water (such as in retention/treatment ponds) at mulching and compost facilities to:
    - Identify the locations and pathways by which impacted surface water with organic carbon is migrating and infiltrating. This provides a primary basis for locating, selecting and designing mitigation and treatment approaches, and optimizes the placement of groundwater monitoring wells.
    - Evaluate the relative impact of composting and mulching operations on surface and groundwater quality
    - Compare the effectiveness of different mitigation measures applied under different circumstances at different sites for optimizing the mitigation or treatment approaches.
    - Compare analytical results between surface water, groundwater, and treated water for a broader "system" evaluation prior to, during, and after mitigation approaches

Overall Sampling strategy. Development of a site-specific monitoring approach is recommended and should include baseline sampling of surface waters to determine primary migration and infiltration areas, followed by confirmation surface water sampling, and groundwater sampling.

Site specific considerations for determining where to sample surface water and groundwater include VOW type, pile locations and size, and other site conditions including where surface water is:

1) contacting VOW,

2) potentially delivering organic carbon from piles (including ditches), and

3) likely infiltrating (such as unlined ditches and ponds).

A limited number of key indicator parameters such as organic carbon and manganese should be analyzed for in all water samples (surface water, groundwater, and treated water) from all facilities prior to and after mitigation. This will allow for evaluating the extent of impacts prior to, during, and after mitigation approaches at different facilities.

Surface water sampling and monitoring. A visual inspection of pile run-off and run-on, and percolate seepage out of piles during and after precipitation events is recommended to help select locations for surface and groundwater sampling, and to identify locations where mitigation or treatment may be required.

During baseline surface water sampling, samples should be collected where:

- Water is in contact with VOW in low spots
- Immediately adjacent to the piles where water is flowing out of, and/or along the outer edge of the piles
- Migration paths away from the piles including cuts and ditches
- Impacted water may be accumulating and infiltrating such as along unlined ditches and ponds, or flat areas receiving runoff.

Additional considerations for determining where to sample surface water include:

- The site's topography relative to VOW location
- The presence of an impermeable surface such as concrete beneath the facilities including concrete and frozen soil that will impact the migration and infiltration of run-off
- Property boundaries do not influence the migration of surface water
- The extent and rate of precipitation may influence the migration pathways and where infiltration occurs. Therefore, multiple sampling events may be required.

During this initial phase, grab samples of surface water should be collected for key indicator parameters. Indicator compounds should minimally include DOC, dissolved iron, dissolved manganese, potassium, and chloride. Limiting the number of analyses during the baseline sampling is intended to decrease the per sample lab analytical cost so that a larger number of samples can be collected.

After the baseline sampling, surface water sampling may include collecting samples from a limited number of locations for a larger analytical suite to evaluate the type of impacts, to confirm where mitigation or treatment may be required, and/or to fill data gaps for designing the mitigation approach. The baseline and confirmation sampling provide a comparison of results after run-on and run-off are controlled, and/or after percolation through piles is mitigated by covering or lining the piles.

Groundwater sampling and monitoring.

<u>Baseline Groundwater Sampling</u>

Baseline sampling will be conducted to confirm impacts to groundwater and to identify locations and depths for installing monitoring well(s). This sampling event should focus on downgradient of VOW piles and organic carbon infiltration areas previously identified with surface water sampling. Although the regional groundwater flow directions on Long Island is established, the local flow direction including in recharge areas may vary and be difficult to determine. Groundwater upgradient of selected VOW facilities should be collected for comparison with downgradient results.

Appropriate drilling/sampling techniques for this initial groundwater sampling include direct push "push ahead" sampling devices (Section 5.2) and temporary monitoring wells installed at varying depth intervals. Guidance for groundwater sampling with direct push technologies is provided by Geoprobe Systems. Based on the previous results (SCDHS, 2016) sampling at 5 or 10 feet intervals beginning at the water table is appropriate. Field measurements of dissolved oxygen, ORP, specific conductance, and pH coupled with field measurements of iron and manganese can be used to make field decisions on the sampling interval for laboratory analyses and the total drilling depth.

A standardized list of analyses is recommended for this initial groundwater sampling and should minimally include dissolved organic carbon, dissolved iron, dissolved manganese, potassium, sodium, calcium, magnesium, chloride, sulfate, nitrate, and ammonia. Dissolved (filtered) iron, manganese, and organic carbon samples is recommended to avoid the potential for sampling artifacts associated with non-representative turbidity in water samples.

<u>Post Mitigation Groundwater Sampling</u>

Due to the necessity to collect multiple samples over time, monitoring wells are recommended over direct push sampling to evaluate the effectiveness of mitigation measures. The number of monitoring wells required depends on the facility size, the spatial extent of suspected or confirmed organic carbon infiltration, and the location(s) where the mitigation measure(s) are implemented. The sampling timing, frequency, and duration should include, or consider:

- Baseline sampling prior to implementing mitigation measures
- The estimated time for groundwater to flow from the mitigation area to the monitoring well
- Seasonal fluctuations are possible or likely

Other Recommendations

- A focused evaluation of a single plume (or a few plumes) to evaluate the distribution, extent (lateral and vertical), concentrations, and attenuation of metals and other constituents.
- Estimating the relative contribution of percolation through the piles, run-on, and run-off sources of organic carbon to groundwater would aid the selection and optimization of mitigation measures. Quantifying each of these pathways would however be difficult, and each pathway will likely vary considerably depending on site conditions and VOW grind size. Nevertheless, determining if precipitation running down and through the sides of the piles is a primary pathway for infiltration, is recommended. If this is an important pathway, slopes away from VOW piles applied to avoid run-on from contacting VOW would spread organic carbon migrating down the sides of the piles.

SECTION 1 - INTRODUCTION

1.1 PROJECT BACKGROUND

In 2013, the New York State Department of Environmental Conservation (NYSDEC) released a report concerning potential groundwater impacts from vegetative organic waste (VOW) management facilities. In 2016, a separate report regarding VOW management facilities was released by the Suffolk County Department of Health Services (SCDHS). These reports indicated elevated detections of metals and other constituents were identified in groundwater downgradient of the VOW facilities.

The term vegetative organic waste refers to readily biodegradable plant refuse (e.g., trees, leaves, land clearing debris, lawn trimmings). Compost and mulch are typical finished products from VOW facilities. Compost is a type of VOW product that, through management and decomposition, does not resemble the parent materials from which it was produced. Mulch is a processed VOW product that still resembles parent materials (e.g., recognizable pieces of bark, wood, sticks, and leaves); however through processing or decomposition, VOW may be comprised of smaller fragments than the parent materials. Composting and mulching entail differing operations and apply to different NYS Part 361 regulations. While this report initially focuses on VOW in general, field and analytical investigations were targeted solely to mulch, mulching operations, and their impacts on water quality.

1.2 REPORT ORGANIZATION

In addition to this introduction, this Summary Report includes the following sections:

- Section 2 describes current Suffolk County mulching and VOW processes and regional geology and hydrogeology. Section 2 also evaluates trends in the analytical data provided in the 2013 NYSDEC and 2016 SCDHS reports to determine potential mechanisms underlying the apparent linkage between VOW management (VOWM) piles and groundwater impacts.
- Section 3 presents information on the Mulch Percolate Study including locations, sample collection techniques, and analytical results. It is noted that analytical results are not interpreted in Sections 3 through 6. The results are interpreted using additional tables, graphs, and figures in Section 7.
- Section 4 presents information on the Surface Water Study including locations, sample collection techniques, and analytical results.
- Section 5 presents information on the Vertical Groundwater Study including locations, sample collection techniques, and analytical results.
- Section 6 presents information on the Pilot Study including monitoring well and mulch pad construction, sample collection techniques, and analytical results.
- Section 7 presents interpreted results and discussion of the Mulch Percolate Study, Surface Water Study, Vertical Groundwater Study, and Pilot Study. Tables, graphs, and figures used in the interpretation are provided in this section.
- Section 8 presents conclusions and recommendations.

- Section 9 presents references used in the preparation of this Summary Report.

1.3 PROJECT OBJECTIVES

While past studies indicate surface and groundwater resources are impacted by VOWM piles, the mechanisms of impact were not clear. The objective of this research was to evaluate the current data, develop a Conceptual Site Model (CSM), evaluate mulch percolate and run-off mitigation alternatives, and develop stormwater run-off Best Management Practices (BMPs) and groundwater monitoring guidance for implementation at VOWM facilities.

To meet these objectives, the following studies were developed to evaluate surface and subsurface processes that affect the extent of impact:

- Vertical Groundwater Study
- Surface Water Study
- Mulch Percolate Study
- Mulch Pilot Test

These studies were developed in part to identify/determine the following:

- A predominant pathway by which mulch percolate is conveyed to groundwater (i.e., downward water movement through VOW piles where it infiltrates to groundwater or lateral flows and ponding of surface water prior to infiltration).
- If elevated metals concentrations in surface and groundwater are being caused by microbially mediated transformations of metals, and, if so, where those transformations are primarily occurring.

A timeline of activities associated with each study mentioned above can be referenced in **Figure 1-1**.

SECTION 2 - BACKGROUND

2.1 PREVIOUS INVESTIGATIONS

In January 2016, the SCDHS released a report summarizing groundwater impacts associated with VOWM and mulching facilities within the County. The report was prompted by a 2013 NYSDEC report regarding groundwater investigations at a VOWM facility in Yaphank, New York, and at the Town of Islip's composting facility. Some groundwater samples collected downgradient of the facility in Yaphank exceeded drinking water standards for manganese, gross alpha radionuclides, ammonia, and thallium. Groundwater samples from the Islip Compost facility and surface run-off samples from a facility in Yaphank showed some of the same exceedances. Compost and soil samples did not contain constituents at concentrations greater than the NYSDEC Unrestricted Use Soil Cleanup Objectives.

The 2016 SCDHS Report details an investigation conducted from July 2011 through October 2014 to evaluate groundwater quality downgradient of 11 VOWM facilities throughout Suffolk County. As part of the investigation, 233 groundwater samples and two surface water samples were collected from 30 temporary well points and six permanent monitoring wells. The primary contaminants of concern detected during the investigation were manganese and iron, followed by antimony, arsenic, beryllium, cadmium, chromium, cobalt, germanium, molybdenum, thallium, titanium, and vanadium. In addition, the number of gross alpha and gross beta radiological detections was higher than typically detected in County groundwater. Low levels of pharmaceuticals, personal care products, and pesticides from historical/current farming were also detected. Analytical data from the 2013 NYSDEC and 2016 SCDHS reports can be referenced in **Appendix A**.

2.2 TYPICAL AND SUFFOLK COUNTY MULCHING AND COMPOSTING PROCESSES

Typical Composting Operations

Composting is an aerobic process where microorganisms decompose organic materials yielding water, heat, carbon dioxide gas (CO_2), and humus (Chardoul, 2015). During composting operations, windrows are typically formed to manage organic waste. Windrows can aerate naturally through a "chimney effect," in which warm air rises from the pile as cool air is drawn from the bottom. Windrow dimensions are relative to their contents, with sizes typically ranging from 4 to 12 feet high and 10 to 20 feet wide. Turning occurs when the center of the windrow reaches 140 degrees F or if anaerobic conditions develop. Optimal temperature and moisture conditions for composting are 105 to 140 degrees F and 45 to 60% by weight, respectively. Following consumption of most labile carbon, piles are formed to "cure" for one to six months. Most sites cannot efficiently handle more than 5,000 cubic yards (CY) per acre per year (CY/acre/yr), and 8,000 CY/acre/year is generally the upper limit for an intensely managed site (Chardoul, 2015).

With optimum oxygen conditions greater than 10%, active composting can take several weeks. Finished compost may take up to two years, with curing. Curing is usually considered complete when internal pile temperatures reach ambient conditions and oxygen levels remain stable at 10 to 15% (Cooperband, 2002).

The following are General Guidelines for compost pile management (Cooperband, 2002):

- Composting technologies
  - Static piles
  - Windrows
    - Usually turned two to three times a week during active composting, then one to two times a month during curing. Referenced studies also showed that windrow management reduced methanogenesis by two orders of magnitude while increasing the rate of volume reduction by 18 percentage points
  - Passively aerated windrow system
    - This system includes perforated pipes at the base of the piles to encourage aeration. This system could also help provide preferential flow of percolate to control area, rather than into the soil system. The perforated pipes could be solid on the bottom to further prevent percolation.
  - Forced air static piles
  - Enclosed composting
- Manage for good aeration (desired temperature and low odor are good indicators)
  - Proper sizing, turning rate, porosity (45% to 60% air filled voids)

Table 2-1. Typical composting pile sizes.

Composting Method	Height (feet)	Width (feet)
Static Piles	3 to 6	12
Passively Aerated Windrow Systems	3 to 6	10
Windrow Composting		
Tractor pulled	6 to 8	10
Self-propelled turner	3 to 9	9 to 20
Bucket loader	6 to 12	10 to 20

Long Island Compost Inc. (LIC) – Composting Operations

The facility known as Great Gardens is a Part 360 yard waste transfer station, owned and operated by Long Island Compost Company (LICC), located at 445 Horseblock Road, Yaphank, Township of Brookhaven. This facility is located on a 62-acre property, of which a transfer station occupies about 15 acres of the site. Great Gardens' operations generally consist of large-scale material flow and pile management of completed composting material. Leaf litter, yard waste and other VOW arrives at transfer stations in Westbury and Yaphank where it is trucked out to different farms on the east end of Long Island and placed into windrows. Carbon and nitrogen levels in the windrows are managed with grass clippings providing nitrogen and leaves/thatch providing carbon. The materials are incorporated into the windrows with a loader using a "top and turn" method. Once the windrows drop to approximately 100°F (one month to one year depending on moisture and carbon and nitrogen levels), the material is trucked back to Great Gardens' Yaphank location, piled up to cure for about a year, and then screened to a finished product. Curing piles are managed as 50-foot tall push piles. Curing provides time for excess nitrogen and salts to leach out. LIC usually starts compost retrieval in June or July so that windrows are gone by the winter. Great Gardens' Yaphank site is also used for chipping, processing and storage of a large volume of mulch piles in windrows. Their windrows are generally approximately 8 feet tall and 20 feet wide and are created from back to front, not bottom to top.

Typical Mulching Operations

In New York State, wood or other unaltered (e.g., not painted) wood debris may be processed into mulch for commercial sale at dedicated facilities. Operations at these facilities typically entail receipt, an initial grind and stockpiling of materials; turning as needed to avoid overheating; secondary grind; and delivery to a buyer. Oftentimes, materials accumulate at mulch facilities through summer, are stockpiled through winter, and are sold in spring. Stockpiled materials are usually left as unground or initial grind materials, while the second grind is usually performed in spring, prior to sale. Selected grind sizing varies among facilities according to the operator's preferences and market drivers. During stockpiling, mulch is turned with loaders to avoid overheating (internal pile temperatures >150 degrees F). Mulch piles in NY are typically unlined and uncovered thus allowing for open contact with precipitation and surface water.

Suffolk County Mulching Operations

Different mulching practices are used in Suffolk County depending on the starting VOW, desired mulch product, and operator preferences. VOW used in mulching operations include wood chips, trees (trunks, limbs, and leaves if present), and pallets. Mulch products include naturally colored mulch, artificially colored mulch, fibar mulch (finely ground used mainly for playgrounds), and dried mulch.

The typical approach used on Long Island to generate naturally colored mulch includes grinding the VOW, stockpiling the first grind for one to two months, and preparing a second finer grind that is piled over winter for purchase in spring. Different operators appear to implement different approaches. Recycled Earth Products' current mulching approach for naturally colored mulch is comprised of generating a coarser first grind (through a 6-inch X 9-inch screen) that is placed in windrows for the duration of winter with little to no turning until spring when the material is ground again prior to selling. This coarser grind was implemented to enhance aeration for controlling odors.

Discussions with the operators indicate the following for naturally colored mulch operations:

- Approximately one year of "shelf life" before the mulch becomes too fine and degraded
- Frequent turning of the mulch enhances mulch decomposition
- The frequency at which the piles are turned is in part dependent on the frequency required to maintain pile temperatures less than approximately 150° F to avoid fires
- Increased quantities of leaves result in increased heat generated within the piles
- Leaves can be removed via screens prior to grinding

Colored mulch is generated from dried VOW, such as trees that are allowed to dry prior to processing, and from wooden pallets. The trees and pallets are ground (often twice) and dyed for immediate sale (i.e, no piles or rows required).

2.3 NYS REGULATIONS

NYS Part 360 Solid Waste Management and Part 361 Material Recovery Facilities regulations were issued in November 2017. Part 361-3 regulations cover composting and other organics recycling facilities. Mulch processing facilities are covered in Part 361-4. Guidance for mulch processing facilities as defined by 361-4, which took effect November 4, 2017 can be found at the following NYDEC website:

https://www.dec.ny.gov/docs/materials_minerals_pdf/mulchregsguidance.20171212.pdf

Topics of the regulations for mulch processing facilities in 361-4 (Appendix X) include:

- Criteria for exempt versus registered facilities including the quantity of material that can be stored and processed on-site
- Operating requirements for registered materials includes:
    - Material types approved for processing, and provisions to preclude acceptance of contaminated materials
    - Length of time that unprocessed and processed material can be held on-site
    - Provisions to reduce fire risk including pile configuration, separation between piles, temperature monitoring, and pile restacking requirements
    - Provision 13 states: "For the purposes of Part 360 and this Part, precipitation, surface water, and groundwater that has come in contact with wood debris, tree debris, and yard trimmings, both incoming and processed, is not considered leachate, but must be managed in a manner acceptable to the department. The facility must have a written run-on and run-off plan, submitted with the registration request, that is acceptable to the department that outlines the methods that will be used to prevent run-on from entering

and run-off from leaving the site and to minimize the movement of organic matter into the soil at the site.

- Provision 14 establishes horizontal buffer distances between material processing and storage to property lines (25 feet), residences (200 feet), potable water wells (200 feet), and surface and state regulated wetlands (200 feet).

2.4 REGIONAL AND LOCAL HYDROGEOLOGY AND GEOCHEMISTRY

Regional Hydrogeology and Geochemistry

Because groundwater is the exclusive source of drinking water to Long Island's nearly three million residents, the hydrogeology (Smolensky et al., 1989; Jensen and Soren, 1974) and threats to Long Island's groundwater are of vital importance to the area. Groundwater on the island is recharged by approximately 44 inches of annual precipitation through highly porous soil that favors the vertical infiltration of precipitation. Long Island's topography includes hills in the northern and central portions of the islands, plains slopping south from the hills to barrier beaches along the southern shore, and deeply eroded headlands along the northern shore.

The geological units of the island dip to the south and include, with increasing depth, the Upper Glacial Aquifer, Magothy Aquifer, and the Raritan Formation comprised of an upper clay confining unit and the lower Lloyd sand and gravel aquifer above consolidated metamorphic rock. Other geological units are present at the north and south shores. Groundwater flow is predominantly north or south of a ground water divide along the center of the island.

The Upper Glacial Aquifer is unconfined and comprised of either sand, gravel, and rock glacial till along two moraines running east to west along the island, or sorted sand and gravel between the moraines and to the south. The Magothy aquifer, comprised of sand and alternating clay sequences, is the largest (thickest) aquifer and is the primary source of potable water on the island. The young age of groundwater within the Magothy reflects the high degree of recharge through the Upper Glacial Aquifer to the Magothy and rapid groundwater flow velocities. Aquifer testing estimated the hydraulic conductivity of the Upper Glacial and Magothy aquifer system to be 50 feet per day (ft/d) (horizontal) and 0.5 ft/d (vertical) consistent with other estimates (P. Misut and R. Busciolano, 2009). Although a comprehensive evaluation of the redox and geochemical conditions of groundwater across Long Island has apparently not been conducted, aerobic conditions are typical in the Upper Glacial Aquifer and anoxic conditions develop along flow paths and with depth. Groundwater with elevated dissolved oxygen concentrations, nitrate, and low organic carbon concentrations was observed at public supply wells (total depth of 96 to 188 meters) and monitoring wells (total depth of 14 to 35 meters) screened in the Upper Glacial Aquifer in Northport north of the groundwater divide (Young, Kroeger, and Hanson; 2013). Limited denitrification was indicated. In another study, the redox sensitive geochemistry of the Magothy aquifer in Suffolk county was evaluated by sampling wells along a flow path extending south of the groundwater divide (Brown et. al, 2000). Aerobic conditions and low dissolved iron concentrations (< 0.005 millimoles [mM]; 0.28 milligrams per liter [mg/L]) were observed within the first eight kilometers of the flow path. Iron concentrations increased (0.005-0.02 mM; 0.28-1.11 mg/L) further downgradient. Localized zones of microbial iron and sulfate reduction were identified within the downgradient anoxic portion of the flow path. Sulfate reduction and iron sulfide precipitation appeared to help maintain lower concentrations of iron in groundwater. Sulfate migration from interbedded clay units is believed to be a source of sulfate and the increasing sulfate concentrations along the flow path (Brown and Schoonen, 2004).

Pilot Study Area Hydrogeology

The pilot study area is located within a topographically low area (**Figure 2-1**) in a grassy field behind the Ridge NYSDEC Area office. Sand and gravel were identified for the 100-foot borehole at U.S. Geological Survey (USGS) observation well S-65855 located west of the pilot area. The depth to water at this well since 1972 has fluctuated by approximately 10 feet, averaging approximately 28 feet below land surface. The pilot area is near the groundwater divide, with groundwater flow indicated to the southeast based on potentiometric surface maps for Long Island and the Brookhaven National Laboratory located southeast of the pilot area (BLM, 2015).

Prior to bringing mulch to the site, four monitoring wells (P-1 through P-4) were drilled approximately 5 feet southeast of the southeastern edge of four mulch pads. The distance from the pads was originally 10 feet; however, that did not account for the additional 5 feet between the edge of the pad and the 5 feet to where the mulch pile edge begins. Soil encountered during drilling the four pilot monitoring wells was comprised of fine sand with minor round gravel with wet conditions observed at approximately 22 feet (boring logs are provided in **Appendix C**). Fine-grained material (silt or clay) that could impede or alter the vertical migration of mulch percolate to groundwater was not observed within these borings.

2.5 LITERATURE REVIEW

Literature on prior leachate studies focusing on mulch and/or metals contamination was also reviewed to assist in developing the CSM and identify any successful management or mitigation techniques and practices. This review was focused on gathering the following information:

- VOW mulch percolate composition and influencing factors
- The biogeochemical mechanism(s) by which VOWM facilities impact groundwater
- How environmental conditions may affect such mechanisms
- Field methods to quantify mulch pile impacts to groundwater

2.5.1 Non Peer-reviewed Literature

State and County Reports

Compost Leachate Research (Kennedy/Jenks Consultants, 2007)

Following a review of the literature, the authors concluded that there was limited information on the groundwater quality beneath composting facilities, though there are numerous studies describing constituent levels many-fold above background (though values were highly variable, as a function of organic matter type and age). The authors noted that nine out of 13 states required impervious layers under the active composting process and that this approach may be most prudent in humid climates.

The Compost White Paper (Gaskin, 2003)

A key finding of this paper was that, "composting high nutrient feedstocks on coarse-textured soils, *e.g*. sands, loamy sands, sandy loams, where there are no barriers to soil water movement can create elevated nitrates in shallow groundwater."

Chemical and Physical Characteristics of Compost Leachates. A Review (Chatterjee, 2013)

Organic colloids can help to mobilize metals from compost and lysimeter studies have shown groundwater exceedances of cadmium, nickel, cobalt, zinc, copper, lead, and chromium during the first flush following simulated precipitation.

Horseblock Road Investigation Yaphank, NY (New York State Department of Environmental Conservation, 2013)

The Great Gardens facility is 62 acres in size and has been operated since 1999. The site collates yard and food waste and animal manure, then ships them offsite for composting. The finished compost is then returned to the site for screening and bagging. Beginning in 2011, such waste materials began being incorporated into mulch products at the facility. The site takes 85,500 tons of yard and food waste annually with an additional amount of land clearing debris. From 2009 to 2010, seven vertical profile wells were installed downgradient of Great Gardens. These wells and the potable well at the Great Gardens facility were sampled.

Summary findings of this report include:

- The most significant (i.e., greatest magnitude of exceedance) and most frequent constituents exceeding groundwater standards were manganese, iron, thallium, gross beta and alpha, and radium decay compounds.
- Offsite, downgradient wells had significantly higher (one to two orders of magnitude) concentrations of manganese and iron than upgradient wells.
- Surface water had concentrations of aluminum, arsenic and lead that were above standards as well as elevated levels of manganese, ammonia, gross alpha and beta, and detergents.
- Soil samples from below a compost pile and solid samples from a compost pile met NYSDEC Soil Cleanup Objectives for Unrestricted Uses.
- Manganese impacts to groundwater have also been documented at the East Moriches and the Town of Brookhaven facilities, though the former is confounded by previous manganese pollution. New wells along Main Street in Yaphank also showed excessive manganese levels downgradient of VOWM facilities.
- The 27-acre parcel east of Great Gardens evaluated by others also exhibited the previously described patterns of groundwater impacts

Investigation of the Impacts to Groundwater Quality from Compost/Vegetative Organic Waste Management Facilities in Suffolk County (Suffolk County Department of Health Services, 2016)

Groundwater samples were collected from borings located downgradient of 11 VOWM facilities of varying size receiving a variety of VOW for mulching and composting operations. All 11 sites had intermediate to significant groundwater impacts associated with VOWM facilities. Impacts included metals, though many other types of impacts (e.g., radiological) were noted. Patterns in the timing and location of impacted groundwater were consistent with impacts originating from the VOW facilities. Manganese exceedances of drinking water standards were still observed despite the relatively small size of the facility.

2.5.2 Peer-Reviewed Literature

The following search terms were used in Google Scholar to identify the following references:

- Compost leachate windrow pile groundwater (1st 10 pages of results)
- Mulch leachate windrow pile groundwater (1st five pages of results)
- Vegetative organic waste windrow pile groundwater (1st five pages of results)
- Organic carbon leachate groundwater (1st three pages of results)

Within the identified references (or others not included herein), citing papers were also evaluated to locate relevant information.

New York and New Jersey Case Studies

Environmental Impact of Yard Waste Composting (Richard & Chadsey, 1990)

During October to December 1988, 500 tons of leaves (4,800 CY) were windrowed (six feet tall, 12 feet wide) at a site in Croton, New York. An 18- to 24-inch-thick layer of sandy soil was placed beneath the windrows, and porous cup lysimeters were installed in that layer to a depth of 12 to 18 inches. Samples were collected on October 18, 1988 (background, prior to windrow placement) and on May 3, 1989. Windrows were turned on a bi-weekly basis and combined as necessary to maintain six feet of height and 12 feet of width. By mid-June 1989, the original 4,800 CY had reduced to 1,400 CY and was considered ready for market.

Most constituents were within background levels, except:

- Iron, which was near the groundwater standard (0.57 parts per million [ppm] versus 0.6 ppm, respectively)
- Biological oxygen demand (BOD) levels, which were 5x the surface water discharge standard of 30 ppm
- Concentrations of ammonia and nitrate, which suggested that the vadose zone was anaerobic (i.e., nitrate concentrations were lower than background while ammonia concentrations were higher)

*Characterization of wood mulch and leachate/runoff from three wood recycling facilities (*Kannapalli et. al., 2016*)*

Twenty-six leachate runoff samples were collected from three mulching facilities in New Jersey over 1.5 years. Median BOD (107 mg/L), chemical oxygen demand (COD) (566.5 mg/L), and suspended solids (145 mg/L) were comparable to untreated domestic wastewater. The median total Kjeldahl nitrogen concentration was 6.3 mg/L. The pH of the samples ranged between 4.8 to 7.6, with a median pH of 6.7.

Seminal papers, focus on cool/humid environments

Ground-Water Pollution by Wood Waste Disposal (Sweet & Fetrow, 1975)

During 1972, a two- to three-acre gravel pit (10 to 12 feet deep) in Oregon was filled with 3,000 tons of hemlock bark. The pit had groundwater levels ranging from zero to 10 feet below ground surface (bgs) and a conductive gravelly loam soil (up to three feet per day of lateral flow). Within one year, the site created a 15-acre plume, 1,500 feet downgradient. Iron and manganese concentrations ranged up to 13,000 and 106,000 parts per billion (ppb), respectively; upgradient levels were below detection.

Stormwater run-off and pollutant transport related to the activities carried out in a modern waste management park (Marques & Hogland, 2001)

The authors noted that runoff from compost piles had higher concentrations of metals (zinc, nickel, cobalt, iron, and cadmium) compared to a variety of construction, metal scrap and varied refuse (e.g., slag, car parts and machinery). Surface water iron concentrations reported in SCDHS (2016) exceeded those noted in this paper, while manganese runoff concentrations at the Exit 69 LIE Ramp were greater than the variety of commercial/industrial uses reported in this paper (**Table 2-2**).

Table 2-2. Comparison of Surface Water Concentrations Reported in Marques & Hogland (2001) and SCDHS (2016).

		Median runoff values reported in Marques and Hogland (2001)						SCDHS (2016)	
Parameter	Unit	Sorting & storage of slag	Car park for cars & machinery	Recovery yard & storage of soil	Wood chipping & wood storage	Composting center & storage	Ind. & demolition waste storage	Papermill Road Site Pond	Exit 69 LIE Ramp Site Pond
Iron	(mg/L)	0.18	0.24	0.11	0.11	0.9	0.29	***1.27***	***1.29***
Manganese	(mg/L)	0.08	0.03	0.04	0.07	***0.16***	***0.16***	0.01	0.07

Potential pollutants from farm, food and yard waste composts at differing ages: Leaching potential of nutrients under column experiments. Part II. (Confesor Jr, 2009)

The authors evaluated three different compost mixes (farm waste, food waste and yard waste) from fresh to mature ages with regard to leachability in laboratory columns. Across all types, nitrate leaching increased with material age, with farm waste having the greatest proportion of nitrate nitrogen and yard waste the least (with a similar pattern observed for phosphate).

Leachate migration from spent mushroom substrate through intact and repacked subsurface soil columns (Guo, 2006)

Biodegradation of leachate DOC (approximately 2500 ppm) caused reduction and dissolution of manganese and iron in soil columns.

2.5.3 Literature Review Summary

Key findings:

- Numerous evaluations in New York and other cool/humid climates find that surface water and groundwater associated with VOWM facilities are consistently impacted by elevated dissolved organic carbon (DOC) (or BOD), reduced dissolved oxygen (DO), and elevated metals, particularly iron and manganese. This syndrome of impacts on groundwater can extent over 1000 feet from VOWM facilities.
- Oftentimes, metal concentrations in soil and mulch samples are at background levels and/or meet unrestricted use standards, suggesting that critical subsurface internal loading and/or transformation processes are occurring.
- However, concentrations of metals and other contaminants have also been shown to be consistently elevated in surface water associated with VOW piles.

2.6 DATA REVIEW

Groundwater analytical data provided in the 2013 NYSDEC and 2016 SCDHS reports (**Appendix A**) were evaluated for overarching trends and any potential mechanisms underlying the apparent linkage between VOWM piles and groundwater impacts. Prior to analysis, the data were edited as follows:

- The data set was paired to the following key site and response variables:
    - Site: VOWM facility, sample date, sample location, screen interval, depth to water, water temperature
    - Response: DO, pH, electrical conductivity, aluminum, barium, calcium, cobalt, copper, chromium, iron, potassium, manganese, sodium, chloride, ammonia, and nitrate
- Only samples with complete data sets were included in the analysis (i.e., rows with not applicable (NA) for any of the above site or response variables were excluded)
- Non-detect and right-censored data values were used as presented in the 2013 and 2016 NYSDEC and SCDHS reports, respectively. Right-censored values are those whose true value may have exceeded the measurement limits of the analytical technique.

- Relative depth to water was calculated for each sample as the difference between the depth to water table value at a well and the screen start value (i.e., relative depth to water is the depth of the sample below the water table)
- Proximity of samples to VOW piles was scaled from figures provided in the 2013 NYSDEC and 2016 SCDHS reports.

Cluster analysis was performed to objectively classify samples as "impacted" or "unimpacted" by VOW. Prior to cluster analysis, the raw response variable data for each sample were simplified and scaled using nonmetric multidimensional scaling (NMDS). The NMDS sample scores were used in the cluster analysis in lieu of the raw data because these scores capture the key patterns of variation in the raw data while simplifying the data set (both of which help to provide a more reliable categorization of samples). The cluster analysis objectively created two relatively homogenous groups of samples, and the group with high iron, manganese and chloride was assigned as "impacted." If a sample location had any sample (at a given depth or date) that fell into the "impacted" group, then the overall sample location was categorized as impacted.

This analysis correctly identified upgradient sample locations as unimpacted. These six locations include: HB-12 and -14 at Great Gardens; PA-6 at the Peconic Ave Site; and CF-1, -2, and -3 at the Fifth Avenue Site. All but three downgradient sample locations were categorized as impacted. The three downgradient sample locations classified as unimpacted were:

- MS-1 at East Main Street, which was 1800 feet away from the nearest VOW pile
- HB-6 (deep) at Great Gardens, which was only screened at 75 to 85 feet and likely below the plume of impact
- PA-1 at Peconic Avenue, where the iron and manganese signal in the data were likely not high enough to be statistically grouped with other impacted locations

In order to visualize spatial patterns of VOW impacts (i.e., impacted vs. unimpacted sample locations), response variables were averaged by proximity to VOW piles and relative depth to water and plotted according to classification. These averages are presented in **Figures 2-2** through **2-6**.

Key findings of the data analysis include:

- While sample locations categorized as impacted often showed elevated levels of groundwater manganese concentrations (which could be related to DOC leaching from VOW piles and the resulting enhancement of microbial activity), other parameters relatively unrelated to microbial activity (such as potassium, magnesium, sodium and chloride) were also elevated in concentration. These results suggest that, while enhanced microbial transformation of manganese may be associated with elevated concentrations in groundwater, other mechanisms (e.g., direct leaching from VOW piles) may also be responsible for elevated metal concentrations. **Table 2-3** provides a description of sample locations categorized as impacted and unimpacted.
- Impacted locations are characterized by depressed DO that extends over 1,000 feet from VOW piles (**Figure 2-2**). Depressed DO could be related to enhanced microbial

activity resulting from relatively high levels of DOC known to be present in VOW mulch percolate. While depressed, DO is acute near the water table at locations near VOW piles. At distances greater than 1,000 feet, DO reductions spread vertically across the groundwater profile (**Figure 2-2**). This spatial pattern supports the notion that water recharging from VOW piles or nearby surface water features is causing localized reductions in DO, which is then spread across the groundwater profile as impacted water is conveyed downgradient.

- Patterns of elevated iron and manganese concentrations closely follow that of DO which may suggest that microbially-mediated transformation of these metals is occurring in the subsoil. However, magnesium, potassium, sodium and chloride, which are not similarly solubilized by microbial processes as iron and manganese, also follow the DO pattern (**Figures 2-3** through **2-5**). Hence it not clear whether elevated iron and manganese concentrations are attributable to microbially-mediated transformations of iron and manganese in the subsurface or if iron and manganese are being directly conveyed to the subsurface from VOW piles. Because magnesium, potassium, sodium and chloride also follow the DO pattern, it appears as though loading of other constituents, in addition to DOC, from VOW piles is an important process.
- Overall, patterns of average ammonia and nitrate concentrations reflect patterns in iron and manganese (**Figure 2-6)**; however, substantial site-to-site variability exists. In reviewing patterns site by site, the vertical distribution of nitrate and ammonia relative to iron, manganese, and DO for several sites indicates ammonia oxidation to nitrate where DO concentrations are elevated. For example, at Site 7 (East Main Street, sample location M3) groundwater from 20-65 feet contains high manganese, higher ammonia, low or no detectable nitrate, and low dissolved oxygen. Groundwater from 70-95 contains high nitrate, high dissolved oxygen, and low manganese. This pattern indicates ammonia oxidation to nitrate in the deeper portion of the plume. A similar pattern was observed at Site 3 (Papermill Road Facility), but flipped vertically with the high nitrate geochemistry pattern observed in the shallowest sampled interval.
- **Table 2-4** compares the average sample depth and average concentration of several metals and anions between impacted and non-impacted samples. Impacted groundwater is enriched with manganese on a percentage basis relative to non-impacted groundwater to the greatest extent (23X). On average, DO concentrations in impacted samples are half that observed in unimpacted samples.
- While elevated iron and chloride concentrations are both associated with VOW piles, iron attenuates with distance from VOW piles at a greater rate than chloride. That is, the ratio of iron to chloride is significantly lower in samples collected 1,000 feet or greater from VOW piles than samples collected nearby piles (**Figure 2-7**). On the other hand, the chloride to manganese ratio is consistent in samples collected near VOW piles and in those collected approximately 1000 feet away. This pattern supports the notion that iron is attenuating preferentially to manganese along the flow path. Possible explanations include the potential resistance of manganese to oxidize and/or precipitate relative to iron, or the preferential microbial

transformation (reductive dissolution) of manganese oxides relative to iron oxides. A good site-specific example includes Site #4 of SCDHS 2016 (Exit 69 LIE Ramp), where elevated iron was observed only from 10-15 feet, corresponding with the highest manganese concentration, highest conductivity, potassium, sodium, and other constituents. Elevated manganese was more broadly distributed.

Table 2-3. Cluster analysis summary - 2013 NYSDEC and 2016 SCDHS groundwater data.

Site	Uses	Impacted / Down-gradient	Sample locations	Sample size	Depth to water	Relative depth to water	DO	pH	EC	Al	Ba	Ca	Co	Cr	Cu	Fe	K	Mg	Mn	Na	Ni	NH3	Cl	NO3
Exit 69 LIE Ramp	Yard waste, food waste, composting	Yes/Yes	1	9	10±0	-40±9.3	4.8±0.4	7.4 ±0.3	195.5±104.4	21.6 ±6.3	61.6 ±24.5	7255.6±2216.9	8.7±5.6	2.2±0.5	1.7±0.3	1722.2±1622.2	3844.4±1731.8	2966.7±1183	2423.9±1990.9	17066.7±11629.4	5.1±1	0.1±0.1	41.3±29.1	1.6±0.4
Great Gardens	Yard waste, wood waste, manure, food waste, composting	No/No	2	8	12.4±0.2	-17.6±5.3	3.7±0.4	6.2±0.1	65.5±4.6	125±55.1	11.6±0.9	2487.5±445.4	4.8±0.5	2.6±0.9	2.6±0.5	1886.3±311.6	1250±277.7	1325±146.1	830.8±139.9	4062.5±146.3	13.7±2.7	0±0	18.5±5.5	3±0.9
		No/Yes	1	2	11.7±1.1	-63.3±0	7.6±0.8	7±0.2	74±19	11±6	10.5±5.5	2450±750	1±0	1±0	3±2	100±0	6450±6050	1200±700	58.5±56.5	5150±1450	0.6±0.1	0.3±0.2	6.5±1.5	0.5±0
		Yes/Yes	18	118	12.1±0.2	-36.6±2.8	3.3±0.3	6.4±0.1	388.2±36.4	56.4±13.5	100.6 ± 14.4	18855.1±1711.4	4.8±1.1	1.9±0.2	4.7±0.9	1507.1±457.4	23594.1±3659.1	6363.6±666.8	3979.2±653.5	27533.9±4124.3	3.7±0.5	1.2±0.2	63.2±7.2	2.7±0.5
East Main Street	Yard waste, wood waste, processing	No/Yes	1	9	15.9±0	-35.2±9.3	8.5±0.5	5.8±0.1	80.4±10.1	38.6±7	13.8±2.8	5866.7±835	1±0	1.1±0.1	1.4±0.4	108.9±7.7	666.7±57.7	2466.7±416	10.4±2	4155.6±474.1	0.7±0.1	0.2±0	5.8±0.6	1.3±0.4
		Yes/Yes	4	26	19.6±0.1	-30.8±5.1	5±0.7	6.8±0.1	319.8±46.5	33.2±6.5	102.2 ± 31.7	22907.7±3580.8	9.3±3.3	1.6±0.2	2±0.3	2795.8±1410.4	7457.7±2460.4	6280.8±721.1	7631.2±2416.9	18038.5±3447.5	5.9±1.3	0.9±0.4	29.7±5.7	5.2±1
Papermill Rd Facility	Yard waste, composting	Yes/Yes	3	19	43.5±0.8	-37.5±5.1	1±0.3	6.6±0	373.4±41.5	51.9±25.2	220.6 ± 25.5	16110.5±2889.1	8±1.2	3.9±0.5	1.8±0.3	10183.7±2104	13736.8±2556.8	6068.4±1320.5	2125±329.2	10789.5±1389.1	2.6 ±0.2	7.3±1.3	103.5±24.9	16.2±4.3
Peconic Ave	Yard waste, wood waste, processing	No/No	1	3	41.3±0.2	4.9±0	8±0.3	6.8±0.3	356.7±124.4	111±32.5	30.3±11.9	32333.3±3527.7	1±0	2.1±1	3.7±1.3	350±230.1	1433.3±88.2	3066.7±88.2	13.7±7.3	37166.7±26530.4	1±0.3	0.5±0	58.4±42.5	1.2±0.4
		No/Yes	1	1	42.7±NA	2.7±NA	3.8±NA	6.3±NA	308±NA	9±NA	33±NA	31000±NA	1±NA	1±NA	1.3±NA	100±NA	4900±NA	3400±NA	1.4±NA	19000±NA	0.5±NA	0.5±NA	31±NA	1.5±NA
		Yes/Yes	3	10	43.8±0.4	2.8±0	2.7±0.2	6.7±0.1	764±41.9	3292.1±1643.9	138.9 ± 36.4	54200±6622.9	8±2.6	5.3±2.1	14.6±3.6	22466±7984.9	34800±5581.3	9220±1166.9	1053.9±439.8	53100±4118.9	6.5±1.7	0.5±0	87.4±3.9	6.4±0.9
Fifth Ave.	Yard waste, wood waste, processing	No/No	3	17	41.4±0.1	-32.1±4.6	7.3±0.3	6.8±0.3	68.1±7.1	12.1±2.2	10.4±1	1829.4±142.1	1.1±0.1	1±0	1±0	100±0	788.2±203.8	1800±110.5	9.7±5.5	4864.7±172.6	0.5±0	0.5±0	7.6±0.4	0.5±0

* Values are means ± standard error of sample locations categorized as impacted or unimpacted. Sample locations categorized “Impacted” by VOW are shown as “Yes” in the table. Samples locations described as “Downgradient” in the 2013 and 2016 reports are noted as such as well. Instances where a downgradient sample location is not categorized as impacted (i.e., “No/Yes”) are discussed in Section 2.5. Standard error values of NA are due to instances of one set of data values per group.

* Units are as follows: Dissolved oxygen, ammonia, nitrate and chloride are in ppm. Depth to water and relative depth to water are in ft. Electrical conductivity is in µS. All other variables are in ppb.

Table 2-4. Mean ± SE parameters of water samples classified as "impacted" and "unimpacted" by the cluster analysis of 2013 NYSDEC and 2016 SCDHS groundwater data.

Variable	Unit	Impacted	Unimpacted	Enrichment factor
Depth to water	ft	18.1±0.9	28.4±2.2	--
Relative depth to water	ft	-33.9±2.1	-27.8±3.5	--
Dissolved oxygen	mg/l	3.4±0.2	6.9±0.3	0.5
Temperature	Celsius	14±0.1	12.6±0.2	1.1
pH	SU	6.5±0.1	6.4±0.1	1.0
Electrical conductivity	µS	388±26.5	98.3±15.8	3.9
Aluminum	µg/l	228.7±102.4	47.9±13.1	4.8
Barium	µg/l	113.5±11.2	13.5±1.4	8.4
Calcium	µg/l	20515.9±1454.6	5917.5±1447.2	3.5
Cobalt	µg/l	6.1±0.9	1.8±0.3	3.4
Chromium	µg/l	2.3±0.2	1.4±0.2	1.6
Copper	µg/l	4.4±0.6	1.7±0.2	2.6
Iron	µg/l	3759.2±709.2	478±128.5	7.9
Potassium	µg/l	19898.9±2494.2	1287.5±323.5	15.5
Magnesium	µg/l	6309.9±476.6	1960±140.7	3.2
Manganese	µg/l	4069.7±566	176.6±58.8	23.0
Sodium	µg/l	25316.5±2856.5	7335±2170.4	3.5
Nickel	µg/l	4.1±0.4	3.2±1	1.3
Chloride	mg/l	62.9±5.7	13.7±3.6	4.6
Ammonia	mg/l	1.7±0.3	0.3±0	5.7
Nitrate	mg/l	4.6±0.6	1.3±0.2	3.5

2.7 FACILITY VISITS

Several VOWM and mulch facility site visits were performed by NYSDEC, Parsons and OBG on August 3, 2016, to develop an understanding of facility operations and to screen sites for potential field study locations. The below list of facilities was developed based on consideration of documented groundwater depths and impacts, accessibility, size, and presence of surface water features. Facilities visited included:

- Great Gardens, Yaphank
- South Street Farm, Manorville
- Exit 69 LIE Facility, Manorville
- Islip Town Compost Facility, Ronkonkoma
- NYSDEC Site, Ridge

Site visits were geared toward potential candidates for implementation of each of the field efforts. Site visits included photographic documentation, hand sketches of facilities, and general site conditions. Discussions regarding general operation activities and challenges were also conducted with the Director of Operations for Great Gardens, South Street Farm, and the Exit 69 Facility. Valuable water management insights from the facility visits include:

- No facilities had stormwater permits or requirements to monitor constituents in surface water
- None of the Long Island Compost supporting farms had apparent stormwater controls

Great Gardens had long stormwater ditches, and Town of Islip had swales draining to ponds. The extent to which these features act as hotspots for recharge of impacted water is unknown.

SECTION 3 – MULCH PILE STUDY

3.1 SITE LOCATIONS

Following the facility visits, the Edgewood and Recycled Earth Products locations were determined to be ideal for performing the mulch percolate study because each facility uses a different mulching method that could influence mulch percolate characteristics. The Edgewood facility uses a mulching method typical to most Long Island facilities. A coarser first grind is generated and temporarily stockpiled for one to two months, followed by a second finer grind. The finer grind materials are stockpiled over winter for purchase in spring. Recycled Earth Products' current mulching approach is comprised of a coarser first grind that is placed in windrows throughout winter, with little to no turning. In spring, it is ground again prior to selling. This revised approach by Recycled Earth was implemented as a method to reduce odors. Photographs documenting the mulch percolate study can be referenced in **Appendix B**.

3.2 SAMPLE COLLECTION

Mulch percolate, mulch, and mulch gas samples were to be collected at both facilities to obtain samples representative of the different mulching practices. Samples for mulch percolate, mulch, and mulch gas from Recycled Earth were collected in December 2016 and September 2017. Samples from Edgewood were scheduled to be collected in December 2016, January 2017, and September 2017. Since no water was encountered in the Edgewood lysimeter during the first event, a mulch percolate sample could not be collected; however, mulch and mulch gas samples were collected. The Edgewood lysimeter remained dry during the second event, and the pile was excavated to assess its functionality. The lysimeter was deemed in good condition, the pile wet within the top foot, and the interior of the pile completely dry. No additional samples were collected from the Edgewood mulching operations beyond the first event because the mulch percolate study pile was destroyed during the functionality assessment.

The moisture of the mulch piles were taken at each sample event using a moisture probe and horizontally inserting the probe into the center of each side of the pile. Moisture readings were recorded at depths of one, two, three, four, and five feet at each location. The temperatures of the mulch piles were taken when possible during sample events using a temperature probe and horizontally inserting the probe into the center of each side of the pile. Temperature readings were recorded at a depth of 5 feet. A sample summary table can be referenced as **Table 3-1**.

3.2.1 Mulch Percolate Samples

Mulch percolate samples were collected from mulch piles placed by facility operators over a lysimeter. The lysimeter was constructed from a 5-gallon bucket, ¼-inch polyethylene tubing, and 6 mil plastic sheeting. Prior to placing the mulch, the ground surface was graded by facility operators to create a 10-foot by 10-foot shallow/concave area to convey mulch percolate to a central collection point. Using a shovel, a small area was excavated at the center of the collection point to accommodate the 5-gallon bucket. A 10-foot by 30-foot section of sheeting was then affixed to the bucket lid by pulling the sheeting through a 2-inch hole in the lid and gluing it to the edge/ring of the lid. After the sheeting was secured to the lid, it was fastened to the bucket and sealed with silicone caulk. Once the glue and sealant dried, the lysimeter was placed in the hole at the center of the pad and the sheeting was unfolded to its full extent and staked into the soil. A conduit was constructed from 1-inch schedule 40 polyvinyl chloride (PVC) piping to facilitate sample collection from the bucket. The piping was keyed into the bucket at the center of the mulch pile, run to the western edge of the sheeting, and fitted with an end cap to provide wintertime insulation. Polyethylene tubing was run through the piping to the bucket to collect the samples. The length of tubing was approximately four feet longer than the piping to allow for sample collection. The mulch was then piled to approximately 25 feet wide by 40 feet long pile with a maximum height of 15 feet. Mulch percolate was collected by locating and removing the PVC end cap, unfolding the extra sample tubing, and assembling a peristaltic pump with a water quality meter flow-through cell. The lysimeter bucket was completely purged and fresh mulch percolate infiltrating into the bucket was sampled. Residual mulch percolate was left in the lysimeter after sampling.

At the Edgewood facility, the lysimeter was installed on top of a 2-foot layer of mulch, with the bucket set into the layer of mulch. This was done to accommodate the Edgewood facility's asphalt-like ground surface and operators preferring not to disturb it.

Field parameters for mulch percolate were monitored for pH, specific conductance, turbidity, oxidation reduction potential (ORP), and DO before samples were collected. Mulch percolate samples were collected for laboratory analysis of total organic carbon (TOC), DOC, BOD, Target Analyte List (TAL) metals, nitrate, nitrite, ammonia, sulfide, dissolved methane, pesticides, herbicides, chloride, sulfate, alkalinity, magnesium, sodium, potassium, and calcium. One mulch percolate sample was analyzed for alachlor, atrazine, metolachlor, and dichlorvos following the first grind.

3.2.2 Mulch Samples

Following each mulch percolate sample collection event, a composite mulch sample was collected from each facility. Mulch was homogenized from depths of one to four feet on the sides of the piles; the sample area was kept small to reduce potential influence on the pile conditions. The section of pile from which the homogenized sample was collected was recorded. Once the mulch was homogenized, a composite mulch sample was acquired by compositing five grab samples into a clean 5-gallon bucket followed by thorough mixing. The homogenized mulch was placed into laboratory-provided sample containers and analyzed for moisture content, total TAL metals, and directly leachable components via toxicity characteristic leachate procedure (TCLP).

3.2.3 Mulch Gas Samples

Mulch-gas samples were also collected during each mulch percolate sample event. Temporary sample points were constructed by hammering a 2-inch Schedule 40 PVC pipe horizontally, approximately 10 feet into the pile. A sample port and valve were installed on the end of the PVC pipe for sample collection. Gas samples were collected using evacuated Summa® canisters. Prior to collection, the volume of air in the PVC pipe was calculated, and three volumes were purged using a vacuum pump or gas-tight syringe. Once purged, the canister was connected to the sample port via silicon tubing for sample collection. The collection sample point was changed to an AMS soil gas probe kit for the third and last events in an attempt to secure a tighter seal during collection.

3.3 ANALYTICAL RESULTS

3.3.1 Mulch Percolate Results

Mulch percolate samples collected from the Recycled Earth pile in December 2016 were non-detect for nitrate, nitrite, herbicides, and pesticides. The following analyte concentrations were detected: methane (388 micrograms per liter [µg/L]), propane (0.47 J[1] µg/L), BOD (79 mg/L), alkalinity (295 mg/L), chloride (79.5 mg/L), DOC (108 mg/L), ammonia (0.118 mg/L), sulfate (51.4 mg/L), sulfide (4.6 mg/L), and TOC (170 mg/L). TAL metals detected during the sample event were titanium (63 µg/L), aluminum (510 µg/L), arsenic (15 µg/L), barium (51 µg/L), calcium (92,500 µg/L), chromium (1.8J µg/L), iron (1,500 µg/L), magnesium (15,400 µg/L), manganese (570 µg/L), potassium (50,200 µg/L), selenium (17 J µg/L), sodium (75,200 µg/L, 7.3 J µg/L), and vanadium (6.8 µg/L).

Mulch percolate samples collected from the Recycled Earth pile in September 2017 were non-detect for nitrate, nitrite, herbicides, and pesticides. Concentrations of methane (4540 µg/L), propane (0.78 J µg/L), BOD (26 mg/L), alkalinity (485 mg/L), chloride (129 mg/L), DOC (203 mg/L), ammonia (18 mg/L), sulfate (0.88J mg/L), sulfide (1.3 mg/L), and TOC (279 mg/L) were detected. TAL metals detected during the sample event were barium (100 µg/L), calcium (101,000 µg/L), iron (3,900 µg/L), magnesium (15,900 µg/L), manganese (380 µg/L), potassium (185,500 µg/L), and sodium (41,100 µg/L), 7.3J µg/L).

As discussed above, after several unsuccessful attempts to purge water from the Edgewood lysimeter, no mulch percolate samples were collected from that facility.

Table 3-2 summarizes the mulch percolate analytical results. Analytical data packages can be referenced in **Appendix C**.

3.3.2 Mulch Gas Results

Mulch gas samples were collected from the Recycled Earth pile in December 2016 and September 2017 and analyzed for carbon dioxide, methane, and oxygen. Carbon dioxide was non-detect in the December event and detected at 3.36 volume/volume percent (%v/v) in September. Mulch gas samples analyzed for methane were non-detect during each event. Oxygen was detected at 22.2 %v/v in December and 18.7 %v/v in September.

Mulch gas samples were collected from the Edgewood pile September 2017 and analyzed carbon dioxide, methane, and oxygen. Carbon dioxide and methane were non-detect, and oxygen was detected at 22.4 %v/v. **Table 3-3** summarizes mulch gas analytical results. Analytical data packages can be referenced in **Appendix C**.

3.3.3 Mulch Results

Mulch samples were collected from Recycled Earth in December 2016. The following analyte concentrations were detected: aluminum (140 milligrams per kilogram [mg/kg]), barium

[1] J is a laboratory qualifier indicating an estimated concentration.

(4.2 mg/kg), calcium (765 mg/kg), iron (174 mg/kg), magnesium (144 mg/kg), manganese (10.9 mg/kg), potassium (10.9 mg/kg), and zinc (9.1 mg/kg). Concentrations of the following analytes were detected in mulch samples collected from Recycled Earth in September 2017: aluminum (1780 mg/kg), antimony (2.6J mg/kg), arsenic (4.4 mg/kg), barium (29.6 mg/kg), calcium (8590 mg/kg), chromium (4.7 mg/kg), cobalt (0.83J mg/kg), iron (2,470 mg/kg), lead (15.4 mg/kg), magnesium (1210 mg/kg), manganese (87 mg/kg), nickel (2.5J mg/kg), potassium (1,300 mg/kg), selenium (7.5J mg/kg), sodium (76.6J mg/kg), vanadium (5.7 mg/kg), and zinc (34.1 mg/kg).

Concentrations of the following analytes were detected in mulch samples collected from Edgewood in December 2016: aluminum (225 mg/kg), barium (6.2 mg/kg), calcium (2,550 mg/kg), chromium (1.5J mg/kg), copper (3.9J mg/kg), iron (522 mg/kg), lead (2.7J mg/kg), magnesium (232 mg/kg), manganese (17 mg/kg), mercury (0.087J mg/kg), potassium (141mg/kg), vanadium (1.2J mg/kg), and zinc (10.1 mg/kg).

TCLP result for volatiles, semi-volatiles, metals, herbicides, and pesticides were below their respective TCLP screening values.

Table 3-4 summaries the mulch analytical results. Analytical data packages can be referenced in **Appendix C**.

SECTION 4 – SURFACE WATER STUDY

4.1 SAMPLE COLLECTION

The surface water study was conducted to evaluate potential mulch percolate run-off from mulch piles to nearby surface water features or depressions with aggregate precipitation (i.e., puddles). Surface water samples were taken from the pilot study location when no other options were available or permission to obtain such samples were not approved. Field measurements were collected using a water quality meter for conductivity, pH, DO, and ORP and analyzed for TOC, TAL metals, nitrate, nitrite, ammonia, BOD, DOC, sulfide, alkalinity, dissolved methane, pesticides, herbicides, chloride, sulfate (anions), magnesium, sodium, potassium, and calcium (cations). A sample summary table can be referenced as **Table 3-1**.

4.2 SAMPLE RESULTS

The following analyte concentrations were detected in the surface water sample collected from the P-4 trench: alpha- benzenehexachloride (BHC) (0.015J μg/L), methane (14.2 μg/L), alkalinity (148 mg/L), ammonia (0.630 mg/L), BOD (10.5 mg/L), chloride (197 mg/L), nitrate (0.060J mg/L), and TOC (101 mg/L). No other pesticides or wet chemistry concentrations were detected. TAL metals detected were aluminum (620 μg/L), arsenic (25 μg/L), barium (28 μg/L), cadmium (2J μg/L), calcium (3,1600 μg/L), chromium (7.1J μg/L), copper (11J μg/L), iron (860 μg/L), lead (5.3J μg/L), magnesium (14600 μg/L), manganese (220 μg/L), potassium (123,000 μg/L), sodium (76400 μg/L), and zinc (30J μg/L). No other TAL metals were detected in the sample. **Table 4-1** summarizes the surface water analytical results. Analytical data packages can be referenced in **Appendix C**.

SECTION 5 – VERTICAL GROUNDWATER STUDY

5.1 SITE LOCATION

Groundwater composition and redox conditions were evaluated at Edgewood via vertical groundwater profiling with temporary well points at two locations. One sample location was located upgradient of existing facility mulch piles to obtain a baseline groundwater sample of the area. The second sample location was selected based on groundwater analytical results from the mulch percolate study and elevated manganese in groundwater observed in 2013 at location CS-3. This location was downgradient of the mulch piles (Suffolk County Report, 2016). Photographs documenting the vertical groundwater study can be referenced in **Appendix B**.

5.2 TEMPORARY WELL POINT INSTALLATION

Prior to beginning subsurface intrusive work, the Parsons Field Team Leader and driller walked the area and identified any visible overhead obstructions or indications of marked subsurface utilities and used ground penetrating radar (GPR) to confirm each location. Each drilling location was also hand-augered to a minimum depth of 5 feet bgs as an additional safety check prior to drilling.

Following utility clearance activities, a Geoprobe® equipped with a push-ahead sampler (Geoprobe® Screen Point 22 (SP22) Groundwater Sampler) with a 2-foot screen operated by Parratt-Wolff Inc. was used to collect groundwater samples by advancing a 2.25-inch-diameter outer rod to the target sampling depth, inserting the SP22 screen with a 1.25-inch inner rod, and pulling back the outer rod to expose the screen. The upgradient temporary well point (TWP) location was advanced 10 feet below the water table, and two groundwater samples were collected, one from the top of the water table and one 10 feet below the water table . The downgradient TWP location was installed to approximately 66 feet bgs. Four groundwater samples were collected from this location. The first was collected with the top of the screen located 1 foot below the water table. The remaining four samples were collected at 10-foot intervals. Boring holes were abandoned by filling with soil cuttings and grouted with bentonite to ground surface. Soil boring logs can be referenced in **Appendix D.**

Temporary monitoring well location coordinates were obtained and recorded through the use of a hand held global positioning system (GPS) unit.

5.3 GROUNDWATER SAMPLE COLLECTION

Groundwater samples were collected via low flow sampling methodology following stabilization of field parameters (specific conductance, turbidity, pH, ORP, and DO) and analyzed for TOC, DOC, BOD, dissolved TAL metals, nitrate, nitrite, ammonia, sulfide, dissolved methane, chloride, sulfate, alkalinity, magnesium, sodium, potassium, and calcium. Purged groundwater was assumed to be not impacted and was discharged to the permeable ground surface. A sample summary table can be referenced as **Table 3-1**.

5.4 GROUNDWATER ANALYTICAL RESULTS

Groundwater samples were collected from the upgradient and downgradient TWPs at various depths. Concentrations of analytes were detected above the NYSDEC Ambient Groundwater Quality Standards (AGWQS) as follows:

- From the upgradient TWP at a depth of 36 feet bgs: manganese (600 µg/L), thallium (8.4J µg/L), and sulfide (0.54J µg/L).
- From the upgradient TWP at a depth of 46 feet bgs: manganese (590 µg/L), thallium (8.4J µg/L), and sulfide (1.2 µg/L).
- From the downgradient TWP at a depth of 36 feet bgs: thallium (9.9J µg/L).
- From the downgradient TWP at a depth of 46 feet bgs: chromium (71 µg/L), iron (14,100 µg/L), manganese (470 µg/L), thallium (6.8J µg/L), and sulfide (0.51J µg/L). Samples were also collected from this location for total metals. Concentrations for chromium (77 µg/L), iron (14,800 µg/L), and manganese (470 µg/L) were above the NYSDEC AGWQS.
- From the downgradient TWP at a depth of 56 feet bgs: iron (780 µg/L), manganese (310 µg/L), thallium (6.9J µg/L), and sulfide (0.51J µg/L).
- From the downgradient TWP at a depth of 66 feet bgs: iron (6,200 µg/L), manganese (1,900 µg/L), sodium (34,800 µg/L), thallium (8.1J µg/L), sulfate (266 µg/L), and sulfide (1.8 µg/L).

The vertical groundwater study analytical results are discussed in Section 7.0. A summary of groundwater analytical results can be referenced in **Table 5-1**. Analytical data packages can be referenced in **Appendix C**.

SECTION 6 – PILOT STUDY

6.1 SITE LOCATION

The pilot study was conducted at NYSDEC's Ridge facility beginning December 7, 2016, driven by the availability and delivery of approximately 1,000 CY of mulch. The pilot study evaluated mulch percolate mitigation measures at four side-by-side mulch piles, each with varying leachate mitigation approaches. In addition to the four mulch piles, the pilot test layout includes monitoring wells located approximately 10 feet downgradient of each pile. **Figure 6-1** provides a plan view of the pilot study layout. Mulch Pile #1 was constructed with twice-ground mulch ground to a consistency typical of Long Island's process (first grind through an 8- by 8-inch screen; second grind through a 2- by 2-inch screen). This pile served as a control. Mulch Pile #2 was constructed with mulch consisting of a single coarse grind (ground through an 8- by 8_inch screen) in an effort to reduce the mulch surface area in contact with precipitation. Mulch Piles #3 and #4 were constructed like Mulch Pile #1, except that Mulch Pile #3 was covered with a TopTex composting fleece. The pad for Mulch Pile #4 was lined with two overlapping layers of 6-mil polyethylene sheeting for mulch percolate collection.

Mulch Piles #1, #2, and #4 were turned once during the pilot study based on internal temperatures to mitigate the risk of fire. Photographs documenting the pilot study can be referenced in **Appendix B**.

6.2 MULCH PAD CONSTRUCTION

Pad construction for Mulch Piles #1 through #4 required the assistance of a NYSDEC operator removing vegetation and top soil within the root zone over a 45-foot by 30-foot area using a front-end loader to a create level working surface. To prevent run-off from cross contaminating piles, plastic landscape edging was installed in July 2017 along the outer sides of the constructed pads. Edging was only placed along sides that faced other pads. A 10-foot by 10-foot area in the center of each pad was graded such that it was shallow/concave to draw mulch percolate to a central location for sample collection. Excavated soil was temporarily stockpiled topographically and hydraulically downgradient of the mulch piles and will eventually be used to backfill the pad areas.

Consistent with the mulch percolate study design detailed in Section 1.2.1, a lysimeter was constructed under each pad prior to mulch placement using a 5-gallon bucket, ¼-inch polyethylene tubing, and 6-mil plastic sheeting. The mulch percolate collection lysimeter with liner and attached tubing was constructed below grade. The sample tubing extends to the western extent of the pad through a PVC access pipe fitted with a gas sampling point. A schematic of the mulch pile layout for Mulch Piles #1 and #2 is provided on **Figure 6-2.** A schematic layout for Mulch Pile #3 is provided on **Figure 6-3**.

Construction requirements for Mulch Pile #4 included a lined pad sloped north into an excavated lined sump located on the northern side of the pile. The sump dimensions are approximately 2 feet deep by 5-feet wide by 45 feet long with necessary slope for stability. The sump was covered with untreated plywood to deter rainwater and as a safety measure. A lysimeter was constructed for Mulch Pile #4 like those for Mulch Piles #1 through #3, except that two layers of liner run across the full extent of the pile as well as across a sump on the north side of the pile. The second liner runs underneath the pile, lysimeter, and sump. Soil excavated during Mulch Pile #4 sump construction was placed adjacent to the excavated surface soil topographically and hydraulically downgradient of the piles. A schematic layout for Mulch Pile #4 is provided on **Figure 6-4,** and a schematic of the mulch percolate collection system is provided on **Figure 6-5**.

6.3 MULCH PROCESSING AND PILE CONSTRUCTION

The source material for the pilot study was exclusively woody biomass from the town of Brookhaven's Municipal Yard in Yaphank, New York. Mulch preparation, mulch homogenization, mulch transportation to the pilot site, and construction of the pilot piles are described below.

- Ground woody material (mainly branches already present on site) from the Brookhaven Municipal Yard generated 250 CY when processed through a 5-inch screen. A portion of this material was ground a second time through a 2-inch by 2-inch screen, yielding 750 CY.
- Brookhaven's operator, under Parsons oversight, thoroughly homogenized the 5-inch screened mulch using a front end pay loader. Extensive homogenization was completed to ensure each of the four pilot piles received similar mulch.
- The 750 CY of 2-inch by 2-inch screened mulch were used for Mulch Piles #1, #3, and #4. The 250 CY of 5-inch screened mulch was used for Mulch Pile #2.
- Screened mulch was transported from the Brookhaven Facility to the Ridge facility the day after grinding. Liotta and Sons Trucking, LLC provided 100-yard trailers and drivers to transport the mulch to the Ridge facility. A Parsons representative was present at the Brookhaven Municipal Yard to inspect each load of mulch material and ensure any demurrage time was minimized during the transport. A second Parsons representative was stationed at the Ridge facility during each delivery to assist with placement and direction to the NYSDEC operator.
- A front end loader operated by a NYSDEC operator was used to shape the four piles within the mulch pad footprints. During construction of Mulch Pile #2, 12.5 kg (27.5 pounds) of sodium bromide tracer was added to the mulch, spread evenly with a hand-held spreader at a depth of approximately 2 feet above the base of the pile. The bromide tracer was used to trace mulch percolate flow from the pile to its downgradient monitoring well and to confirm that mulch percolate from Mulch Pile #2 was not influencing the monitoring well for Mulch Pile #1.

6.4 MONITORING WELL INSTALLATION

Prior to beginning subsurface intrusive work, the Parsons Field Team Leader and driller walked the area and identified any visible overhead obstructions or indications of marked subsurface utilities and used a GPR to confirm each location. Each drilling location was also hand-augered to a minimum depth of 5 feet bgs as an additional safety check prior to drilling.

One shallow monitoring well was installed at the center of the downgradient edge of each mulch pad location. The four wells were drilled using 4.25-inch inside diameter (ID) hollow-stem augers and constructed of 2-inch PVC, single well casing with a 10-slot screen. Continuous cores were collected at the first boring location to log the site geology. The top of the 15-foot well screen was positioned approximately 5 feet above the water table, which ranged from 20 to 22 feet bgs. The annulus around the outside of the screen was backfilled with sand to 2-feet above the screen, followed by a bentonite seal above the sand pack. The seal in each new well was allowed to hydrate before grout was placed above it. Each well was completed with a flush-mount protective cover. The wells were developed by the driller after completing well installation.

6.5 SAMPLE COLLECTION

The monitoring requirements detailed below include sampling groundwater, mulch pile mulch percolate, and mulch gas at each of the four test piles.

6.5.1 Groundwater

Each of the four monitoring wells were sampled using low-flow sampling procedures prior to placement of the mulch, and then again at three months, six months, and nine months. The groundwater sampling interval in each well was determined by vertical profiling of DO concentrations within each water column.

The groundwater sampling program included key mulch percolate indicator parameters measured in the field (specific conductance, turbidity, DO, ORP, and pH). Groundwater samples were collected for laboratory analyses of TOC, DOC, BOD, dissolved TAL metals, nitrate, nitrite, ammonia, sulfide, dissolved methane, chloride, sulfate, alkalinity, magnesium, sodium, potassium, calcium and bromide. Following the introduction of a bromide a tracer in Mulch Pile #2, each monitoring well was sampled and analyzed for bromide. Additionally, molybdenum, germanium, titanium, and vanadium were collected during the first sample round from monitoring well MW-1. A sample summary is provided as **Table 3-1**.

6.5.2 Mulch Percolate

Mulch percolate samples were collected during three separate events (February, May, and September 2017) following construction of the mulch piles, using lysimeters installed at the bottom of each pile. Lysimeters from Mulch Piles #2 and #4 contained mulch percolate during each sample event. The lysimeter from Mulch Pile #1 only contained mulch percolate during the last sample event, and the lysimeter from Mulch Pile #3 (the covered pile) did not contain mulch percolate during any of the sample events. An additional mulch percolate sampling event was conducted at Mulch Pile #2 in January 2017, prior to the first sampling event. This additional event was used to collect a sample from a lysimeter that contained standing mulch percolate for comparison to the February sampling event where the lysimeter had been recently purged. Mulch percolate was collected by locating and removing the PVC end cap, unfolding the extra sample tubing and pulling the sample with a peristaltic pump via the sample tubing. The lysimeter was purged and fresh mulch percolate infiltrating into the bucket was sampled with a peristaltic pump via the sample tubing. Analyses included field parameters and laboratory analysis of TOC, DOC, BOD, field filtered TAL metals, nitrate, nitrite, ammonia, sulfide, dissolved methane, chloride, sulfate, alkalinity, magnesium, sodium, potassium, and calcium. A sample summary is provided as **Table 3-1**.

6.5.3 Mulch and Mulch Gas

The moisture content of composite mulch samples from each of the four mulch piles was measured after pile set up and during each of the three mulch sampling events (February, May, and September 2017). Composite mulch samples were collected by compositing three grab samples of approximately 1 gallon each into a clean 5-gallon bucket followed by thorough mixing and addition to sample containers. A composite sample was collected by compositing three grab samples collected from a pile height above 6-feet to a depth of approximately 3 feet at random locations in the pile. Grab samples were collected by manually mixing mulch over an approximately 3-square-foot area at the sampling locations.

The gas sampling devices installed in each pile were used to collect mulch-gas samples for oxygen, carbon dioxide, and methane from each of the four mulch piles. Mulch gas samples were taken from Mulch Pile #1 and Mulch Pile #2 the day after pile setup to obtain baseline gas readings from the two different mulch grinds. Mulch gas samples were also collected from each of the four piles during the three mulch percolate sampling events. Gas sampling devices were constructed using 15 feet of 2-inch PVC piping with 5 feet of the probe being slotted screen at one end. A point was installed on the screened end for driving the probe into the mulch pile. The probe was inserted into the mulch piles 3 feet above bottom. An end cap was attached to the PVC to facilitate hammering the pipe horizontally approximately 10 feet into the pile. A sample port and valve were installed on the end of the PVC probe for eventual sample collection. Gas samples were collected using an evacuated Summa® canister. Prior to collection, the volume of air in the PVC was calculated, and three volumes were purged using a vacuum pump. Once purged, the canister was connected to the sample port via silicon tubing for sample collection into a Summa® canister. After completion of sampling, sample port was closed until next sampling event. Following the February event, the sampling device was changed to an AMS soil gas probe kit for a tighter seal. The purge and collection process remained the same. A sample summary for mulch-gas analysis can be referenced as **Table 3-1**.

The temperature of the mulch piles was measured each week following pile construction for approximately one month, followed by a maximum of bi-weekly measurements for the remainder of the Study. The frequency of temperature measurements were reduced to every other week when the piles stabilize at or below 135 degrees Fahrenheit. Temperature readings were taken by either Parsons or NYSDEC personnel from the center of all four sides of each pile by inserting the probe horizontally into the piles. Temperature readings were recorded at a depth of five feet at each location. Mulch pile temperature readings can be referenced in **Table 6-1**.

6.6 ANALYTICAL RESULTS

Monitoring results are provided below for groundwater, mulch percolate, gas, and mulch samples associated with the four pilot test mulch piles including:

- Mulch Pile 1 and monitoring well 1 (MW-1): Control pile prepared with twice ground mulch with no percolate mitigation
- Mulch Pile 2 and MW-2: Course ground mulch.
- Mulch Pile 3 and MW-3: Covered pile prepared with twice ground mulch
- Mulch Pile 4 and MW-4: Lined pile prepared with twice ground mulch

6.6.1 Groundwater

Groundwater samples collected from the monitoring well MW-1 in November 2016 contained concentrations above the NYSDEC AGWQS for iron (440 µg/L), manganese (330 µg/L), and thallium (12J µg/L). Samples collected in March 2017 did not exhibit any concentrations of analytes above the AGWQS. Samples collected in June 2017 contained thallium (7.5J µg/L) at a concentration above the AGWQS. Samples collected in September 2017 again exhibited no concentrations of analytes above the AGWQS.

Groundwater samples collected from the monitoring well MW-2 in November 2016 contained thallium (12J µg/L) at a concentrations above the NYSDEC AGWQS. Samples collected in March 2017 did not exhibit any concentrations of analytes above the AGWQS. Samples collected in June 2017 contained thallium (9.6J µg/L) above the AGWQS. Samples collected in September 2017 again exhibited no concentrations of analytes above the AGWQS.

Groundwater samples collected from the monitoring well MW-3 in November 2016 contained concentrations above the NYSDEC AGWQS for iron (470 µg/L) and thallium (7.4J µg/L). Samples collected in March 2017 did not exhibit any concentrations of analytes above the AGWQS. Samples collected in June 2017 contained thallium (9.6J µg/L) and sulfide (0.22J µg/L) above the AGWQS. Samples collected in September 2017 again exhibited no concentrations of analytes above the AGWQS.

Groundwater samples collected from the monitoring well MW-4 in November 2016 contained thallium (8.8J µg/L) at a concentrations above the NYSDEC AGWQS Samples collected in March 2017 did not exhibit any concentrations of analytes above the AGWQS. Samples collected in June 2017 contained thallium (8.6J µg/L) above the AGWQS. Samples collected in September 2017 again exhibited no concentrations of analytes above the AGWQS.

A discussion of the mulch pilot study analytical results is presented in Section 7.0. A summary of groundwater analytical results can be referenced in **Table 6-2**. Analytical data packages can be referenced in **Appendix C**. Low-flow groundwater monitoring purge sheets containing the above field measurements can be found in **Appendix E**.

6.6.2 Mulch Percolate

Mulch percolate samples collected from Mulch Pile #1 in September 2017 were non-detect for butane, ethene, 2-methyl propane, propane, nitrate, nitrite, sulfate, sulfide and bromide. Samples analyzed contained concentrations of ethane, (0.31J µg/L), methane (2,810 µg/L), DOC (677 mg/L), ammonia (8.18 mg/L) and TOC (1,020 mg/L). TAL metals detected during the sample event were arsenic (64J µg/L), barium (140 µg/L), calcium (272,000 µg/L), iron (12,100 µg/L), magnesium (123,000 µg/L), manganese (2,800 µg/L), potassium (717,000 µg/L), and sodium (395,000 µg/L).

Mulch percolate samples collected from Mulch Pile #2 in January 2017 were non-detect for nitrate, nitrite, sulfate, sulfide, herbicides, and pesticides. Samples analyzed contained concentrations of ethane, (0.31J µg/L), methane (2,810 µg/L), BOD (38.3 mg/L), alkalinity (1,580 mg/L), bromide (3.8 mg/L), chloride (1,510 mg/L), DOC (677 mg/L), ammonia (8.18 mg/L) and TOC (1020 mg/L). TAL metals detected during the sample event were aluminum (1,500 µg/L), arsenic (37J µg/L), barium (270 µg/L), calcium (165,000 µg/L), chromium (16J µg/L), cobalt (22J µg/L), iron (36,900 µg/L), magnesium (61,300 µg/L), manganese (4,300 µg/L), potassium (289,000 µg/L), sodium (133,000 µg/L), vanadium (19J µg/L), and zinc (140 µg/L).

Mulch percolate samples collected from Mulch Pile #2 in February 2017 were non-detect for nitrate, bromide, butane, ethane, ethene, 2-methyl propane, and propane. Samples analyzed contained concentrations of methane (8,140 µg/L), DOC (374 mg/L), alkalinity, (258 mg/L), BOD (171 mg/L), bromide (7.1 mg/L), chloride (54.2 mg/L), ammonia (1.38 mg/L), nitrite (0.18J mg/L), sulfate (0.42J µg/L), sulfide (0.46J mg/L) and TOC (511 mg/L). TAL metals detected during the sample event were aluminum (2 µg/L), arsenic (42 µg/L), barium (110 µg/L), calcium (70,400 µg/L), copper (35J µg/L), iron (15,700 µg/L), lead (21J µg/L), magnesium (19,600 µg/L), manganese (1,400 µg/L), potassium (108,000 µg/L), sodium (43,400 µg/L), vanadium 8.5JJ µg/L), and zinc (610 µg/L).

Mulch percolate samples collected from Mulch Pile #2 in May 2017 were non-detect for nitrate, nitrite, sulfide, sulfate, bromide, butane, ethane, ethene, 2-methyl propane, and propane. Samples analyzed contained concentrations of methane (6,020 µg/L), DOC (149 mg/L), alkalinity, (291 mg/L), BOD (36.4 mg/L), chloride (127 mg/L), ammonia (0.316 mg/L), and TOC (176 mg/L). TAL metals detected during the sample event were aluminum (210 µg/L), arsenic (29 µg/L), barium (130 µg/L), calcium (86,600 µg/L), cobalt (82J µg/L), iron (13,000 µg/L), magnesium (1,800 µg/L), manganese (1,100 µg/L), nickel (14J µg/L), potassium (120,000 µg/L), sodium (47,300 µg/L), and zinc (480 µg/L).

Mulch percolate samples collected from Mulch Pile #2 in September 2017 were non-detect for nitrate, nitrite, sulfate, bromide, butane, ethane, ethene, 2-methyl propane, and propane.

Samples analyzed contained concentrations of methane (3,250 µg/L), sulfide (0.37J µg/L), DOC (637 mg/L), alkalinity, (597 mg/L), BOD (20.5 mg/L), chloride (763 mg/L), ammonia (7.4 mg/L), and TOC (995 mg/L). TAL metals detected during the sample event were arsenic (57J µg/L), barium (290 µg/L), calcium (817,000 µg/L), iron (23,600 µg/L), magnesium (42,700 µg/L), potassium (437,000 µg/L), sodium (180,000 µg/L), and zinc (480 µg/L).

Mulch percolate samples collected from Mulch Pile #4 in February 2017 were non-detect for nitrate, nitrite, butane, and 2-methyl propane. Samples analyzed contained concentrations of ethane (0.27J µg/L), ethene 073J µg/L), methane (2,380 µg/L), propane (0.45J µg/L), DOC (345 mg/L), alkalinity (538 mg/L), BOD (186 mg/L), bromide (0.36 µg/L), chloride (352 mg/L), ammonia (1.26 mg/L), sulfide (0.8J µg/L), sulfate (0.36J µg/L), and TOC (494 mg/L). TAL metals detected during the sample event were aluminum (46J µg/L), arsenic (140 µg/L), barium (83 µg/L), calcium (120,000 µg/L), chromium (12J µg/L), copper (27J µg/L), iron (7,600 µg/L), magnesium (40,900 µg/L), manganese (1,400 µg/L), potassium (296,000 µg/L), sodium (157,000 µg/L), and zinc (99J µg/L).

Mulch percolate samples collected from Mulch Pile #4 in May 2017 were non-detect for nitrate, nitrite, sulfate, sulfide, butane, bromide, ethane, ethene, propane, and 2-methyl propane. Samples analyzed contained concentrations of methane (6,020 µg/L), DOC (149 mg/L), alkalinity (291 mg/L), BOD (36.4 mg/L), chloride (127 mg/L), ammonia (0.316 mg/L), and TOC (176 mg/L). TAL metals detected during the sample event were aluminum (210J µg/L), arsenic (32 µg/L), barium (120 µg/L), calcium (83,700 µg/L), cobalt (8.4J µg/L), iron (13,000 µg/L), nickel (1.5J µg/L), magnesium (17,700 µg/L), manganese (1,000 µg/L), potassium (108,000 µg/L), sodium (43,200 µg/L), and zinc (470 µg/L).

Mulch percolate samples collected from Mulch Pile #4 in September 2017 were non-detect for nitrate, nitrite, sulfate, butane, ethane, ethene, propane, and 2-methyl propane. Samples analyzed contained concentrations of methane (2,010 µg/L), DOC (552 mg/L), alkalinity (3,910 mg/L), BOD (76 mg/L), chloride (1,670 mg/L), ammonia (24.7 mg/L), sulfide (0.29J µg/L), bromide (3.8 µg/L), and TOC (905 mg/L). TAL metals detected during the sample event were aluminum (4,000 µg/L), arsenic (89J µg/L), barium (270 µg/L), cadmium (27 µg/L), calcium (570,000 µg/L), cobalt (28J µg/L), iron (42,000 µg/L), magnesium (447,000 µg/L), manganese (9,200 µg/L), potassium (847,000 µg/L), sodium (513,000 µg/L), and vanadium (39J µg/L).

The mulch pilot study analytical results are discussed in Section 7.0. A summary of mulch percolate analytical results can be referenced in **Table 6-3**. Analytical data packages can be referenced in **Appendix C**.

6.6.3 Mulch Gas

Mulch gas samples were collected from Mulch Pile #1 in December 2016, and February, May, and September 2017 and analyzed for carbon dioxide, methane, and oxygen. Mulch gas samples from Mulch Pile #1 contained carbon dioxide at 2.17 %v/v, 1.13 %v/v, 13.6 %v/v, and 16.6 %v/v, sequentially. Mulch Pile #1 gas samples were non-detect for methane from each of the first three events and detected at 1.07 %v/v during the fourth event. Oxygen at mulch Pile #1 was detected at 19.8 %v/v, 21 %v/v, 7.74 %v/v, and 7.77 %v/v, sequentially.

Mulch gas samples were collected from Mulch Pile #2 in December 2016 and February, May, and September and analyzed for carbon dioxide, methane, and oxygen. Mulch gas samples analyzed from Mulch Pile #2 contained carbon dioxide at 2.7 %v/v, 0.274 %v/v, 1.47 %v/v, and 17 %v/v, sequentially. Methane were non-detect for each of the four events at Mulch Pile #2. Oxygen was detected at 19.2 %v/v, 22 %v/v, 20.6 %v/v, and 5.15 %v/v, sequentially.

Mulch gas samples were collected from Mulch Pile #3 in February 2017 and May and September 2017 and analyzed for carbon dioxide, methane, and oxygen. Mulch gas samples analyzed from Mulch Pile #3 contained carbon dioxide at 2.1 %v/v, 5.93 %v/v, and 10.1 %v/v, sequentially. Methane were non-detect for each of the three events at Mulch Pile #3. Oxygen was detected at 19.8 %v/v, 16.2 %v/v, and 12.7 %v/v, sequentially.

The mulch pilot study analytical results are discussed in Section 7.0. A summary of mulch gas analytical results can be referenced in **Table 6-4**. Analytical data packages can be referenced in **Appendix C**.

6.6.4 Mulch

Mulch samples were collected from Mulch Pile #1 in February 2017 and analyzed for TAL metals. Concentrations of the following analytes were detected: aluminum (844 mg/kg), arsenic (1.8J mg/kg), barium (12.3 mg/kg), calcium (2,470 mg/kg), chromium (3.2 mg/kg), copper (5.3 mg/kg), iron (1,170 mg/kg), lead (7.1 mg/kg), magnesium (410 mg/kg), manganese (40.2 mg/kg), nickel (1.5J mg/kg), potassium (864 mg/kg), sodium (316 mg/kg), vanadium (2.8 mg/kg), and zinc (19 mg/kg).

Mulch samples were collected from Mulch Pile #1 in May 2017 and analyzed for TAL metals. Concentrations of the following analytes were detected: aluminum (1,460 mg/kg), arsenic (2.3J mg/kg), barium (18.6 mg/kg), calcium (3,990 mg/kg), chromium (6.2 mg/kg), cobalt (0.92J mg/kg), copper (11.1 mg/kg), iron (2,320 mg/kg), lead (12.8 mg/kg), magnesium (620 mg/kg), manganese (64.7 mg/kg), nickel (2.2J mg/kg), potassium (658 mg/kg), sodium (133 mg/kg), vanadium (5.2 mg/kg), and zinc (31.3 mg/kg).

Mulch samples were collected from Mulch Pile #1 in September 2017 and analyzed for TAL metals. Concentrations of the following analytes were detected: aluminum (2,340 mg/kg), antimony (2.4J mg/kg), arsenic (4.8 mg/kg), barium (31.9 mg/kg), cadmium (0.36J mg/kg), calcium (8,330 mg/kg), chromium (9.2 mg/kg), cobalt (1.4J mg/kg), copper (18.5 mg/kg), iron (3,850 mg/kg), lead (23.8 mg/kg), magnesium (1,320 mg/kg), manganese (124 mg/kg), nickel (3.5J mg/kg), potassium (1,120 mg/kg), selenium (6J mg/kg), sodium (512 mg/kg), vanadium (7.6 mg/kg), and zinc (52.7 mg/kg).

Mulch samples were collected from Mulch Pile #2 in February 2017 and analyzed for TAL metals. Concentrations of the following analytes were detected: aluminum (392 mg/kg), barium (7 mg/kg), calcium (1,440 mg/kg), chromium (1.5J mg/kg), copper (4.5 mg/kg), iron (505 mg/kg), lead (3.6 mg/kg), magnesium (269 mg/kg), manganese (23.5 mg/kg), potassium (170 mg/kg), sodium (86.5J mg/kg), vanadium (1.2J mg/kg), and zinc (12.7 mg/kg).

Mulch samples were collected from Mulch Pile #2 in May 2017 and analyzed for TAL metals. Concentrations of the following analytes were detected: aluminum (1480 mg/kg), arsenic (2.1J mg/kg), barium (18.7 mg/kg), calcium (3,490 mg/kg), chromium (3.5 mg/kg), cobalt (0.8J mg/kg), copper (37.1 mg/kg), iron (2450 mg/kg), lead (9.7 mg/kg), magnesium (626 mg/kg), manganese (80.6 mg/kg), nickel (2J mg/kg), potassium (497 mg/kg), sodium (104 mg/kg), vanadium (4.9 mg/kg), and zinc (28.3 mg/kg).

Mulch samples were collected from Mulch Pile #2 in September 2017 and analyzed for TAL metals. Concentrations of the following analytes were detected: aluminum (1,710 mg/kg), barium (18.5 mg/kg), calcium (3,770 mg/kg), chromium (4.5 mg/kg), cobalt (0.78J mg/kg), copper (8.4 mg/kg), iron (2,910 mg/kg), lead (13.2 mg/kg), magnesium (681 mg/kg), manganese (90.5 mg/kg), nickel (2.1J mg/kg), potassium (648 mg/kg), selenium (3.6J mg/kg), sodium (204 mg/kg), vanadium (6.4 mg/kg), and zinc (37 mg/kg).

Mulch samples were collected from Mulch Pile #3 in February 2017 and analyzed for TAL metals. Concentrations of the following analytes were deteced: aluminum (580 mg/kg), arsenic (0.92J mg/kg), barium (8.7 mg/kg), calcium (1,870 mg/kg), chromium (2.8 mg/kg), copper (4 mg/kg), iron (901 mg/kg), lead (7.5 mg/kg), magnesium (307 mg/kg), manganese (29.6 mg/kg), potassium (724 mg/kg), sodium (299 mg/kg), vanadium (2 mg/kg), and zinc (15.7J mg/kg).

Mulch samples were collected from Mulch Pile #3 in May 2017 and analyzed for TAL metals. Concentrations of the following analytes were detected: aluminum (1,970 mg/kg), antimony (1.4J mg/kg), arsenic (3.2 mg/kg), barium (25.2 mg/kg), cadmium (0.27J mg/kg), calcium (7,920 mg/kg), cobalt (1.3J mg/kg), chromium (7 mg/kg), copper (13.6 mg/kg), iron (3,090 mg/kg), lead (17.7 mg/kg), magnesium (1,660 mg/kg), manganese (101 mg/kg), nickel (3.2 mg/kg), potassium (1,920 mg/kg), sodium (415 mg/kg), vanadium (6.6 mg/kg), and zinc (51.6 mg/kg).

Mulch samples were collected from Mulch Pile #3 in September 2017 and analyzed for TAL metals. Concentrations of the following analytes were detected: aluminum (1,620 mg/kg), antimony (1.3J mg/kg), arsenic (3.3 mg/kg), barium (21.8 mg/kg), cadmium (0.31J mg/kg), calcium (5,840 mg/kg), cobalt (0.85J mg/kg), chromium (5.7 mg/kg), copper (13.6 mg/kg), iron (2,630 mg/kg), lead (15.3 mg/kg), magnesium (730 mg/kg), manganese (95.8 mg/kg), nickel (2.3J mg/kg), potassium (513 mg/kg), selenium (4J mg/kg), sodium (42.2J mg/kg), vanadium (5.6 mg/kg), and zinc (45.2 mg/kg).

Mulch samples were collected from Mulch Pile #4 in February 2017 and analyzed for TAL metals. Concentrations of the following analytes were detected: aluminum (1,080 mg/kg), barium (12.6 mg/kg), calcium (2,560 mg/kg), chromium (3.5 mg/kg), cobalt (0.68J mg/kg), copper (6 mg/kg), iron (1,690 mg/kg), lead (10.8 mg/kg), magnesium (395 mg/kg), manganese (43.7 mg/kg), nickel (1.5J mg/kg), potassium (512 mg/kg), sodium (127 mg/kg), vanadium (3.3 mg/kg), and zinc (23.2 mg/kg).

Mulch samples were collected from Mulch Pile #4 in May 2017 and analyzed for TAL metals. Concentrations of the following analytes were detected: aluminum (1,520 mg/kg), arsenic (2.8 mg/kg), barium (21.1 mg/kg), calcium (3,590 mg/kg), chromium (4.8 mg/kg), cobalt (0.73J mg/kg), copper (9.5 mg/kg), iron (2,210 mg/kg), lead (12.2 mg/kg), magnesium (539 mg/kg), manganese (64.3 mg/kg), nickel (2.1J mg/kg), potassium (418 mg/kg), sodium (64.7 mg/kg), vanadium (4.7 mg/kg), and zinc (29.7 mg/kg).

Mulch samples were collected from Mulch Pile #4 in September 2017 and analyzed for TAL metals. Concentrations of the following analytes were detected: aluminum (2,260 mg/kg), antimony (2.1J mg/kg), arsenic (5.4 mg/kg), barium (30.3 mg/kg), cadmium (3.3J m,g/kg), calcium (7,470 mg/kg), chromium (8.9 mg/kg), cobalt (1.1J mg/kg), copper (17.2 mg/kg), iron (3,830 mg/kg), lead (19.6 mg/kg), magnesium (1,040 mg/kg), manganese (126 mg/kg), nickel (3.2J mg/kg), potassium (840 mg/kg), selenium (6.1J mg/kg), sodium (173 mg/kg), vanadium (8.2 mg/kg), and zinc (59.7 mg/kg).

TCLP results from Mulch Piles #1 through #4 were below their respective TCLP screening values for volatiles, semi-volatiles, metals, herbicides, and pesticides during each sampling event.

The mulch pilot study analytical results are discussed in Section 7.0. A summary of mulch analytical results can be referenced in **Table 6-5**. Analytical data packages can be referenced in **Appendix C.**

SECTION 7 – RESULTS AND DISCUSSION

7.1 PILE MOISTURE, TEMPERATURE, AND GAS COMPOSITION

A better understanding of how mulching practices influence mulch percolate strength and/or quantity may aid the development of mulch percolate mitigation approaches. For example, more coarsely ground mulch could result in decreased mulch percolate strength by decreasing mulch surface area and/or the retention of water in the piles. An evaluation was also performed on how mulch percolate mitigation approaches might affect the availability of oxygen. The increased retention of moisture in more finely ground mulch is believed to decrease the exchange of air, resulting in anoxic conditions that could create odors and influence mulch percolate composition. Another question evaluated was whether the temperature of the covered pile would increase significantly, thereby increasing the risk for fire which could negate, or minimally complicate, covering piles as a mulch percolate mitigation approach.

Mulching practices that influence the migration of precipitation through mulch piles, mulch moisture and distribution, and pile temperature are anticipated to have a strong effect on biodegradation and mulch percolate composition and quantity. Given these likely interactions, the distribution of moisture, temperature, and the composition of gas in mulch piles prepared or treated differently (i.e., coarse vs. fine grind, covered, and lined) are collectively considered in this section and related to mulch percolate in Section 7.2. Our conceptual model going into this study was that precipitation would migrate vertically through all of the mulch piles (other than the covered pile) and drain into the lysimeters beneath the three uncovered pilot piles, the Edgewood pile, and the Recycled Earth pile.

Moisture Distribution

Figure 7-1 illustrates the distribution of soil moisture within the outer five feet of the four pilot piles during each of four sampling events. Each data point represents the average of four moisture readings taken from each pile. As should be expected, the distribution of moisture was similar between Mulch Pile #1 (no mulch percolate mitigation measure) prepared with twice-ground fine mulch and Mulch Pile #4 (lined) prepared with the same fine mulch. The strong decreasing moisture trend with depth at these two piles during each event suggests that the mulch within the interior of piles did not become saturated. It is noted that the moisture content of the bottom of the piles was not taken.

The distribution of moisture with depth at Mulch Pile #2 (coarse mulch; one grind) varied over time in comparison to Mulch Piles #1 and #4, which were prepared with fine mulch. This is more readily observed in **Figure 7-2**. The moisture content at Mulch Pile #2 decreased in May 2017 and then increased in September 2017. This increase may be attributed to the increased precipitation observed in early September (**Figure 7-3**). The soil moisture profiles from the Recycled Earth pile (**Figure 7-4**) also indicate decreasing moisture content with depth into the pile and increased moisture in September 2017. Mulch moisture level readings for the pilot study and Recycled Earth can be referenced in **Table 7-1**.

By February 2017, 57 days after establishing the piles, the moisture content of the covered pile decreased significantly relative to the other piles. This decrease suggests that the mulch is subject to significant drying in the absence of precipitation and to fluctuations in moisture content between precipitation events, as observed for the coarsely ground mulch pile. The measured moisture content of homogenized mulch from the covered pile remained at less than 30% compared to between approximately 45 and 55% observed at the other pilot piles (**Figure 7-5**).

The decreasing moisture with depth into the piles, in combination with the absence of mulch percolate on most occasions in the lysimeters below the fine mulch pile at Edgewood and Mulch Pile #1 (fine mulch, no mulch percolate mitigation), indicate that precipitation did not effectively migrate vertically through the entire thickness of the twice-ground mulch piles. The presence of mulch percolate within the lysimeter of lined Mulch Pile #4 during all sampling events is likely attributed to the migration of relatively small quantities of mulch percolate along the liner into the lysimeter. Visual observations of the dismantled Edgewood pile indicated wet mulch within the top foot and dry mulch in the interior of the pile. Wet mulch was observed only around the periphery of the pile.

Temperature

Temperature readings taken on 11 occasions from the four pilot piles are plotted in **Figure 7-6.** Each data point in the figure represents the average of four measurements taken from each pile. At all piles, the temperature decreased with advancement of winter, increased during spring into summer, and peaked in June 2017. The piles were turned on June 30. Overall, the trends in temperature between the four piles were similar. The temperature of the covered pile remained comparable to the other piles throughout the study. The temperatures of Mulch Pile #1 (no mulch percolate mitigation) and Mulch Pile #4 (lined), both of which were prepared with fine mulch, were very similar.

Pile Gas Composition

Pile gas composition over time in the four pilot piles is shown on **Figure 7-7**. Pile gas composition in September 2017 is compared between the four piles in **Figure 7-8.** The following observations were made:

- An increase in carbon dioxide corresponding with a decrease in oxygen, indicating increased biodegradation, was observed at each of the piles except the covered pile during summer when the pile temperatures increased. During this time, the covered pile exhibited a gradual decrease of both oxygen and carbon dioxide.

5 Oxygen was sustained at a higher concentration at Mulch Pile #3 (covered) where the lowest concentration of carbon dioxide relative to other piles was observed. Methane was not detected at Mulch Pile #3. These trends are consistent with less biodegradation and/or the increased exchange of air within the dry mulch of the covered pile.

6 Methane was observed at Mulch Pile #1 (no mitigation) and Mulch Pile #4 (lined) by September 2017. Both piles were prepared with fine mulch. The presence of methane indicates highly anaerobic conditions, likely within wet portions at the bottom of the piles. The highest concentration of methane and carbon dioxide and the lowest concentration of oxygen in September 2017 were observed at lined Mulch Pile #4.

7.2 MULCH PERCOLATE COMPOSITION

To evaluate the relative potential of mulch percolate to impact groundwater, this section compares the composition of mulch percolate with impacted Suffolk County groundwater. Additionally, this section describes the composition and strength of mulch percolate samples relative to the mulch percolate mitigation approach and pile conditions described in Section 7.1 to help evaluate the mulch percolate mitigation approaches.

Table 7-2 compares the average composition of mulch percolate (Pilot and Recycled Earth samples) including pH and primary ions from this study with the average composition of non-impacted and impacted groundwater samples taken downgradient of facilities with primarily composted yard wastes (e.g., grasses) from the Suffolk County study (SCDHS, 2016). Impacted groundwater samples contain higher concentrations of primary ions relative to non-impacted groundwater samples. Mulch percolate is enriched in these primary ions relative to impacted groundwater by a factor between 7 and 9 for sodium and chloride, and by a factor of 13 and 17 for potassium and magnesium on a mg/L basis. The pH of the mulch percolate samples ranged between 5.2 and 7.2, which is very similar to the range (4.8 to 7.6) reported by Kannapalli et. al. (2016) for mulch percolate runoff samples collected from mulching facilities in New Jersey. This pH is not low enough to leach metals including iron and manganese from soil minerals. Impacted groundwater was depleted of dissolved oxygen relative to non-impacted samples.

Table 7-2 – Comparison of mulch percolate composition (field parameters and primary ions) from Pilot study to SCDHS Data (2016).

Sample Type	DO (ppm)	pH	EC (µS)	Na (µg/L)	Cl (mg/L)	K (µg/L)	Mg (µg/L)
Non-Impacted Groundwater	6.9 ±0.3	6.4 ±0.1	98.3 ±15.8	7335 ±2,170.4	13.7 ±3.6	1,287.5 ±323.5	1,960 ±140.7
Impacted Groundwater	3.4 ±0.2	6.5 ±0.1	388 ±26.5	25,316.5 ±2,856.5	62.9± 5.7	19,898.9 ±2,494.2	6,309.9 ±476.6
Mulch Percolate	NA	6.2 ±0.7	3,428 ±2,634	176,000 ±172,000	585 ±635	338,800 ±286,200	87,000 ±135,000

Values are means ± standard error.

In contrast to primary ions, the average concentration of manganese in mulch percolate was lower than the concentration in impacted groundwater (**Table 7-3**). Iron was on average present in mulch percolate at a higher concentration than impacted groundwater only by a factor of less than 5. Significantly higher dilution of mulch percolate with groundwater would be anticipated. This suggests that the direct input of manganese and iron at concentrations in mulch percolate observed in this study would not account for the concentrations observed in impacted Suffolk County groundwater. As discussed below, the anaerobic biodegradation of the organic carbon concentrations in the mulch percolate has the potential to result in the in-situ mobilization of manganese and iron in minerals to groundwater.

Table 7-3. Comparison of mulch percolate composition (metals, nitrogen compounds, and organic carbon) from Pilot study to SCDHS Data (2016)

Sample Type	Mn (µg/L)	Fe (µg/L)	Nitrate (mg/L)	Ammonia (mg/L)	Methane (µg/L)	DOC (mg/L)	TOC (mg/L)	BOD (mg/L)
Non-Impacted Groundwater	176.6±58.8	478±128.5	1.3±0.2	0.3±0	NA	NA	NA	NA
Impacted Groundwater	4069.7±566	3759.2±709.2	4.6±0.6	1.7±0.3	NA	NA	NA	NA
Mulch Percolate	2,610 ±2,938	17,370 ±14,635	< 0.4	7.7 ±9.2	3.8±2.2	380 ±439	568 ±370	79.2 ±71

Values are means ± standard error.

Because chloride moves conservatively in groundwater, the average chloride concentration in impacted groundwater greater than non-impacted groundwater (49.2 mg/L), divided by the average concentration of chloride in mulch percolate (585.6 mg/L) was used as an estimated mulch percolate dilution factor (11.9) in the calculations provided in **Table 7-4**. Applying this dilution factor to the average measured concentration of iron and manganese in mulch percolate yields an iron and manganese concentration in impacted groundwater of only 1,461 µg/L and 218 µg/L, respectively. Converting the measured biological oxygen demand (aerobic biodegradation) of the mulch percolate, to an anaerobic biodegradation potential under iron and manganese oxide reducing conditions (accounting for electron transfer reactions), yields high iron production (~550,000 µg/L) and manganese production (~108,000 µg/L) potentials. Applying the estimated dilution factor to the manganese production potential yields a manganese concentration in groundwater of 9,107 µg/L which is comparable to the average manganese concentration in impacted groundwater. The lower concentration of iron in groundwater relative to the calculated iron potential from microbial iron reduction would be consistent with preferential manganese reduction over iron reduction and/or the observed increased attenuation of iron relative to manganese as detailed in Section 2.5.

Table 7-4. Calculated potential concentrations of iron and manganese in groundwater from mulch percolate dilution vs. anaerobic biodegradation (as diluted BOD).

Parameter	Value
Average iron (µg/L) in impacted groundwater	3,759±709
Iron (µg/L) from diluted mulch percolate	1,461
Iron (µg/L) potential of mulch percolate BOD	552,500
Iron (µg/L) potential from diluted mulch percolate BOD	46,419
Average manganese (µg/L) in impacted groundwater	7,069.5 ± 9,113
Manganese (µg/L) from diluted mulch percolate	218
Manganese (µg/L) potential of mulch percolate BOD	108,400
Manganese (µg/L) potential from diluted mulch percolate BOD	9,107

Thus, several lines of evidence indicate that the anaerobic biodegradation of organic carbon in mulch percolate has a higher potential to impact groundwater than direct influence of percolate on groundwater:

- The pH of mulch percolate will not result in significant solubilization/mobilization of metals.
- Patterns of elevated iron and manganese concentrations closely follow DO.
- Elevated concentrations of TOC, DOC, and BOD in mulch percolate indicating ample biodegradable organic carbon in leachate to fuel microbial manganese and iron reduction.
- The concentration of manganese in impacted groundwater is higher than in mulch percolate.
- Calculations that account for the dilution of mulch percolate indicate that the anaerobic biodegradation of organic carbon in mulch percolate would generate concentrations of manganese similar to what is present in impacted groundwater.

Mulch percolate collected in lysimeters beneath the piles contained elevated DOC, TOC, and BOD, and was highly anaerobic based on the detection of significant dissolved methane and elevated concentrations of ammonia but no nitrate (**Table 7-2**). Thus, despite the gas measurements indicating the presence of oxygen within the piles, the wet portions in contact with mulch percolate were anaerobic minimally at the bottom of the piles where the mulch percolate was collected.

The compositions of mulch percolate samples are provided in **Figure 7-9**. These include concentrations of BOD and DOC, the ratio of DOC/BOD as a DOC biodegradability index, chloride, potassium, manganese, iron, and ammonia over the course of the study**.** Variables associated with mulch percolate strength include the following:

- The concentration of DOC, BOD, ammonia, chloride, potassium, manganese, and iron in percolate from the lined pilot pile (Mulch Pile #4) prepared with twice-ground mulch increased significantly over the course of the study. This is believed to be attributed to wet mulch above the liner at the bottom of the pile, which enhanced leaching.
- These percolate constituents were detected at lower concentrations at the coarse ground mulch pilot pile at the pilot site (Mulch Pile #2) and at Recycled Earth compared to the finer mulch pilot Mulch Piles #1 and #4. Exceptions include iron and DOC concentrations in the first mulch percolate sample collected from pilot Mulch Pile #2 (coarse grind). This is consistent with decreased mulch percolate strength being associated with coarse mulch. Laboratory research results from other studies also indicate increased mulch percolate strength associated with more finely ground mulch.
- The overall similar trends between constituents known to be directly related to biodegradation (ammonia and DOC), with constituents that are not directly impacted by microbial activity including chloride and potassium, suggests that the latter are more readily released from the mulch structure as the mulch loses its structure during biodegradation. This is consistent with the increased concentrations of chloride and major cations in impacted groundwater samples from the SCDHS 2016 study.
- The ratio of DOC/BOD was used as an indicator of the biodegradability of organic carbon within the mulch percolate. The decreasing DOC/BOD ratio of leachate samples collected over time is consistent with decreasing biodegradability of organic carbon in the percolate over time.

Overall, the leachate composition results indicate that fine textured mulch and mulching practices that contribute to sustained wet mulch will enhance the strength of mulch percolate. However, the biodegradability of organic carbon in the percolate decreased over time. These findings are consistent with the literature. A review of the composition of runoff at log yards and wood waste facilities found high concentrations of organic carbon resulting in increased oxygen demand to be a unifying feature amongst the facilities (Hedmark and Scholz, 2008). Rex et al. (2016) observed that wet coniferous wood chip samples produced leachate with higher COD, TOC, and phenols relative to dry wood chips. The study also found significantly lower COD levels in leachate drawn from larger wood chips than smaller chips. Tao et al. (2005) observed that leachate from fresh piles of cedar waste generated acidic, very high COD (12,00-14,000 mg/L) leachate with high concentrations of tannin and lignin and elevated volatile fatty acids (1,500-2,100 mg/L), whereas 1.5-year-old cedar piles produced less acidic and lower oxygen demand leachate. This is consistent with decreasing biodegradability of organic carbon in the mulch leachate over time observed in the current study.

7.3 PILOT STUDY GROUNDWATER

Groundwater at each of the four monitoring wells located downgradient of the pilot piles was not observed to be affected by mulch percolate based on the absence of the bromide tracer or significant changes in analyzed constituents, including those determined to be present in impacted groundwater and mulch percolate, and based on consistently elevated dissolved oxygen concentrations and ORP values. Groundwater low-flow stabilization sheets can be referenced in **Appendix E**. **Figure 7-10** shows that concentrations of chloride, TOC, and manganese remained relatively unchanged between the baseline groundwater sampling event and the three sampling events after installing the piles, including at MW-1 adjacent to the control pile with no leachate mitigation and at MW-2 adjacent to Mulch Pile #2 (coarse mulch) where leachate was consistently observed in the lysimeter beneath the pile. Chloride concentrations typically ranged between 2 and 4.5 mg/L at all four monitoring wells compared to between 54 mg/L to 1,670 mg/L chloride in mulch percolate during the pilot study. TOC concentration ranged between approximately 0.5 mg/L to 1.5 mg/L compared to between 176 mg/L to 1,020 mg/L chloride observed in mulch percolate during the pilot study. TOC concentration ranged between approximately 0.5 mg/L to 1.5 mg/L in groundwater compared to between 176 mg/L to 1,020 mg/L chloride in mulch percolate during the pilot study. Manganese concentrations varied by location within the pilot area, were highest at MW-3, and lowest at MW-1 throughout the pilot test.

Potential reasons for the absence of observable influence of percolate on groundwater during the pilot test include the following and combinations thereof:

- Limited infiltration of mulch percolate within the area of the pile because most of the leachate migrated along the outside of the pile to the ground surface where it ran away from the piles. It is noted that edging was installed around piles in July to further prevent the mulch percolate from running off and to force infiltration at the piles. However the limited precipitation from mid-May to November would have reduced the quantity of mulch percolate infiltration after installing the edging.
- A larger quantity of mulch percolate compared to that generated from the relatively small pilot piles is required for a detectable influence to groundwater. The anticipated high groundwater flow velocity combined with a large percentage of precipitation that infiltrates through the sandy soil may result in significant dilution of mulch percolate.
- Other potential hydrological reasons include: 1) the local groundwater flow path does not follow the regional gradient resulting in the monitoring wells not being located downgradient of the piles, 2) there is a lateral component to mulch percolate infiltration through the unsaturated zone in a direction away from the monitoring wells, and 3) the groundwater flow velocity was not adequate to move impacted groundwater from the piles to the monitoring wells. The later possibility is highly

unlikely given the soil conditions and the close proximity of the monitoring wells to the piles

7.4 MULCH PERCOLATE STUDY (EDGEWOOD) GROUNDWATER

Two vertical groundwater sampling locations (TMW-Down and TMW-Up) were installed upgradient of SCDHS's boring CS-3 to evaluate groundwater composition in the immediate vicinity of VOW (TMW-Down) and on the upgradient side of the facility (TMW-Up). Despite the presence of a concrete pad at both drilling locations and over a large portion of the facility, groundwater at both locations was impacted based primarily on elevated manganese concentrations (**Figure 7-11**). This may be a result of surface water run-off and infiltration beyond the edges of the concrete pad.

The trends at location TMW-Down are consistent with anaerobic biodegradation of TOC/DOC as a source of the elevated manganese and iron. The 66-foot interval, which contained the lowest DO and ORP readings for that boring, also contained the highest manganese, sodium, potassium, TOC, and DOC concentrations.

7.5 CONCEPTUAL SITE MODEL

The following conceptual model includes VOWM processes and conditions that influence mulch percolate and groundwater composition based on the results of this study, SCDHS's 2016 report, and the literature:

- Conceptual model diagrams for fine (twice-ground) mulch and coarse-ground mulch piles can be referenced on **Figures 7-12** through **Figure 7-14**. Wet mulch is present within the outer periphery of the mulch piles. Migration of percolate to the bottom of the piles, especially in twice-ground mulch, is limited due to: 1) the high moisture carrying capacity of mulch, 2) preferential migration of precipitation through the exterior of the down-sloping portion of the pile, and 3) the evaporative loss of moisture. This results in less percolate infiltration beneath fine textured mulch piles. Percolate more readily infiltrates through the coarse mulch piles resulting in more infiltration below the piles but less runoff.
- Increased mulch percolate strength is associated with fine-textured mulch and mulching practices that contribute to sustained wet mulch. Mulch percolate collected in lysimeters beneath the fine-grind piles contained elevated DOC, TOC, and BOD, and was highly anaerobic. The biodegradability of organic carbon in the percolate decreased over time in this study.
- The native redox conditions of the Upper Glacial Aquifer are highly oxidizing with elevated concentrations of DO in groundwater. The infiltration of VOW percolate containing elevated biodegradable organic carbon concentrations stimulates microbial activity and the development of reducing conditions under which iron and manganese minerals are used as electron acceptors. The reductive dissolution of these minerals is believed to be the primary source of elevated dissolved iron and manganese concentrations in groundwater. Anticipated or observed redox processes

that are most likely to occur at mixing boundaries between oxidizing and reducing groundwater include ammonia oxidation to nitrate (nitrification), nitrate reduction (denitrification), and iron oxidation.

- Uncertainties in the CSM include the following:
    - The extent to which mulch percolate runoff may increase the aerial extent of VOW percolate infiltration and the width of impacted groundwater
    - The extent to which impermeable pads (e.g., concrete, compacted soil) and mulch piles on permeable soil decrease the natural supply of oxygen to groundwater by reducing oxygen concentrations in the vadose zone and by reducing the infiltration of oxygenated recharge
    - The processes responsible for higher concentrations of metals other than iron and manganese including aluminum, barium, thallium, lead, and arsenic in groundwater impacted from VOW operations (Table 21 in SCDHS, 2016)
    - The release of a variety of trace metals from iron and manganese oxyhydroxides during reductive dissolution including lead, chromium, nickel, zinc, cadmium, and arsenic is well established and likely contributes, as may metals associated with the dissolved organic carbon (Grybos et al., 2007, and references therein).
    - The length, size, and attenuation of groundwater plumes associated with the VOWM facilities

SECTION 8 - CONCLUSIONS AND RECOMMENDATIONS

The following conclusions were derived from the results of the VOW facility study presented in this summary report:

- Many of the same constituents detected at elevated concentrations in impacted groundwater at VOW facilities were detected at elevated concentrations in mulch percolate. However, the concentration or iron, and especially manganese in the percolate samples was too low to account for the concentrations detected in impacted groundwater.
- Runoff impacted with organic carbon has been observed at VOW facilities.
- Anaerobic biodegradation supported by organic carbon concentrations in percolate derived from VOW is driving the reductive dissolution of iron and manganese oxides. This is the likely the primary mechanism for elevated concentrations of manganese and iron in groundwater.
- Fine textured mulch and mulching practices that contribute to sustained wet mulch enhance the strength of mulch percolate. However, fine textured mulch limited the migration of percolate to the bottom of twice-ground mulch piles.
- Based on qualitative observations, percolate running down and through the outside of the mulch piles appears to be a preferential pathway for percolate infiltration to groundwater and runoff of fine-ground mulch piles. Surface water accumulating around the base of mulch piles and at site surface water management facilities (e.g., unlined stormwater ditches and detention basins) may provide another opportunity for percolate to recharge.
- Covering mulch with a breathable cover was an acceptable mulch percolate mitigation approach at the pilot scale. Percolate was not collected beneath the pile, the mulch moisture content decreased substantially, and no difference in the temperature of the covered pile was observed relative to uncovered piles.

  Limiting the covers to the edges of fine-ground mulch piles would favor acceptance of this approach by the VOWM operators. Coarse mulch piles may require either a complete cover or be underlain with an impervious material to collect mulch percolate for treatment. Potential benefits of completely covered piles include less odor associated with dry mulch (piles and sold mulch), longer shelf life, and significantly lighter mulch that will reduce transportation costs. Lining the piles results in the requirement to treat the mulch percolate, may increase leaching, and may enhance the development of anaerobic conditions at the bottom of the piles which could lead to odors. A conceptual mulch percolate mitigation approach for fine-textured mulch piles is provided in **Figure 7-12.** Conceptual mulch percolate mitigation approaches for coarse textured mulch piles is provided in **Figures 7-13** and **Figure 7-14**.

- Application of a liner or cover alone to mitigate percolate infiltration may not protect groundwater quality due to the likely significant role that surface water run-on plays, and contact with the piles generates impacted run-off.
- A key consideration in determining the risk of iron and manganese, now and in the future, is the extent to which natural processes are attenuating iron and manganese with distance and depth within this rapid groundwater flow system. The attenuation of manganese and iron should be expected in the Upper Glacial Aquifer due to its native oxidizing conditions. Evidence indicates that iron is attenuating along the plume flow path relative to chloride and manganese.

The following recommendations for VOW facilities were derived from the results presented in this summary report:

- Reduce stormwater contact with mulch using approaches such as using a breathable cover and/or strategically placing piles where the topography slopes away from the piles.
- Reduce run-off infiltration to groundwater by placing mulch piles on impermeable surfaces or implementing a liner. Stormwater conveyance and detention facilities (e.g., basins) may be lined in order to prevent percolation of water laden with elevated DOC.
- Control surface water run-off through buffers, vegetative filters and/or diversion swales providing segregation of stormwater that is impacted by VOM versus unimpacted stormwater.
- Collect baseline samples of groundwater, water in adjacent ditches/swales, and surface water ponding around the outer edge of the pile.
- Collect post-mitigation samples for a comparison of current groundwater and surface water conditions in comparison to the baseline results.

Potential additional studies/monitoring could include the following:

- Increase the offset to potable wells from the current 200-foot requirement.
- Decrease the size of exempt facilities.
- Monitor surface water and groundwater at mulch processing and storage facilities, including facilities that are currently exempt under Part 361-4 regulations, focused on evaluating the effectiveness of the above recommendations. The need to monitor would be removed if it was demonstrated that impacts to water resources (surface and groundwater) are negligible. Conduct a focused evaluation of a single plume (or a few plumes) to evaluate the distribution, extent (lateral and vertical), concentrations, and attenuation of metals.

SECTION 9 REFERENCES

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Tables

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Summary of Samples and Analyses
Table 3-1

				Field Samples			
Event	Media	Parameters	Analytical Method	Field Samples	Field Blank	D/MS/MSD[a] (Total)	Total
Leachate Study	Solid	TCLP	1311/8260/8270/8081/8151/6010/7470	3	0	0	3
		Total TAL Metals	6010C/7470A	3	0	0	3
		Moisture	1684	3	0	0	3
	Aqueous	TOC	415.1 SM5310B	2	0	0	2
		Germanium	6010C	2	0	0	2
		Molybdenum	6010C	2	0	0	2
		Titanium	6010C	2	0	0	2
		Vanadium	6010C	2	0	0	2
		Nitrate	SM 4500-NO3, 300.0	2	0	0	2
		Nitrite	SM 4500-NO2, 300.0	2	0	0	2
		Ammonia	350.1 ASTM D6919-09	2	0	0	2
		BOD	SM5210B	2	0	0	2
		DOC	SM5310B	2	0	0	2
		Sulfide	SM 4500-S2F	2	0	0	2
		Alkalinity	SM 2320B	2	0	0	2
		Dissolved Methane	RSK 175	2	0	0	2
		Pesticides	8081A 8081B	2	0	0	2
		Alachlor, Atrazine, Metolachlor	8141C	2	0	0	2
		Dichlorvos	8141A	2	0	0	2
		Chloride (anions)	SM 4500-Cl 300.0	2	0	0	2
		Sulfate (anions)	375.2, 300.0	2	0	0	2
		Magnesium (cations)	6010C	2	0	0	2
		Sodium (cations)	6010C	2	0	0	2
		Potassium (cations)	6010C	2	0	0	2
		Calcium (cations)	6010C	2	0	0	2
	Air (SUMMA)	Oxygen, methane, Carbon Dioxide	ALS In House Method	3	0	0	3
		Nitrous Oxide	ALS In House Method	3	0	0	3

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	Media	Parameters	Analytical Method	Field Samples			
				Field Samples	Field Blank	D/MS/MSD[a] (Total Set)	Sub-Total
Surface Water Study	Aqueous	TOC	415.1 SM5310B	1	0	0	1
*Max of 6 samples with 2 heavy rain events		TAL Metals	6010B 6010C	1	0	0	1
		Nitrate	SM 4500-NO3, 300.0	1	0	0	1
		Nitrite	SM 4500-NO2, 300.0	1	0	0	1
		Ammonia	350.1 ASTM D6919-09	1	0	0	1
		BOD	SM5210B	1	0	0	1
		DOC	SM5310B	1	0	0	1
		Sulfide	SM 4500-S2F	1	0	0	1
		Alkalinity	SM 2320B	1	0	0	1
		Dissolved Methane	RSK 175	1	0	0	1
		Pesticides	8081A 8081B	1	0	0	1
		Chloride (anions)	SM 4500-Cl 300.0	1	0	0	1
		Sulfate (anions)	375.2, 300.0	1	0	0	1
		Magnesium (cations)	6010C	1	0	0	1
		Sodium (cations)	6010C	1	0	0	1
		Potassium (cations)	6010C	1	0	0	1
		Calcium (cations)	6010C	1	0	0	1
Vertical Groundwater Sampling	Aqueous	TOC	415.1 SM5310B	6	1	1	8
		TAL Metals	6010B 6010C	6	1	1	8
		Nitrate	SM 4500-NO3, 300.0	6	1	1	8
		Nitrite	SM 4500-NO2, 300.0	6	1	1	8
		Ammonia	350.1 ASTM D6919-09	6	1	1	8
		BOD	SM5210B	6	1	1	8
		DOC	SM5310B	6	1	1	8
		Sulfide	SM 4500-S2F	6	1	1	8
		Alkalinity	SM 2320B	6	1	1	8
		Dissolved Methane	RSK 175	6	1	1	8
		Chloride (anions)	SM 4500-Cl 300.0	6	1	1	8
		Sulfate (anions)	375.2, 300.0	6	1	1	8
		Magnesium (cations)	6010C	6	1	1	8
		Sodium (cations)	6010C	6	1	1	8
		Potassium (cations)	6010C	6	1	1	8
		Calcium (cations)	6010C	6	1	1	8

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	Media	Parameters	Analytical Method	Field Samples			
				Field Samples	Field Blank	D/MS/MSD[a] (Total Sets)	Sub-Total
Pilot Study	Solid	TCLP	1311/8260/8270/8081/8151/6010/7470	11	0	0	11
		Total TAL Metals	6010C/7470A	11	0	0	11
		Moisture	1684	11	0	0	11
* GWM -Four events: Baseline, and 1, 4, and 8 months. QC for baseline event only.	Groundwater Monitoring - Aqueous	TOC	415.1 SM5310B	14	1	1	16
		TAL Metals	6010B 6010C	16	1	1	18
		Germanium	6010C	16	1	1	18
		Titanium	6010C	16	1	1	18
		Vanadium	6010C	16	1	1	18
		Nitrate	SM 4500-NO3, 300.0	16	1	1	18
		Nitrite	SM 4500-NO3, 300.0	16	1	1	18
		Ammonia	350.1 ASTM D6919-09	16	1	1	18
		BOD	SM5210B	16	1	1	18
		DOC	SM5310B	16	1	1	18
		Sulfide	SM 4500-S2F	16	1	1	18
		Alkalinity	SM 2320B	16	1	1	18
		Dissolved Methane	RSK 175	16	1	1	18
		Chloride (anions)	SM 4500-Cl 300.0	16	1	1	18
		Sulfate (anions)	375.2, 300.0	16	1	1	18
		Magnesium (cations)	6010C	16	1	1	18
		Sodium (cations)	6010C	16	1	1	18
		Potassium (cations)	415.1 SM5310B	16	1	1	18
		Calcium (cations)	6010B 6010C	16	1	1	18
		Bromide	9211	4	0	0	4

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Table 3-1

	Media	Parameters	Analytical Method	Field Samples			
				Field Samples	Field Blank	D/MS/MSD[a] (Total Sets)	Sub-Total
* LS - QC performed in conjunction with GWM Samples	Percolate Sampling - Aqueous	TOC	415.1 SM5310B	8	0	0	8
		TAL Metals	6010B 6010C	8	0	0	8
		Germanium	6010C	4	0	0	4
		Molybdenum	6010C	4	0	0	4
		Titanium	6010C	4	0	0	4
		Vanadium	6010C	4	0	0	4
		Nitrate	SM 4500-NO3, 300.0	8	0	0	8
		Nitrite	SM 4500-NO3, 300.0	8	0	0	8
		Ammonia	350.1 ASTM D6919-09	8	0	0	8
		BOD	SM5210B	8	0	0	8
		DOC	SM5310B	8	0	0	8
		Sulfide	SM 4500-S2F	8	0	0	8
		Alkalinity	SM 2320B	8	0	0	8
		Dissolved Methane	RSK 175	8	0	0	8
		Chloride (anions)	SM 4500-Cl 300.0	8	0	0	8
		Sulfate (anions)	375.2, 300.0	8	0	0	8
		Magnesium (cations)	6010C	8	0	0	8
		Sodium (cations)	6010C	8	0	0	8
		Potassium (cations)	6010C	8	0	0	8
		Calcium (cations)	6010C	8	0	0	8
	Air (SUMMA)	Oxygen, methane, Carbon Dioxide	ALS In House Method	10	0	0	10
			ALS In House Method	10	0	0	10

(a) Matrix spike / matrix spike duplicate for organic analyses; matrix spike and laboratory duplicate for inorganic analysis is collected for every 20 samples collected, as applicable.

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Mulch Percolate Study - Mulch Percolate Analtyical Results
Table 3-2

NYSDEC-Organic Mulch Study Leachate Data SDGs: 2195616, 2203500, 2206117, 2227020, 2262901, and 2262904		Location:	Recycled Earth - Leachate 1	Recycled Earth - Leachate 2
		Sample ID:	REC-LEACHATE-121316	REC-LEACHATE-09152017
		Lab Sample Id:	2195616001	2262901001
		Depth:	0 - 0 ft	0 - 0 ft
		Source:	ALS	ALS
		SDG:	2195616	2262901
		Matrix:	WATER	WATER
		Sampled:	12/13/2016 12:00	9/15/2017 11:45
CAS NO.	COMPOUND	UNITS:		
	RSK 175 VOLATILES			
106-97-8	Butane	ug/l	4.3 U	4.3 U
74-84-0	Ethane	ug/l	3.3 U	3.3 U
74-85-1	Ethene	ug/l	2.4 U	2.4 U
74-82-8	Methane	ug/l	388	4540
75-28-5	2-Methyl Propane	ug/l	4.6 U	4.6 U
74-98-6	Propane	ug/l	0.47 J	0.78 J
	PESTICIDES			
309-00-2	Aldrin	ug/l	0.019 U	0.019 U
319-84-6	Alpha Bhc (Alpha Hexachlorocyclohexane)	ug/l	0.019 U	0.019 U
959-98-8	Alpha Endosulfan	ug/l	0.019 U	0.019 U
5103-71-9	cis-Chlordane	ug/l	0.019 U	0.019 U
319-85-7	Beta Bhc (Beta Hexachlorocyclohexane)	ug/l	0.019 U	0.019 U
33213-65-9	Beta Endosulfan	ug/l	0.019 U	0.019 U
5103-74-2	trans-Chlordane	ug/l	0.019 U	0.019 U
319-86-8	Delta BHC (Delta Hexachlorocyclohexane)	ug/l	0.019 U	0.019 U
60-57-1	Dieldrin	ug/l	0.019 U	0.019 U
1031-07-8	Endosulfan Sulfate	ug/l	0.019 U	0.019 U
72-20-8	Endrin	ug/l	0.019 U	0.019 U
7421-93-4	Endrin Aldehyde	ug/l	0.019 U	0.019 U
53494-70-5	Endrin Ketone	ug/l	0.019 U	0.019 U
58-89-9	Gamma Bhc (Lindane)	ug/l	0.019 U	0.019 U
76-44-8	Heptachlor	ug/l	0.019 U	0.019 U
1024-57-3	Heptachlor Epoxide	ug/l	0.019 U	0.019 U
72-43-5	Methoxychlor	ug/l	0.019 U	0.019 U
72-54-8	P,P'-DDD	ug/l	0.019 U	0.019 U
72-55-9	P,P'-DDE	ug/l	0.019 U	0.019 U
50-29-3	P,P'-DDT	ug/l	0.019 U	0.019 U
8001-35-2	Toxaphene	ug/l	0.96 U	0.94 U
	ORGANOPHOSPHORUS COMPOUNDS			
15972-60-8	Alachlor	ug/l	0.94 U	0.96 U
1912-24-9	Atrazine	ug/l	0.94 U	0.96 U
62-73-7	Dichlorvos	ug/l	0.94 U	0.96 U
51218-45-2	Metolachlor	ug/l	0.94 U	0.96 U

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Mulch Percolate Study - Mulch Percolate Analtyical Results
Table 3-2

NYSDEC-Organic Mulch Study Leachate Data SDGs: 2195616, 2203500, 2206117, 2227020, 2262901, and 2262904		Location: Sample ID: Lab Sample Id: Depth: Source: SDG: Matrix: Sampled:	Recycled Earth - Leachate 1 REC-LEACHATE-121316 2195616001 0 - 0 ft ALS 2195616 WATER 12/13/2016 12:00	Recycled Earth - Leachate 2 REC-LEACHATE-09152017 2262901001 0 - 0 ft ALS 2262901 WATER 9/15/2017 11:45
CAS NO.	COMPOUND	UNITS:		
	TOTAL METALS			
7429-90-5	Aluminum	mg/l		1.1 U
7440-36-0	Antimony	mg/l		0.22 U
7440-38-2	Arsenic	mg/l		0.09 U
7440-39-3	Barium	mg/l		0.1 J
7440-41-7	Beryllium	mg/l		0.044 U
7440-43-9	Cadmium	mg/l		0.022 U
7440-70-2	Calcium	mg/l		101
7440-47-3	Chromium, Total	mg/l		0.056 U
7440-48-4	Cobalt	mg/l		0.056 U
7440-50-8	Copper	mg/l		0.11 U
7440-56-4	Germanium	mg/l	0.1 U	0.1 U
7439-89-6	Iron	mg/l		3.9
7439-92-1	Lead	mg/l		0.067 U
7439-95-4	Magnesium	mg/l		15.9
7439-96-5	Manganese	mg/l		0.38
7439-97-6	Mercury	mg/l		0.0005 U
7439-98-7	Molybdenum	mg/l	0.022 U	
7440-02-0	Nickel	mg/l		0.22 U
7440-09-7	Potassium	mg/l		185
7782-49-2	Selenium	mg/l		0.22 U
7440-22-4	Silver	mg/l		0.044 U
7440-23-5	Sodium	mg/l		41.1
7440-28-0	Thallium	mg/l		0.22 U
7440-32-6	Titanium	mg/l	0.063	
7440-62-2	Vanadium	mg/l	0.0077	0.056 U
7440-66-6	Zinc	mg/l		0.22 U
	DISSOLVED METALS			
7429-90-5	Aluminum	mg/l	0.51	
7440-36-0	Antimony	mg/l	0.02 U	
7440-38-2	Arsenic	mg/l	0.015	
7440-39-3	Barium	mg/l	0.051	
7440-41-7	Beryllium	mg/l	0.004 U	
7440-43-9	Cadmium	mg/l	0.002 U	
7440-70-2	Calcium	mg/l	92.5	
7440-47-3	Chromium, Total	mg/l	0.0018 J	
7440-48-4	Cobalt	mg/l	0.005 U	
7440-50-8	Copper	mg/l	0.01 U	
7439-89-6	Iron	mg/l	1.5	
7439-92-1	Lead	mg/l	0.006 U	
7439-95-4	Magnesium	mg/l	15.4	
7439-96-5	Manganese	mg/l	0.57	
7439-97-6	Mercury	mg/l	0.0005 U	
7440-02-0	Nickel	mg/l	0.02 U	
7440-09-7	Potassium	mg/l	50.2	
7782-49-2	Selenium	mg/l	0.017 J	
7440-22-4	Silver	mg/l	0.004 U	
7440-23-5	Sodium	mg/l	75.2	
7440-28-0	Thallium	mg/l	0.0073 J	
7440-62-2	Vanadium	mg/l	0.0068	
7440-66-6	Zinc	mg/l	0.02 U	

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Mulch Percolate Study - Mulch Percolate Analtyical Results
Table 3-2

NYSDEC-Organic Mulch Study Leachate Data SDGs: 2195616, 2203500, 2206117, 2227020, 2262901, and 2262904		Location:	Recycled Earth - Leachate 1	Recycled Earth - Leachate 2
		Sample ID:	REC-LEACHATE-121316	REC-LEACHATE-09152017
		Lab Sample Id:	2195616001	2262901001
		Depth:	0 - 0 ft	0 - 0 ft
		Source:	ALS	ALS
		SDG:	2195616	2262901
		Matrix:	WATER	WATER
		Sampled:	12/13/2016 12:00	9/15/2017 11:45
CAS NO.	COMPOUND	UNITS:		
	WET CHEMISTRY			
ALK	Alkalinity, Total (As CaCO3)	mg/l	295	485
24959-67-9	Bromide	mg/l		
BOD5	Biologic Oxygen Demand, Five Day	mg/l	79	26
16887-00-6	Chloride (As Cl)	mg/l	79.5	129
7664-41-7	Nitrogen, Ammonia (As N)	mg/l	0.118	18
14797-55-8	Nitrogen, Nitrate (As N)	mg/l	0.5 U	0.2 U
14797-65-0	Nitrogen, Nitrite	mg/l	0.5 U	0.2 U
14808-79-8	Sulfate (As SO4)	mg/l	51.4	0.88 J
18496-25-8	Sulfide	mg/l	4.6	1.3
TOC	Total Organic Carbon	mg/l	170	279
DOC	Dissolved Organic Carbon	mg/l	108	203

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Mulch Percolate Study - Mulch Gas Analytical Results
Table 3-3

NYSDEC-Organic Mulch Study Air Data SDGs: P1605887, P1700019, P1700618, P1702253, and P1704668		Location: Sample ID: Lab Sample Id: Depth: Source: SDG: Matrix: Sampled:	Recycled Earth - Mulch Gas 1 REC-AIR-09152017 P1704668-005 - CASLAB P1704668 AIR 9/15/2017 11:25	Recycled Earth - Mulch Gas 2 REC-GAS-121316 P1605887-001 - CASLAB P1605887 AIR 12/13/2016 13:15
CAS NO.	COMPOUND	UNITS:		
	FIXED GASES			
124-38-9	Carbon Dioxide	%v/v	3.36	0.15 U
74-82-8	Methane	%v/v	0.16 U	0.15 U
7782-44-7	Oxygen	%v/v	18.7	22.2

NYSDEC-Organic Mulch Study		Location:	Edgewood - Mulch 1
Mulch Data		Sample ID:	EDC-MULCH-122216
SDGs: 2195610, 2198013, 2206116, 2227335, and 2262902		Lab Sample Id:	2198013001
		Depth:	0 - 0 ft
		Source:	ALS
		SDG:	2198013
		Matrix:	SO
		Sampled:	12/22/2016 13:30
CAS NO.	COMPOUND	UNITS:	
	METALS		
7429-90-5	Aluminum	mg/kg	255
7440-36-0	Antimony	mg/kg	7.2 U
7440-38-2	Arsenic	mg/kg	7.2 U
7440-39-3	Barium	mg/kg	6.2
7440-41-7	Beryllium	mg/kg	3.6 U
7440-43-9	Cadmium	mg/kg	1.8 U
7440-70-2	Calcium	mg/kg	2550
7440-47-3	Chromium, Total	mg/kg	1.5 J
7440-48-4	Cobalt	mg/kg	3.6 U
7440-50-8	Copper	mg/kg	3.9 J
7439-89-6	Iron	mg/kg	522
7439-92-1	Lead	mg/kg	2.7 J
7439-95-4	Magnesium	mg/kg	232
7439-96-5	Manganese	mg/kg	17
7439-97-6	Mercury	mg/kg	0.087 J
7440-02-0	Nickel	mg/kg	7.2 U
7440-09-7	Potassium	mg/kg	141 J
7782-49-2	Selenium	mg/kg	18.1 U
7440-22-4	Silver	mg/kg	1.8 U
7440-23-5	Sodium	mg/kg	181 U
7440-28-0	Thallium	mg/kg	10.8 U
7440-62-2	Vanadium	mg/kg	1.2 J
7440-66-6	Zinc	mg/kg	10.1
	WET CHEMISTRY		
MOIST	Moisture, Percent	%	44.7
TSO	Total Solids	%	55.3
BOD5	Biologic Oxygen Demand, Five Day	mg/kg	
TOC	Total Organic Carbon	mg/kg	

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Surface Water Study Analytical Results
Table 4-1

NYSDEC-Organic Mulch Study			
SW Data		Location:	Ridge P-4-SW
SDG: 2231137		Sample ID:	P-4-SW-05162017
		Lab Sample Id:	2231137001
		Depth:	0 - 0 ft
		Source:	ALS
		SDG:	2231137
		Matrix:	WATER
		Sampled:	5/16/2017 9:55
CAS NO.	COMPOUND	UNITS:	
	RSK 175 VOLATILES		
106-97-8	Butane	ug/l	4.3 U
74-84-0	Ethane	ug/l	3.3 U
74-85-1	Ethene	ug/l	2.4 U
74-82-8	Methane	ug/l	14.1
75-28-5	2-Methyl Propane	ug/l	4.6 U
74-98-6	Propane	ug/l	3.2 U
	PESTICIDES		
309-00-2	Aldrin	ug/l	0.021 U
319-84-6	Alpha Bhc (Alpha Hexachlorocyclohexane)	ug/l	0.015 J
959-98-8	Alpha Endosulfan	ug/l	0.021 U
319-85-7	Beta Bhc (Beta Hexachlorocyclohexane)	ug/l	0.021 U
33213-65-9	Beta Endosulfan	ug/l	0.021 U
5103-71-9	cis-Chlordane	ug/l	0.021 U
5103-74-2	trans-Chlordane	ug/l	0.021 U
319-86-8	Delta BHC (Delta Hexachlorocyclohexane)	ug/l	0.021 U
60-57-1	Dieldrin	ug/l	0.021 U
1031-07-8	Endosulfan Sulfate	ug/l	0.021 U
72-20-8	Endrin	ug/l	0.021 U
7421-93-4	Endrin Aldehyde	ug/l	0.021 U
53494-70-5	Endrin Ketone	ug/l	0.021 U
58-89-9	Gamma Bhc (Lindane)	ug/l	0.021 U
76-44-8	Heptachlor	ug/l	0.021 U
1024-57-3	Heptachlor Epoxide	ug/l	0.021 U
72-43-5	Methoxychlor	ug/l	0.021 U
72-54-8	P,P'-DDD	ug/l	0.021 U
72-55-9	P,P'-DDE	ug/l	0.021 U
50-29-3	P,P'-DDT	ug/l	0.021 U
8001-35-2	Toxaphene	ug/l	1 U
	TOTAL METALS		
7429-90-5	Aluminum	ug/l	620
7440-36-0	Antimony	ug/l	44 U
7440-38-2	Arsenic	ug/l	25
7440-39-3	Barium	ug/l	28
7440-41-7	Beryllium	ug/l	8.8 U
7440-43-9	Cadmium	ug/l	2 J
7440-70-2	Calcium	ug/l	31600
7440-47-3	Chromium, Total	ug/l	7.1 J
7440-48-4	Cobalt	ug/l	11 U
7440-50-8	Copper	ug/l	11 J
7439-89-6	Iron	ug/l	860
7439-92-1	Lead	ug/l	5.3 J
7439-95-4	Magnesium	ug/l	14600
7439-96-5	Manganese	ug/l	220
7439-97-6	Mercury	ug/l	0.5 U
7440-02-0	Nickel	ug/l	44 U
7440-09-7	Potassium	ug/l	123000
7782-49-2	Selenium	ug/l	44 U
7440-22-4	Silver	ug/l	8.8 U
7440-23-5	Sodium	ug/l	76400
7440-28-0	Thallium	ug/l	44 U
7440-62-2	Vanadium	ug/l	11 U
7440-66-6	Zinc	ug/l	30 J

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Surface Water Study Analytical Results
Table 4-1

NYSDEC-Organic Mulch Study		Location:	Ridge P-4-SW
SW Data		Sample ID:	P-4-SW-05162017
SDG: 2231137		Lab Sample Id:	2231137001
		Depth:	0 - 0 ft
		Source:	ALS
		SDG:	2231137
		Matrix:	WATER
		Sampled:	5/16/2017 9:55
CAS NO.	COMPOUND	UNITS:	
	WET CHEMISTRY		
ALK	Alkalinity, Total (As CaCO3)	mg/l	148
BOD5	Biologic Oxygen Demand, Five Day	mg/l	10.5
16887-00-6	Chloride (As Cl)	mg/l	197
DOC	Dissolved Organic Carbon	mg/l	82.6
7664-41-7	Nitrogen, Ammonia (As N)	mg/l	0.63
14797-55-8	Nitrogen, Nitrate (As N)	mg/l	0.06 J
14797-65-0	Nitrogen, Nitrite	mg/l	0.2 U
14808-79-8	Sulfate (As SO4)	mg/l	0.5 J
18496-25-8	Sulfide	mg/l	1 U
TOC	Total Organic Carbon	mg/l	101

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Vertical Groundwater Study Analytical Results
Table 5-1

NYSDEC-Organic Mulch Study Groundwater Data SDGs: 2186904, 2190421, 2206117, 2217404, and 2262903		Location: Sample ID: Lab Sample Id: Depth: Source: SDG: Matrix: Sampled:	TOGS Class GA Groundwater Standards[1]	Edgewood Downgradient-36 TMW-DOWN-36 2186904003 0 - 0 ft ALS 2186904 WATER 11/1/2016 16:10	Dup of Edgewood Downgradient-36 Edgewood Downgradient-36D TMW-DOWN-36 DUP 2186904004 0 - 0 ft ALS 2186904 WATER 11/1/2016 16:10	Edgewood Downgradient-46 TMW-DOWN-46 2186904006 0 - 0 ft ALS 2186904 WATER 11/2/2016 9:25	Edgewood Downgradient-56 TMW-DOWN-56 2186904007 0 - 0 ft ALS 2186904 WATER 11/2/2016 11:15	Edgewood Downgradient-66 TMW-DOWN-66 2186904008 0 - 0 ft ALS 2186904 WATER 11/2/2016 12:00
CAS NO.	COMPOUND	UNITS:						
	RSK 175 VOLATILES							
106-97-8	Butane	ug/l	NS	4.3 U	4.3 U	4.3 U	4.3 U	4.3 U
74-84-0	Ethane	ug/l	NS	0.46 J	0.59 J	0.99 J	0.62 J	7.8
74-85-1	Ethene	ug/l	NS	2.4 U	2.4 U	0.45 J	2.4 U	3.5
74-82-8	Methane	ug/l	NS	2.2	2.2	3.3	2.6	29.1
75-28-5	2-Methyl Propane	ug/l	NS	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U
74-98-6	Propane	ug/l	NS	0.4 J	0.38 J	0.64 J	0.36 J	5.2
	TOTAL METALS							
7429-90-5	Aluminum	ug/l	NS			1100		
7440-36-0	Antimony	ug/l	3			22 U		
7440-38-2	Arsenic	ug/l	25			9 U		
7440-39-3	Barium	ug/l	1000			34		
7440-41-7	Beryllium	ug/l	3 (G)			4.4 U		
7440-43-9	Cadmium	ug/l	5			2.2 U		
7440-70-2	Calcium	ug/l	NS			24300		
7440-47-3	Chromium	ug/l	50			77		
7440-48-4	Cobalt	ug/l	NS			4.1 J		
7440-50-8	Copper	ug/l	200			100		
7440-56-4	Germanium	ug/l	NS					
7439-89-6	Iron	ug/l	300			14800		
7439-92-1	Lead	ug/l	25			3.4 J		
7439-95-4	Magnesium	ug/l	35000 (G)			3200		
7439-96-5	Manganese	ug/l	300			470		
7439-97-6	Mercury	ug/l	0.7			0.5 U		
7439-98-7	Molybdenum	ug/l	NS					
7440-02-0	Nickel	ug/l	100			22		
7440-09-7	Potassium	ug/l	NS			1700		
7782-49-2	Selenium	ug/l	10			22 U		
7440-22-4	Silver	ug/l	50			4.4 U		
7440-23-5	Sodium	ug/l	20000			11500		
7440-28-0	Thallium	ug/l	0.5 (G)			22 U		
7440-32-6	Titanium	ug/l	NS					
7440-62-2	Vanadium	ug/l	NS			5 J		
7440-66-6	Zinc	ug/l	2000 (G)			93		

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Vertical Groundwater Study Analytical Results
Table 5-1

NYSDEC-Organic Mulch Study Groundwater Data SDGs: 2186904, 2190421, 2206117, 2217404, and 2262903			TOGS Class GA Groundwater Standards[1]	Edgewood Downgradient-36	Dup of Edgewood Downgradient-36 Edgewood Downgradient-36D	Edgewood Downgradient-46	Edgewood Downgradient-56	Edgewood Downgradient-66
		Sample ID:		TMW-DOWN-36	TMW-DOWN-36 DUP	TMW-DOWN-46	TMW-DOWN-56	TMW-DOWN-66
		Lab Sample Id:		2186904003	2186904004	2186904006	2186904007	2186904008
		Depth:		0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft
		Source:		ALS	ALS	ALS	ALS	ALS
		SDG:		2186904	2186904	2186904	2186904	2186904
		Matrix:		WATER	WATER	WATER	WATER	WATER
		Sampled:		11/1/2016 16:10	11/1/2016 16:10	11/2/2016 9:25	11/2/2016 11:15	11/2/2016 12:00
CAS NO.	COMPOUND	UNITS:						
	DISSOLVED METALS							
7429-90-5	Aluminum	ug/l	NS	100 U	100 U	740	100 U	100 U
7440-36-0	Antimony	ug/l	3	20 U	20 U	20 U	20 U	20 U
7440-38-2	Arsenic	ug/l	25	4.4 J	3.1 J	3.7 J	8 U	5.2 J
7440-39-3	Barium	ug/l	1000	18	12	33	18	84
7440-41-7	Beryllium	ug/l	3 (G)	4 U	4 U	4 U	4 U	4 U
7440-43-9	Cadmium	ug/l	5	2 U	2 U	2 U	2 U	2 U
7440-70-2	Calcium	ug/l	NS	33300	18700	25600	27000	137000
7440-47-3	Chromium	ug/l	50	5 U	5 U	71	5 U	5 U
7440-48-4	Cobalt	ug/l	NS	5 U	5 U	4.7 J	2.7 J	7.9
7440-50-8	Copper	ug/l	200	10 U	10 U	94	10 U	10 U
7439-89-6	Iron	ug/l	300	130	91	14100	780	6200
7439-92-1	Lead	ug/l	25	6 U	6 U	4.7 J	6 U	6 U
7439-95-4	Magnesium	ug/l	35000 (G)	2500	1500	3100	2300	11300
7439-96-5	Manganese	ug/l	300	290	220	470	310	1900
7439-97-6	Mercury	ug/l	0.7	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
7440-02-0	Nickel	ug/l	100	7.2 J	20 U	22	11 J	33
7440-09-7	Potassium	ug/l	NS	3700	3200	1600	2100	7200
7782-49-2	Selenium	ug/l	10	20 U	20 U	20 U	20 U	20 U
7440-22-4	Silver	ug/l	50	4 U	4 U	4 U	4 U	4 U
7440-23-5	Sodium	ug/l	20000	18600	17700	12000	12700	34800
7440-28-0	Thallium	ug/l	0.5 (G)	9.7 J	9.9 J	6.8 J	6.9 J	8.1 J
7440-62-2	Vanadium	ug/l	NS	5 U	5 U	3.7 J	5 U	6.4
7440-66-6	Zinc	ug/l	2000 (G)	6.9 J	20 U	89	9.5 J	18 J
	WET CHEMISTRY							
ALK	Alkalinity, Total (As CaCO3)	mg/l	NS	52	44	39	42	72
BOD5	Biologic Oxygen Demand, Five Day	mg/l	NS	0.99 J	0.86 J	2 U	2 U	2 U
24959-67-9	Bromide	mg/l	2 (G)					
16887-00-6	Chloride (As Cl)	mg/l	250	16.3	15.8	9.7	11.4	45.2
DOC	Dissolved Organic Carbon	mg/l	NS	0.66	0.67	0.88	0.51	3.7
7664-41-7	Nitrogen, Ammonia (As N)	mg/l	2	0.072 J	0.1 U	0.1 U	0.172	0.178
14797-55-8	Nitrogen, Nitrate (As N)	mg/l	10	0.62	0.62	0.36	0.36	0.86
14797-65-0	Nitrogen, Nitrite	mg/l	10	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
14808-79-8	Sulfate (As SO4)	mg/l	250	45.2	35.5	26	38.5	266
18496-25-8	Sulfide	mg/l	0.05 (G)	1 U	1 U	0.51 J	0.51 J	1.8
TOC	Total Organic Carbon	mg/l	NS	1.1	1.2	0.64	0.62	4.5

[1] Criteria are Ambient Water Quality Standards and Guidance Values (Water Class - GA), June 1998.
NS - No standard.
(G) - Guidance Value

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Vertical Groundwater Study Analytical Results
Table 5-1

NYSDEC-Organic Mulch Study Groundwater Data SDGs: 2186904, 2190421, 2206117, 2217404, and 2262903		Location: Sample ID: Lab Sample Id: Depth: Source: SDG: Matrix: Sampled:	TOGS Class GA Groundwater Standards[1]	Edgewood Upgradient-36 TMW-UP-36 2186904001 0 - 0 ft ALS 2186904 WATER 11/1/2016 11:25	Edgewood Upgradient-46 TMW-UP-46 2186904002 0 - 0 ft ALS 2186904 WATER 11/1/2016 12:30
CAS NO.	COMPOUND	UNITS:			
	RSK 175 VOLATILES				
106-97-8	Butane	ug/l	NS	4.3 U	4.3 U
74-84-0	Ethane	ug/l	NS	2 J	3.6
74-85-1	Ethene	ug/l	NS	0.92 J	1.4 J
74-82-8	Methane	ug/l	NS	8.7	13.5
75-28-5	2-Methyl Propane	ug/l	NS	4.6 U	4.6 U
74-98-6	Propane	ug/l	NS	0.91 J	2.1 J
	TOTAL METALS				
7429-90-5	Aluminum	ug/l	NS		
7440-36-0	Antimony	ug/l	3		
7440-38-2	Arsenic	ug/l	25		
7440-39-3	Barium	ug/l	1000		
7440-41-7	Beryllium	ug/l	3 (G)		
7440-43-9	Cadmium	ug/l	5		
7440-70-2	Calcium	ug/l	NS		
7440-47-3	Chromium	ug/l	50		
7440-48-4	Cobalt	ug/l	NS		
7440-50-8	Copper	ug/l	200		
7440-56-4	Germanium	ug/l	NS		
7439-89-6	Iron	ug/l	300		
7439-92-1	Lead	ug/l	25		
7439-95-4	Magnesium	ug/l	35000 (G)		
7439-96-5	Manganese	ug/l	300		
7439-97-6	Mercury	ug/l	0.7		
7439-98-7	Molybdenum	ug/l	NS		
7440-02-0	Nickel	ug/l	100		
7440-09-7	Potassium	ug/l	NS		
7782-49-2	Selenium	ug/l	10		
7440-22-4	Silver	ug/l	50		
7440-23-5	Sodium	ug/l	20000		
7440-28-0	Thallium	ug/l	0.5 (G)		
7440-32-6	Titanium	ug/l	NS		
7440-62-2	Vanadium	ug/l	NS		
7440-66-6	Zinc	ug/l	2000 (G)		

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Vertical Groundwater Study Analytical Results
Table 5-1

NYSDEC-Organic Mulch Study Groundwater Data SDGs: 2186904, 2190421, 2206117, 2217404, and 2262903		Location: Sample ID: Lab Sample Id: Depth: Source: SDG: Matrix: Sampled:	TOGS Class GA Groundwater Standards[1]	Edgewood Upgradient-36 TMW-UP-36 2186904001 0 - 0 ft ALS 2186904 WATER 11/1/2016 11:25	Edgewood Upgradient-46 TMW-UP-46 2186904002 0 - 0 ft ALS 2186904 WATER 11/1/2016 12:30
CAS NO.	COMPOUND	UNITS:			
	DISSOLVED METALS				
7429-90-5	Aluminum	ug/l	NS	33 U	100 U
7440-36-0	Antimony	ug/l	3	20 U	20 U
7440-38-2	Arsenic	ug/l	25	3.8 J	4.1 J
7440-39-3	Barium	ug/l	1000	23	18
7440-41-7	Beryllium	ug/l	3 (G)	4 U	4 U
7440-43-9	Cadmium	ug/l	5	2 U	2 U
7440-70-2	Calcium	ug/l	NS	31100	26700
7440-47-3	Chromium	ug/l	50	5 U	5 U
7440-48-4	Cobalt	ug/l	NS	7.8	5
7440-50-8	Copper	ug/l	200	10 U	10 U
7439-89-6	Iron	ug/l	300	200	160
7439-92-1	Lead	ug/l	25	6 U	6 U
7439-95-4	Magnesium	ug/l	35000 (G)	4000	2400
7439-96-5	Manganese	ug/l	300	600	590
7439-97-6	Mercury	ug/l	0.7	0.5 U	0.5 U
7440-02-0	Nickel	ug/l	100	6.8 J	7.9 J
7440-09-7	Potassium	ug/l	NS	3000	2100
7782-49-2	Selenium	ug/l	10	20 U	20 U
7440-22-4	Silver	ug/l	50	4 U	4 U
7440-23-5	Sodium	ug/l	20000	12500	11000
7440-28-0	Thallium	ug/l	0.5 (G)	8.4 J	8.4 J
7440-62-2	Vanadium	ug/l	NS	2 J	1.7 J
7440-66-6	Zinc	ug/l	2000 (G)	20 U	20 U
	WET CHEMISTRY				
ALK	Alkalinity, Total (As CaCO3)	mg/l	NS	63	55
BOD5	Biologic Oxygen Demand, Five Day	mg/l	NS	8.3	3.3
24959-67-9	Bromide	mg/l	2 (G)		
16887-00-6	Chloride (As Cl)	mg/l	250	12.1	9.9
DOC	Dissolved Organic Carbon	mg/l	NS	5.5	0.86
7664-41-7	Nitrogen, Ammonia (As N)	mg/l	2	0.106	0.117
14797-55-8	Nitrogen, Nitrate (As N)	mg/l	10	0.9	0.9
14797-65-0	Nitrogen, Nitrite	mg/l	10	0.2 U	0.2 U
14808-79-8	Sulfate (As SO4)	mg/l	250	41.5	24.3
18496-25-8	Sulfide	mg/l	0.05 (G)	0.54 J	1.2
TOC	Total Organic Carbon	mg/l	NS	9.8	1.4

[1]Criteria are Ambient Water Quality Standards and Guidance Values (Water Class - GA), June 1998.
NS - No standard.
(G) - Guidance Value

Vegetative Organic Waste Management Facility
Research Project Summary Report
Mulch Pile Temperature Readings (F) - Pilot Study
Table 6-1

Pile ID	Date	North	South	East	West
Pile 1	12/13/2016	115	122	113	110
Pile 1	12/22/2016	118	120	110	115
Pile 1	1/4/2017	116	126	86	91
Pile 1	1/20/2017	101	99	96	98
Pile 1	2/2/2017	85	80	84	77
Pile 1	2/21/2017	68	66	78	90
Pile 1	3/23/2017	68	77	74	74
Pile 1	5/2/2017	126	122	128	120
Pile 1	6/13/2017	140	129	139	135
Pile 1	6/28/2017	133	127	129	131
Pile 1	9/15/2017	125	126	127	129
Pile 2	12/13/2016	80	87	110	105
Pile 2	12/22/2016	77	81	115	120
Pile 2	1/4/2017	78	126	86	80
Pile 2	1/20/2017	86	99	92	90
Pile 2	2/2/2017	90	88	93	94
Pile 2	2/21/2017	102	98	80	84
Pile 2	3/23/2017	86	80	84	71
Pile 2	5/2/2017	122	121	114	95
Pile 2	6/13/2017	136	142	146	137
Pile 2	6/28/2017	138	130	140	129
Pile 2	9/15/2017	133	123	131	129
Pile 3	12/13/2016	80	97	90	87
Pile 3	12/22/2016	85	90	98	82
Pile 3	1/4/2017	123	121	--	--
Pile 3	1/20/2017	102	109	95	110
Pile 3	2/2/2017	88	80	86	92
Pile 3	2/21/2017	54	63	64	60
Pile 3	3/23/2017	72	79	84	70
Pile 3	5/2/2017	120	122	118	116
Pile 3	6/13/2017	121	126	--	--
Pile 3	6/28/2017	136	132	129	128
Pile 3	9/15/2017	125	130	126	130
Pile 4	12/13/2016	101	104	117	124
Pile 4	12/22/2016	82	94	125	130
Pile 4	1/4/2017	108	96	123	122
Pile 4	1/20/2017	103	100	111	103
Pile 4	2/2/2017	88	99	97	100
Pile 4	2/21/2017	54	63	64	60
Pile 4	3/23/2017	72	79	84	70
Pile 4	5/2/2017	120	122	118	116
Pile 4	6/13/2017	140	136	129	134
Pile 4	6/28/2017	136	132	129	128
Pile 4	9/15/2017	137	139	122	120

NYSDEC-Organic Mulch Study Groundwater Data SDGs: 2186904, 2190421, 2206117, 2217404, and 2262903		Location: Sample ID: Lab Sample Id: Depth: Source: SDG: Matrix: Sampled:	TOGS Class GA Groundwater Standards[1]	Ridge MW-1 MW-1-1172016 2190421001 0 - 0 ft ALS 2190421 WATER 11/17/2016 10:10	Ridge MW-1 MW-1 2206117003 0 - 0 ft ALS 2206117 WATER 2/2/2017 15:40	Ridge MW-1 MW-1-03232017 2217404001 0 - 0 ft ALS 2217404 WATER 3/23/2017 11:30	Dup of Ridge MW-1-03232017 Ridge MW-1 MW-1-03232017-D 2217404002 0 - 0 ft ALS 2217404 WATER 3/23/2017 11:30	Ridge MW-1 MW-1-06282017 2242526001 0 - 0 ft ALS 2242526 WATER 6/28/2017 15:30	Ridge MW-1 MW-1-09152017 2262903001 0 - 0 ft ALS 2262903 WATER 9/14/2017 9:00
CAS NO.	COMPOUND	UNITS:							
	RSK 175 VOLATILES								
106-97-8	Butane	ug/l	NS	4.3 U		4.3 U	4.3 U	4.3 U	4.3 U
74-84-0	Ethane	ug/l	NS	3.3 U		3.3 U	3.3 U	3.3 U	3.3 U
74-85-1	Ethene	ug/l	NS	2.4 U		2.4 U	2.4 U	2.4 U	2.4 U
74-82-8	Methane	ug/l	NS	0.57 J		1.5 U	1.5 U	1.5 U	1.5 U
75-28-5	2-Methyl Propane	ug/l	NS	4.6 U		4.6 U	4.6 U	4.6 U	4.6 U
74-98-6	Propane	ug/l	NS	3.2 U		3.2 U	3.2 U	3.2 U	3.2 U
	TOTAL METALS								
7429-90-5	Aluminum	ug/l	NS	350		110 U	110 U		110 U
7440-36-0	Antimony	ug/l	3	22 U		22 U	22 U		22 U
7440-38-2	Arsenic	ug/l	25	9 U		9 U	9 U		9 U
7440-39-3	Barium	ug/l	1000	45		13	14		12
7440-41-7	Beryllium	ug/l	3 (G)	4.4 U		4.4 U	4.4 U		4.4 U
7440-43-9	Cadmium	ug/l	5	2.2 U		2.2 U	2.2 U		2.2 U
7440-70-2	Calcium	ug/l	NS	22000		6900	6900		6900
7440-47-3	Chromium	ug/l	50	5.6 U		5.6 U	5.6 U		5.6 U
7440-48-4	Cobalt	ug/l	NS	5.6 U		5.6 U	5.6 U		5.6 U
7440-50-8	Copper	ug/l	200	11 U		11 U	11 U		11 U
7440-56-4	Germanium	ug/l	NS	100 U		100 U	100 U		100 U
7439-89-6	Iron	ug/l	300	440		27 J	24 J		67 U
7439-92-1	Lead	ug/l	25	6.7 U		6.7 U	3.6 J		6.7 U
7439-95-4	Magnesium	ug/l	35000 (G)	3000		1400	1400		1300
7439-96-5	Manganese	ug/l	300	330		22	22		8.4
7439-97-6	Mercury	ug/l	0.7	0.5 U		0.5 U	0.5 U		0.5 U
7439-98-7	Molybdenum	ug/l	NS	22 U					
7440-02-0	Nickel	ug/l	100	22 U		22 U	22 U		22 U
7440-09-7	Potassium	ug/l	NS	1700		920	890		780
7782-49-2	Selenium	ug/l	10	22 U		22 U	22 U		22 U
7440-22-4	Silver	ug/l	50	4.4 U		4.4 U	4.4 U		4.4 U
7440-23-5	Sodium	ug/l	20000	3800		2100	2000		2000
7440-28-0	Thallium	ug/l	0.5 (G)	22 U		22 U	22 U		22 U
7440-32-6	Titanium	ug/l	NS	12 J					
7440-62-2	Vanadium	ug/l	NS	5.6 U		5.6 U	5.6 U		5.6 U
7440-66-6	Zinc	ug/l	2000 (G)	22 U		22 U	22 U		22 U
	DISSOLVED METALS								
7429-90-5	Aluminum	ug/l	NS	100 U				100 U	
7440-36-0	Antimony	ug/l	3	20 U				20 U	
7440-38-2	Arsenic	ug/l	25	8 U				8 U	
7440-39-3	Barium	ug/l	1000	37				13	
7440-41-7	Beryllium	ug/l	3 (G)	4 U				4 U	
7440-43-9	Cadmium	ug/l	5	2 U				2 U	
7440-70-2	Calcium	ug/l	NS	19800				6500	
7440-47-3	Chromium	ug/l	50	5 U				5 U	
7440-48-4	Cobalt	ug/l	NS	5 U				5 U	
7440-50-8	Copper	ug/l	200	10 U				10 U	
7439-89-6	Iron	ug/l	300	60 U				60 U	
7439-92-1	Lead	ug/l	25	6 U				6 U	
7439-95-4	Magnesium	ug/l	35000 (G)	2900				1300	
7439-96-5	Manganese	ug/l	300	280				13	
7439-97-6	Mercury	ug/l	0.7	0.5 U				0.5 U	
7440-02-0	Nickel	ug/l	100	20 U				20 U	
7440-09-7	Potassium	ug/l	NS	1400				940	
7782-49-2	Selenium	ug/l	10	20 U				20 U	
7440-22-4	Silver	ug/l	50	4 U				4 U	
7440-23-5	Sodium	ug/l	20000	3500				1900	
7440-28-0	Thallium	ug/l	0.5 (G)	12 J				7.5 J	
7440-62-2	Vanadium	ug/l	NS	5 U				5 U	
7440-66-6	Zinc	ug/l	2000 (G)	20 U				20 U	

Vegetative Organic Waste Management Facility
Research Project Summary Report
Groundwater Analytical Results - Pilot Study
Table 6-2

NYSDEC-Organic Mulch Study Groundwater Data SDGs: 2186904, 2190421, 2206117, 2217404, and 2262903		Location: Sample ID: Lab Sample Id: Depth: Source: SDG: Matrix: Sampled:	TOGS Class GA Groundwater Standards[1]	Ridge MW-1 MW-1-1172016 2190421001 0 - 0 ft ALS 2190421 WATER 11/17/2016 10:10	Ridge MW-1 MW-1 2206117003 0 - 0 ft ALS 2206117 WATER 2/2/2017 15:40	Ridge MW-1 MW-1-03232017 2217404001 0 - 0 ft ALS 2217404 WATER 3/23/2017 11:30	Dup of Ridge MW-1-03232017 Ridge MW-1 MW-1-03232017-D 2217404002 0 - 0 ft ALS 2217404 WATER 3/23/2017 11:30	Ridge MW-1 MW-1-06282017 2242526001 0 - 0 ft ALS 2242526 WATER 6/28/2017 15:30	Ridge MW-1 MW-1-09152017 2262903001 0 - 0 ft ALS 2262903 WATER 9/14/2017 9:00
CAS NO.	COMPOUND	UNITS:							
	WET CHEMISTRY								
ALK	Alkalinity, Total (As CaCO3)	mg/l	NS	23		12	11	10	9
BOD5	Biologic Oxygen Demand, Five Day	mg/l	NS	2 U		0.85 J	0.92 J	2 U	2.6
24959-67-9	Bromide	mg/l	2 (G)		0.08 J	0.12 J	0.12 J		0.6 U
16887-00-6	Chloride (As Cl)	mg/l	250	6.1		3.6	3.5	3	2.6
DOC	Dissolved Organic Carbon	mg/l	NS	1.4		1.4	0.85	0.9	1.1
7664-41-7	Nitrogen, Ammonia (As N)	mg/l	2	0.1 U		0.1 U	0.1 U	0.068 J	0.1 U
14797-55-8	Nitrogen, Nitrate (As N)	mg/l	10	2.3		2.2	2.1	1.5	1.6
14797-65-0	Nitrogen, Nitrite	mg/l	10	0.2 U		0.2 U	0.2 U	0.2 U	0.2 U
14808-79-8	Sulfate (As SO4)	mg/l	250	35.8		9.8	9.5	7.8	7.2
18496-25-8	Sulfide	mg/l	0.05 (G)	1 U		1 U	1 U	0.19 J	1 U
TOC	Total Organic Carbon	mg/l	NS	1.7		1.3	0.92	1.1	1

[1]Criteria are Ambient Water Quality Standards and Guidance Values (Water Class - GA), June 1998.
NS - No standard.
(G) - Guidance Value

Vegetative Organic Waste Management Facility
Research Project Summary Report
Groundwater Analytical Results - Pilot Study
Table 6-2

					Ridge Dup of MW-2-1172016				
NYSDEC-Organic Mulch Study Groundwater Data SDGs: 2186904, 2190421, 2206117, 2217404, and 2262903		Location:		Ridge MW-2	Ridge MW-2	Ridge MW-2	Ridge MW-2	Ridge MW-2	Ridge MW-2
		Sample ID:		MW-2-1172016	MW-2-1172016-DUP	MW-2	MW-2-03232017	MW-2-06282017	MW-2-09152017
		Lab Sample Id:	TOGS Class GA	2190421002	2190421003	2206117004	2217404003	2242526002	2262903002
		Depth:	Groundwater	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft
		Source:	Standards[1]	ALS	ALS	ALS	ALS	ALS	ALS
		SDG:		2190421	2190421	2206117	2217404	2242526	2262903
		Matrix:		WATER	WATER	WATER	WATER	WATER	WATER
		Sampled:		11/17/2016 11:50	11/17/2016 11:50	2/2/2017 15:45	3/23/2017 13:35	6/28/2017 14:30	9/14/2017 10:20
CAS NO.	COMPOUND	UNITS:							
	RSK 175 VOLATILES								
106-97-8	Butane	ug/l	NS	4.3 U	4.3 U		4.3 U	4.3 U	4.3 U
74-84-0	Ethane	ug/l	NS	3.3 U	3.3 U		3.3 U	3.3 U	3.3 U
74-85-1	Ethene	ug/l	NS	2.4 U	2.4 U		2.4 U	2.4 U	2.4 U
74-82-8	Methane	ug/l	NS	1.5 U	1.5 U		1.5 U	1.5 U	1.5 U
75-28-5	2-Methyl Propane	ug/l	NS	4.6 U	4.6 U		4.6 U	4.6 U	4.6 U
74-98-6	Propane	ug/l	NS	3.2 U	3.2 U		3.2 U	3.2 U	3.2 U
	TOTAL METALS								
7429-90-5	Aluminum	ug/l	NS	69 J	70 J		120		110 U
7440-36-0	Antimony	ug/l	3	22 U	22 U		22 U		22 U
7440-38-2	Arsenic	ug/l	25	9 U	9 U		9 U		9 U
7440-39-3	Barium	ug/l	1000	12	11 J		37		26
7440-41-7	Beryllium	ug/l	3 (G)	4.4 U	4.4 U		4.4 U		4.4 U
7440-43-9	Cadmium	ug/l	5	2.2 U	2.2 U		2.2 U		2.2 U
7440-70-2	Calcium	ug/l	NS	5300	5300		4200		3200
7440-47-3	Chromium	ug/l	50	5.6 U	5.6 U		5.6 U		5.6 U
7440-48-4	Cobalt	ug/l	NS	5.6 U	5.6 U		5.6 U		5.6 U
7440-50-8	Copper	ug/l	200	11 U	11 U		11 U		11 U
7440-56-4	Germanium	ug/l	NS				100 U		100 U
7439-89-6	Iron	ug/l	300	57 J	63 J		120		67 U
7439-92-1	Lead	ug/l	25	6.7 U	6.7 U		6.7 U		6.7 U
7439-95-4	Magnesium	ug/l	35000 (G)	650	630		730		590
7439-96-5	Manganese	ug/l	300	110	100		24		15
7439-97-6	Mercury	ug/l	0.7	0.5 U	0.5 U		0.5 U		0.5 U
7439-98-7	Molybdenum	ug/l	NS						
7440-02-0	Nickel	ug/l	100	22 U	22 U		22 U		22 U
7440-09-7	Potassium	ug/l	NS	1500	1500		2200		1500
7782-49-2	Selenium	ug/l	10	22 U	22 U		22 U		22 U
7440-22-4	Silver	ug/l	50	4.4 U	4.4 U		4.4 U		4.4 U
7440-23-5	Sodium	ug/l	20000	2600	2400		2600		3800
7440-28-0	Thallium	ug/l	0.5 (G)	22 U	22 U		22 U		22 U
7440-32-6	Titanium	ug/l	NS						
7440-62-2	Vanadium	ug/l	NS	5.6 U	5.6 U		5.6 U		5.6 U
7440-66-6	Zinc	ug/l	2000 (G)	22 U	22 U		22 U		22 U
	DISSOLVED METALS								
7429-90-5	Aluminum	ug/l	NS	100 U	100 U			100 U	
7440-36-0	Antimony	ug/l	3	20 U	20 U			20 U	
7440-38-2	Arsenic	ug/l	25	8 U	8 U			8 U	
7440-39-3	Barium	ug/l	1000	9.6 J	10			24	
7440-41-7	Beryllium	ug/l	3 (G)	4 U	4 U			4 U	
7440-43-9	Cadmium	ug/l	5	2 U	2 U			2 U	
7440-70-2	Calcium	ug/l	NS	5100	5200			3800	
7440-47-3	Chromium	ug/l	50	5 U	5 U			5 U	
7440-48-4	Cobalt	ug/l	NS	5 U	5 U			5 U	
7440-50-8	Copper	ug/l	200	10 U	10 U			10 U	
7439-89-6	Iron	ug/l	300	60 U	60 U			60 U	
7439-92-1	Lead	ug/l	25	2.9 J	6 U			6 U	
7439-95-4	Magnesium	ug/l	35000 (G)	600	620			650	
7439-96-5	Manganese	ug/l	300	92	99			19	
7439-97-6	Mercury	ug/l	0.7	0.5 U	0.5 U			0.5 U	
7440-02-0	Nickel	ug/l	100	20 U	20 U			20 U	
7440-09-7	Potassium	ug/l	NS	1400	1400			1400	
7782-49-2	Selenium	ug/l	10	20 U	20 U			20 U	
7440-22-4	Silver	ug/l	50	4 U	4 U			4 U	
7440-23-5	Sodium	ug/l	20000	2300	2300			2900	
7440-28-0	Thallium	ug/l	0.5 (G)	12 J	9.2 J			9.6 J	
7440-62-2	Vanadium	ug/l	NS	5 U	5 U			5 U	
7440-66-6	Zinc	ug/l	2000 (G)	20 U	20 U			20 U	

Vegetative Organic Waste Management Facility
Research Project Summary Report
Groundwater Analytical Results - Pilot Study
Table 6-2

NYSDEC-Organic Mulch Study		Location:		Ridge MW-2	Ridge MW-2 (Ridge Dup of MW-2-1172016)	Ridge MW-2	Ridge MW-2	Ridge MW-2	Ridge MW-2
Groundwater Data		Sample ID:		MW-2-1172016	MW-2-1172016-DUP	MW-2	MW-2-03232017	MW-2-06282017	MW-2-09152017
SDGs: 2186904, 2190421, 2206117, 2217404, and 2262903		Lab Sample Id:	TOGS Class GA	2190421002	2190421003	2206117004	2217404003	2242526002	2262903002
		Depth:	Groundwater	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft
		Source:	Standards[1]	ALS	ALS	ALS	ALS	ALS	ALS
		SDG:		2190421	2190421	2206117	2217404	2242526	2262903
		Matrix:		WATER	WATER	WATER	WATER	WATER	WATER
		Sampled:		11/17/2016 11:50	11/17/2016 11:50	2/2/2017 15:45	3/23/2017 13:35	6/28/2017 14:30	9/14/2017 10:20
CAS NO.	COMPOUND	UNITS:							
	WET CHEMISTRY								
ALK	Alkalinity, Total (As CaCO3)	mg/l	NS	10	11		3 J	4 J	4 J
BOD5	Biologic Oxygen Demand, Five Day	mg/l	NS	2 U	2 U		2 U	2 U	0.93 J
24959-67-9	Bromide	mg/l	2 (G)			0.08 J	0.2 U		0.6 U
16887-00-6	Chloride (As Cl)	mg/l	250	2.8	2.9		4.3	3.8	2.8
DOC	Dissolved Organic Carbon	mg/l	NS	0.71	0.66		0.88	0.5 J	0.55
7664-41-7	Nitrogen, Ammonia (As N)	mg/l	2	0.031 J	0.1 U		0.1 U	0.284	0.1 U
14797-55-8	Nitrogen, Nitrate (As N)	mg/l	10	0.88	0.84		3.9	1.7	1.5
14797-65-0	Nitrogen, Nitrite	mg/l	10	0.2 U	0.2 U		0.2 U	0.2 U	0.2 U
14808-79-8	Sulfate (As SO4)	mg/l	250	5.2	5.4		5.5	5.2	6.7
18496-25-8	Sulfide	mg/l	0.05 (G)	1 U	1 U		1 U	1 U	1 U
TOC	Total Organic Carbon	mg/l	NS	0.54	0.57		0.93	0.52	0.59

[1]Criteria are Ambient Water Quality Standards and Guidance Values (Water Class - GA), June 1998.
NS - No standard.
(G) - Guidance Value

NYSDEC-Organic Mulch Study		Location:		Ridge MW-3	Ridge MW-3	Ridge MW-3	Ridge MW-3	Ridge MW-3
Groundwater Data		Sample ID:		MW-3-1172016	MW-3	MW-3-03232017	MW-3-06282017	MW-3-09152017
SDGs: 2186904, 2190421, 2206117, 2217404, and 2262903		Lab Sample Id:	TOGS Class GA	2190421004	2206117005	2217404004	2242526003	2262903003
		Depth:	Groundwater	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft
		Source:	Standards[1]	ALS	ALS	ALS	ALS	ALS
		SDG:		2190421	2206117	2217404	2242526	2262903
		Matrix:		WATER	WATER	WATER	WATER	WATER
		Sampled:		11/17/2016 14:10	2/2/2017 15:20	3/23/2017 14:55	6/28/2017 13:30	9/14/2017 11:15
CAS NO.	COMPOUND	UNITS:						
	RSK 175 VOLATILES							
106-97-8	Butane	ug/l	NS	4.3 U		4.3 U	4.3 U	4.3 U
74-84-0	Ethane	ug/l	NS	3.3 U		3.3 U	3.3 U	3.3 U
74-85-1	Ethene	ug/l	NS	2.4 U		2.4 U	2.4 U	2.4 U
74-82-8	Methane	ug/l	NS	1.5 U		1.5 U	1.5 U	1.5 U
75-28-5	2-Methyl Propane	ug/l	NS	4.6 U		4.6 U	4.6 U	4.6 U
74-98-6	Propane	ug/l	NS	3.2 U		3.2 U	3.2 U	3.2 U
	TOTAL METALS							
7429-90-5	Aluminum	ug/l	NS	220		72 J		110 U
7440-36-0	Antimony	ug/l	3	22 U		22 U		22 U
7440-38-2	Arsenic	ug/l	25	9 U		9 U		9 U
7440-39-3	Barium	ug/l	1000	11 J		11 J		14
7440-41-7	Beryllium	ug/l	3 (G)	4.4 U		4.4 U		4.4 U
7440-43-9	Cadmium	ug/l	5	2.2 U		2.2 U		2.2 U
7440-70-2	Calcium	ug/l	NS	3200		1800		2300
7440-47-3	Chromium	ug/l	50	5.6 U		5.6 U		5.6 U
7440-48-4	Cobalt	ug/l	NS	5.6 U		5.6 U		5.6 U
7440-50-8	Copper	ug/l	200	11 U		11 U		11 U
7440-56-4	Germanium	ug/l	NS			100 U		100 U
7439-89-6	Iron	ug/l	300	260		67 J		67 U
7439-92-1	Lead	ug/l	25	6.7 U		6.7 U		6.7 U
7439-95-4	Magnesium	ug/l	35000 (G)	560		450		630
7439-96-5	Manganese	ug/l	300	200		100		84
7439-97-6	Mercury	ug/l	0.7	0.5 U		0.5 U		0.5 U
7439-98-7	Molybdenum	ug/l	NS					
7440-02-0	Nickel	ug/l	100	22 U		22 U		22 U
7440-09-7	Potassium	ug/l	NS	1100		750		820
7782-49-2	Selenium	ug/l	10	22 U		22 U		22 U
7440-22-4	Silver	ug/l	50	4.4 U		4.4 U		4.4 U
7440-23-5	Sodium	ug/l	20000	2600		2200		2400
7440-28-0	Thallium	ug/l	0.5 (G)	22 U		22 U		22 U
7440-32-6	Titanium	ug/l	NS					
7440-62-2	Vanadium	ug/l	NS	5.6 U		5.6 U		5.6 U
7440-66-6	Zinc	ug/l	2000 (G)	22 U		22 U		22 U
	DISSOLVED METALS							
7429-90-5	Aluminum	ug/l	NS	100 U			100 U	
7440-36-0	Antimony	ug/l	3	20 U			20 U	
7440-38-2	Arsenic	ug/l	25	8 U			8 U	
7440-39-3	Barium	ug/l	1000	8 J			11	
7440-41-7	Beryllium	ug/l	3 (G)	4 U			4 U	
7440-43-9	Cadmium	ug/l	5	2 U			2 U	
7440-70-2	Calcium	ug/l	NS	3000			2000	
7440-47-3	Chromium	ug/l	50	5 U			5 U	
7440-48-4	Cobalt	ug/l	NS	5 U			5 U	
7440-50-8	Copper	ug/l	200	10 U			10 U	
7439-89-6	Iron	ug/l	300	470			60 U	
7439-92-1	Lead	ug/l	25	6 U			6 U	
7439-95-4	Magnesium	ug/l	35000 (G)	500			490	
7439-96-5	Manganese	ug/l	300	170			94	
7439-97-6	Mercury	ug/l	0.7	0.5 U			0.5 U	
7440-02-0	Nickel	ug/l	100	20 U			20 U	
7440-09-7	Potassium	ug/l	NS	990			820	
7782-49-2	Selenium	ug/l	10	20 U			20 U	
7440-22-4	Silver	ug/l	50	4 U			4 U	
7440-23-5	Sodium	ug/l	20000	2500			2200	
7440-28-0	Thallium	ug/l	0.5 (G)	7.4 J			10 J	
7440-62-2	Vanadium	ug/l	NS	5 U			5 U	
7440-66-6	Zinc	ug/l	2000 (G)	20 U			20 U	

NYSDEC-Organic Mulch Study Groundwater Data SDGs: 2186904, 2190421, 2206117, 2217404, and 2262903		Location: Sample ID: Lab Sample Id: Depth: Source: SDG: Matrix: Sampled:	TOGS Class GA Groundwater Standards[1]	Ridge MW-3 MW-3-1172016 2190421004 0 - 0 ft ALS 2190421 WATER 11/17/2016 14:10	Ridge MW-3 MW-3 2206117005 0 - 0 ft ALS 2206117 WATER 2/2/2017 15:20	Ridge MW-3 MW-3-03232017 2217404004 0 - 0 ft ALS 2217404 WATER 3/23/2017 14:55	Ridge MW-3 MW-3-06282017 2242526003 0 - 0 ft ALS 2242526 WATER 6/28/2017 13:30	Ridge MW-3 MW-3-09152017 2262903003 0 - 0 ft ALS 2262903 WATER 9/14/2017 11:15
CAS NO.	COMPOUND	UNITS:						
	WET CHEMISTRY							
ALK	Alkalinity, Total (As CaCO3)	mg/l	NS	6		4 J	3 J	3 J
BOD5	Biologic Oxygen Demand, Five Day	mg/l	NS	2 U		2 U	2 U	0.84 J
24959-67-9	Bromide	mg/l	2 (G)		0.2 U	0.2 U		0.6 U
16887-00-6	Chloride (As Cl)	mg/l	250	3.1		3.2	2.6	2.8
DOC	Dissolved Organic Carbon	mg/l	NS	0.54		0.5 U	0.31 J	0.34 J
7664-41-7	Nitrogen, Ammonia (As N)	mg/l	2	0.1 U		0.1 U	0.093 J	0.1 U
14797-55-8	Nitrogen, Nitrate (As N)	mg/l	10	0.42		0.48	0.48	0.34
14797-65-0	Nitrogen, Nitrite	mg/l	10	0.2 U		0.2 U	0.2 U	0.2 U
14808-79-8	Sulfate (As SO4)	mg/l	250	4.5		3.9	3.8	5.3
18496-25-8	Sulfide	mg/l	0.05 (G)	1 U		1 U	0.22 J	1 U
TOC	Total Organic Carbon	mg/l	NS	0.56		0.5 U	0.33 J	0.36 J

[1]Criteria are Ambient Water Quality Standards and Guidance Values (Water Class - GA), June 1998.
NS - No standard.
(G) - Guidance Value

NYSDEC-Organic Mulch Study		Location:		Ridge MW-4	Ridge MW-4	Ridge MW-4	Ridge MW-4	Ridge MW-4
Groundwater Data		Sample ID:		MW-4-1172016	MW-4	MW-4-03232017	MW-4-06282017	MW-4-09152017
SDGs: 2186904, 2190421, 2206117, 2217404,		Lab Sample Id:	TOGS Class GA	2190421005	2206117006	2217404005	2242526004	2262903004
and 2262903		Depth:	Groundwater	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft
		Source:	Standards[1]	ALS	ALS	ALS	ALS	ALS
		SDG:		2190421	2206117	2217404	2242526	2262903
		Matrix:		WATER	WATER	WATER	WATER	WATER
		Sampled:		11/17/2016 15:30	2/2/2017 15:30	3/23/2017 16:00	6/28/2017 12:20	9/14/2017 12:05
CAS NO.	COMPOUND	UNITS:						
	RSK 175 VOLATILES							
106-97-8	Butane	ug/l	NS	4.3 U		4.3 U	4.3 U	4.3 U
74-84-0	Ethane	ug/l	NS	3.3 U		3.3 U	3.3 U	3.3 U
74-85-1	Ethene	ug/l	NS	2.4 U		2.4 U	2.4 U	2.4 U
74-82-8	Methane	ug/l	NS	1.5 U		0.35 J	1.5 U	1.5 U
75-28-5	2-Methyl Propane	ug/l	NS	4.6 U		4.6 U	4.6 U	4.6 U
74-98-6	Propane	ug/l	NS	3.2 U		3.2 U	3.2 U	3.2 U
	TOTAL METALS							
7429-90-5	Aluminum	ug/l	NS	190		61 J		110 U
7440-36-0	Antimony	ug/l	3	22 U		22 U		22 U
7440-38-2	Arsenic	ug/l	25	9 U		9 U		9 U
7440-39-3	Barium	ug/l	1000	30		20		18
7440-41-7	Beryllium	ug/l	3 (G)	4.4 U		4.4 U		4.4 U
7440-43-9	Cadmium	ug/l	5	2.2 U		2.2 U		2.2 U
7440-70-2	Calcium	ug/l	NS	6300		2600		2700
7440-47-3	Chromium	ug/l	50	5.6 U		5.6 U		5.6 U
7440-48-4	Cobalt	ug/l	NS	5.6 U		5.6 U		5.6 U
7440-50-8	Copper	ug/l	200	11 U		11 U		11 U
7440-56-4	Germanium	ug/l	NS			100 U		100 U
7439-89-6	Iron	ug/l	300	190		46 J		67 U
7439-92-1	Lead	ug/l	25	6.7 U		6.7 U		6.7 U
7439-95-4	Magnesium	ug/l	35000 (G)	960		530		540
7439-96-5	Manganese	ug/l	300	110		32		10
7439-97-6	Mercury	ug/l	0.7	0.5 U		0.5 U		0.5 U
7439-98-7	Molybdenum	ug/l	NS					
7440-02-0	Nickel	ug/l	100	22 U		22 U		22 U
7440-09-7	Potassium	ug/l	NS	1200		880		740
7782-49-2	Selenium	ug/l	10	22 U		22 U		22 U
7440-22-4	Silver	ug/l	50	20		4.4 U		4.4 U
7440-23-5	Sodium	ug/l	20000	2500		2100		2000
7440-28-0	Thallium	ug/l	0.5 (G)	22 U		22 U		22 U
7440-32-6	Titanium	ug/l	NS					
7440-62-2	Vanadium	ug/l	NS	5.6 U		5.6 U		5.6 U
7440-66-6	Zinc	ug/l	2000 (G)	22 U		22 U		22 U
	DISSOLVED METALS							
7429-90-5	Aluminum	ug/l	NS	100 U			100 U	
7440-36-0	Antimony	ug/l	3	20 U			20 U	
7440-38-2	Arsenic	ug/l	25	8 U			8 U	
7440-39-3	Barium	ug/l	1000	27			24	
7440-41-7	Beryllium	ug/l	3 (G)	4 U			4 U	
7440-43-9	Cadmium	ug/l	5	2 U			2 U	
7440-70-2	Calcium	ug/l	NS	6600			3300	
7440-47-3	Chromium	ug/l	50	5 U			5 U	
7440-48-4	Cobalt	ug/l	NS	5 U			5 U	
7440-50-8	Copper	ug/l	200	10 U			10 U	
7439-89-6	Iron	ug/l	300	60 U			60 U	
7439-92-1	Lead	ug/l	25	6 U			6 U	
7439-95-4	Magnesium	ug/l	35000 (G)	960			650	
7439-96-5	Manganese	ug/l	300	96			24	
7439-97-6	Mercury	ug/l	0.7	0.5 U			0.5 U	
7440-02-0	Nickel	ug/l	100	20 U			20 U	
7440-09-7	Potassium	ug/l	NS	1200			1000	
7782-49-2	Selenium	ug/l	10	20 U			20 U	
7440-22-4	Silver	ug/l	50	4 U			4 U	
7440-23-5	Sodium	ug/l	20000	2500			2200	
7440-28-0	Thallium	ug/l	0.5 (G)	8.8 J			8.6 J	
7440-62-2	Vanadium	ug/l	NS	5 U			5 U	
7440-66-6	Zinc	ug/l	2000 (G)	20 U			20 U	

Groundwater Analytical Results - Pilot Study

Table 6-2

NYSDEC-Organic Mulch Study Groundwater Data SDGs: 2186904, 2190421, 2206117, 2217404, and 2262903		Location: Sample ID: Lab Sample Id: Depth: Source: SDG: Matrix: Sampled:	TOGS Class GA Groundwater Standards[1]	Ridge MW-4 MW-4-1172016 2190421005 0 - 0 ft ALS 2190421 WATER 11/17/2016 15:30	Ridge MW-4 MW-4 2206117006 0 - 0 ft ALS 2206117 WATER 2/2/2017 15:30	Ridge MW-4 MW-4-03232017 2217404005 0 - 0 ft ALS 2217404 WATER 3/23/2017 16:00	Ridge MW-4 MW-4-06282017 2242526004 0 - 0 ft ALS 2242526 WATER 6/28/2017 12:20	Ridge MW-4 MW-4-09152017 2262903004 0 - 0 ft ALS 2262903 WATER 9/14/2017 12:05
CAS NO.	COMPOUND	UNITS:						
	WET CHEMISTRY							
ALK	Alkalinity, Total (As CaCO3)	mg/l	NS	10		6	7	6
BOD5	Biologic Oxygen Demand, Five Day	mg/l	NS	2 U		2 U	2 U	2 U
24959-67-9	Bromide	mg/l	2 (G)		0.2 U	0.2 U		0.6 U
16887-00-6	Chloride (As Cl)	mg/l	250	3.5		3.4	2.8	2.4
DOC	Dissolved Organic Carbon	mg/l	NS	0.62		0.5 U	0.32 J	0.34 J
7664-41-7	Nitrogen, Ammonia (As N)	mg/l	2	0.1 U		0.1 U	0.062 J	0.1 U
14797-55-8	Nitrogen, Nitrate (As N)	mg/l	10	0.48		0.52	0.36	0.36
14797-65-0	Nitrogen, Nitrite	mg/l	10	0.2 U		0.2 U	0.2 U	0.2 U
14808-79-8	Sulfate (As SO4)	mg/l	250	8.2		4.4	4.7	3.4
18496-25-8	Sulfide	mg/l	0.05 (G)	1 U		1 U	1 U	1 U
TOC	Total Organic Carbon	mg/l	NS	0.6		0.5	0.31 J	0.34 J

[1]Criteria are Ambient Water Quality Standards and Guidance Values (Water Class - GA), June 1998.

NS - No standard.

(G) - Guidance Value

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Table 6-3

NYSDEC-Organic Mulch Study		Location:	Ridge - Leachate P-1	Ridge - Leachate P-2	Ridge - Leachate P-2
Leachate Data		Sample ID:	P-1-LEACHATE-09142017	RDG-P2-LEACHATE-012017	RDG-P2-LEACHATE-020217
SDGs: 2195616, 2203500, 2206117, 2227020, 2262901,		Lab Sample Id:	2262904001	2203500001	2206117001
and 2262904		Depth:	0 - 0 ft	0 - 0 ft	0 - 0 ft
		Source:	ALS	ALS	ALS
		SDG:	2262904	2203500	2206117
		Matrix:	WATER	WATER	WATER
		Sampled:	9/14/2017 9:30	1/20/2017 10:00	2/2/2017 10:15
CAS NO.	COMPOUND	UNITS:			
	RSK 175 VOLATILES				
106-97-8	Butane	ug/l	4.3 U	4.3 U	4.3 U
74-84-0	Ethane	ug/l	0.31 J	0.5 J	3.3 U
74-85-1	Ethene	ug/l	2.4 U	1.2 J	2.4 U
74-82-8	Methane	ug/l	2810	4890	8140
75-28-5	2-Methyl Propane	ug/l	4.6 U	4.6 U	4.6 U
74-98-6	Propane	ug/l	3.2 U	1.2 J	3.2 U
	TOTAL METALS				
7429-90-5	Aluminum	mg/l	1.1 U		
7440-36-0	Antimony	mg/l	0.22 U		
7440-38-2	Arsenic	mg/l	0.064 J		
7440-39-3	Barium	mg/l	0.14		
7440-41-7	Beryllium	mg/l	0.044 U		
7440-43-9	Cadmium	mg/l	0.022 U		
7440-70-2	Calcium	mg/l	272		
7440-47-3	Chromium, Total	mg/l	0.056 U		
7440-48-4	Cobalt	mg/l	0.056 U		
7440-50-8	Copper	mg/l	0.11 U		
7440-56-4	Germanium	mg/l	0.1 U		
7439-89-6	Iron	mg/l	12.1		
7439-92-1	Lead	mg/l	0.067 U		
7439-95-4	Magnesium	mg/l	123		
7439-96-5	Manganese	mg/l	2.8		
7439-97-6	Mercury	mg/l	0.0005 U		
7439-98-7	Molybdenum	mg/l			
7440-02-0	Nickel	mg/l	0.22 U		
7440-09-7	Potassium	mg/l	717		
7782-49-2	Selenium	mg/l	0.22 U		
7440-22-4	Silver	mg/l	0.044 U		
7440-23-5	Sodium	mg/l	395		
7440-28-0	Thallium	mg/l	0.22 U		
7440-32-6	Titanium	mg/l			
7440-62-2	Vanadium	mg/l	0.056 U		
7440-66-6	Zinc	mg/l	0.22 U		
	DISSOLVED METALS				
7429-90-5	Aluminum	mg/l		1.5	2
7440-36-0	Antimony	mg/l		0.1 U	0.1 U
7440-38-2	Arsenic	mg/l		0.037 J	0.042
7440-39-3	Barium	mg/l		0.27	0.11
7440-41-7	Beryllium	mg/l		0.02 U	0.02 U
7440-43-9	Cadmium	mg/l		0.01 U	0.01 U
7440-70-2	Calcium	mg/l		165	70.4
7440-47-3	Chromium, Total	mg/l		0.016 J	0.025 U
7440-48-4	Cobalt	mg/l		0.022 J	0.025 U
7440-50-8	Copper	mg/l		0.05 U	0.035 J
7439-89-6	Iron	mg/l		36.9	15.7
7439-92-1	Lead	mg/l		0.03 U	0.021 J
7439-95-4	Magnesium	mg/l		61.3	19.6
7439-96-5	Manganese	mg/l		4.3	1.4
7439-97-6	Mercury	mg/l		0.0005 U	0.0005 U
7440-02-0	Nickel	mg/l		0.1 U	0.1 U
7440-09-7	Potassium	mg/l		289	108
7782-49-2	Selenium	mg/l		0.1 U	0.1 U
7440-22-4	Silver	mg/l		0.02 U	0.02 U
7440-23-5	Sodium	mg/l		133	43.4
7440-28-0	Thallium	mg/l		0.1 U	0.1 U
7440-62-2	Vanadium	mg/l		0.019 J	0.0085 J
7440-66-6	Zinc	mg/l		0.14	0.61

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Table 6-3

NYSDEC-Organic Mulch Study Leachate Data SDGs: 2195616, 2203500, 2206117, 2227020, 2262901, and 2262904		Location:	Ridge - Leachate P-1	Ridge - Leachate P-2	Ridge - Leachate P-2
		Sample ID:	P-1-LEACHATE-09142017	RDG-P2-LEACHATE-012017	RDG-P2-LEACHATE-020217
		Lab Sample Id:	2262904001	2203500001	2206117001
		Depth:	0 - 0 ft	0 - 0 ft	0 - 0 ft
		Source:	ALS	ALS	ALS
		SDG:	2262904	2203500	2206117
		Matrix:	WATER	WATER	WATER
		Sampled:	9/14/2017 9:30	1/20/2017 10:00	2/2/2017 10:15
CAS NO.	COMPOUND	UNITS:			
	WET CHEMISTRY				
ALK	Alkalinity, Total (As CaCO3)	mg/l	1580		258
24959-67-9	Bromide	mg/l	3.8	0.5 U	7.1
BOD5	Biologic Oxygen Demand, Five Day	mg/l	38.3		171
16887-00-6	Chloride (As Cl)	mg/l	1510		54.2
7664-41-7	Nitrogen, Ammonia (As N)	mg/l	8.18	12.8	1.38
14797-55-8	Nitrogen, Nitrate (As N)	mg/l	0.5 U	0.5 U	0.2 U
14797-65-0	Nitrogen, Nitrite	mg/l	2.5 U	0.4 J	0.18 J
14808-79-8	Sulfate (As SO4)	mg/l	5 U		0.42 J
18496-25-8	Sulfide	mg/l	1 U	3.4	0.46 J
TOC	Total Organic Carbon	mg/l	1020		511
DOC	Dissolved Organic Carbon	mg/l	677	1630	374

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Table 6-3

NYSDEC-Organic Mulch Study		Location:	Ridge - Leachate P-2	Ridge - Leachate P-2	Ridge - Leachate P-4	Ridge - Leachate P-4	Ridge - Leachate P-4
Leachate Data		Sample ID:	P-2-LEACHATE-05022017	P-2-LEACHATE-09142017	RDG-P4-LEACHATE-020217	P-4-LEACHATE-05022017	P-4-LEACHATE-09142017
SDGs: 2195616, 2203500, 2206117, 2227020, 2262901,		Lab Sample Id:	2227020001	2262904002	2206117002	2227020002	2262904003
and 2262904		Depth:	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft
		Source:	ALS	ALS	ALS	ALS	ALS
		SDG:	2227020	2262904	2206117	2227020	2262904
		Matrix:	WATER	WATER	WATER	WATER	WATER
		Sampled:	5/2/2017 10:35	9/14/2017 7:45	2/2/2017 11:50	5/2/2017 9:20	9/14/2017 8:55
CAS NO.	COMPOUND	UNITS:					
	RSK 175 VOLATILES						
106-97-8	Butane	ug/l	4.3 U	4.3 U	4.3 U	4.3 U	4.3 U
74-84-0	Ethane	ug/l	3.3 U	3.3 U	0.27 J	3.3 U	3.3 U
74-85-1	Ethene	ug/l	2.4 U	2.4 U	0.73 J	2.4 U	2.4 U
74-82-8	Methane	ug/l	6020	3250	2380	3760	2010
75-28-5	2-Methyl Propane	ug/l	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U
74-98-6	Propane	ug/l	3.2 U	3.2 U	0.45 J	3.2 U	3.2 U
	TOTAL METALS						
7429-90-5	Aluminum	mg/l	0.21 J	1.1 U		2	4
7440-36-0	Antimony	mg/l	0.044 U	0.22 U		0.11 U	0.22 U
7440-38-2	Arsenic	mg/l	0.032	0.057 J		0.085	0.089 J
7440-39-3	Barium	mg/l	0.12	0.29		0.15	0.27
7440-41-7	Beryllium	mg/l	0.0088 U	0.044 U		0.022 U	0.044 U
7440-43-9	Cadmium	mg/l	0.0044 U	0.022 U		0.0083 J	0.027
7440-70-2	Calcium	mg/l	83.7	187		355	570
7440-47-3	Chromium, Total	mg/l	0.011 U	0.056 U		0.062	0.092
7440-48-4	Cobalt	mg/l	0.0084 J	0.056 U		0.032	0.028 J
7440-50-8	Copper	mg/l	0.022 U	0.11 U		0.056 U	0.11 U
7440-56-4	Germanium	mg/l	0.1 U	0.1 U		0.1 U	0.1 U
7439-89-6	Iron	mg/l	13	23.6		37.6	42
7439-92-1	Lead	mg/l	0.0091 J	0.067 U		0.012 J	0.067 U
7439-95-4	Magnesium	mg/l	17.7	42.7		198	447
7439-96-5	Manganese	mg/l	1	1.9		7	9.2
7439-97-6	Mercury	mg/l	0.0013 U	0.0005 U		0.0025 U	0.0005 U
7439-98-7	Molybdenum	mg/l					
7440-02-0	Nickel	mg/l	0.015 J	0.22 U		0.054 J	0.078 J
7440-09-7	Potassium	mg/l	108	437		665	847
7782-49-2	Selenium	mg/l	0.044 U	0.22 U		0.11 U	0.22 U
7440-22-4	Silver	mg/l	0.0088 U	0.044 U		0.022 U	0.044 U
7440-23-5	Sodium	mg/l	43.2	180		391	513
7440-28-0	Thallium	mg/l	0.044 U	0.22 U		0.11 U	0.22 U
7440-32-6	Titanium	mg/l					
7440-62-2	Vanadium	mg/l	0.011 U	0.056 U		0.025 J	0.039 J
7440-66-6	Zinc	mg/l	0.47	0.52		0.061 J	0.22 U
	DISSOLVED METALS						
7429-90-5	Aluminum	mg/l	0.21		0.46 J	1.6	
7440-36-0	Antimony	mg/l	0.04 U		0.1 U	0.1 U	
7440-38-2	Arsenic	mg/l	0.029		0.14	0.087	
7440-39-3	Barium	mg/l	0.13		0.083	0.15	
7440-41-7	Beryllium	mg/l	0.008 U		0.02 U	0.02 U	
7440-43-9	Cadmium	mg/l	0.004 U		0.01 U	0.004 J	
7440-70-2	Calcium	mg/l	86.6		120	349	
7440-47-3	Chromium, Total	mg/l	0.01 U		0.012 J	0.058	
7440-48-4	Cobalt	mg/l	0.0082 J		0.025 U	0.032	
7440-50-8	Copper	mg/l	0.02 U		0.027 J	0.05 U	
7439-89-6	Iron	mg/l	13		7.6	36.3	
7439-92-1	Lead	mg/l	0.012 U		0.03 U	0.03 U	
7439-95-4	Magnesium	mg/l	18		40.9	191	
7439-96-5	Manganese	mg/l	1.1		1.8	7	
7439-97-6	Mercury	mg/l	0.0005 U		0.0005 U	0.0005 U	
7440-02-0	Nickel	mg/l	0.014 J		0.1 U	0.054 J	
7440-09-7	Potassium	mg/l	120		296	695	
7782-49-2	Selenium	mg/l	0.04 U		0.1 U	0.1 U	
7440-22-4	Silver	mg/l	0.008 U		0.02 U	0.02 U	
7440-23-5	Sodium	mg/l	47.3		157	400	
7440-28-0	Thallium	mg/l	0.04 U		0.1 U	0.1 U	
7440-62-2	Vanadium	mg/l	0.01 U		0.025 U	0.013 J	
7440-66-6	Zinc	mg/l	0.48		0.099 J	0.056 J	

Vegetative Organic Waste Management Facility
Research Project Summary Report
Mulch Percolate Analytical Results - Pilot Study
Table 6-3

NYSDEC-Organic Mulch Study		Location:	Ridge - Leachate P-2	Ridge - Leachate P-2	Ridge - Leachate P-4	Ridge - Leachate P-4	Ridge - Leachate P-4
Leachate Data		Sample ID:	P-2-LEACHATE-05022017	P-2-LEACHATE-09142017	RDG-P4-LEACHATE-020217	P-4-LEACHATE-05022017	P-4-LEACHATE-09142017
SDGs: 2195616, 2203500, 2206117, 2227020, 2262901,		Lab Sample Id:	2227020001	2262904002	2206117002	2227020002	2262904003
and 2262904		Depth:	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft
		Source:	ALS	ALS	ALS	ALS	ALS
		SDG:	2227020	2262904	2206117	2227020	2262904
		Matrix:	WATER	WATER	WATER	WATER	WATER
		Sampled:	5/2/2017 10:35	9/14/2017 7:45	2/2/2017 11:50	5/2/2017 9:20	9/14/2017 8:55
CAS NO.	COMPOUND	UNITS:					
	WET CHEMISTRY						
ALK	Alkalinity, Total (As CaCO3)	mg/l	291	597	538	1790	3910
24959-67-9	Bromide	mg/l		47.3	0.36		3.8
BOD5	Biologic Oxygen Demand, Five Day	mg/l	36.4	20.5	186	190	76
16887-00-6	Chloride (As Cl)	mg/l	127	763	352	1010	1670
7664-41-7	Nitrogen, Ammonia (As N)	mg/l	0.316	7.4	1.26	17.3	24.7
14797-55-8	Nitrogen, Nitrate (As N)	mg/l	0.2 U	0.5 U	0.2 U	0.2 U	0.5 U
14797-65-0	Nitrogen, Nitrite	mg/l	0.2 U	2.5 U	0.2 U	0.2 U	2.5 U
14808-79-8	Sulfate (As SO4)	mg/l	2 U	5 U	0.36 J	0.88 J	5 U
18496-25-8	Sulfide	mg/l	1 U	0.37 J	0.8 J	1 U	0.29 J
TOC	Total Organic Carbon	mg/l	176	995	494	696	905
DOC	Dissolved Organic Carbon	mg/l	149	637	345	432	552

Vegetative Organic Waste Management Facility
Research Project Summary Report
Mulch Gas Analytical Results - Pilot Study
Table 6-4

NYSDEC-Organic Mulch Study Air Data SDGs: P1605887, P1700019, P1700618, P1702253, and P1704668		Location: Sample ID: Lab Sample Id: Depth: Source: SDG: Matrix: Sampled:	Ridge - Mulch Gas P-1 PILE1-GAS-121316 P1605887-002 - CASLAB P1605887 AIR 12/13/2016 16:55	Ridge - Mulch Gas P-1 RDG-P1-Air-020217 P1700618-004 - CASLAB P1700618 AIR 2/2/2017 14:20	Ridge - Mulch Gas P-1 P-1-AIR-05022017 P1702253-001 - CASLAB P1702253 AIR 5/2/2017 11:47	Ridge - Mulch Gas P-1 P-1-AIR-09142017 P1704668-004 - CASLAB P1704668 AIR 9/14/2017 15:43	Ridge - Mulch Gas P-2 PILE2-GAS-121316 P1605887-003 - CASLAB P1605887 AIR 12/13/2016 16:30	Ridge - Mulch Gas P-2 RDG-P2-Air-020217 P1700618-001 - CASLAB P1700618 AIR 2/2/2017 11:25	Ridge - Mulch Gas P-2 P-2-AIR-05022017 P1702253-002 - CASLAB P1702253 AIR 5/2/2017 10:48	Ridge - Mulch Gas P-2 P-2-AIR-09142017 P1704668-003 - CASLAB P1704668 AIR 9/14/2017 14:57
CAS NO.	COMPOUND	UNITS:								
	FIXED GASES									
124-38-9	Carbon Dioxide	%v/v	2.17	1.13	13.6	16.6	2.7	0.274	1.47	17
74-82-8	Methane	%v/v	0.14 U	0.15 U	0.16 U	1.07	0.15 U	0.16 U	0.16 U	0.18 U
7782-44-7	Oxygen	%v/v	19.8	21	7.74	7.77	19.2	22	20.6	5.15

Vegetative Organic Waste Management Facility
Research Project Summary Report
Mulch Gas Analytical Results - Pilot Study
Table 6-4

NYSDEC-Organic Mulch Study Air Data SDGs: P1605887, P1700019, P1700618, P1702253, and P1704668		Location: Sample ID: Lab Sample Id: Depth: Source: SDG: Matrix: Sampled:	Ridge - Mulch Gas P-3 RDG-P3-Air-020217 P1700618-003 - CASLAB P1700618 AIR 2/2/2017 13:50	Ridge - Mulch Gas P-3 P-3-AIR-05022017 P1702253-003 - CASLAB P1702253 AIR 5/2/2017 12:30	Ridge - Mulch Gas P-3 P-3-AIR-09142017 P1704668-002 - CASLAB P1704668 AIR 9/14/2017 14:03	Ridge - Mulch Gas P-4 RDG-P4-Air-020217 P1700618-002 - CASLAB P1700618 AIR 2/2/2017 13:05	Ridge - Mulch Gas P-4 P-4-AIR-05022017 P1702253-004 - CASLAB P1702253 AIR 5/2/2017 9:23	Ridge - Mulch Gas P-4 P-4-AIR-09142017 P1704668-001 - CASLAB P1704668 AIR 9/14/2017 13:25
CAS NO.	COMPOUND	UNITS:						
	FIXED GASES							
124-38-9	Carbon Dioxide	%v/v	2.1	5.93	10.1	0.511	1.03	21.3
74-82-8	Methane	%v/v	0.14 U	0.16 U	0.17 U	0.19 U	0.16 U	3.49
7782-44-7	Oxygen	%v/v	19.8	16.1	12.7	21.8	21.1	4.38

Vegetative Organic Waste Management Facility
Research Project Summary Report
Mulch Analytical Results - Pilot Study
Table 6-5

NYSDEC-Organic Mulch Study		Location:	Ridge - Mulch P-1	Ridge - Mulch P-1	Ridge - Mulch P-1	Ridge - Mulch P-2	Ridge - Mulch P-2
Mulch Data		Sample ID:	RDG-P1-MULCH-020217	P-1-MULCH-05022017	P-1-MULCH-09142017	RDG-P2-MULCH-020217	P-2-MULCH-05022017
SDGs: 2195610, 2198013, 2206116, 2227335, and 2262902		Lab Sample Id:	2206116001	2227335001	2262902001	2206116002	2227335002
		Depth:	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft
		Source:	ALS	ALS	ALS	ALS	ALS
		SDG:	2206116	2227335	2262902	2206116	2227335
		Matrix:	SO	SO	SO	SO	SO
		Sampled:	2/2/2017 15:00	5/2/2017 11:35	9/14/2017 9:38	2/2/2017 14:40	5/2/2017 11:05
CAS NO.	COMPOUND	UNITS:					
	METALS						
7429-90-5	Aluminum	mg/kg	844	1460	2340	392	1480
7440-36-0	Antimony	mg/kg	4 U	3.9 U	2.4 J	3.5 U	3.7 U
7440-38-2	Arsenic	mg/kg	1.8 J	2.3 J	4.8	3.5 U	2.1 J
7440-39-3	Barium	mg/kg	12.3	18.6	31.9	7	18.7
7440-41-7	Beryllium	mg/kg	2 U	2 U	2 U	1.8 U	1.8 U
7440-43-9	Cadmium	mg/kg	1 U	0.98 U	0.36 J	0.88 U	0.91 U
7440-70-2	Calcium	mg/kg	2470	3990	8330	1440	3490
7440-47-3	Chromium, Total	mg/kg	3.2	6.2	9.2	1.5 J	3.5
7440-48-4	Cobalt	mg/kg	2 U	0.92 J	1.4 J	1.8 U	0.8 J
7440-50-8	Copper	mg/kg	5.3	11.1	18.5	4.5	7.1
7439-89-6	Iron	mg/kg	1170	2320	3850	505	2450
7439-92-1	Lead	mg/kg	7.1	12.8	23.8	3.6	9.7
7439-95-4	Magnesium	mg/kg	410	620	1320	269	626
7439-96-5	Manganese	mg/kg	40.2	64.7	124	23.5	80.6
7439-97-6	Mercury	mg/kg	0.086 U	0.1 U	0.19 U	0.085 U	0.09 U
7440-02-0	Nickel	mg/kg	1.5 J	2.2 J	3.5 J	3.5 U	2 J
7440-09-7	Potassium	mg/kg	864	658	1120	170	497
7782-49-2	Selenium	mg/kg	10 U	9.8 U	6 J	8.8 U	9.1 U
7440-22-4	Silver	mg/kg	1 U	0.98 U	1 U	0.88 U	0.91 U
7440-23-5	Sodium	mg/kg	316	133	512	86.5 J	104
7440-28-0	Thallium	mg/kg	6 U	5.9 U	6 U	5.3 U	5.5 U
7440-62-2	Vanadium	mg/kg	2.8	5.2	7.6	1.2 J	4.9
7440-66-6	Zinc	mg/kg	19	31.3	52.7	12.7	28.3
	WET CHEMISTRY						
MOIST	Moisture, Percent	%	49.9	51.9	53.2	43.5	45.3
TSO	Total Solids	%	50.1	48.1	46.8	56.5	54.7
BOD5	Biologic Oxygen Demand, Five Day	mg/kg					
TOC	Total Organic Carbon	mg/kg					

Vegetative Organic Waste Management Facility
Research Project Summary Report
Mulch Analytical Results - Pilot Study
Table 6-5

NYSDEC-Organic Mulch Study		Location:	Ridge - Mulch P-2	Ridge - Mulch P-3	Ridge - Mulch P-3	Ridge - Mulch P-3	Ridge - Mulch P-4	Ridge - Mulch P-4
Mulch Data		Sample ID:	P-2-MULCH-09142017	RDG-P3-MULCH-020217	P-3-MULCH-05022017	P-3-MULCH-09142017	RDG-P4-MULCH-020217	P-4-MULCH-09142017
SDGs: 2195610, 2198013, 2206116, 2227335,		Lab Sample Id:	2262902002	2206116003	2227335003	2262902003	2206116004	2262902005
and 2262902		Depth:	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft
		Source:	ALS	ALS	ALS	ALS	ALS	ALS
		SDG:	2262902	2206116	2227335	2262902	2206116	2262902
		Matrix:	SO	SO	SO	SO	SO	SO
		Sampled:	9/14/2017 10:10	2/2/2017 13:35	5/2/2017 12:30	9/14/2017 10:50	2/2/2017 13:15	9/14/2017 12:25
CAS NO.	COMPOUND	UNITS:						
	METALS							
7429-90-5	Aluminum	mg/kg	1710	580	1970	1620	1080	2260
7440-36-0	Antimony	mg/kg	3.6 U	2.8 U	1.4 J	1.3 J	3.9 U	2.1 J
7440-38-2	Arsenic	mg/kg	3.6 U	0.92 J	3.2	3.3	3.9 U	5.4
7440-39-3	Barium	mg/kg	18.5	8.7	25.2	21.8	12.6	30.3
7440-41-7	Beryllium	mg/kg	1.8 U	1.4 U	1.3 U	1.3 U	1.9 U	1.8 U
7440-43-9	Cadmium	mg/kg	0.89 U	0.69 U	0.27 J	0.31 J	0.97 U	0.33 J
7440-70-2	Calcium	mg/kg	3770	1870	7920	5840	2560	7470
7440-47-3	Chromium, Total	mg/kg	4.5	2.8	7	5.7	3.5	8.9
7440-48-4	Cobalt	mg/kg	0.78 J	1.4 U	1.3 J	0.85 J	0.68 J	1.1 J
7440-50-8	Copper	mg/kg	8.4	4	13.6	12.4	6	17.2
7439-89-6	Iron	mg/kg	2910	901	3090	2630	1690	3830
7439-92-1	Lead	mg/kg	13.2	7.5	17.7	15.3	10.8	19.6
7439-95-4	Magnesium	mg/kg	681	307	1660	730	395	1040
7439-96-5	Manganese	mg/kg	90.5	29.6	101	95.8	43.7	126
7439-97-6	Mercury	mg/kg	0.16 U	0.064 U	0.07 U	0.11 U	0.09 U	0.21 U
7440-02-0	Nickel	mg/kg	2.1 J	2.8 U	3.2	2.3 J	1.5 J	3.2 J
7440-09-7	Potassium	mg/kg	648	724	1920	513	512	840
7782-49-2	Selenium	mg/kg	3.6 J	6.9 U	6.7 U	4 J	9.7 U	6.1 J
7440-22-4	Silver	mg/kg	0.89 U	0.69 U	0.67 U	0.65 U	0.97 U	0.92 U
7440-23-5	Sodium	mg/kg	204	299	415	42.4 J	127	173
7440-28-0	Thallium	mg/kg	5.3 U	4.1 U	4 U	3.9 U	5.8 U	5.5 U
7440-62-2	Vanadium	mg/kg	6.4	2	6.6	5.6	3.3	8.2
7440-66-6	Zinc	mg/kg	37	15.7	51.6	45.2	23.2	59.7
	WET CHEMISTRY							
MOIST	Moisture, Percent	%	45	27.6	28.3	23.1	48.5	54.2
TSO	Total Solids	%	55	72.4	71.7	76.9	51.5	45.8
BOD5	Biologic Oxygen Demand, Five Day	mg/kg						
TOC	Total Organic Carbon	mg/kg						

Vegetative Organic Waste Management Facility
Research Project Summary Report
Mulch Moisture Readings - Pilot Study and Recycled Earth
Table 7-1

Pile ID	Date	North	South	East	West	AVG.	Depth of Probe (ft)
Pile 1	5/16/2017	7	8	7	8	7.5	1
		6	7	6	8	6.75	2
		2	3	2	4	2.75	3
		3	2	3	3	2.75	4
		2	2	1	1	1.5	5
Pile 2	5/16/2017	5	3	4	5	4.25	1
		4	3	3	4	3.5	2
		4	5	4	3	4	3
		4	4	2	2	3	4
		3	3	3	4	3.25	5
Pile 3	5/16/2017	1	0	0	1	0.5	1
		1	1	1	1	1	2
		0	1	1	2	1	3
		1	1	0	1	0.75	4
		0	1	0	1	0.5	5
Pile 4	5/16/2017	8	8	8	8	8	1
		6	6	7	5	6	2
		3	3	2	3	2.75	3
		3	2	3	3	2.75	4
		1	1	3	1	1.5	5
Pile 1	9/15/2017	8	9	7	8	8	1
		4	6	7	6	5.75	2
		2	3	4	4	3.25	3
		3	2	2	3	2.5	4
		1	2	1	1	1.25	5
Pile 2	9/15/2017	6	7	8	9	7.5	1
		4	5	5	6	5	2
		4	3	5	3	3.75	3
		3	2	3	4	3	4
		2	3	3	4	3	5
Pile 3	9/15/2017	0	0	0	1	0.25	1
		1	2	2	1	1.5	2
		1	2	2	2	1.75	3
		1	2	1	1	1.25	4
		0	1	2	0	0.75	5
Pile 4	9/15/2017	8	8	7	8	7.75	1
		6	4	7	6	5.75	2
		2	3	4	4	3.25	3
		1	2	2	1	1.5	4
		1	1	2	2	1.5	5

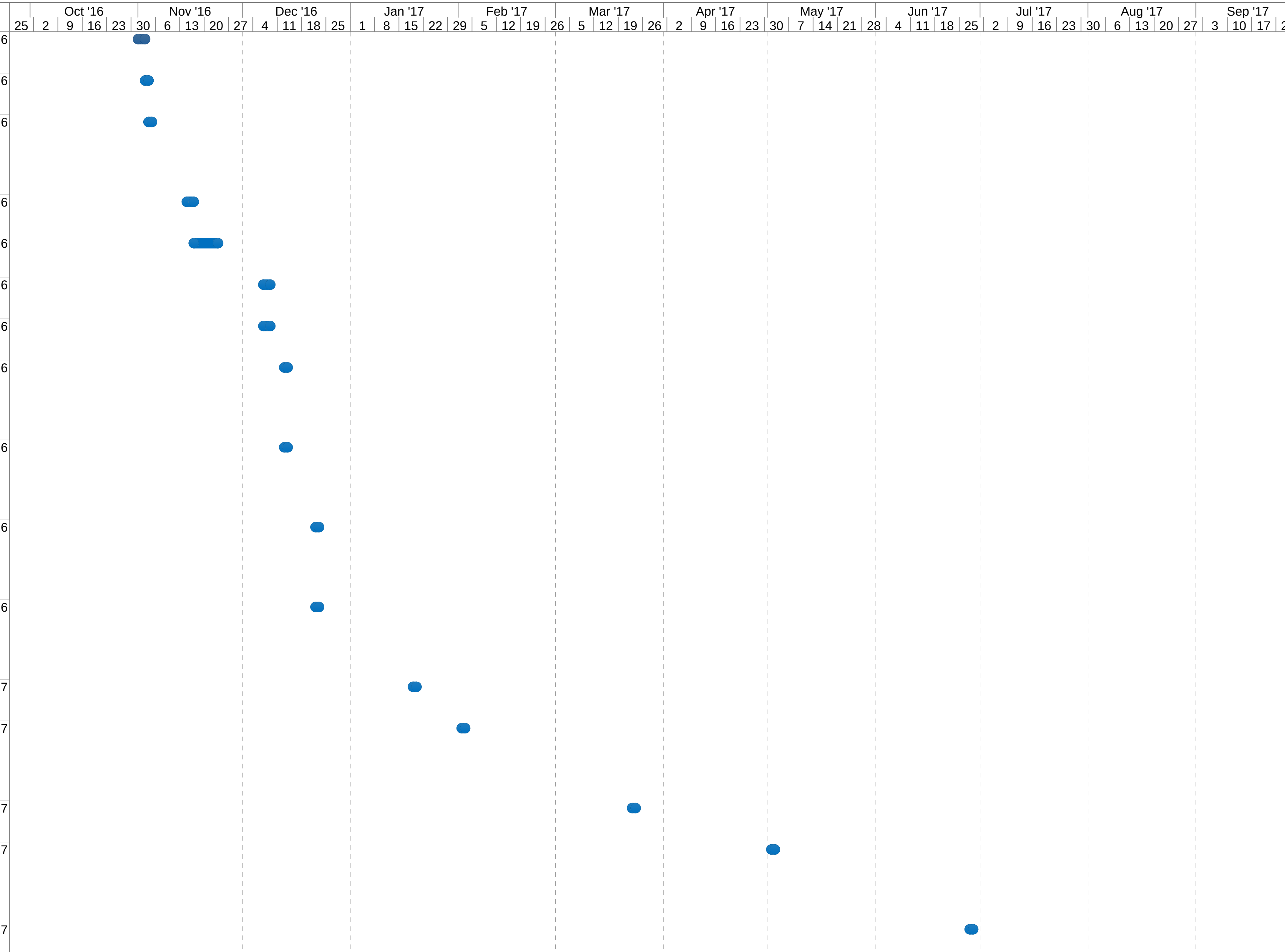
Vegetative Organic Waste Management Facility
Research Project Summary Report
Mulch Moisture Readings - Pilot Study and Recycled Earth
Table 7-1

Pile ID	Date	North	South	East	West	AVG.	Depth of Probe (ft)
Pile 1	2/2/2017	8	7	8	9	8	1
		9	6	5	6	6.5	2
		1	3	3	2	2.25	3
		2	2	3	2	2.25	4
		2	1	1	1	1.25	5
Pile 2	2/2/2017	4	7	6	8	6.25	1
		4	7	5	5	5.25	2
		1	5	2	3	2.75	3
		1	1	1	3	1.5	4
		2	2	2	1	1.75	5
Pile 3	2/2/2017	5	3	2	2	3	1
		1	1	1	2	1.25	2
		1	1	1	1	1	3
		0	0	1	2	0.75	4
		0	0	1	1	0.5	5
Pile 4	2/2/2017	9	8	7	8	8	1
		3	5	6	3	4.25	2
		2	2	3	2	2.25	3
		2	3	3	1	2.25	4
		1	2	1	2	1.5	5
Pile 1	5/2/2017	7	8	8	8	7.75	1
		7	8	6	9	7.5	2
		4	6	4	5	4.75	3
		3	1	3	3	2.5	4
		3	2	1	2	2	5
Pile 2	5/2/2017	4	1	2	5	3	1
		4	2	3	4	3.25	2
		4	4	3	3	3.5	3
		5	4	2	2	3.25	4
		3	3	3	4	3.25	5
Pile 3	5/2/2017	1	0	1	0	0.5	1
		2	1	1	1	1.25	2
		1	2	1	3	1.75	3
		1	1	1	1	1	4
		0	1	1	1	0.75	5
Pile 4	5/2/2017	8	9	8	7	8	1
		7	8	6	7	7	2
		7	6	4	3	5	3
		3	4	3	3	3.25	4
		1	1	3	1	1.5	5

Figures

Vegetative Organic Waste Management Facility
Research Project Summary Report
VOW Facility Research Study Timeline
Figure 1-1

ID	Task Name	Duration	Start	Finish
1	Edgewood Vertical Groundwater Stud	2 days	Tue 11/1/16	Wed 11/2/16
2	Edgewood Mulch Pile Construction	1 day	Thu 11/3/16	Thu 11/3/16
3	Recycled Earth Mulch Pile Construction	1 day	Fri 11/4/16	Fri 11/4/16
4	Ridge Monitoring Well Installation	2 days	Tue 11/15/16	Wed 11/16/16
5	Ridge Baseline GW Sample Event	5 days	Thu 11/17/16	Wed 11/23/16
6	Mulch Delivery to Ridge	2 days	Wed 12/7/16	Thu 12/8/16
7	Ridge Mulch Pile Construction	2 days	Wed 12/7/16	Thu 12/8/16
8	Ridge Mulch, Mulch Gas, and Mulch Percolate Sample Event #1	1 day	Tue 12/13/16	Tue 12/13/16
9	Recycled Earth Mulch, Mulch Gas, and Mulch Percolate Sample Event #1	1 day	Tue 12/13/16	Tue 12/13/16
10	Addition of Bromide Tracer to Ridge Pile #2	1 day	Thu 12/22/16	Thu 12/22/16
11	Edgewood Mulch and Mulch Gas Sample Event	1 day	Thu 12/22/16	Thu 12/22/16
12	Edgewood Lysimeter Assessment	1 day	Thu 1/19/17	Thu 1/19/17
13	Ridge Mulch, Mulch Gas, and Mulch Percolate Sample Event #2	1 day	Thu 2/2/17	Thu 2/2/17
14	Ridge Groundwater Sample Event #1	1 day	Thu 3/23/17	Thu 3/23/17
15	Ridge Mulch, Mulch Gas, and Mulch Percolate Sample Event #3	1 day	Tue 5/2/17	Tue 5/2/17
16	Ridge Groundwater Sample Event #2	1 day	Wed 6/28/17	Wed 6/28/17

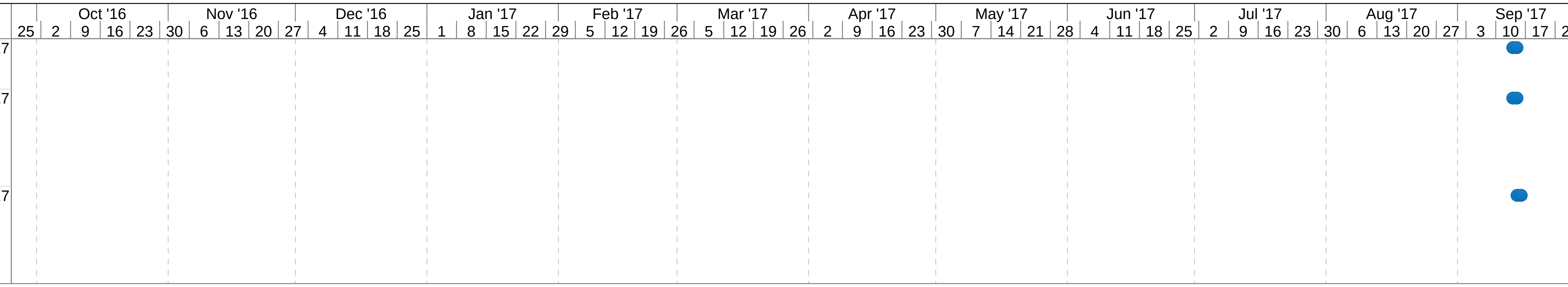


Project: VOW Research Project Timeli
Date: Fri 12/1/17

Task Performed

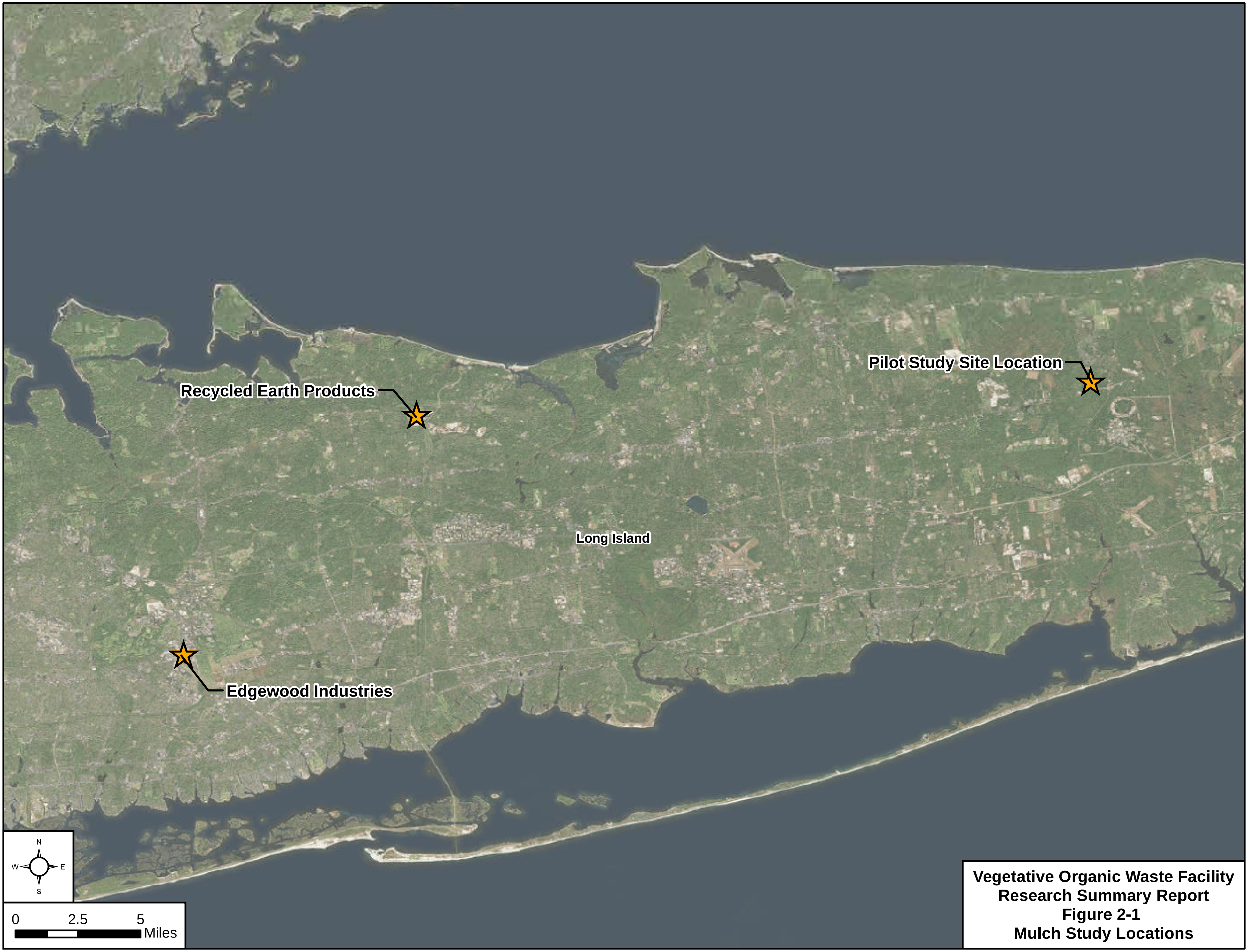
Vegetative Organic Waste Management Facility
Research Project Summary Report
VOW Facility Research Study Timeline
Figure 1-1

ID	Task Name	Duration	Start	Finish
17	Ridge Groundwater Sample Event #3	1 day	Thu 9/14/17	Thu 9/14/17
18	Ridge Mulch, Mulch Gas, and Mulch Percolate Sample Event #4	1 day	Thu 9/14/17	Thu 9/14/17
19	Recycled Earth Mulch, Mulch Gas, and Mulch Percolate Sample Event #2	1 day	Fri 9/15/17	Fri 9/15/17

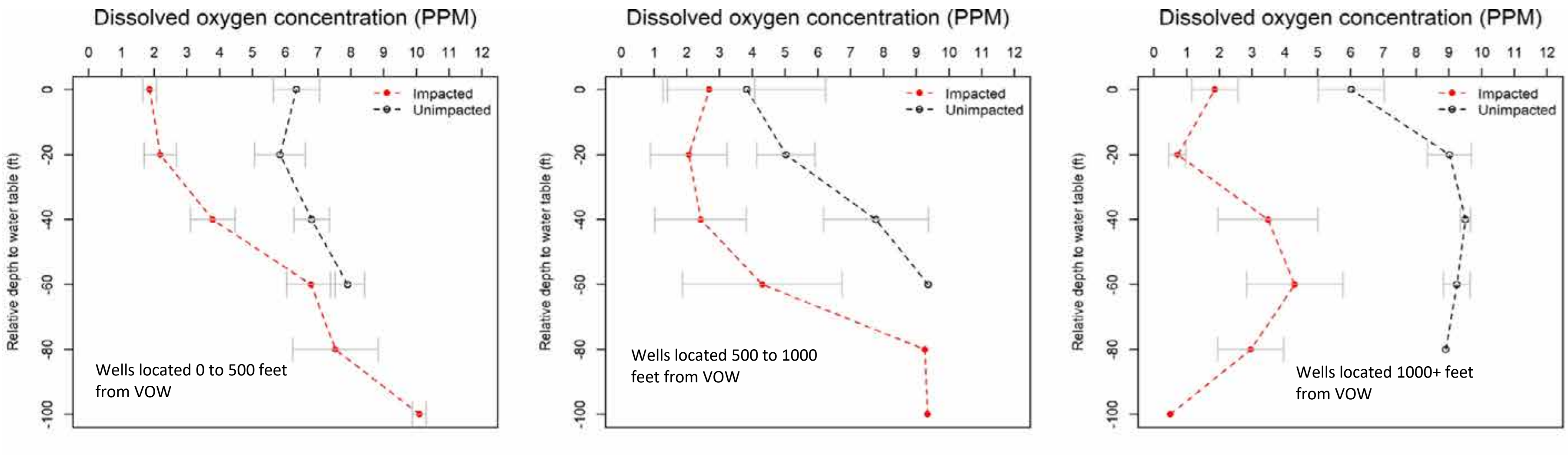


Project: VOW Research Project Timeli
Date: Fri 12/1/17

Task Performed

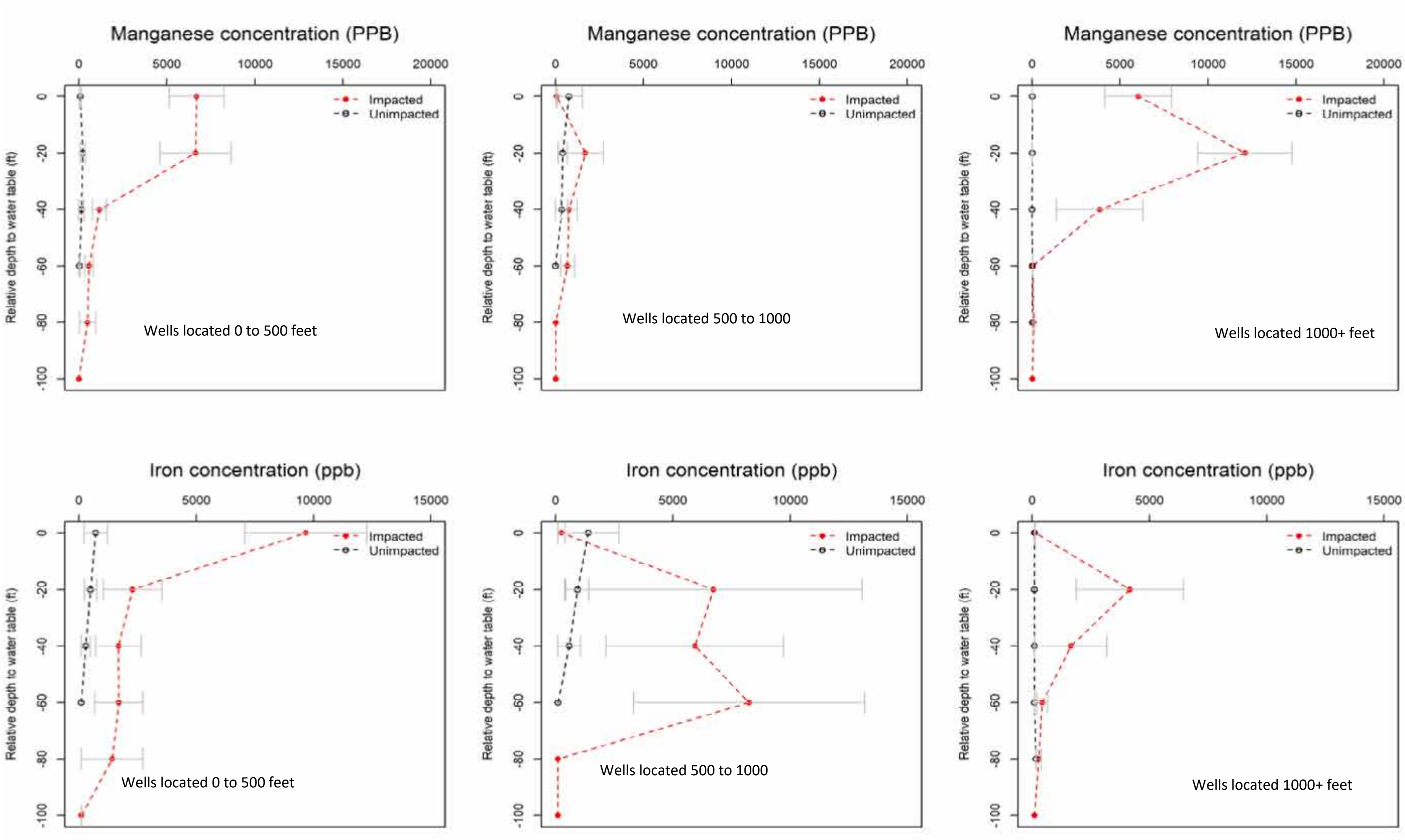

Recycled Earth Products
Pilot Study Site Location
Long Island
Edgewood Industries
N
W
E
S
0
2.5
5
Miles
Vegetative Organic Waste Facility
Research Summary Report
Figure 2-1
Mulch Study Locations

Vegetative Organic Waste Management Facility
Research Project Summary Report
Mean Dissolved Oxygen Concentrations - SCDH 2013 and 2016 Reports
Figure 2-2



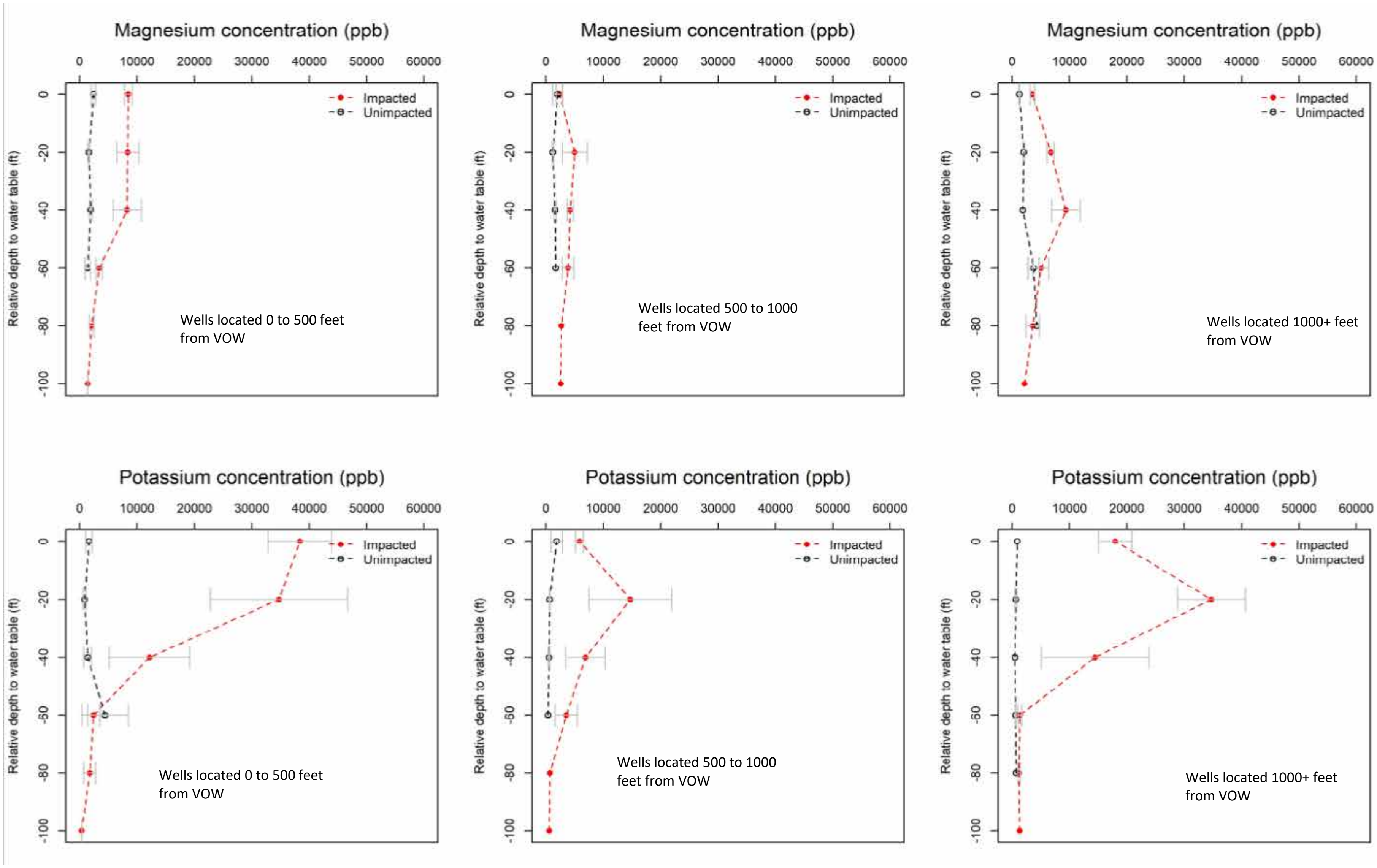
Mean dissolved oxygen concentrations (ppm) ± SE in groundwater at sample locations grouped by proximity to vow piles and impact category

Vegetative Organic Waste Management Facility
Research Project Summary Report
Mean Manganese and Iron Concentrations - SCDH 2013 and 2016 Reports
Figure 2-3

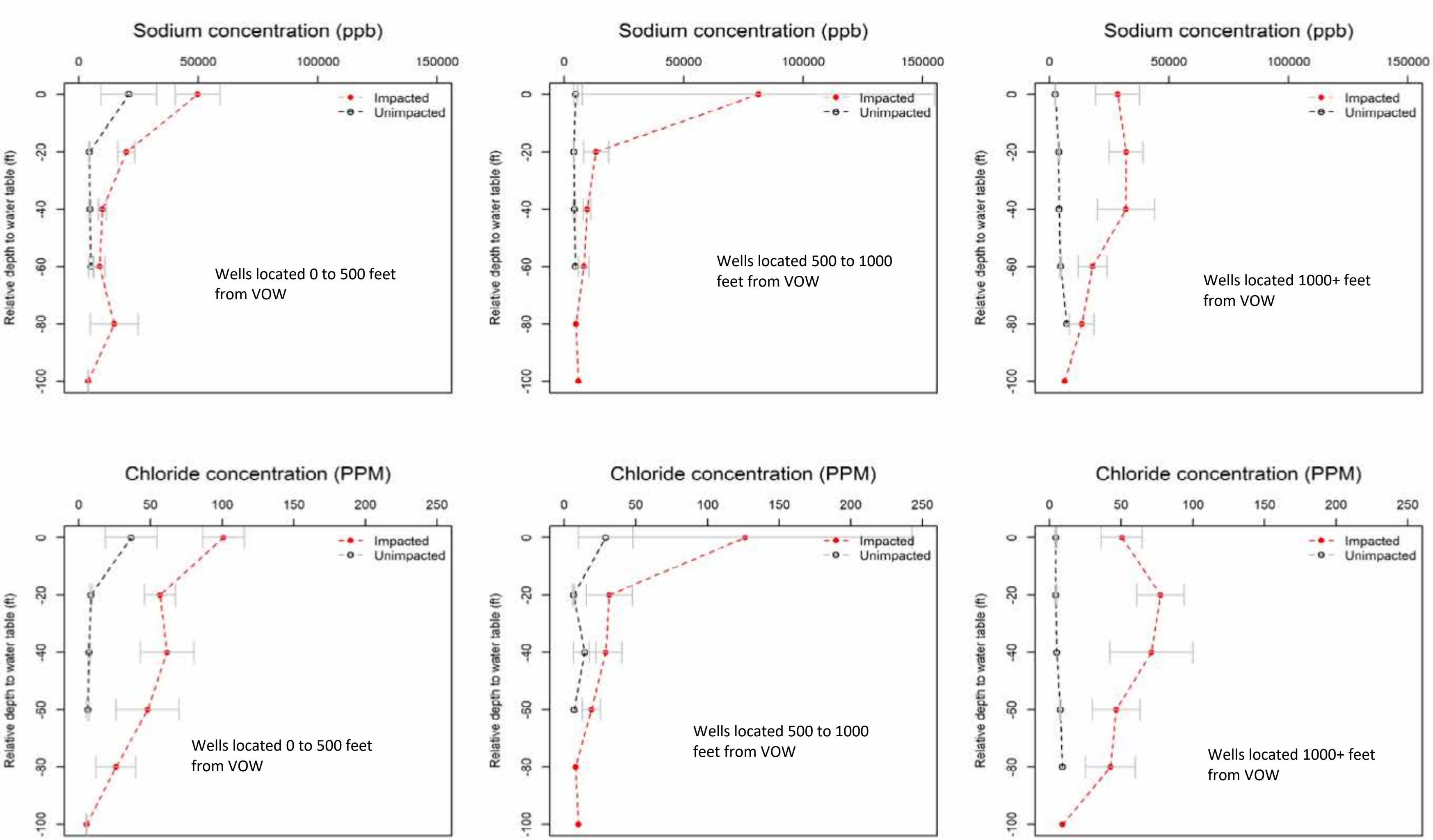


Mean iron and manganese comcentrations (ppm and ppb respectively) ± SE in groundwater at sample locations grouped by proximity to vow piles and impact category

Vegetative Organic Waste Management Facility
Research Project Summary Report
Mean Magnesium and Potassium Concentrations - SCDH 2013 and 2016 Reports
Figure 2-4



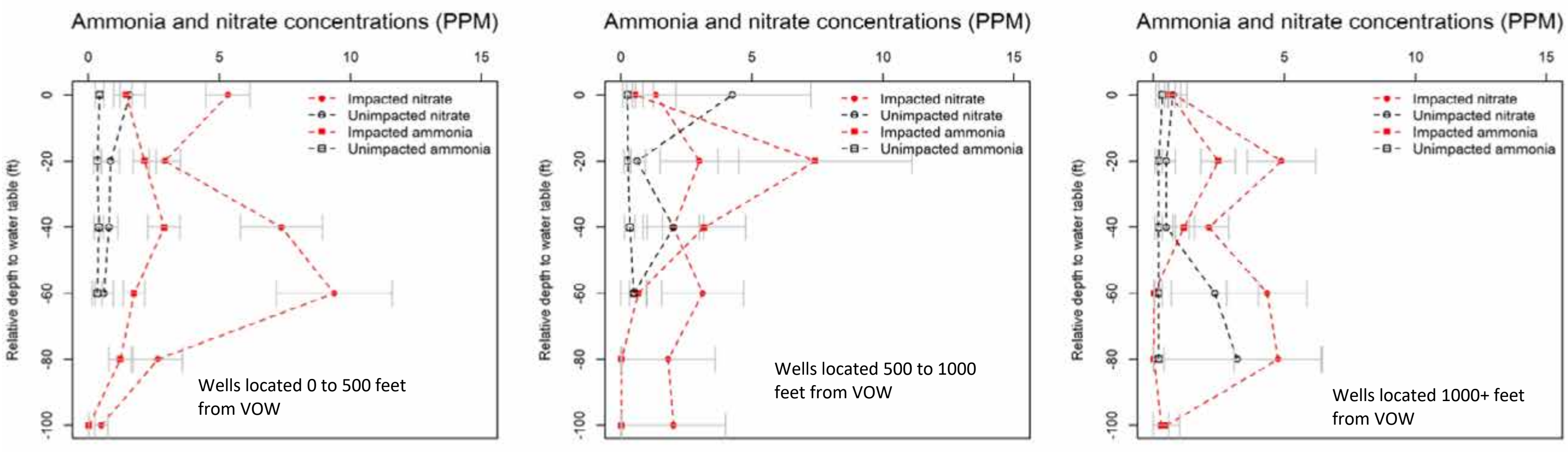
Vegetative Organic Waste Management Facility
Research Project Summary Report
Mean Sodium and Chloride Concentrations - SCDH 2013 and 2016 Reports
Figure 2-5



Mean sodium and potassium concentrations (ppb) ± SE in groundwater at sample locations grouped by proximity to vow piles and impact category

Mean Ammonia and Nitrate Concentrations - SCDH 2013 and 2016 Reports

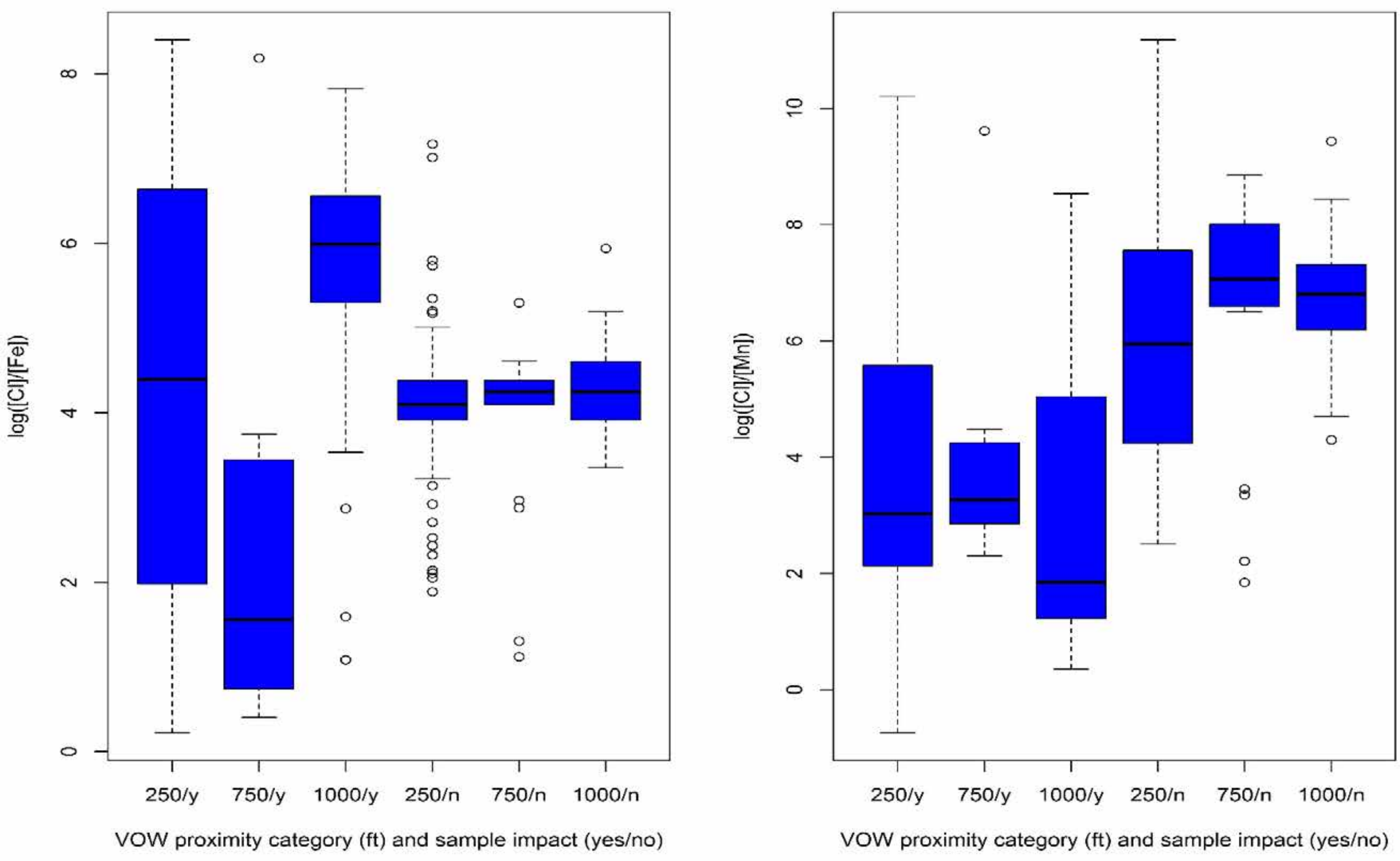
Figure 2-6



Mean ammonia and nitrate concentrations (ppm) ± SE in groundwater at sample locations grouped by proximity to vow piles and impact category

Mean Chloride to Iron and Chloride to Manganese Ratios - SCDH 2013 and 2016 Reports

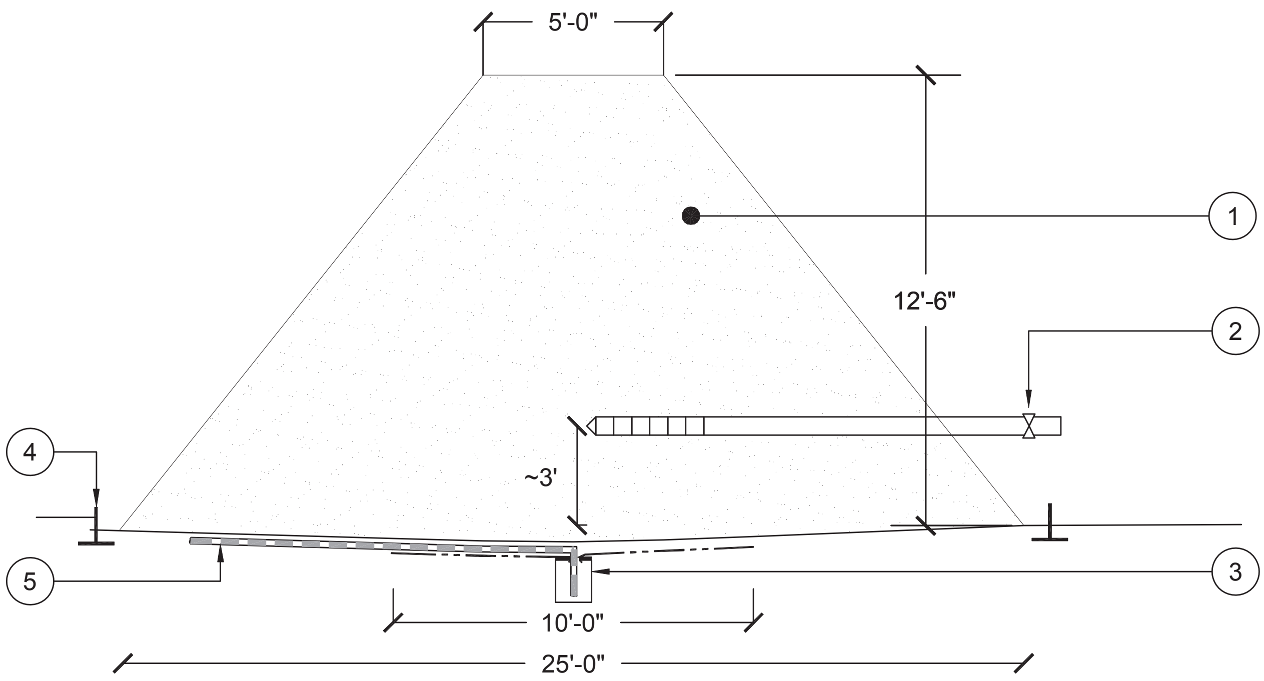
Figure 2-7



Mean chloride to iron and chloride to manganese ratios (ppm:ppm) ± SE in groundwater samples grouped by proximity to vow piles and impact category

Vegetative Organic Waste Facility
Research Summary Report
Figure 2-2
Pilot Study Layout

Schematic Layout of Mulch Piles #1 and #2
Figure 6-2

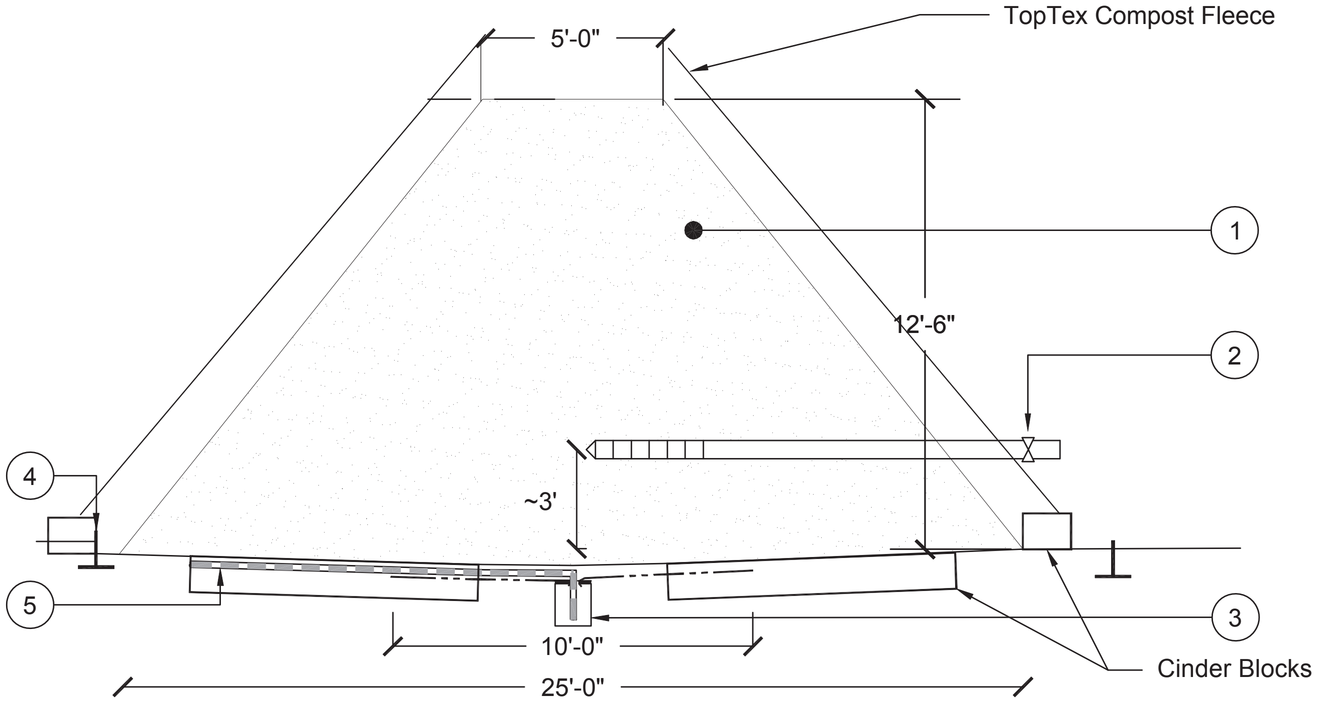


NOTES:

1. MULCH PILE; 40' LONG AT BASE.
2. GAS MONITORING POINT - NON-PERMENANT
3. PERMANENT LEACHATE COLLECTION LYSIMETER WITH TUBING (LINED TO PREVENT LEACHATE INFILTRATION INTO SUBSURFACE).
4. EDGING TO KEEP RUNOFF FROM ENTERING PAD
5. 1" SCH 40 PVC

SCALE: 3/16" = 1'

Schematic Layout of Mulch Pile #3
Figure 6-3

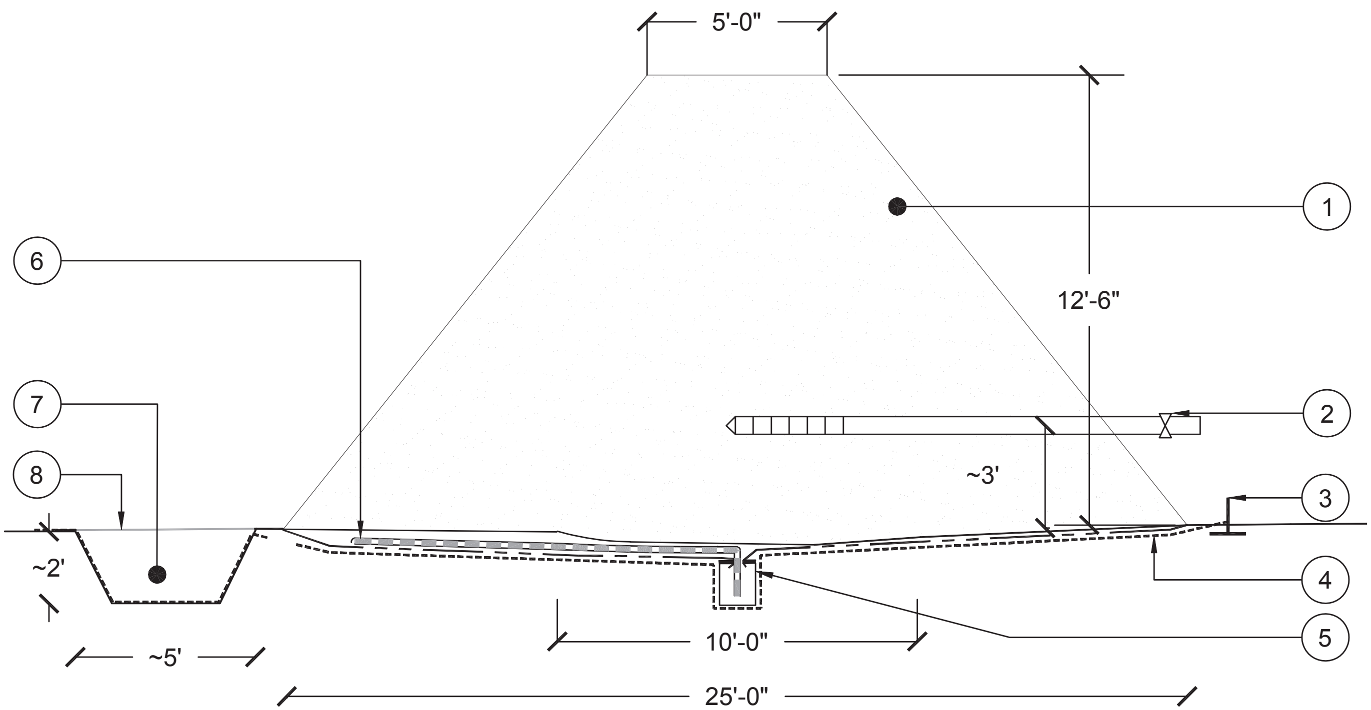


NOTES:

1. MULCH PILE; 40' LONG AT BASE.
2. GAS MONITORING POINT - NON-PERMENANT
3. PERMANENT LEACHATE COLLECTION LYSIMETER WITH TUBING (LINED TO PREVENT LEACHATE INFILTRATION INTO SUBSURFACE).
4. EDGING CREATED FROM SOIL DURING CONSTRUCTION OF PAD
5. 1" SCH 40 PVC

SCALE: 3/16" = 1'

Schematic Layout of Mulch Pile #4
Figure 6-4

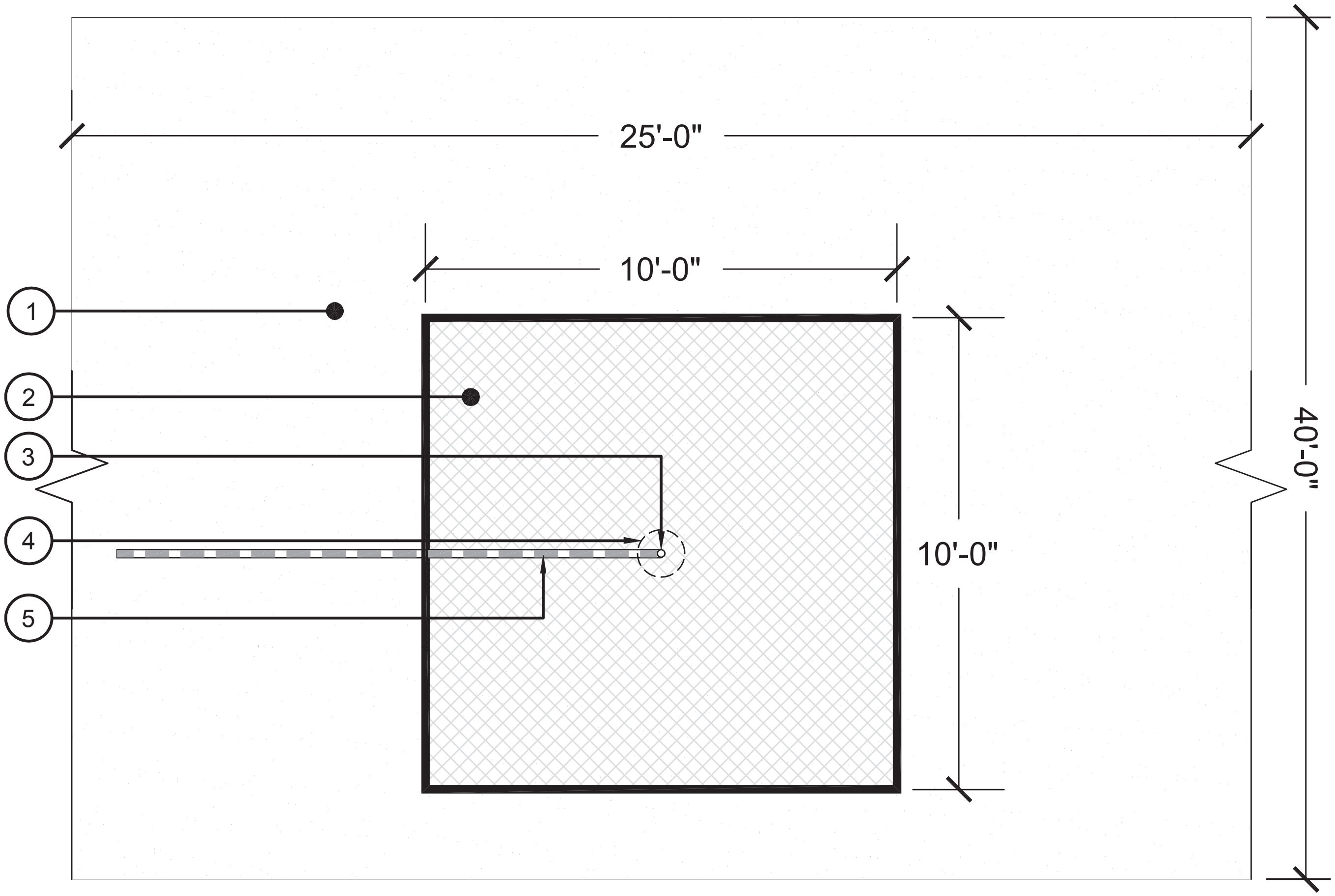


NOTES:

1. MULCH PILE; 40' LONG AT BASE
2. GAS MONITORING POINT - NON-PERMENANT
3. EDGING TO KEEP RUNOFF FROM ENTERING PAD
4. LINER TO EXTEND UNDER ALL PILE FEATURES - 2 LAYERS
5. PERMANENT LEACHATE COLLECTION LYSIMETER WITH TUBING.
6. 1" SCH. 40 PVC
7. LEACHATE COLLECTION SUMP
8. UNTREATED PLYWOOD COVER

SCALE: 3/16" = 1'

Schematic Layout of Mulch Percolate Collection System
Figure 6-5



NOTES:

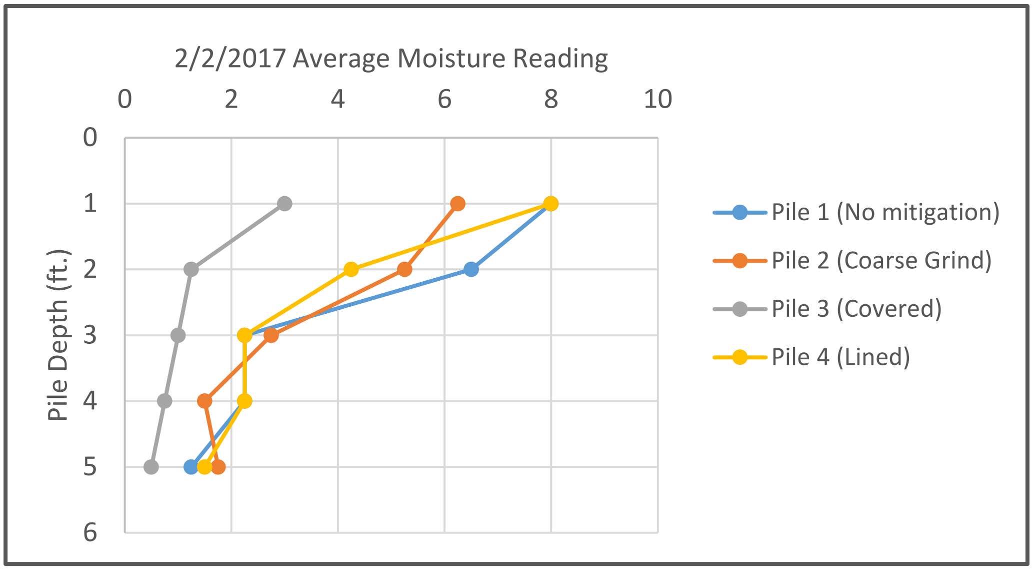
1. MULCH PILE
2. LINER (6 MIL. PLASTIC SHEETING)*
3. 2" HOLE IN LID OF 5 GALLON BUCKET
4. 5 GALLON BUCKET
5. 1" SCH. 40 PVC CONDUIT

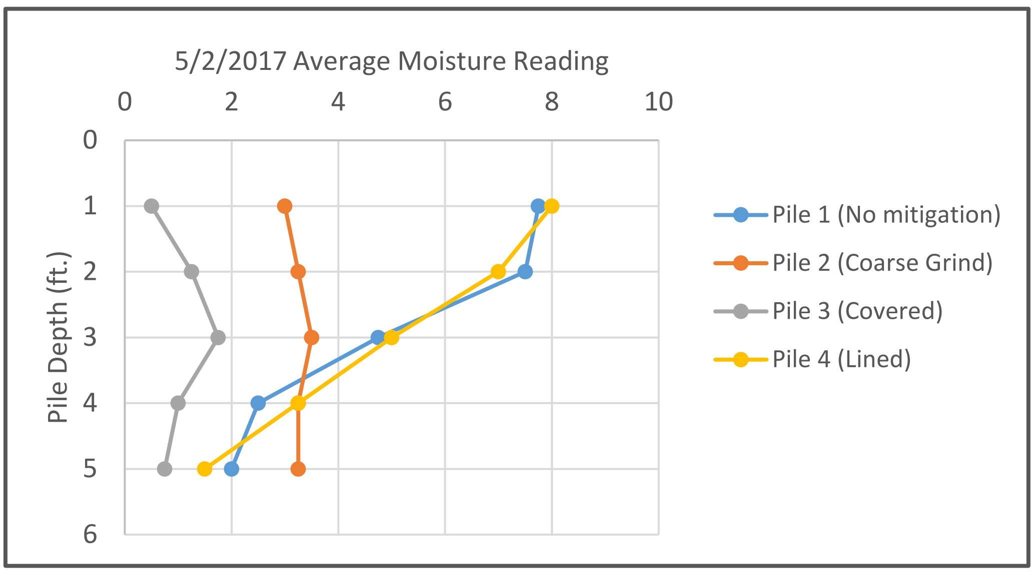
*FOR PILE 4 (FIGURE 4) LINER SHALL EXTEND TO EDGES OF PILE

DETAIL

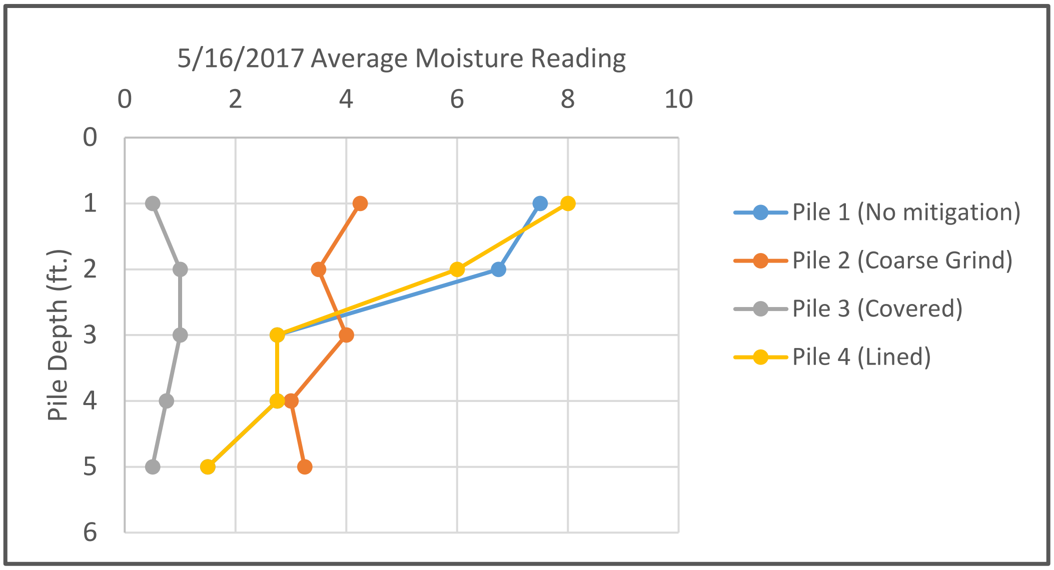
SCALE: 1/4" = 1'

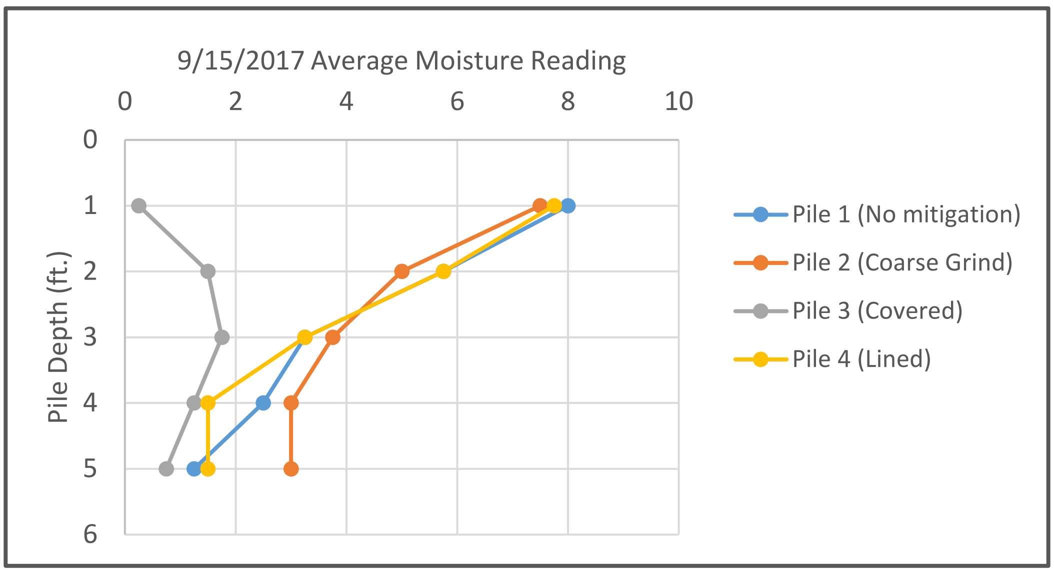
Vegetative Organic Waste Management Facility
Research Project Summary Report
Soil Moisture Distribution by Date - Pilot Study
Figure 7-1



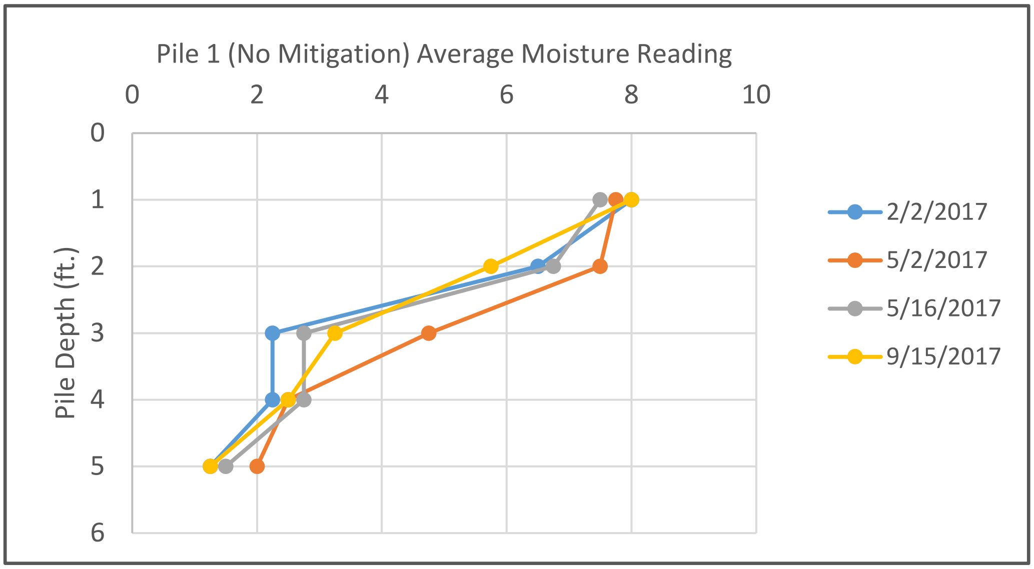


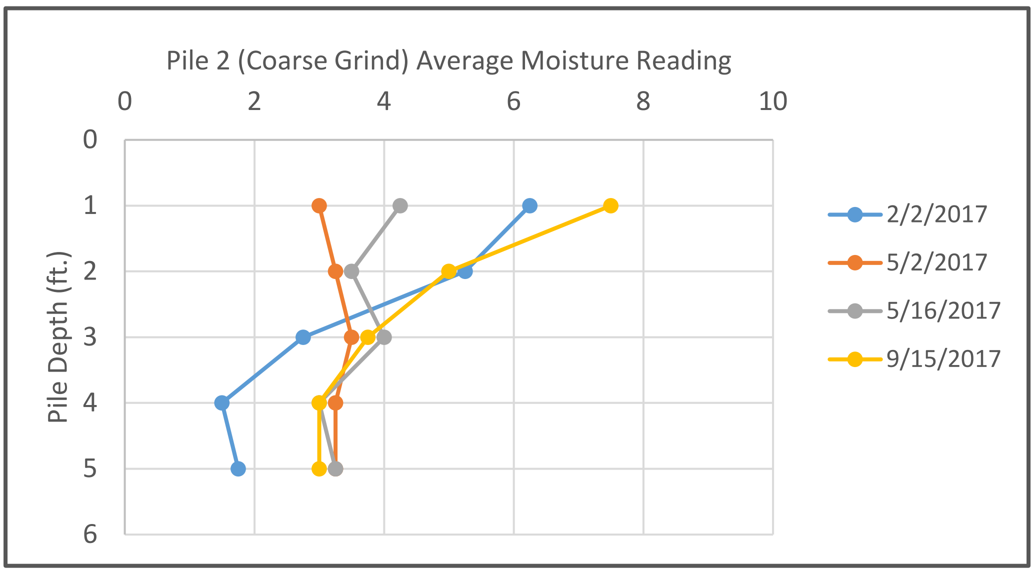
Vegetative Organic Waste Management Facility
Research Project Summary Report
Soil Moisture Distribution by Date - Pilot Study
Figure 7-1



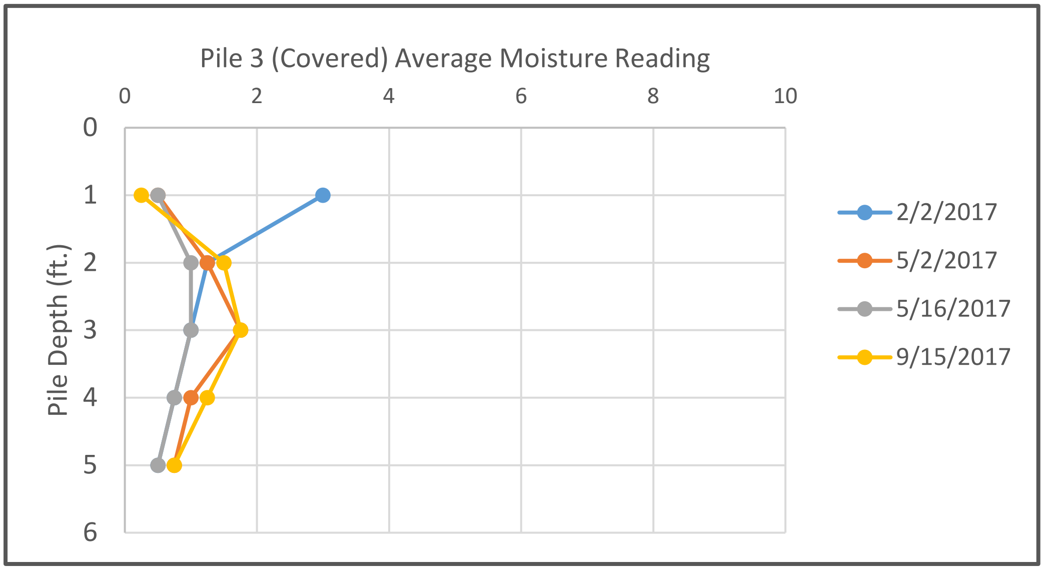


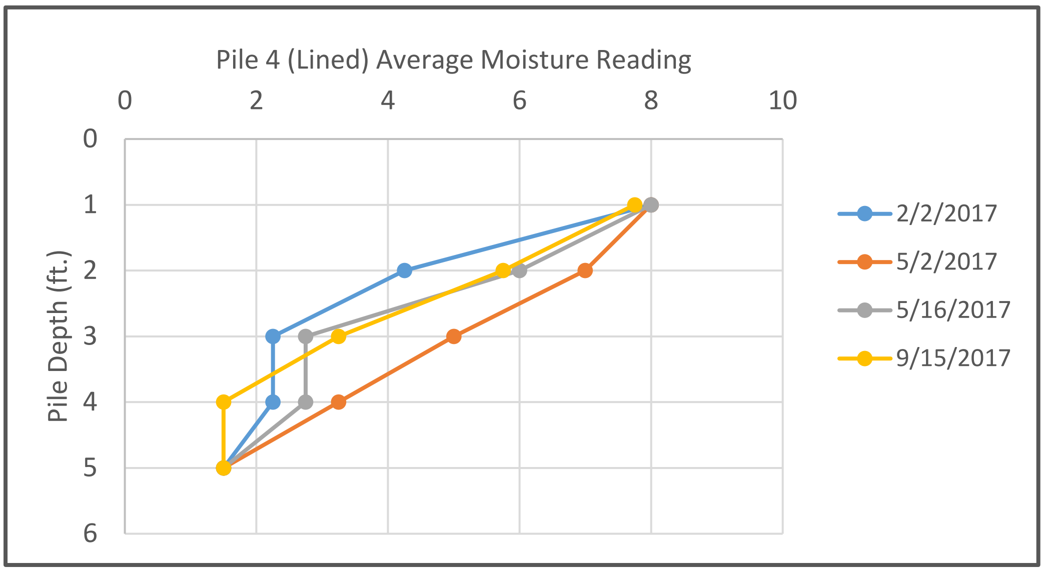
Vegetative Organic Waste Management Facility
Research Project Summary Report
Soil Moisture Distribution by Pile - Pilot Study
Figure 7-2



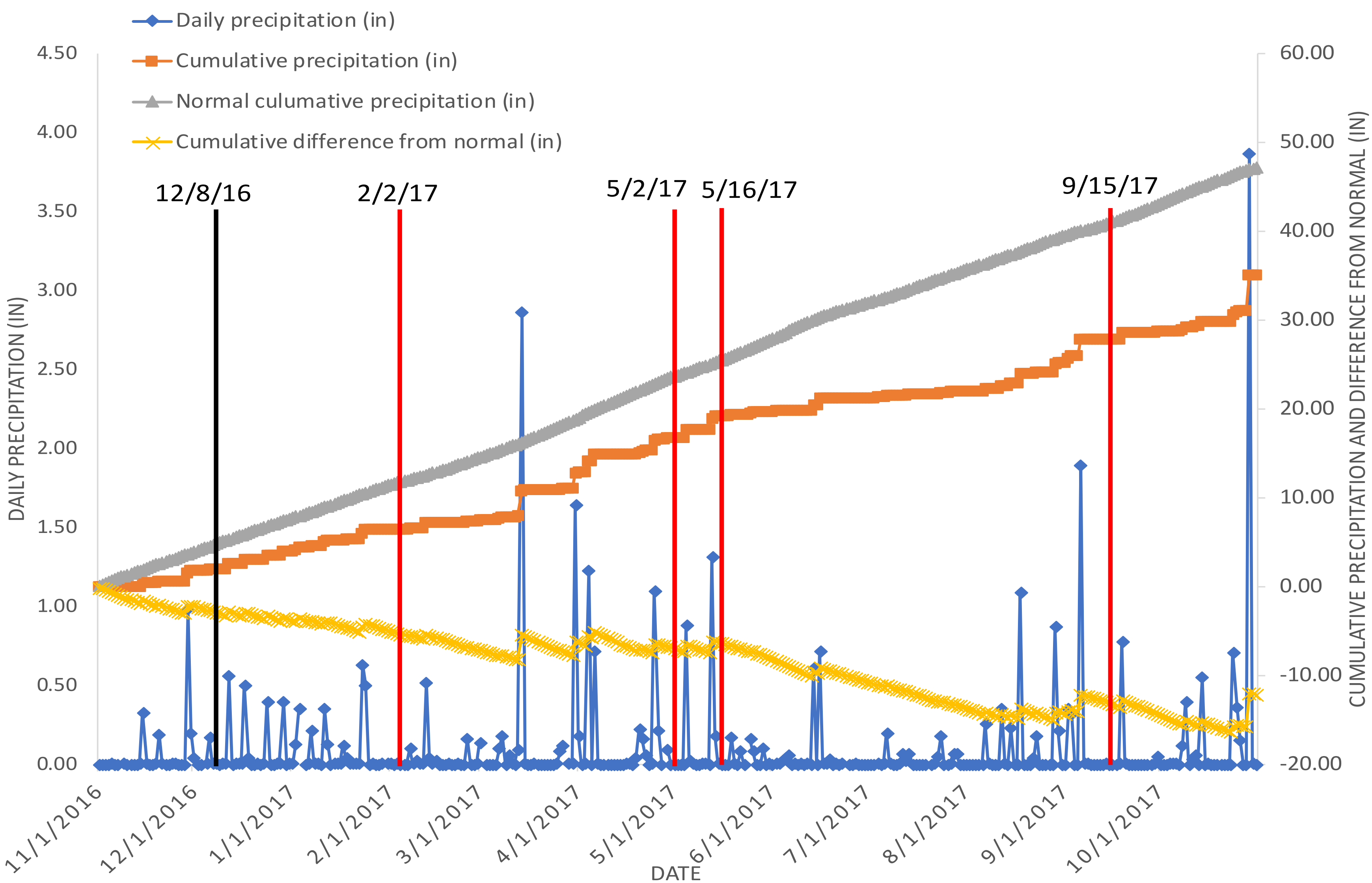


Vegetative Organic Waste Management Facility
Research Project Summary Report
Soil Moisture Distribution by Pile - Pilot Study
Figure 7-2



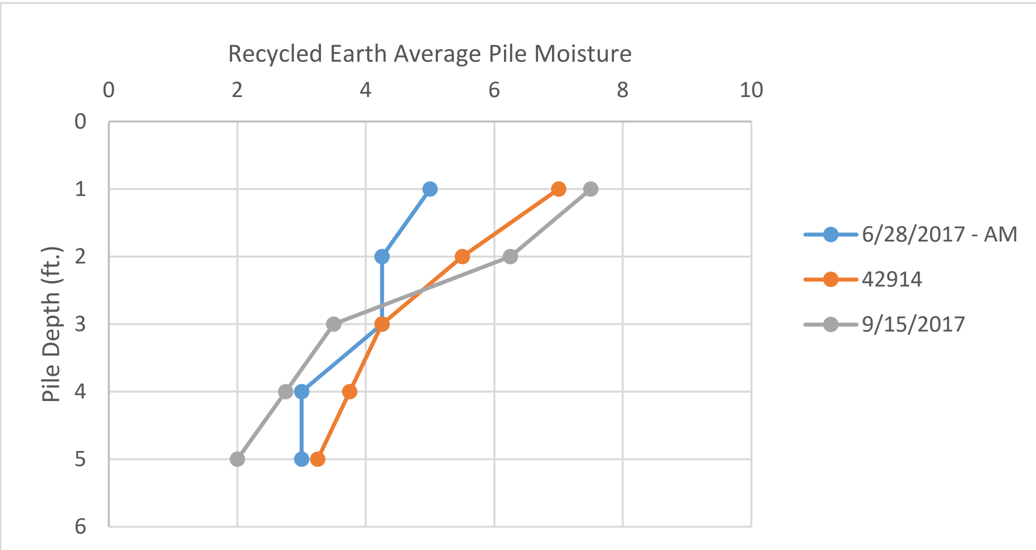


Vegetative Organic Waste Management Facility
Research Project Summary Report
Precipitation History - Pilot Study
Figure 7-3



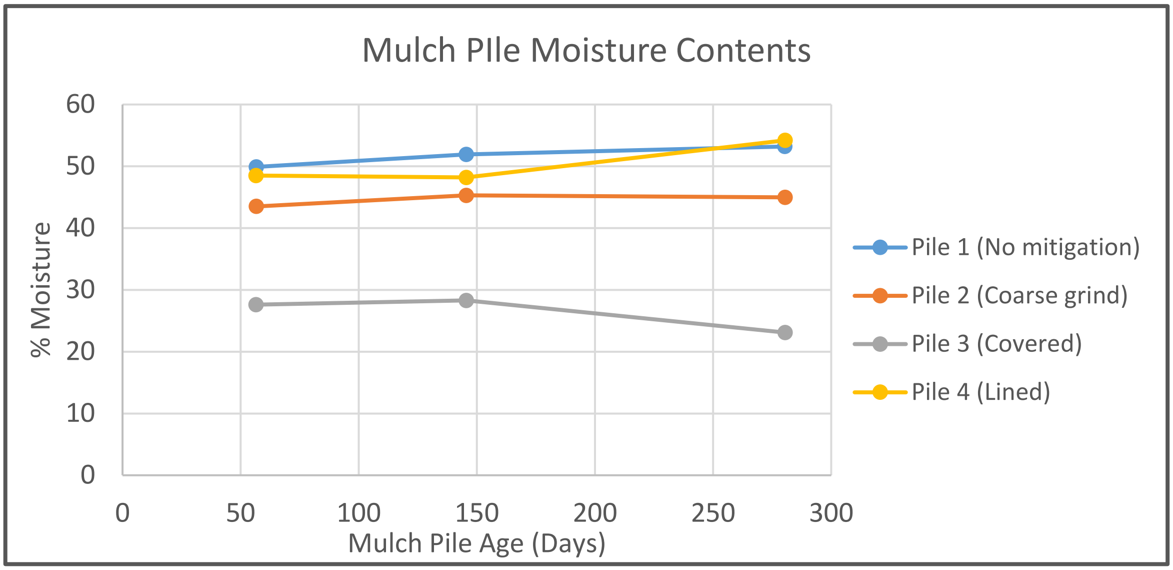
Black Vertical line-Start of Pilot Test
Red Vertical Line - Pilot Study Sampling Events

Vegetative Organic Waste Management Facility
Research Project Summary Report
Moisture Profiles - Recycled Earth Site
Figure 7-4

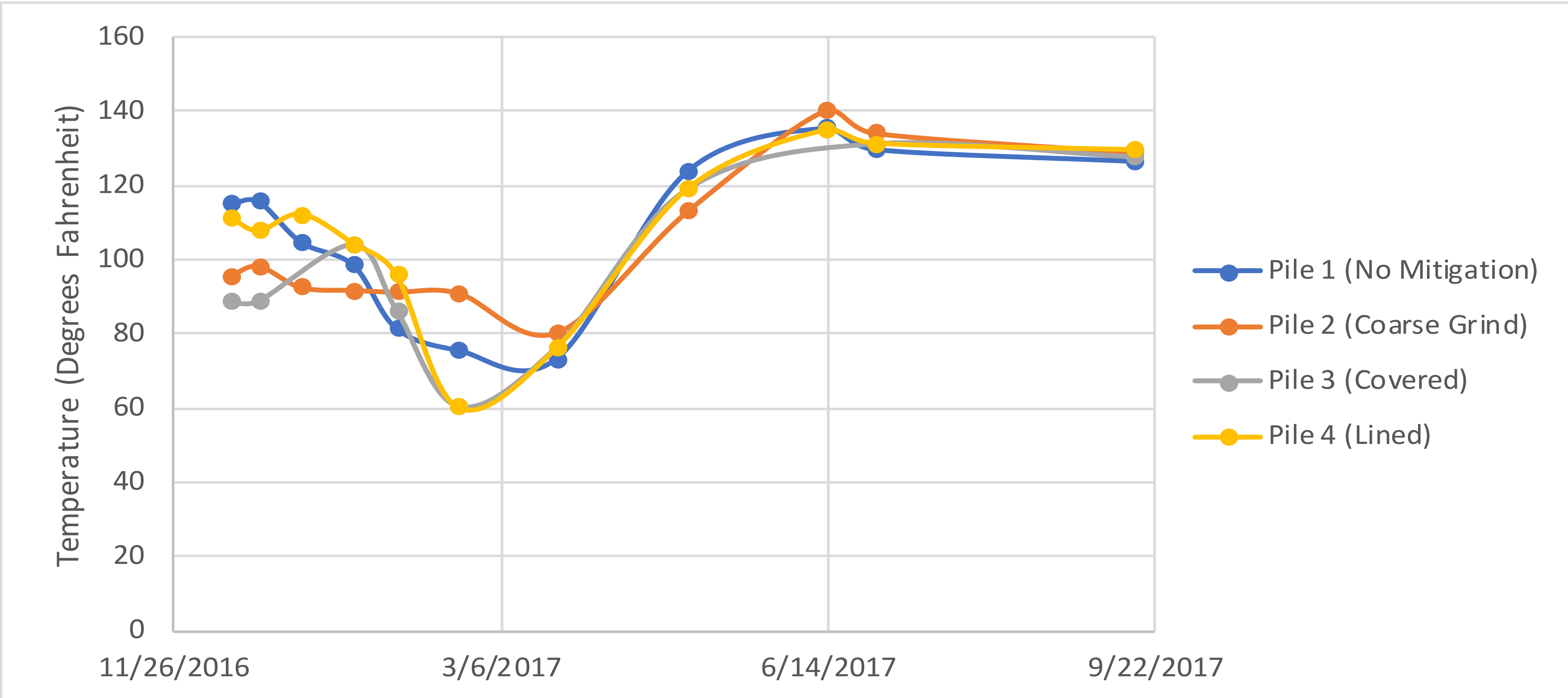


Comparison of Moisture Contents - Pilot Study

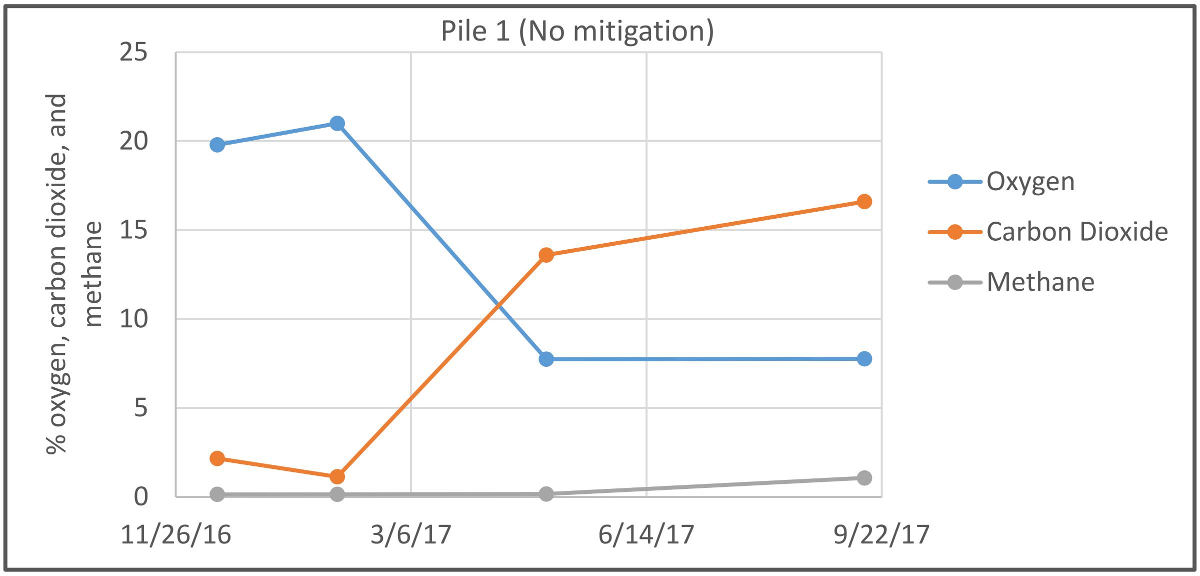
Figure 7-5

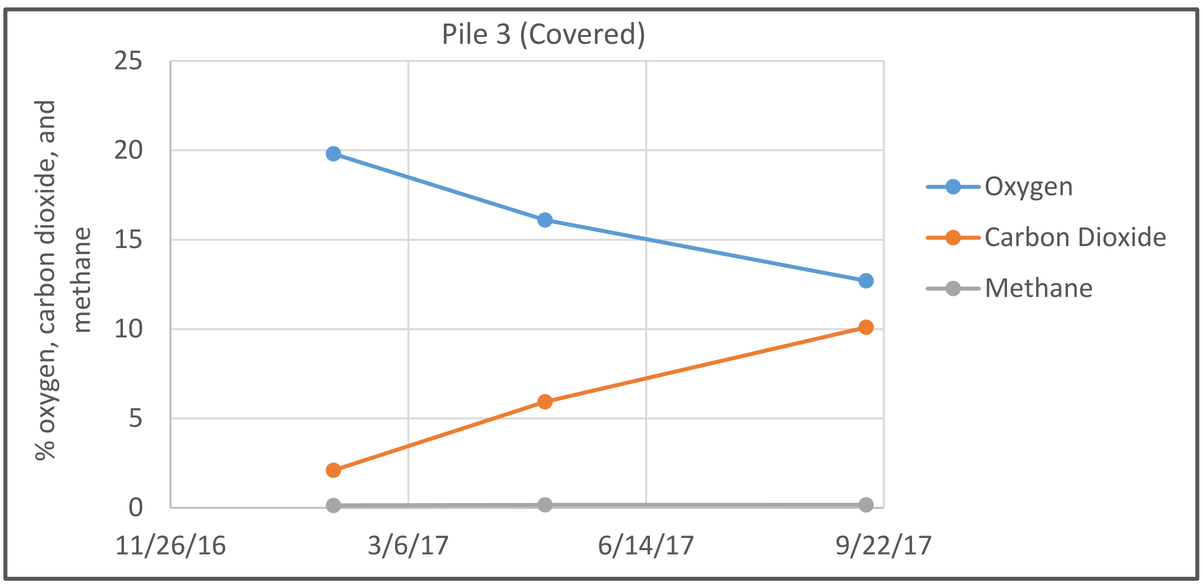


Vegetative Organic Waste Management Facility
Research Project Summary Report
Pile Temperature Over Time - Pilot Study
Figure 7-6

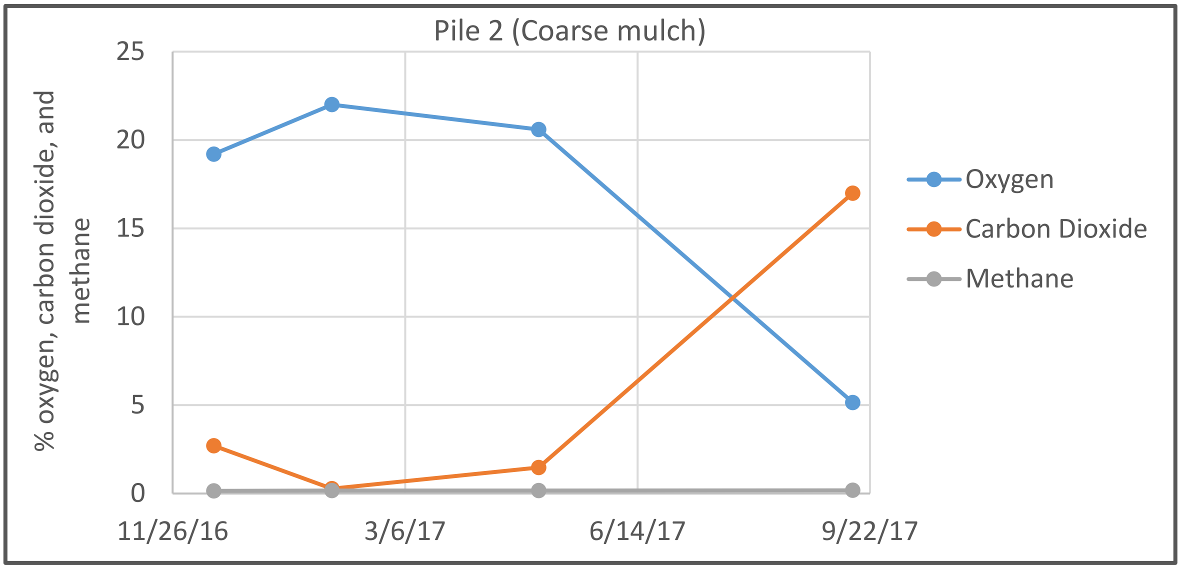


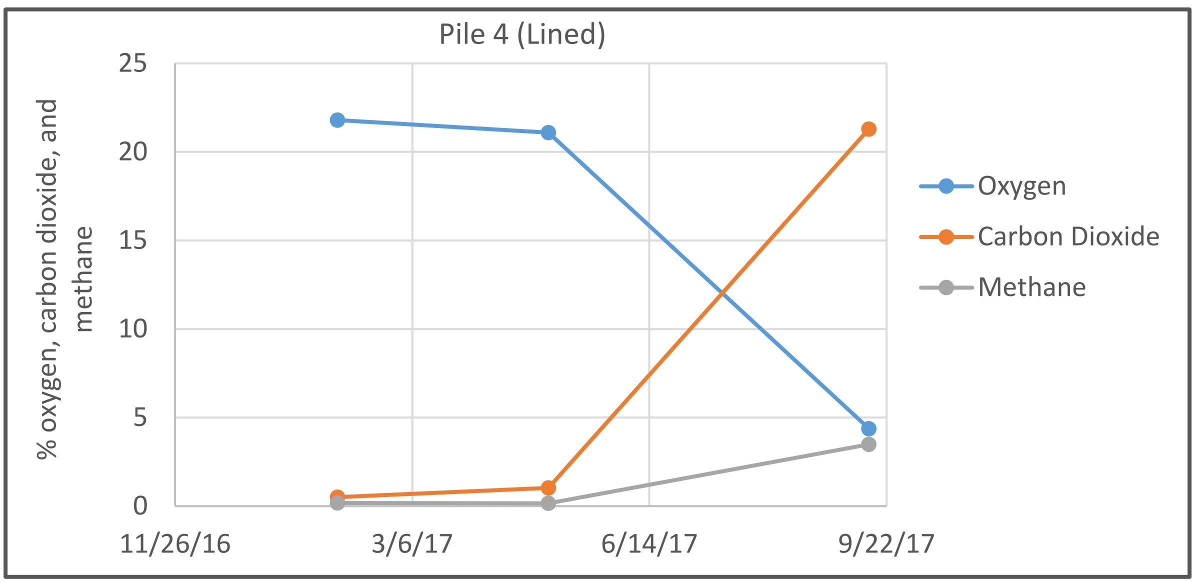
Vegetative Organic Waste Management Facility
Research Project Summary Report
Mulch Pile Gas Composition Over Time - Pilot Study
Figure 7-7



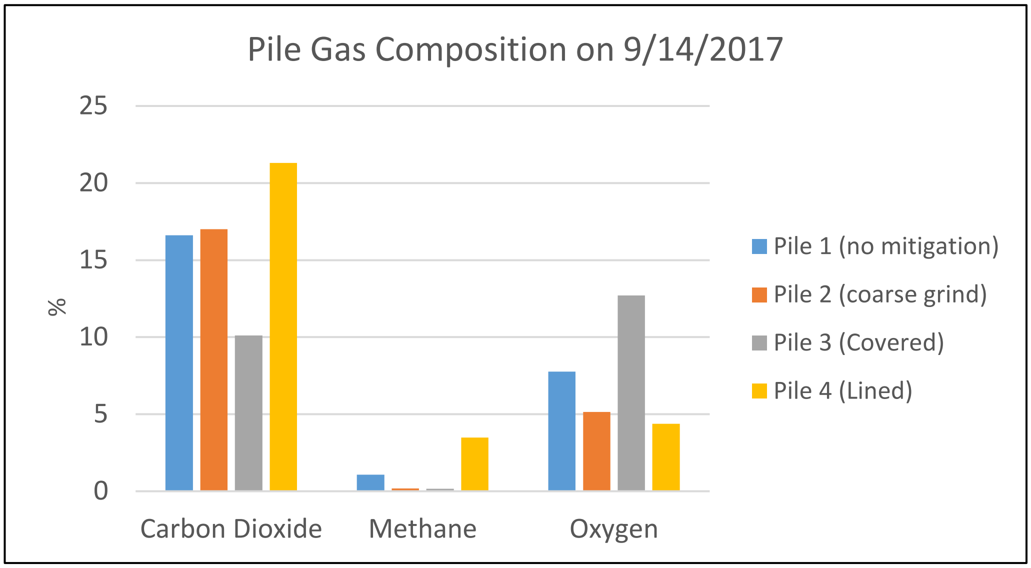


Vegetative Organic Waste Management Facility
Research Project Summary Report
Mulch Pile Gas Composition Over Time - Pilot Study
Figure 7-7

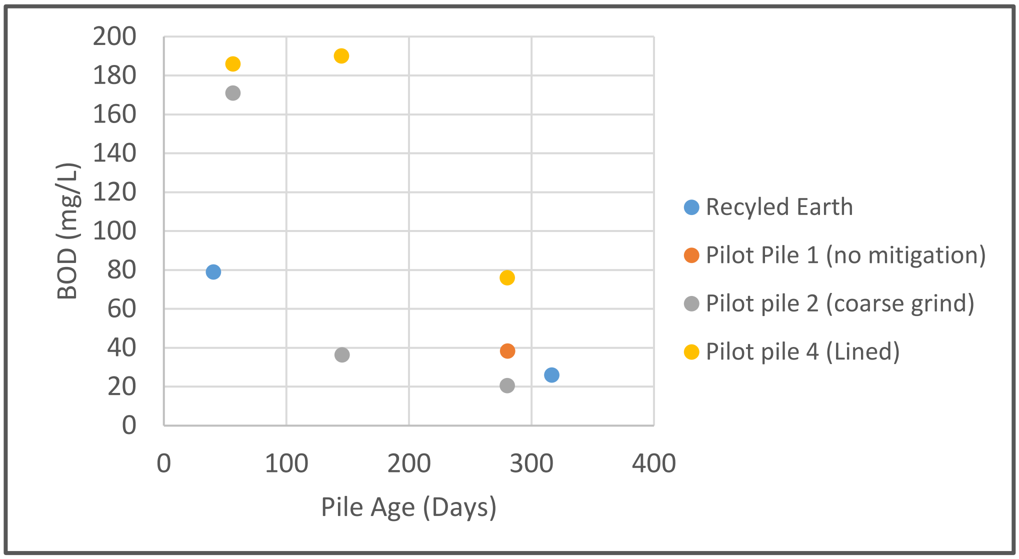


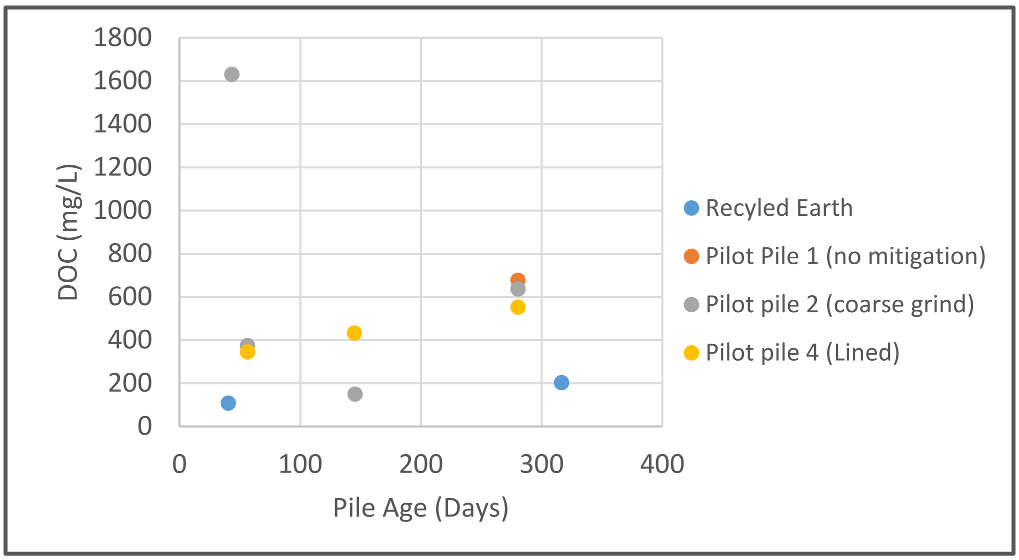


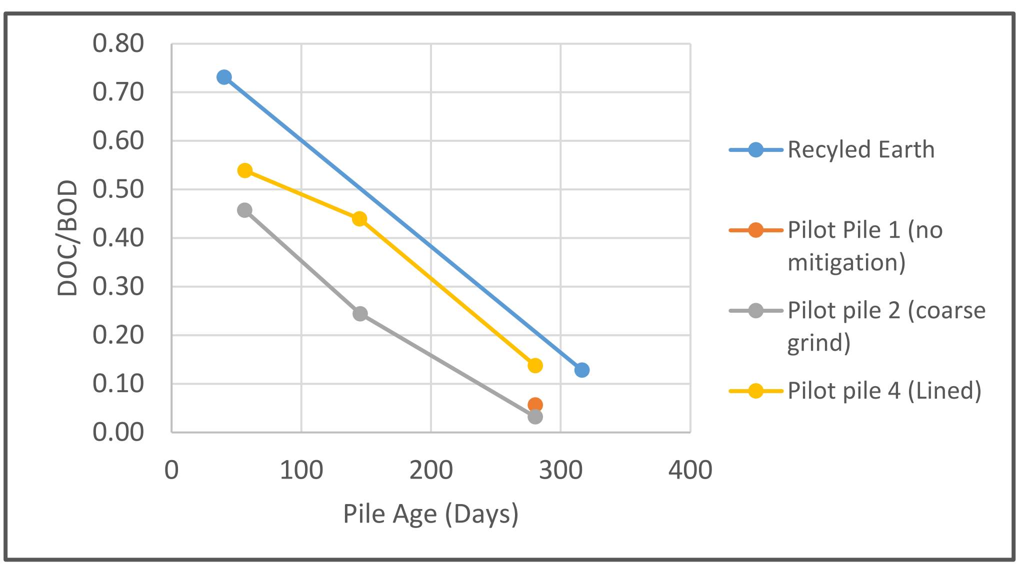
Vegetative Organic Waste Management Facility
Research Project Summary Report
Mulch Pile Gas Composition - September - Pilot Study
Figure 7-8



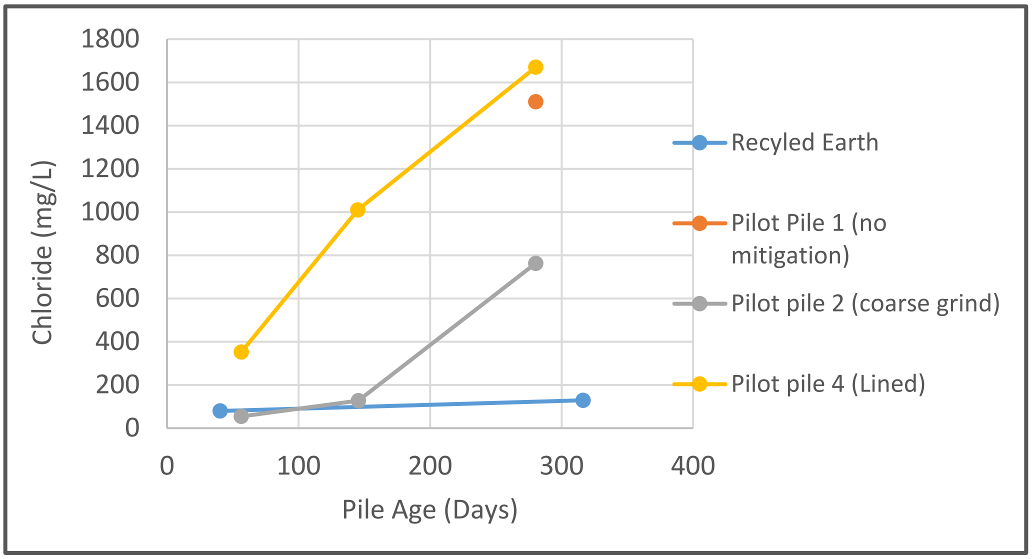
Vegetative Organic Waste Management Facility
Research Project Summary Report
Composition of Mulch Percolate Samples - Pilot Study and Recycled Earth
Site Figure 7-9

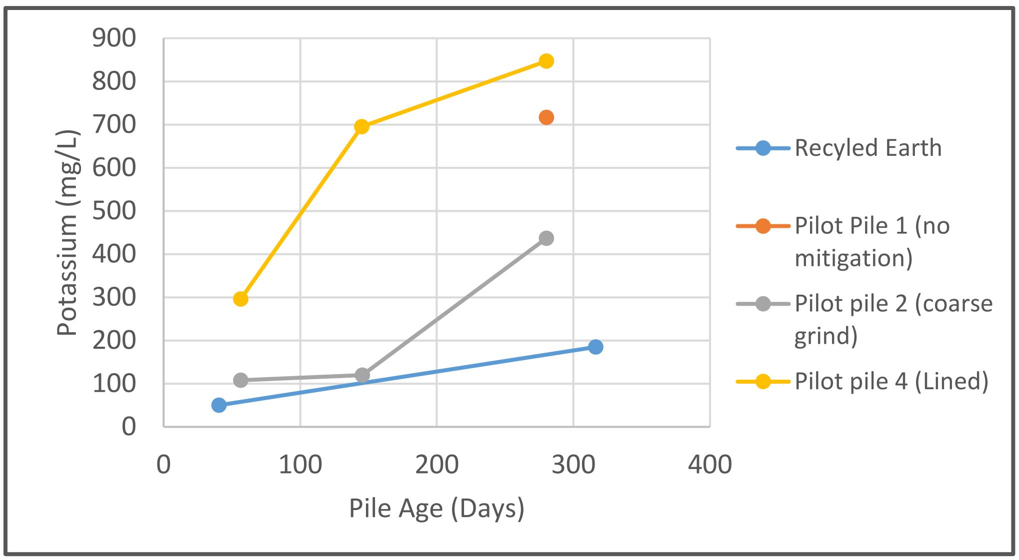


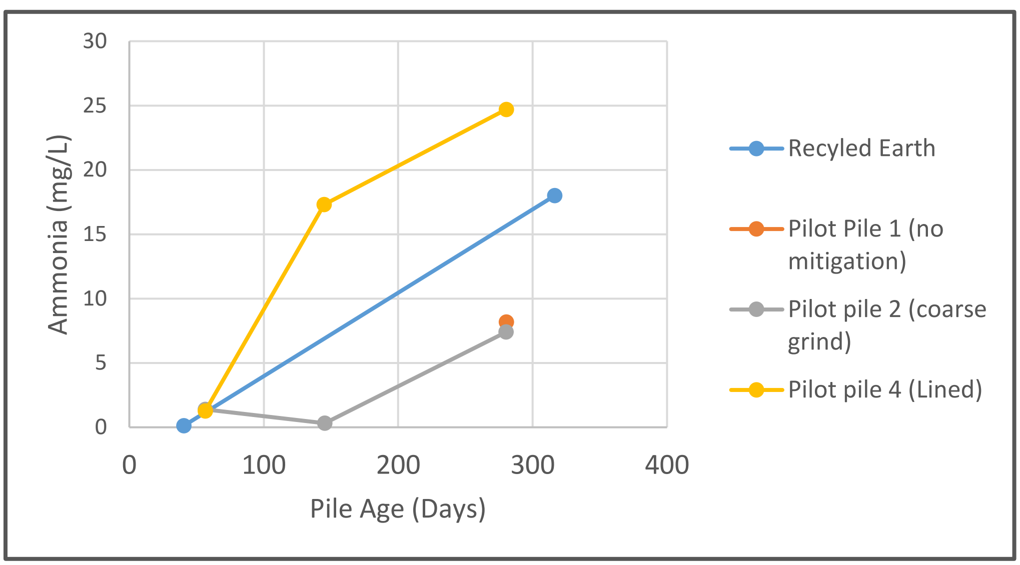




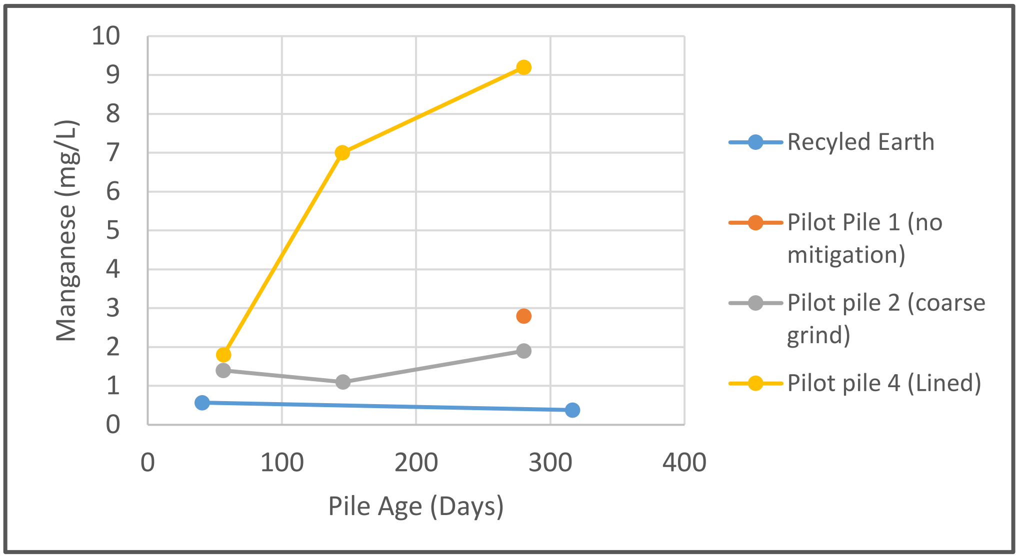
Vegetative Organic Waste Management Facility
Research Project Summary Report
Composition of Mulch Percolate Sample - Pilot Study and Recycled Earth Site
Figure 7-9

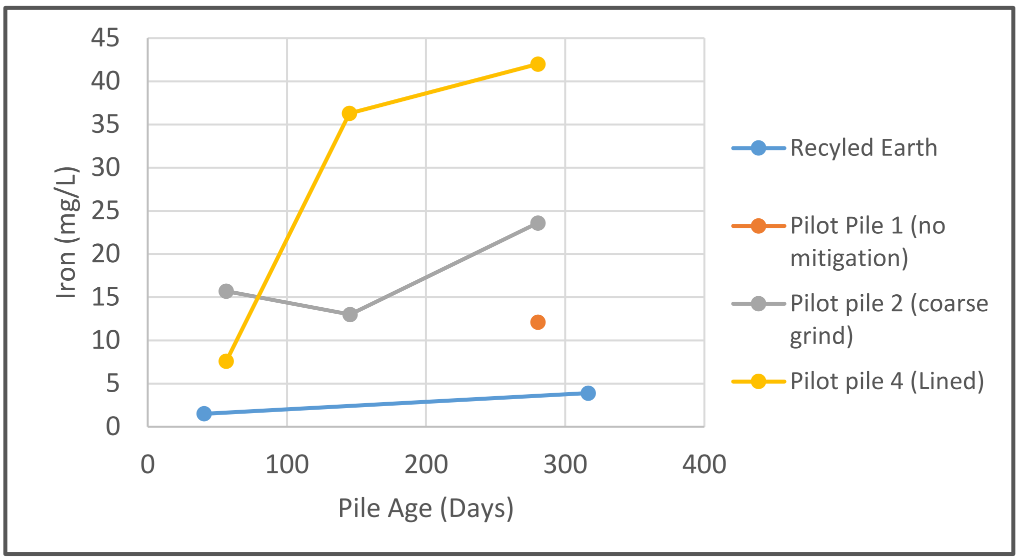




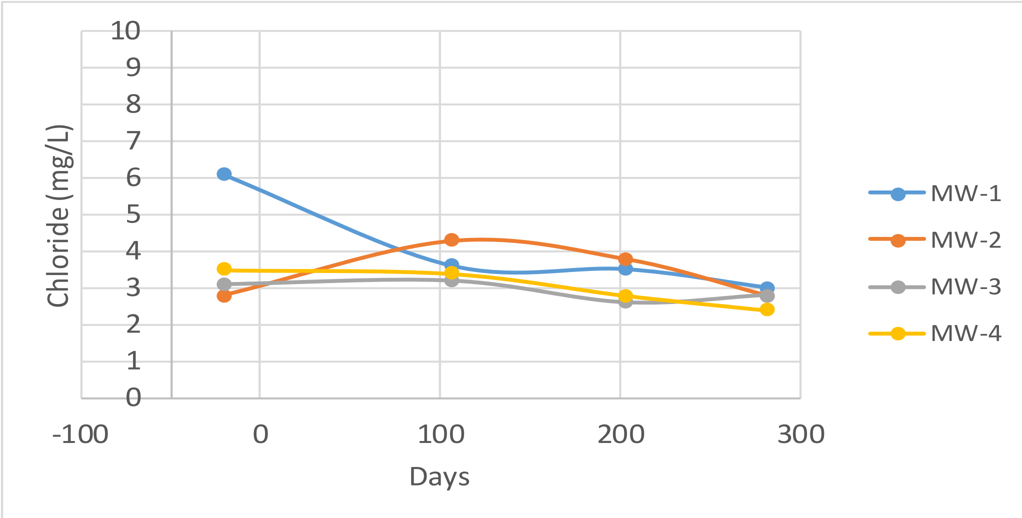


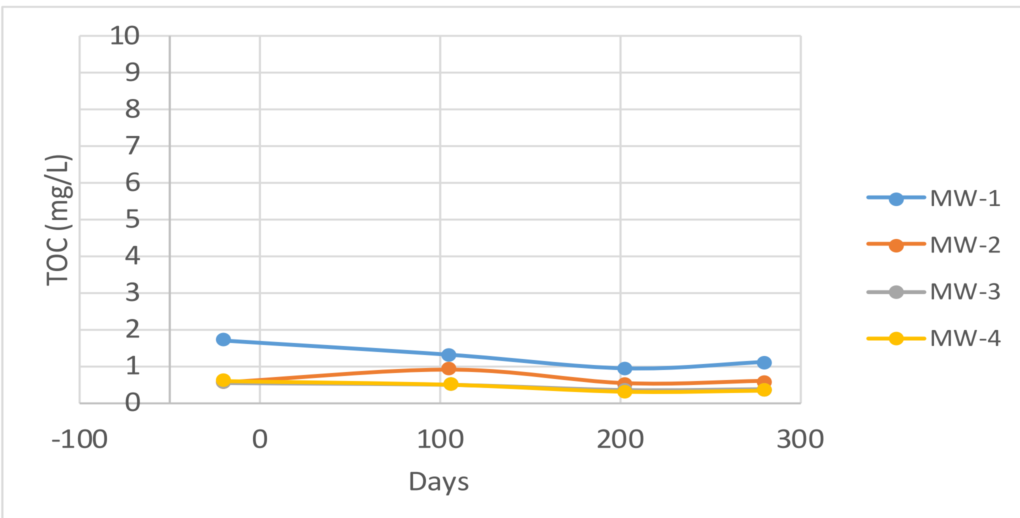
Vegetative Organic Waste Management Facility
Research Project Summary Report
Composition of Mulch Percolate Sample - Pilot Study and Recycled Earth Site
Figure 7-9

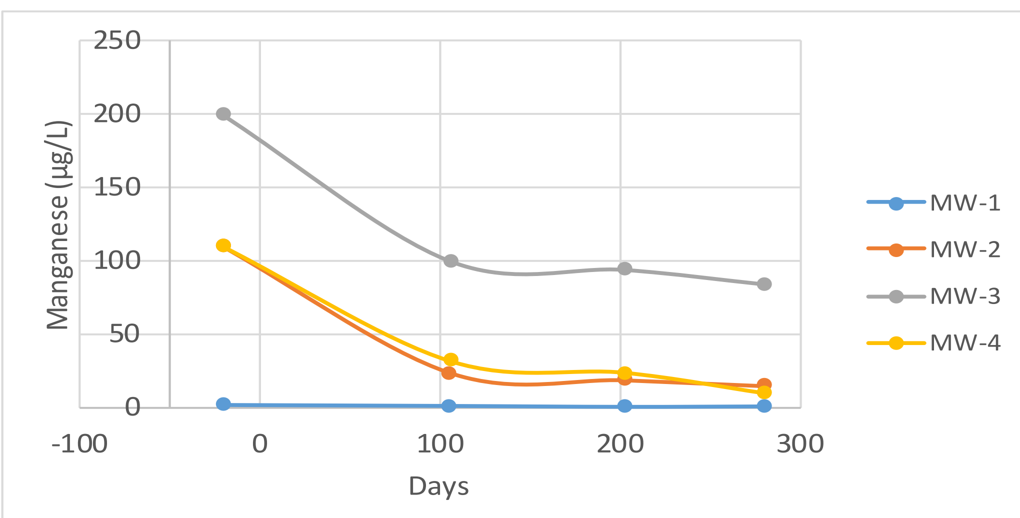


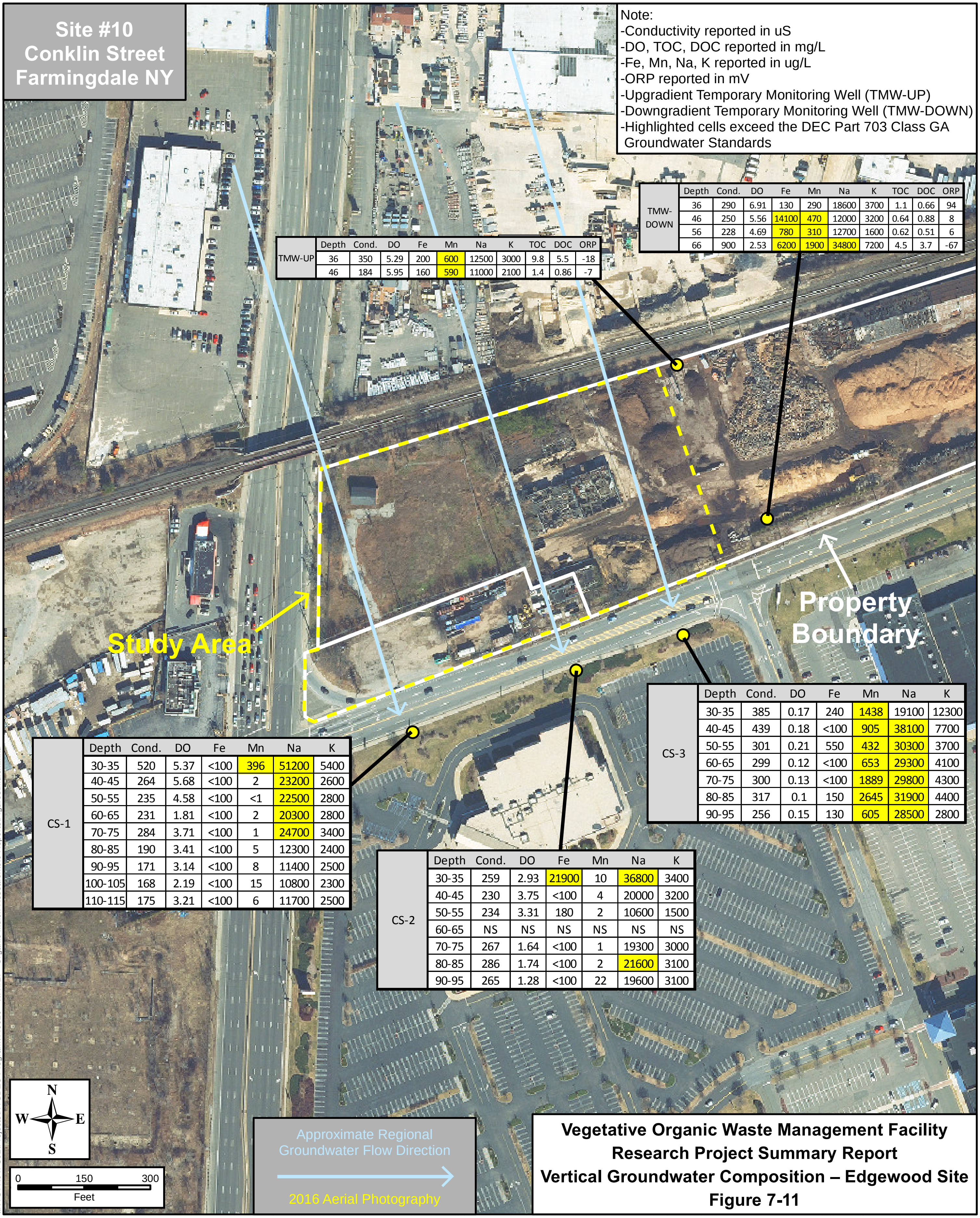


Vegetative Organic Waste Management Facility
Research Project Summary Report
TOC, Manganese, and Chloride Concentrations in Groundwater - Pilot Study
Figure 7-10









Note:
-Conductivity reported in uS
-DO, TOC, DOC reported in mg/L
-Fe, Mn, Na, K reported in ug/L
-ORP reported in mV
-Upgradient Temporary Monitoring Well (TMW-UP)
-Downgradient Temporary Monitoring Well (TMW-DOWN)
-Highlighted cells exceed the DEC Part 703 Class GA Groundwater Standards

	Depth	Cond.	DO	Fe	Mn	Na	K	TOC	DOC	ORP
TMW-UP	36	350	5.29	200	600	12500	3000	9.8	5.5	-18
	46	184	5.95	160	590	11000	2100	1.4	0.86	-7

	Depth	Cond.	DO	Fe	Mn	Na	K	TOC	DOC	ORP
TMW-DOWN	36	290	6.91	130	290	18600	3700	1.1	0.66	94
	46	250	5.56	14100	470	12000	3200	0.64	0.88	8
	56	228	4.69	780	310	12700	1600	0.62	0.51	6
	66	900	2.53	6200	1900	34800	7200	4.5	3.7	-67

	Depth	Cond.	DO	Fe	Mn	Na	K
CS-3	30-35	385	0.17	240	1438	19100	12300
	40-45	439	0.18	<100	905	38100	7700
	50-55	301	0.21	550	432	30300	3700
	60-65	299	0.12	<100	653	29300	4100
	70-75	300	0.13	<100	1889	29800	4300
	80-85	317	0.1	150	2645	31900	4400
	90-95	256	0.15	130	605	28500	2800

	Depth	Cond.	DO	Fe	Mn	Na	K
CS-1	30-35	520	5.37	<100	396	51200	5400
	40-45	264	5.68	<100	2	23200	2600
	50-55	235	4.58	<100	<1	22500	2800
	60-65	231	1.81	<100	2	20300	2800
	70-75	284	3.71	<100	1	24700	3400
	80-85	190	3.41	<100	5	12300	2400
	90-95	171	3.14	<100	8	11400	2500
	100-105	168	2.19	<100	15	10800	2300
	110-115	175	3.21	<100	6	11700	2500

	Depth	Cond.	DO	Fe	Mn	Na	K
CS-2	30-35	259	2.93	21900	10	36800	3400
	40-45	230	3.75	<100	4	20000	3200
	50-55	234	3.31	180	2	10600	1500
	60-65	NS	NS	NS	NS	NS	NS
	70-75	267	1.64	<100	1	19300	3000
	80-85	286	1.74	<100	2	21600	3100
	90-95	265	1.28	<100	22	19600	3100

Vegetative Organic Waste Management Facility
Research Project Summary Report
Vertical Groundwater Composition – Edgewood Site
Figure 7-11

\\NYSYR04FS01\Projects\NYSDEC Program\449929 - WA #27 - Organic Mulch Research\9.0 Reports\Figures\Mulch.mxd

Figure 7-12
Conceptual Mitigation Approach
For Fine Textured Mulch
– Partial Covered Pile

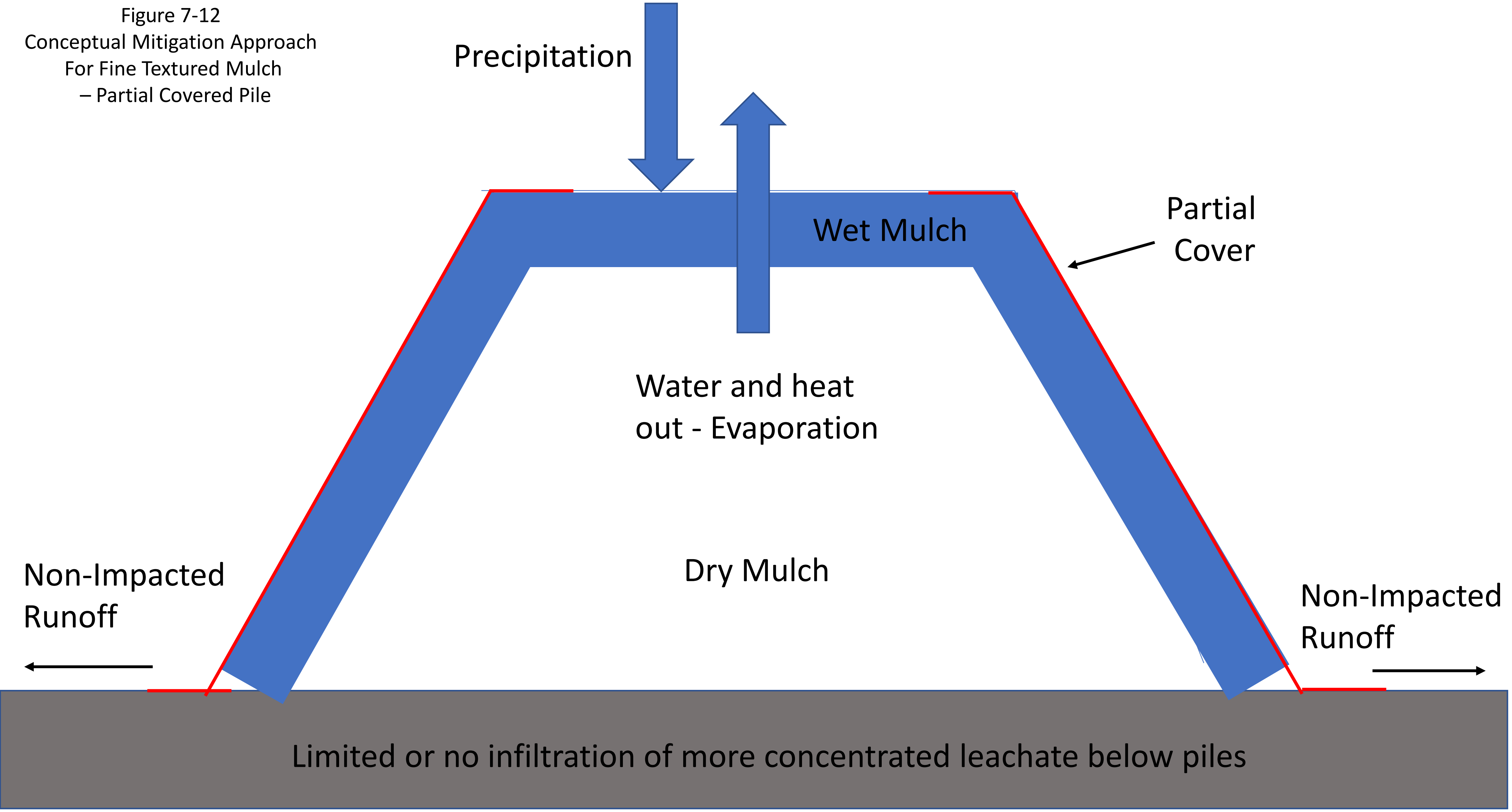


Figure 7-13
Conceptual Mitigation Approach
For Coarse Mulch
- Covered Pile

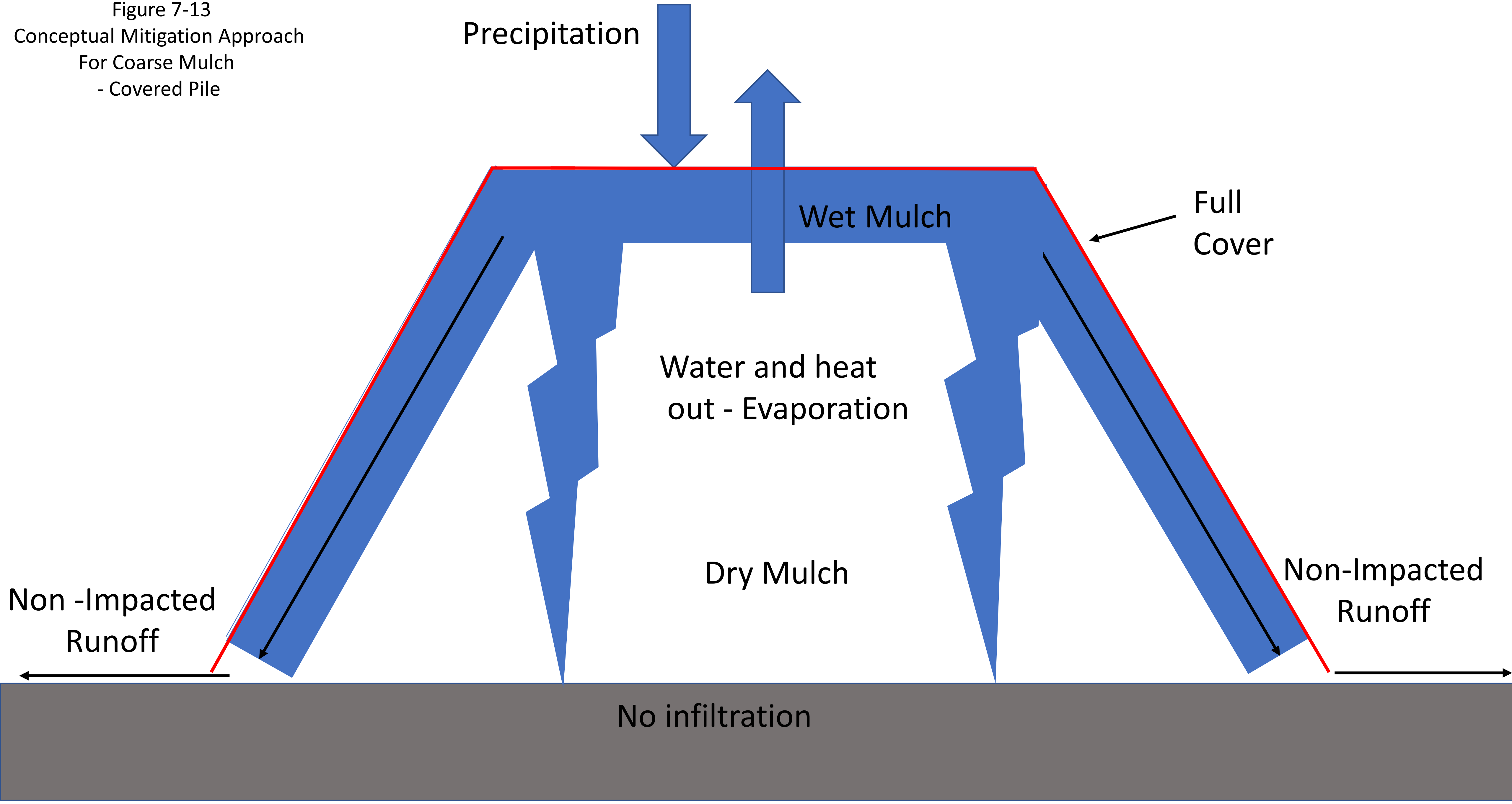
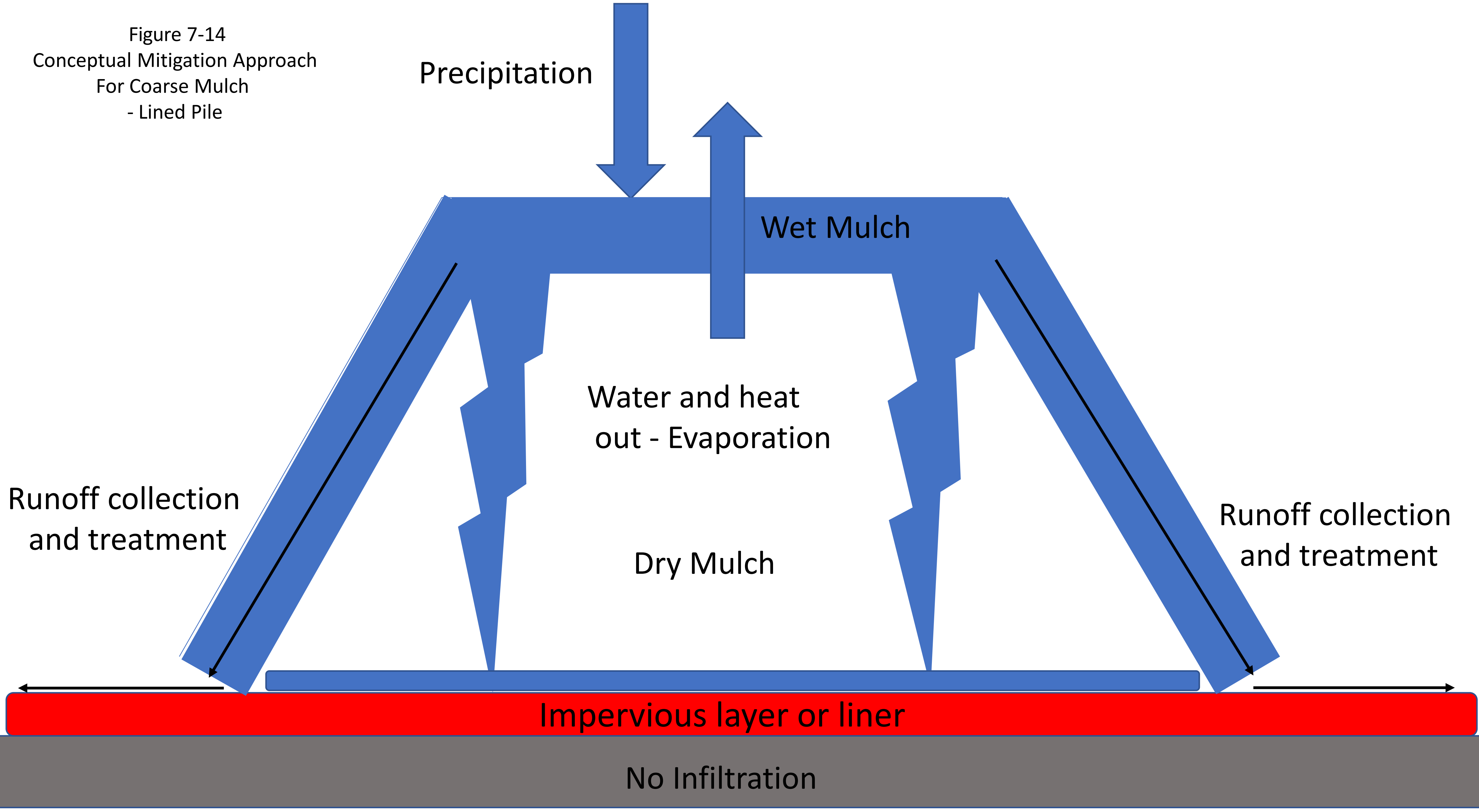


Figure 7-14
Conceptual Mitigation Approach
For Coarse Mulch
- Lined Pile



Appendix A

Vegetative Organic Waste Management Facility
Research Project Summary Report
SCDHS 2016 Analytical Data
Appendix A

Site	Sample_ID	Sample Type	Screen Interval	Sample Date	DTW	DO (ppm)	Temp C	pH	EC (uS)	Al (ppb)	Ba (ppb)	Ca (ppb)	Co (ppb)	Cr (ppb)	Cu (ppb)	Fe (ppb)	K (ppb)	Mg (ppb)	Mn (ppb)	Na (ppb)	Ni (ppb)	NH3 (ppm)	Cl (ppm)	NO3 (ppm)
Ben Doziak Farm	WR-1	GW	90-95	8/25/2011	10.02	3.55	15.4	8.73	66.28	10	20	4300	1	1	4	100	800	1000	60	4800	1.5	0.02	7	0.7
Ben Doziak Farm	WR-1	GW	80-85	8/25/2011	10.02	5.74	15.6	8.19	64.5	17	24	4800	2	1	2	100	1600	1000	189	4300	4.7	0.02	6	1.5
Ben Doziak Farm	WR-1	GW	70-75	8/31/2011	10.02	6.20	15.7	7.9	67.5	10	28	4000	2	1	1	100	1800	900	228	4400	4.3	0.02	7	1.5
Ben Doziak Farm	WR-1	GW	40-45	8/31/2011	10.02	3.50	17.2	6.9	113.1	16	46	5800	6	2	1	100	2900	3400	359	5400	5.8	0.02	12	4.6
Ben Doziak Farm	WR-1	GW	60-65	8/31/2011	10.02	6.26	16.5	7.45	59.55	17	19	2900	2	1	1	100	1400	900	374	3900	6	0.02	5	1
Ben Doziak Farm	WR-1	GW	50-55	8/31/2011	10.02	5.08	16.8	7.27	60	27	19	2800	2	2	1	100	1300	1300	447	4600	6.4	0.02	6	1.3
Ben Doziak Farm	WR-1	GW	20-25	9/1/2011	10.02	4.38	17.2	6.8	91.45	23	28	4100	3	3	1	100	1800	1900	188	7300	2.4	0.02	12	0.5
Ben Doziak Farm	WR-1	GW	30-35	9/1/2011	10.02	5.00	17.5	7	217	69	144	14200	7	3	2	100	5900	4500	1670	8900	3.2	0.31	45	1.5
Ben Doziak Farm	WR-1	GW	10-15	9/1/2011	10.02	3.33	20.6	6.1	1020	5	226	22400	53	6	2	14700	17100	11800	18300	110000	11.9	0.77	272	1.5
Bruno Farm	MMIR-1	GW	110-115	11/3/2011	26.25	9.30	13.4	6.85	48	86	9	3200	1	2	1	330	400	1200	6	4400	0.5	NA	9	1.5
Bruno Farm	MMIR-1	GW	90-95	11/3/2011	26.25	9.67	13.9	6.41	50	95	8	3500	1	1	1	360	500	1500	8	4200	1	NA	9	1.5
Bruno Farm	MMIR-1	GW	100-105	11/3/2011	26.25	8.96	14	6.84	50	111	9	2300	1	1	1	340	400	1000	13	4000	1.1	NA	12	2
Bruno Farm	MMIR-1	GW	80-85	11/3/2011	26.25	9.59	14.2	6.31	53	117	8	56800	1	1	1	3680	4700	18000	15	38100	1.2	NA	30	5
Bruno Farm	MMIR-1	GW	70-75	11/9/2011	26.25	8.75	14.1	6.26	110	5	13	8500	1	1	1	100	600	3600	2	6600	1	NA	14	1.2
Bruno Farm	MMIR-1	GW	60-65	11/9/2011	26.25	8.34	14.5	6.04	101	6	14	6900	1	1	1	100	600	3600	4	7100	1.2	NA	12	1.6
Bruno Farm	MMIR-1	GW	50-55	11/9/2011	26.25	6.05	14.5	5.63	136	11	79	9300	1	1	1	100	6500	4800	7	7900	1.3	NA	18	3.9
Bruno Farm	MMIR-1	GW	40-45	11/9/2011	26.25	5.33	14.8	5.43	141	11	216	4900	1	1	1	100	14600	3200	209	4600	1	NA	13	1.9
Bruno Farm	MMIR-1	GW	30-35	11/9/2011	26.25	7.50	14.8	5.44	145	63	38	10900	1	1	1	100	7200	6700	804	7600	1.8	NA	27	3.6
Bruno Farm	MMIR-2	GW	110-115	11/14/2011	24.80	10.60	14.3	6.6	43	16	6	2200	1	1	1	100	300	900	5	4000	0.7	NA	5	0.5
Bruno Farm	MMIR-2	GW	100-105	11/14/2011	24.80	9.65	14.7	6.62	47	37	6	3100	1	1	1	100	300	1300	8	3900	1.2	NA	30	1
Bruno Farm	MMIR-2	GW	90-95	11/14/2011	24.80	8.68	14.7	6.33	71	42	15	9900	1	1	1	150	600	4100	10	6900	1.3	NA	30	5.9
Bruno Farm	MMIR-2	GW	80-85	11/21/2011	24.80	9.52	14.3	7.02	82	132	9	5400	2	2	1	100	400	2400	11	4100	1.7	NA	7	1.6
Bruno Farm	MMIR-2	GW	70-75	11/21/2011	24.80	9.29	14.3	6.73	93	105	10	6800	1	2	1	100	500	2900	15	4300	4.6	NA	9	3.4
Bruno Farm	MMIR-2	GW	50-55	11/21/2011	24.80	8.28	14	6.32	129	115	35	8500	1	2	1	100	1500	4600	23	6100	3	NA	14	4.5
Bruno Farm	MMIR-2	GW	60-65	11/21/2011	24.80	8.62	14.2	6.65	99	164	16	6300	1	3	1	160	800	3100	27	6000	4.9	NA	11	4.4
Bruno Farm	MMIR-2	GW	40-45	11/22/2011	24.80	6.16	141	5.71	174	33	80	9700	1	1	1	100	4500	6400	20	8000	1.8	NA	24	0.2
Bruno Farm	MMIR-2	GW	30-35	11/22/2011	24.80	2.84	14.5	6.05	220	10	46	9900	1	1	1	100	23100	5900	297	6800	1.7	NA	16	3.9
Bruno Farm	MMIR-3	GW	110-115	11/22/2011	23.95	7.46	13.5	6.41	50	192	10	2000	1	3	1	200	400	1000	16	3900	1.8	NA	12	2
Bruno Farm	MMIR-3	GW	90-95	1/25/2012	23.45	9.03	11.1	6.39	50	5	7	2400	1	1	1	100	300	1000	1	3500	1.2	NA	5	0.5
Bruno Farm	MMIR-3	GW	60-65	1/25/2012	23.45	8.01	11.3	5.65	180	6	25	12500	1	1	1	100	700	5500	2	6000	1.5	NA	17	6.3
Bruno Farm	MMIR-3	GW	70-75	1/25/2012	23.45	7.36	11.1	5.69	276	6	36	20300	1	1	1	100	900	8900	2	7800	2.7	NA	26	5.5
Bruno Farm	MMIR-3	GW	80-85	1/25/2012	23.45	7.97	11.2	5.72	280	8	43	20500	1	1	1	100	900	8600	2	7500	6	NA	25	6
Bruno Farm	MMIR-3	GW	50-55	1/25/2012	23.45	7.47	11.5	5.35	200	13	30	11600	1	1	1	100	900	6900	6	8300	4	NA	24	3.8
Bruno Farm	MMIR-3	GW	100-105	1/25/2012	23.45	8.99	11.1	6.22	49	5	7	2300	1	1	1	100	300	1000	1	3500	0.5	NA	5	0.5
Bruno Farm	MMIR-3	GW	40-45	1/31/2012	23.45	7.00	11.8	7.46	171	19	72	7600	1	1	1	100	2000	5400	17	7800	0.5	NA	17	2.9
Bruno Farm	MMIR-3	GW	30-35	1/31/2012	23.45	7.63	12	7.01	93	152	21	3400	1	1	1	100	5300	2100	87	3900	0.6	NA	7	0.5
Conklin	CS-1	GW	110-115	5/14/2012	24.32	3.21	16.1	5.9	175	31	40	10700	1	1	1	100	2500	3100	6	11700	1	NA	19	2.3
Conklin	CS-1	GW	90-95	5/14/2012	24.32	3.14	16.5	5.9	171	66	37	10800	1	1	1	100	2500	3200	8	11400	1.2	NA	19	2.3
Conklin	CS-1	GW	100-105	5/14/2012	24.32	2.19	16.9	5.9	168	135	37	10600	1	1	1	100	2300	3100	15	10800	2	NA	20	2.3
Conklin	CS-1	GW	70-75	5/15/2012	24.32	3.71	16.7	6.2	284	25	57	14400	1	1	1	100	3400	4100	1	24700	0.8	NA	52	2.1
Conklin	CS-1	GW	60-65	5/15/2012	24.32	1.81	16.9	6.3	231	55	39	11800	1	2	1	100	2800	3200	2	20300	1.1	NA	35	2
Conklin	CS-1	GW	80-85	5/15/2012	24.32	3.41	16.9	6.1	190	84	39	12400	1	1	1	100	2400	3700	5	12300	1.1	NA	23	2.3

Conklin	CS-1	GW	40-45	5/16/2012	24.32	5.68	17.1	6.6	264	153	40	15500	1	1	1	100	2600	3200	2	23200	1	NA	42	1
Conklin	CS-1	GW	30-35	5/16/2012	24.32	5.37	17.1	6.7	520	162	58	27700	1	1	1	100	5400	4900	396	51200	2	NA	100	2
Conklin	CS-1	GW	50-55	5/16/2012	24.32	4.58	17.1	6.5	235	57	39	11200	1	1	1	100	2800	2700	1	22500	0.6	NA	37	1.7
Conklin	CS-2	GW	70-75	7/11/2012	26.69	1.64	18	6.1	267	5	40	17700	1	1	1	100	3000	3600	1	19300	0.7	NA	38	2.9
Conklin	CS-2	GW	80-85	7/11/2012	26.69	1.74	17.6	6.1	286	8	46	18000	1	1	1	100	3100	3900	2	21600	0.8	NA	44	3.1
Conklin	CS-2	GW	90-95	7/11/2012	26.69	1.28	17.7	6	265	5	40	16000	1	1	1	100	3100	3800	22	19600	1.1	NA	43	2.9
Conklin	CS-3	GW	90-95	1/8/2013	29.00	0.15	17.5	6.5	256	64	31	12000	3	1	2	130	2800	3200	605	28500	1.4	NA	47	0.5
Conklin	CS-3	GW	60-65	1/8/2013	29.00	0.12	19.2	6.6	299	43	56	20000	3	1	2	100	4100	3800	653	29300	1.7	NA	49	2.2
Conklin	CS-3	GW	70-75	1/8/2013	29.00	0.13	18.9	6.3	300	12	91	18000	5	1	2	100	4300	3800	1889	29800	1.4	NA	49	2.8
Conklin	CS-3	GW	80-85	1/8/2013	29.00	0.10	18.1	6.4	317	101	96	16900	4	1	2	150	4400	3700	2645	31900	1.4	NA	53	2.3
Conklin	CS-2	GW	50-55	1/9/2013	27.65	3.31	16.7	6	234	8	39	10700	1	1	1	180	1500	4600	2	10600	0.6	NA	32	2.7
Conklin	CS-2	GW	40-45	1/9/2013	27.65	3.75	17	6.07	230	78	35	17500	1	1	1	100	3200	3200	4	20000	1.1	NA	33	2.4
Conklin	CS-2	GW	30-35	1/9/2013	27.65	2.93	17.5	6.17	259	186	35	31600	1	2	1	21900	3400	6000	10	36800	1.3	NA	40	1.8
Conklin	CS-3	GW	50-55	1/9/2013	29.00	0.21	19.2	6.54	301	NA	77	21200	5	1	1	550	3700	3700	432	30300	1.5	NA	49	0.5
Conklin	CS-3	GW	40-45	1/9/2013	29.00	0.18	20.1	6.42	439	16	89	35600	1	1	2	100	7700	4900	905	38100	1.3	NA	54	1
Conklin	CS-3	GW	30-35	1/9/2013	29.00	0.17	20.2	6.8	385	NA	126	39100	2	1	2	240	12300	5500	1438	19100	1.8	NA	25	2
Doziak South Street	SS-4	GW	45-50	4/9/2011	10.25	3.81	12.5	6.2	254	19	37	24500	1	1	1	100	3100	6200	15	6500	2.2	NA	15	6.8
Doziak South Street	SS-4	GW	25-30	4/9/2011	10.25	1.49	13.7	6.4	349	10	52	24700	1	1	1	160	2400	10600	173	11900	6.8	NA	24	15.2
Doziak South Street	SS-4	GW	35-40	4/9/2011	10.25	1.58	13.6	6	262	37	97	21200	3	1	1	1000	4300	5900	265	4600	7.5	NA	17	14.8
Doziak South Street	SS-1	GW	40-45	3/21/2012	17.06	4.78	14.7	5.2	176	495	111	15300	1	2	1	100	5700	5000	82	3400	1.1	NA	10	9.2
Doziak South Street	SS-1	GW	60-65	3/21/2012	17.06	3.76	13.7	5.2	210	588	166	19100	1	1	1	100	5400	5700	86	3500	1.2	NA	11	13.3
Doziak South Street	SS-1	GW	50-55	3/21/2012	17.06	3.55	14.1	5	183	1060	173	15600	1	1	1	100	4800	5700	133	3700	1.4	NA	12	12.4
Doziak South Street	SS-2	GW	65-70	3/27/2012	12.85	2.60	11.2	5.8	178	515	153	15100	1	3	1	480	3600	4500	65	4400	1.3	NA	11	11.2
Doziak South Street	SS-2	GW	45-50	3/27/2012	12.85	4.00	11.9	5.1	206	1133	185	13400	1	3	7	420	10800	4900	104	3100	2	NA	13	14.5
Doziak South Street	SS-2	GW	55-60	3/27/2012	12.85	3.24	11.8	5.3	183	936	204	13500	1	3	2	950	7700	NA	108	2900	2.9	NA	13	12.7
Doziak South Street	SS-2	GW	35-40	3/27/2012	12.85	4.25	11.7	4.9	235	919	255	16000	1	2	1	100	13900	5600	126	3500	1.7	NA	13	17.6
Doziak South Street	SS-2	GW	25-30	3/27/2012	12.85	4.01	10.9	5.3	178	618	206	11400	1	2	2	790	10100	4000	141	2900	3.2	NA	13	10.4
Doziak South Street	SS-5	GW	65-70	4/2/2012	13.75	4.50	11.9	6.1	280	181	48	24100	1	5	1	1070	4100	8800	69	9000	3.2	NA	21	6.8
Doziak South Street	SS-5	GW	35-40	4/2/2012	13.75	7.62	12.7	5	178	973	28	13000	2	1	2	220	3400	4700	116	4600	6.8	NA	16	7.1
Doziak South Street	SS-5	GW	45-50	4/2/2012	13.75	2.94	12.2	6.2	334	59	52	27900	1	2	1	400	3200	10400	139	9900	4.3	NA	19	8.9
Doziak South Street	SS-5	GW	55-60	4/2/2012	13.75	5.57	12	5.9	233	300	61	20800	4	6	1	4080	5100	6900	475	5600	16.5	NA	21	10.1
Doziak South Street	SS-4	GW	55-60	4/3/2012	11.00	0.42	12.5	6.1	186	75	29	15300	3	1	1	420	2600	3800	22	7400	1.6	NA	16	5.2
Doziak South Street	SS-4	GW	65-70	4/3/2012	11.00	0.59	13	5.8	242	105	122	22100	3	1	1	680	5600	4100	57	6200	3.3	NA	17	8.6
Doziak South Street	SS-5	GW	25-30	4/3/2012	13.75	2.79	13.2	6.25	708	1190	167	16800	1	2	2	100	9600	6900	148	99400	2	NA	187	9.3
Doziak South Street	SS-5	GW	15-20	4/3/2012	13.75	0.74	12.4	5.94	1070	360	287	22800	4	3	2	490	10600	10400	326	146100	6.6	NA	297	4.2
Doziak South Street	SS-2	GW	25-30	4/10/2012	12.80	8.21	12.7	5	179	699	188	10200	1	1	1	100	10500	3600	107	2500	1.5	NA	12	9.9
Doziak South Street	SS-2	GW	15-20	4/10/2012	12.80	2.45	11.8	5.1	220	479	217	15800	1	2	3	690	11700	5200	147	2800	5.9	NA	14	14.7
Doziak South Street	SS-1	GW	20-25	4/11/2012	17.85	3.93	12.8	6.29	82	15	17	5400	1	1	1	100	900	1800	15	4100	0.8	NA	9	1.8
Doziak South Street	SS-1	GW	30-35	4/11/2012	17.85	3.52	13.1	6	141	28	25	11500	1	1	1	100	2800	3200	26	3100	0.8	NA	12	3.9
Doziak South Street	SS-4	GW	15-20	4/11/2012	10.25	8.11	11.8	6.5	382	18	96	12000	3	1	1	100	6400	2500	384	50300	3.9	NA	60	11.1
Doziak South Street	SS-3	GW	80-85	4/30/2012	11.10	8.92	12.7	5.9	102	11	36	8200	1	2	1	100	2800	1700	2	3600	0.6	NA	5	2.5
Doziak South Street	SS-3	GW	60-65	4/30/2012	11.10	7.41	13.7	5.9	129	28	48	9900	1	1	1	100	3000	2900	4	3900	3.1	NA	11	3.3
Doziak South Street	SS-3	GW	70-75	4/30/2012	11.10	7.52	14.1	5.9	113	17	36	9100	1	2	1	100	3300	2100	4	3600	1.2	NA	12	2.6
Doziak South Street	SS-3	GW	40-45	5/2/2012	11.10	3.12	13	5.6	139	51	63	12800	1	1	1	100	3600	3000	26	3600	0.7	NA	11	5.7

Doziak South Street	SS-3	GW	50-55	5/2/2012	11.10	3.91	12.8	5.6	101	47	61	6900	1	1	1	100	3700	2300	98	3700	3.2	NA	6	0.5
Doziak South Street	SS-3	GW	30-35	5/2/2012	11.10	4.11	13.4	5.8	227	57	91	19000	1	1	1	100	6900	5600	159	5200	0.9	NA	20	10.7
Doziak South Street	SS-3	GW	20-25	5/2/2012	11.10	11.10	13.5	5.8	581	120	60	23200	4	2	1	100	6600	6600	284	88400	13.4	NA	106	10.2
Great Gardens	HB-1	GW	40-45	9/1/2009	11.27	0.12	13	6.37	378	6	167	39800	1	2	1	100	10300	7000	23	15600	1.3	0.26	66	2.9
Great Gardens	HB-1	GW	60-65	9/1/2009	11.27	2.12	12.8	5.93	312	12	34	17200	1	2	1	100	1500	13600	23	12200	0.9	0.02	80	0.5
Great Gardens	HB-1	GW	50-55	9/1/2009	11.27	0.17	12.9	6.13	522	16	356	52300	1	3	1	100	14100	10700	67	21600	1.8	0.9	107	1
Great Gardens	HB-1	GW	10-15	9/1/2009	11.27	2.44	16.9	7	879	5	74	14900	1	2	2	100	10400	3700	121	143000	1.4	0.02	195	1.5
Great Gardens	HB-1	GW	70-75	9/1/2009	11.27	9.02	12.6	6.73	53	5	9	3200	1	1	1	100	600	1800	132	3800	1.1	0.02	5	0.6
Great Gardens	HB-1	GW	30-35	9/1/2009	11.27	1.66	13	6.54	264	5	63	28500	1	1	1	100	9500	3600	283	9600	1	0.02	38	2.5
Great Gardens	HB-1	GW	20-25	9/1/2009	11.27	0.12	14.1	6.59	752	11	99	65300	1	3	13	100	77300	8600	7710	18000	2.9	0.02	89	1.5
Great Gardens	HB-2	GW	100-105	12/28/2009	10.64	10.06	11.8	7.33	53	84	6	3300	1	1	1	100	400	1500	3	3800	0.5	0.02	6	0.5
Great Gardens	HB-2	GW	110-115	12/28/2009	10.64	10.20	11.7	7.97	50	17	4	3000	1	1	1	100	400	1400	4	3900	0.5	0.02	5	0.5
Great Gardens	HB-2	GW	80-85	12/28/2009	10.64	9.34	12.1	6.87	55	30	8	3300	1	1	1	100	500	1700	36	3500	0.9	0.02	5	0.5
Great Gardens	HB-2	GW	70-75	12/28/2009	10.64	8.30	12.3	6.34	160	20	24	10100	1	1	1	100	900	6100	70	7000	1.1	0.02	33	0.5
Great Gardens	Pvt Well Horseblock Rd	GW	51-54	12/28/2009	10.00	NA	NA	7.1	1037	12	289	29800	1	1	165	100	159000	15800	3350	23900	7.5	11.8	104	1.5
Great Gardens	HB-2	GW	60-65	1/6/2010	10.64	5.55	12.3	7.31	73	16	14	3200	1	1	1	100	500	2600	26	4600	0.5	0.02	11	0.5
Great Gardens	HB-2	GW	50-55	1/6/2010	10.64	0.57	12.6	7	1248	59	308	48600	1	1	6	100	155000	21500	37	31800	1.7	10.4	171	2
Great Gardens	HB-2	GW	40-45	1/6/2010	10.64	0.16	13.2	6.98	1461	50	975	70300	1	1	15	100	179000	26100	14800	32300	2.9	10.5	152	2
Great Gardens	HB-2	GW	30-35	1/6/2010	10.64	0.13	14	7.06	1345	169	531	71600	2	1	25	160	153000	27600	22300	26400	5.5	6.95	118	2
Great Gardens	HB-3	GW	110-115	1/6/2010	10.81	9.49	13.3	8.36	49	68	7	2900	1	4	1	100	300	1300	9	3700	1.8	0.02	5	0.5
Great Gardens	HB-3	GW	100-105	1/6/2010	10.81	9.70	13.6	7.63	60	86	9	3700	1	3	1	100	400	1700	12	4000	1.5	0.02	6	0.6
Great Gardens	HB-3	GW	80-85	1/6/2010	10.81	9.13	13.7	7.04	57	102	9	3100	1	3	1	120	400	1800	14	3800	1.1	0.02	5	0.6
Great Gardens	HB-2	GW	10-15	1/7/2010	10.64	1.98	13.2	7.35	1514	143	227	33400	2	1	2	150	26100	6800	1040	208000	4.4	0.21	331	0.5
Great Gardens	HB-2	GW	20-25	1/7/2010	10.64	0.26	14.6	7.47	874	15	171	49200	1	1	16	100	103000	15700	8390	18300	2.7	1.38	87	0.5
Great Gardens	HB-3	GW	50-55	1/7/2010	10.81	7.16	14.7	5.91	74	9	12	7200	1	1	1	100	1300	1300	7	3700	0.8	0.02	6	0.8
Great Gardens	HB-3	GW	60-65	1/7/2010	10.81	8.66	14.3	5.73	53	18	9	2300	1	1	1	100	500	2000	9	3400	0.6	0.02	5	0.9
Great Gardens	HB-3	GW	70-75	1/7/2010	10.81	9.15	14.1	6.11	52	14	6	2300	1	1	1	100	400	1900	21	3400	0.7	0.02	5	0.6
Great Gardens	HB-5 (shallow)	GW	20-25	1/7/2010	10.60	0.26	14	7.35	1041	28	151	43800	1	14	1	100	116000	12800	8150	29800	2.9	2.17	151	0.5
Great Gardens	HB-6 (deep)	GW	75-80	1/7/2010	10.60	8.41	12	7.13	55	5	5	3200	1	1	1	100	400	1900	2	3700	0.5	0.02	5	0.5
Great Gardens	HB-3	GW	40-45	1/11/2010	10.81	1.58	14.8	6.28	216	5	40	24400	1	2	1	100	4600	2900	17	9500	0.9	0.02	15	0.9
Great Gardens	HB-3	GW	30-35	1/11/2010	10.81	0.17	15.7	6.5	300	6	37	42500	1	2	1	100	4400	3100	2520	7700	1.3	0.02	10	0.5
Great Gardens	HB-4	GW	80-85	1/11/2010	10.90	8.48	11.7	5.67	74	10	11	4600	1	1	1	100	600	2400	7	5100	0.5	0.02	8	1.7
Great Gardens	HB-4	GW	100-105	1/11/2010	10.90	9.26	11.5	6.07	82	11	12	6700	1	2	1	100	700	2700	8	5000	0.5	0.02	8	1.8
Great Gardens	HB-4	GW	110-115	1/11/2010	10.90	9.34	11.5	6.27	88	5	15	5600	1	2	1	100	600	2600	9	5900	0.5	0.02	10	2
Great Gardens	HB-3	GW	10-15	1/12/2010	10.81	3.92	14.4	6.67	1573	51	104	20700	1	2	1	100	4800	3100	78	299000	1.6	0.02	445	2
Great Gardens	HB-3	GW	20-25	1/12/2010	10.81	0.18	16.5	7.04	400	9	66	53000	1	2	1	100	5100	3600	5500	15300	2.3	0.2	20	0.9
Great Gardens	HB-4	GW	60-65	1/12/2010	10.90	5.71	11.8	5.68	63	11	6	2200	1	1	1	100	600	4000	4	6000	0.5	0.02	6	0.5
Great Gardens	HB-4	GW	70-75	1/12/2010	10.90	8.56	11.7	5.7	61	5	8	4100	1	1	1	100	500	2000	10	4200	0.5	0.02	8	0.8
Great Gardens	HB-4	GW	50-55	1/12/2010	10.90	3.78	13.6	5.47	139	6	36	5500	1	1	1	100	1500	3700	12	12100	0.5	0.02	20	0.5
Great Gardens	HB-4	GW	30-35	1/13/2010	10.90	3.31	15.1	6.46	135	5	18	17200	1	1	1	100	2900	2000	2	5100	0.7	0.02	6	0.5
Great Gardens	HB-4	GW	40-45	1/13/2010	10.90	4.74	14.2	6.49	68	5	10	7400	1	1	1	100	1700	800	2	3700	0.5	0.02	6	0.5
Great Gardens	HB-4	GW	20-25	1/13/2010	10.90	0.79	16.1	6.34	170	5	13	22700	1	1	1	100	4500	2300	6	5600	0.6	0.02	7	0.9
Great Gardens	HB-4	GW	10-15	1/13/2010	10.90	5.41	14.5	6.01	1115	18	41	17500	1	1	1	100	6700	3400	24	229000	1	0.03	359	1.5

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Great Gardens	Great Gardens Potable Well	GW	61-66	1/14/2010	17.00	NA	NA	6.3	50	5	7	1900	1	1	325	100	500	1800	5	3300	0.5	0.02	5	0.5
Great Gardens	HB-7	GW	110-115	2/2/2010	9.07	10.47	11.5	6.95	55	26	6	3400	1	2	1	100	400	1500	3	4200	0.5	0.02	6	0.5
Great Gardens	HB-7	GW	100-105	2/2/2010	9.07	10.21	11.6	6.74	51	126	6	3300	1	2	1	120	400	1400	10	4000	0.5	0.02	6	0.5
Great Gardens	HB-7	GW	90-95	2/2/2010	9.07	10.49	11.7	6.33	48	67	5	2900	1	1	1	100	400	1400	23	3500	0.7	0.02	5	0.5
Great Gardens	HB-7	GW	60-65	2/2/2010	9.07	8.52	12.6	5.81	48	59	5	2300	1	1	1	100	500	1700	60	3700	0.9	0.02	5	0.5
Great Gardens	HB-7	GW	80-85	2/2/2010	9.07	9.09	11.7	6.1	55	119	8	3400	1	1	1	130	500	1800	63	3700	1.2	0.02	5	0.5
Great Gardens	HB-7	GW	70-75	2/2/2010	9.07	8.80	11.9	5.97	52	27	6	3000	1	1	1	100	500	1600	88	3600	1.1	0.02	5	0.5
Great Gardens	HB-7	GW	50-55	2/3/2010	9.07	6.79	13.4	5.76	48	5	23	1700	1	1	1	100	3500	50000	53	3300	0.5	0.02	5	0.5
Great Gardens	HB-7	GW	40-45	2/3/2010	9.07	0.28	14.3	6.08	111	19	38	4400	1	1	1	100	12300	1600	752	5000	1.2	0.5	12	0.7
Great Gardens	HB-7	GW	30-35	2/3/2010	9.07	0.18	15.5	6.17	631	8	265	30200	7	3	10	100	54200	10000	13200	16900	7.7	7.5	79	1
Great Gardens	HB-7	GW	20-25	2/3/2010	9.07	0.23	14.8	6.21	1781	49	572	89900	39	1	59	820	205000	36500	25000	32700	14.7	3.79	173	4
Great Gardens	HB-7	GW	10-15	2/3/2010	9.07	0.25	14	6.25	857	22	293	69200	27	5	11	360	49200	19100	28100	24100	14.4	1.98	61	9.2
Great Gardens	Private Well Horseblock Rd	GW	51-54	4/19/2010	10.00	NA	NA	7.1	782	6	248	32900	1	1	41	100	84400	16600	5540	18800	1.6	3.37	83	1.5
Great Gardens	HB-7-SP	GW	20-25	5/4/2010	NA	NA	NA	6.8	1937	15	378	80600	107	2	40	4780	239000	41600	12500	37600	21.8	20	169	5
Great Gardens	Great Gardens South West Irrigation Well	GW	NA	5/27/2010	NA	NA	NA	6.4	49	5	7	2100	1	1	14	100	600	1600	3	3800	0.5	0.02	6	0.5
Great Gardens	WS3_Dug_Pit	GW	Dug Pit	5/27/2010	10.00	NA	NA	NA	NA	53	61	42400	18	5	10	11100	143000	27800	2400	86700	5.6	20	225	0.5
Great Gardens	HB-8	GW	100-105	9/7/2010	12.70	7.04	13.1	6.56	57	98	5	3500	1	3	1	110	800	1800	5	4400	1	0.02	5	0.5
Great Gardens	HB-8	GW	90-95	9/7/2010	12.70	4.24	13.3	5.97	61	127	9	3200	1	1	1	100	1300	1500	5	6100	0.5	0.02	6	0.6
Great Gardens	HB-8	GW	70-75	9/8/2010	12.70	7.76	13.5	6.4	59	52	5	3800	1	2	1	100	500	2000	3	3900	0.5	0.02	5	0.5
Great Gardens	HB-8	GW	60-65	9/8/2010	12.70	10.02	13.6	6	70	43	6	4100	1	1	1	100	600	2000	6	4900	0.5	0.02	7	0.6
Great Gardens	HB-8	GW	80-85	9/8/2010	12.70	6.82	13	5.93	72	44	8	4500	1	2	1	100	800	2000	6	5100	0.7	0.02	7	1.6
Great Gardens	HB-8	GW	50-55	9/8/2010	12.70	9.50	13.7	5.33	72	33	7	4300	1	1	1	100	600	2200	16	4900	0.7	0.02	8	1.4
Great Gardens	HB-8	GW	40-45	9/9/2010	12.80	3.90	12.8	5.02	185	8	72	14300	1	1	1	100	9300	3000	163	8500	1.3	0.02	18	1
Great Gardens	HB-8	GW	10-15	9/9/2010	12.80	5.55	18.2	5.03	176	128	16	3900	1	1	1	100	2100	1700	260	20900	1.8	0.02	38	0.5
Great Gardens	HB-8	GW	30-35	9/9/2010	12.80	0.65	12.8	4.34	242	12	81	16000	1	1	1	100	9900	5400	939	11700	1.7	0.02	33	0.7
Great Gardens	HB-8	GW	20-25	9/9/2010	12.80	0.24	14.5	4.83	297	5	108	22000	1	1	1	100	23800	4600	4130	8300	2.5	0.02	20	0.9
Great Gardens	HB - 9	GW	90-95	9/13/2010	13.70	6.38	12.8	6.11	89	256	16	7200	1	2	1	1040	800	3200	12	4500	0.6	0.02	150	25
Great Gardens	HB - 9	GW	100-105	9/13/2010	13.70	4.12	12.8	5.8	67	228	11	4000	1	1	1	400	1200	1800	13	4900	0.6	0.02	60	10
Great Gardens	HB - 9	GW	80-85	9/13/2010	13.70	9.03	12.9	6.22	69	1520	26	4700	1	4	3	1800	1000	2700	52	4000	2	0.02	150	25
Great Gardens	HB - 9	GW	70-75	9/20/2010	13.90	8.85	13	6.11	70	218	15	4500	1	2	1	1050	700	2400	12	4600	0.6	0.02	30	5
Great Gardens	HB - 9	GW	60-65	9/20/2010	13.90	5.85	13.2	5.5	148	167	16	11600	1	2	1	190	800	5500	14	7700	1.4	0.02	21	2
Great Gardens	HB - 9	GW	50-55	9/20/2010	13.90	0.31	13.3	4.76	304	23	29	21700	1	2	1	100	1600	13600	49	13000	1.5	0.02	41	0.5
Great Gardens	HB - 9	GW	10-15	9/21/2010	14.00	6.20	16.6	5.3	178	132	15	3600	1	1	1	270	2400	1700	435	19200	1.5	0.02	32	1.5
Great Gardens	HB - 9	GW	20-25	9/21/2010	14.00	0.60	14	5.45	217	5	79	13200	1	1	1	100	21200	3500	3150	6100	2	0.76	16	0.5
Great Gardens	HB - 9	GW	40-45	9/21/2010	14.00	0.30	12.8	5.5	346	6	188	15800	1	2	2	100	32000	6700	12800	9000	1.2	1.82	30	0.5
Great Gardens	HB - 9	GW	30-35	9/21/2010	14.00	0.28	13	5.38	341	23	199	14000	1	1	2	100	28200	6400	13500	8900	1.2	2.03	27	1.5
Great Gardens	HB - 10	GW	80-85	9/22/2010	14.70	0.12	14.3	6.81	392	65	35	17000	12	1	11	100	2500	8700	63	46200	18.4	0.02	50	1
Great Gardens	HB - 10	GW	100-105	9/22/2010	14.70	0.17	13.9	6.07	289	31	17	16000	8	1	2	100	2000	6800	329	26700	7.9	0.02	40	0.5
Great Gardens	HB - 10	GW	90-95	9/22/2010	14.70	0.12	14.2	6.51	409	23	22	19900	15	1	7	100	2100	10400	334	44200	18.5	0.02	59	0.5
Great Gardens	HB - 10	GW	70-75	9/27/2010	14.70	0.19	14.2	6.96	353	36	28	17100	7	1	11	100	2500	10100	80	37000	15.8	0.1	49	0.5

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Great Gardens	HB - 10	GW	60-65	9/27/2010	14.70	0.19	14.3	7.29	435	28	35	18300	7	1	8	100	5900	7500	9930	49900	13.2	0.16	54	0.5
Great Gardens	HB - 10	GW	50-55	10/4/2010	14.80	0.26	13.8	6.11	559	5	399	18100	14	2	1	12400	24800	6900	18800	36000	8.2	3.44	61	10
Great Gardens	HB - 10	GW	20-25	10/6/2010	14.90	0.27	15.2	6.8	236	5	66	8100	3	1	1	100	15500	2700	13300	13100	2.6	0.92	19	0.5
Great Gardens	HB - 10	GW	40-45	10/6/2010	14.90	0.22	13.7	6.06	541	5	334	17500	12	1	1	8510	24100	6400	14800	36200	7.1	2.61	150	25
Great Gardens	HB - 10	GW	30-35	10/6/2010	14.90	0.22	13.7	5.82	592	5	220	18200	12	2	1	1840	27800	7000	31600	38700	5.7	3.7	63	10
Great Gardens	Private Well Horseblock Rd	GW	51-54	11/8/2010	10.00	NA	NA	7.1	279	5	113	9300	1	1	14	2740	37400	2900	2700	5800	0.7	1.45	22	0.01
Great Gardens	HB-7-SP	GW	20-25	11/9/2010	NA	NA	NA	6.9	736	39	133	30400	48	1	3	15000	62500	12800	17600	18600	10.5	13	98	0.5
Great Gardens	HB-7-SP	GW	20-25	3/14/2011	NA	NA	NA	6.9	363	5	39	25600	25	2	3	3280	23500	4500	5310	11900	3.6	2.63	32	3
Great Gardens	Private Well Horseblock Rd	GW	51-54	3/14/2011	10	NA	NA	7.2	537	5	285	14900	1	1	16	100	74600	5100	3360	18200	1.7	6.73	53	1
Great Gardens	Private Well Horseblock Rd	GW	NA	6/1/2011	NA	NA	NA	7.2	69	15	2	4000	1	1	24	110	3000	200	10	14100	0.5	0.02	5	0.5
Great Gardens	HB-11	GW	35-40	6/15/2011	9.71	2.00	13.5	6.39	493	13	104	12100	2	2	1	2060	6000	2600	222	65400	12.4	0.02	131	1
Great Gardens	HB-11	GW	15-20	6/15/2011	9.71	2.15	14.4	6.3	34.8	5	134	23400	6	3	2	3120	10000	3600	326	31600	24.7	0.02	49	4
Great Gardens	HB-11	GW	25-30	6/15/2011	9.71	2.16	13.5	6.5	443	56	49	12700	2	4	3	1310	7400	2000	468	69200	11.2	0.02	112	1
Great Gardens	HB-11	GW	45-50	6/15/2011	9.71	1.92	12.6	6.35	173	53	34	8500	2	4	2	1340	3300	1700	692	18600	8.1	0.2	44	1
Great Gardens	HB-12	GW	35-40	6/15/2011	12.91	4.25	13.1	6.04	58.4	323	14	3800	4	9	4	1630	900	1200	548	4500	7	0.02	5	0.5
Great Gardens	HB-12	GW	45-50	6/15/2011	12.91	4.64	13.2	6.03	59.8	45	12	2200	4	2	1	1550	800	1700	1050	3400	7.2	0.02	30	5
Great Gardens	HB-12	GW	25-30	6/15/2011	12.91	2.88	13.1	6.3	50.3	58	9	800	5	1	2	1900	700	900	1100	3700	8.9	0.02	7	1
Great Gardens	HB-12	GW	15-20	6/15/2011	12.91	1.41	13	6.92	94	5	7	4100	4	1	2	2700	2900	1200	1520	4100	8.7	0.02	48	8
Great Gardens	HB-13	GW	35-40	6/15/2011	15.00	2.02	15	5.92	84	116	37	2900	4	1	1	600	4300	2000	439	4700	3.7	0.4	9	1
Great Gardens	HB-13	GW	45-50	6/15/2011	15.00	1.84	14.3	6.82	169	40	71	3900	3	1	2	310	20800	2400	3270	5600	4.8	1.41	36	6
Great Gardens	HB-13	GW	15-20	6/15/2011	15.00	1.08	22	6.5	503	5	254	10100	3	5	1	30600	34100	8100	3660	10400	3.5	3.56	120	20
Great Gardens	HB-13	GW	25-30	6/15/2011	15.00	1.67	18.6	6.52	360	11	156	4900	26	4	1	23300	24000	4900	4900	6100	9.3	2.62	60	10
Great Gardens	HB-14	GW	15-20	6/15/2011	11.82	3.98	13.5	5.99	60	421	15	600	7	1	5	3650	600	900	379	4700	27.3	0.02	30	5
Great Gardens	HB-14	GW	35-40	6/15/2011	11.82	4.71	13.1	5.9	64.6	25	12	2800	7	2	2	1060	900	1800	387	3900	13.7	0.02	7	1.1
Great Gardens	HB-14	GW	45-50	6/15/2011	11.82	5.06	13	5.88	70	64	12	2800	4	3	3	1060	1300	1900	734	4100	14	0.02	9	1.5
Great Gardens	HB-14	GW	25-30	6/15/2011	11.82	2.75	12.3	6.37	66.8	59	12	2800	3	2	2	1540	1900	1000	928	4100	22.6	0.02	12	2
Great Gardens	HB-15	GW	25-30	6/15/2011	12.10	2.06	13	6.1	148	31	6	4100	3	1	1	1080	1100	1200	74	16400	7.6	0.02	27	0.5
Great Gardens	HB-15	GW	15-20	6/15/2011	12.10	1.77	14.9	6.03	248	104	57	9400	6	3	9	2470	17900	6500	133	4900	17.3	0.08	15	5.4
Great Gardens	HB-15	GW	35-40	6/15/2011	12.10	1.74	12	5.93	84	11	30	3500	3	1	2	220	1200	1300	262	21400	5.9	0.02	40	0.5
Great Gardens	HB-15	GW	45-50	6/15/2011	12.10	1.57	12.1	6.54	52	45	2	400	1	1	1	260	500	300	283	7800	2	0.02	6	1
Great Gardens	Great Gardens North East Irrigation Well	GW	NA	6/28/2011	NA	NA	NA	NA	NA	5	143	8700	8	2	2	120	8000	2200	8590	37600	3.6	1.34	44	5
Great Gardens	HB-5 (shallow)	GW	20-25	6/28/2011	12.40	1.74	15.6	6.77	740	53	129	33600	6	6	42	100	99300	13600	15300	10100	20.3	6.15	36	2
Great Gardens	HB-7-SP	GW	20-25	6/28/2011	10.45	1.81	14.6	6.37	1046	5	118	33700	61	8	1	15600	75400	11700	6570	32900	8.2	13.2	136	20
Great Gardens	YA-1	GW	90-95	7/11/2011	13.60	0.94	13.7	6.64	62	90	4	1300	1	3	1	190	400	600	11	8900	0.5	0.02	7	0.5
Great Gardens	YA-1	GW	100-105	7/11/2011	13.60	0.62	13.4	6.71	109	45	10	5900	1	2	1	160	1000	2800	18	9300	0.7	0.02	13	0.5
Great Gardens	YA-1	GW	110-115	7/11/2011	13.60	0.5	13.6	6.91	92	33	8	4900	1	3	1	100	1300	2200	19	6400	0.6	0.3	9	0.5
Great Gardens	YA-1	GW	80-85	7/12/2011	13.60	0.42	13.8	6.24	127	11	10	11400	1	2	1	100	900	2100	10	15500	0.6	0.02	15	0.6
Great Gardens	YA-1	GW	70-75	7/12/2011	13.60	1.19	13.7	5.76	328	10	52	17400	1	2	1	100	2000	10300	15	28300	1.3	0.02	66	0.5
Great Gardens	YA-1	GW	60-65	7/12/2011	13.60	0.38	13.8	5.67	552	13	89	32700	1	5	2	100	4200	22300	25	34700	1.6	0.37	127	0.5

Great Gardens	YA-1	GW	20-25	7/13/2011	13.60	1.31	14.1	6.26	711	32	49	18200	1	3	1	180	15400	3400	712	90900	0.8	0.04	135	1
Great Gardens	YA-1	GW	30-35	7/13/2011	13.60	1.08	14.5	6.18	978	8	256	60500	1	6	2	100	52400	10500	784	74500	1.6	0.51	191	1.5
Great Gardens	YA-1	GW	50-55	7/13/2011	13.60	1.37	14.6	6.23	1025	7	328	43500	1	4	3	100	77100	15200	1840	105000	1.5	5.28	250	1.5
Great Gardens	YA-1	GW	40-45	7/13/2011	13.60	1.14	14.3	6.31	1040	19	332	48100	1	5	3	100	59600	9800	2130	96200	1.3	2.51	199	1.5
Great Gardens	Private Well Horseblock Rd	GW	NA	9/15/2011	NA	NA	NA	6.8	420	19	16	9900	1	1	37	220	1700	1400	32	71300	0.5	0.02	117	0.5
Great Gardens	Private Well Horseblock Rd	GW	NA	2/27/2012	NA	NA	NA	6.8	76	5	1	290	1	1	17	140	260	100	12	14200	0.5	0.5	7	0.5
Great Gardens	Private Well Horseblock Rd	GW	NA	9/11/2012	NA	NA	NA	6.6	68	5	1	150	1	1	21	100	240	100	8	13400	0.5	0.5	5	0.5
Great Gardens	HB - 10M	GW	35-40	10/2/2012	15.00	0.22	15.6	6.9	372	NA	148	12500	13	1	4	630	20000	3900	22662	31800	4.4	2.37	60	10
Great Gardens	HB-7-SP	GW	20-25	10/3/2012	11.75	0.13	16.6	6.7	1557	NA	138	43800	50	1	7	34100	232000	31500	13529	29900	14.4	24.6	155	4
Great Gardens	HB-8M	GW	20-25	10/3/2012	13.98	0.16	15.9	6.6	430	NA	44	35000	1	1	3	100	27000	8000	4300	14800	1.7	0.5	32	1
Great Gardens	YA-1A	GW	40-45	11/13/2012	14.20	0.15	13.3	6.7	621	10	149	21900	1	1	10	100	76300	7900	20700	26300	1	6.4	67	1
Great Gardens	YA-1	GW	20-25	7/17/2013	12.58	0.8	13.2	7.1	625	40	23	20000	1	1	6	100	24000	4300	12760	67000	0.4	1.1	125	1
Great Gardens	HB - 10M	GW	35-40	7/18/2013	14.24	0.21	13.7	7	422	11	177	22000	11	1	5	21000	20000	4400	9718	42500	4.4	2.24	62	10
Great Gardens	HB-7-SP	GW	20-25	7/18/2013	10.25	0.24	14.5	7.1	618	24	57	42000	5.3	1	10	1800	77000	11000	1570	16000	5	5	49	5
Great Gardens	HB-8M	GW	20-25	7/18/2013	12.50	0.54	13.2	6.4	306	12	50	30000	1	1	5	100	26000	4900	4300	9600	0.4	0.5	26	0.5
Great Gardens	HB - 9M	GW	30-35	7/25/2013	13.59	0.25	13	6.9	249	17	110	25000	1	1	5	100	21000	4900	9034	9000	0.3	0.54	22	1.3
Great Gardens	HB-1	GW	10-15	7/25/2013	12.05	0.4	16.5	6.95	941	32	41	45100	1	1	10	100	23000	9300	92	143600	0.8	0.5	253	2
Great Gardens	HB-5 (shallow)	GW	20-25	7/25/2013	12.05	0.4	16.5	6.95	941	168	874	49000	88	2	62	270	129000	11000	18035	20000	29	8	72	5
Great Gardens	HB - 10M	GW	35-40	3/5/2014	15.14	0.42	13.8	7.1	444	21	179	15000	12	1	5	26000	19000	4500	10330	40500	4.5	2.45	77	12.5
Great Gardens	HB - 9M	GW	30-35	3/5/2014	14.26	0.93	13.3	6.9	335	255	141	15000	1	1	5	100	32000	6300	12559	11000	0.9	1.08	35	0.5
Great Gardens	HB-8M	GW	20-25	3/5/2014	13.31	2.6	12.4	6.6	256	107	69	14000	1	1	5	100	23000	3400	4540	7600	0.7	0.89	20	0.6
Great Gardens	HB-7-SP	GW	20-25	3/6/2014	11.05	0.36	12	7.2	564	75	42	32000	5	1	16	1600	53000	14000	4540	21000	6	1.8	66	5
Great Gardens	HB-1	GW	10-15	3/18/2014	12.65	2.45	9.7	6.7	887	27	108	24000	1	1	14	100	69000	9400	1770	86000	1.8	0.04	174	2.8
Great Gardens	HB-5 (shallow)	GW	20-25	3/18/2014	12.72	0.25	12.9	7.01	1084	33	263	50000	65	1	24	7000	96000	9900	6729	74000	11	1.67	173	5
Great Gardens	HB-6 (deep)	GW	75-80	3/18/2014	12.80	6.87	12.4	6.8	93	17	16	1700	1	1	5	100	12500	500	115	6600	0.6	0.5	8	0.5
Great Gardens	YA-1	GW	20-25	3/19/2014	13.40	0.5	10.6	7.1	514	6	32	19400	1	1	10	100	26500	5400	16696	42400	0.6	2.1	74	1
Great Gardens	YA-1A	GW	40-45	3/19/2014	13.37	0.27	13.1	7.2	869	7	251	33000	1	1	12	100	75000	11000	30371	36000	1.4	8.7	110	1.5
Great Gardens	HB - 9M	GW	30-35	10/2/112	14.92	0.17	14.2	6.6	375	NA	156	16000	3	1	5	100	33500	7900	31000	11000	1	1.36	33	0.5
Hololob	MS-1	GW	90-95	7/18/2011	15.97	8.91	13.1	5.91	133	70	6	9800	1	2	1	170	700	4300	10	7200	1.2	0.2	9	3.2
Hololob	MS-1	GW	80-85	7/18/2011	15.97	8.84	13.1	5.95	132	46	35	10200	1	1	1	110	700	4700	11	5000	1	0.2	8	3.4
Hololob	MS-1	GW	70-75	7/18/2011	15.97	9.65	13	5.93	84	26	15	5900	1	1	1	100	500	2800	21	4300	0.6	0.2	7	1.3
Hololob	MS-1	GW	50-55	7/20/2011	15.97	9.66	12.9	5.78	63	11	10	4600	1	1	1	100	500	1900	3	4100	0.5	0.2	5	0.5
Hololob	MS-1	GW	60-65	7/20/2011	15.97	9.35	13	5.88	62	57	9	4100	1	1	1	100	500	1900	4	4100	0.6	0.2	5	0.5
Hololob	MS-1	GW	40-45	7/21/2011	15.97	9.69	12.6	5.67	64	25	10	4100	1	1	1	100	500	1900	6	4200	0.7	0.2	5	0.5
Hololob	MS-1	GW	30-35	7/21/2011	15.97	8.35	12.5	5.49	62	25	15	3600	1	1	1	100	800	2200	14	3600	0.8	0.2	4	0.5
Hololob	MS-1	GW	20-25	7/21/2011	15.97	7.03	12.7	5.42	64	63	14	6300	1	1	1	100	900	1300	17	2300	0.9	0.2	4	0.5
Hololob	MS-2	GW	70-75	7/25/2011	18.85	8.95	13.1	6.02	161	22	40	12700	1	1	1	100	700	5700	6	5100	1.2	0.02	8	5.8
Hololob	MS-2	GW	60-65	7/25/2011	18.85	9.2	13.4	6.08	134	37	24	7900	1	1	1	100	700	3500	7	5600	1	0.02	7	0.9
Hololob	MS-2	GW	90-95	7/25/2011	18.85	8.42	12.5	6.43	120	77	8	14200	1	2	1	100	800	4000	9	7300	1	0.02	8	0.1
Hololob	MS-2	GW	80-85	7/25/2011	18.85	8.62	12.7	6.28	156	57	38	23800	1	2	1	100	800	5700	11	6200	1.2	0.02	9	7.3
Hololob	MS-2	GW	50-55	7/26/2011	18.85	8.7	13.4	5.8	91	17	15	5900	1	1	1	100	700	6000	6	5200	0.8	0.02	6	0.6

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Hololob	MS-2	GW	30-35	7/26/2011	18.85	8.69	13.9	5.63	68	12	16	4900	1	1	1	100	600	1900	9	3900	1.7	0.02	4	0.6
Hololob	MS-2	GW	40-45	7/26/2011	18.85	8.88	13.6	5.82	62	6	13	3000	1	1	1	100	500	2000	10	3600	0.7	0.02	4	0.1
Hololob	MS-2	GW	20-25	7/26/2011	18.85	0.6	12.9	5.92	189	34	97	15300	22	1	1	100	8600	3300	3990	8100	12	0.11	14	0.3
Hololob	MS-3	GW	80-85	7/27/2011	19.92	9.48	15	8.12	292	11	30	3900	1	1	1	100	1200	7000	7	40800	0.8	0.02	21	10.4
Hololob	MS-3	GW	90-95	7/27/2011	19.92	8.78	15.8	8.3	497	14	35	8900	1	2	1	100	2000	3700	29	84800	1	0.02	111	8.3
Hololob	MS-3	GW	70-75	7/28/2011	19.92	7.96	13.5	7.78	195	7	28	6000	2	1	1	100	1200	2800	665	25800	3.2	0.02	11	9.6
Hololob	MS-3	GW	60-65	7/28/2011	19.92	2.65	15.4	7.57	184	9	35	10100	3	1	1	100	3200	2500	6270	18000	1.5	9.74	64	10
Hololob	MS-3	GW	50-55	8/3/2011	19.92	0.54	14.5	7.58	330	6	154	15000	4	2	1	740	20500	3800	3790	17600	3.8	3.99	60	10
Hololob	MS-3	GW	40-45	8/3/2011	19.92	0.29	14.7	7.5	800	7	468	46700	28	6	2	1070	45700	12300	26700	31100	21.7	3.94	54	5
Hololob	MS-3	GW	30-35	8/4/2011	19.92	0.93	14.8	7.49	915	82	746	46000	81	1	6	1940	47300	14200	31500	33400	26.4	0.09	15	1.5
Hololob	MS-3	GW	20-25	8/4/2011	19.92	0.27	14.8	7.3	656	72	62	51500	3	1	4	100	13500	10300	49300	25100	3.3	0.39	37	2
Hololob	MS-5	GW	70-75	5/30/2012	22.31	NA	17.7	7	162	62	27	11500	4	2	2	1310	1400	3800	5010	5900	3.3	0.5	30	5
Hololob	MS-5	GW	60-65	5/30/2012	22.31	NA	NA	7	215	154	51	7300	11	7	9	650	11600	2700	5084	22100	9.5	0.55	30	5
Hololob	MS-5	GW	50-55	5/30/2012	22.31	NA	18.1	7.1	229	403	106	5800	6	17	15	1700	15200	3300	5784	19600	8.2	1.14	60	10
Hololob	MS-5	GW	40-45	5/30/2012	22.31	NA	18.2	7.1	240	188	142	9800	10	4	10	970	11000	4100	7430	15700	6.9	1.27	30	5
Hololob	MS-5	GW	30-35	5/30/2012	22.31	NA	19	7.3	342	136	104	12600	4	4	4	540	18500	5700	13500	15500	12.6	3.51	30	5
Hololob	MS-5	GW	80-85	5/30/2012	22.31	NA	15.2	6.4	215	14	238	15000	31	1	1	100	1000	3400	16300	6000	17.6	0.5	11	12.1
Hololob	MS-4	GW	70-75	6/5/2012	20.08	6.92	12.3	6.4	183	32	35	14800	1	2	1	970	700	6700	220	6100	6.8	0.5	18	6.4
Hololob	MS-4	GW	80-85	6/5/2012	20.08	7.18	12	6.2	185	55	42	14700	2	3	1	1770	800	6600	374	5900	9.6	0.5	18	9
Hololob	MS-4	GW	60-65	6/5/2012	20.08	5.19	12.7	6.7	337	31	56	27500	3	2	1	1300	1700	14500	2280	12600	13.6	0.5	23	3
Hololob	MS-4	GW	50-55	6/5/2012	20.08	3.29	13	6.8	290	17	63	28100	3	1	1	1560	2200	8800	3030	13400	7.8	0.5	15	2
Hololob	MS-4	GW	40-45	6/5/2012	20.08	3.71	13.4	7	395	22	83	43100	16	1	1	2760	3700	6900	8050	17300	8.9	0.5	24	2
Hololob	MS-4	GW	30-35	6/5/2012	20.08	4.79	13.4	7.1	664	10	198	61300	20	1	1	9680	9900	9600	17500	32500	5.8	0.5	66	10
Hololob	MS-1	GW	20-25	7/28/2014	15.67	5.02	12.2	5.8	60	24	10	4200	1	1	5	100	900	1200	8	2600	0.4	0.5	5	1
Hololob	MS-2	GW	20-25	7/28/2014	18.54	2.08	12.3	6.4	125	21	21	9300	1.6	1	5	200	3700	1600	131	7600	2.7	0.5	13	0.5
Hololob	MS-3	GW	20-25	7/30/2014	19.82	1.31	15.1	6.8	637	22	149	55000	21	1.5	5	34000	13000	9500	21082	32000	4	0.4	97	20
Hololob	MS-4	GW	30-35	7/30/2014	20.16	1.75	14.9	7.4	406	31	143	47000	11	1	5	15000	6300	6400	12300	10000	3.6	0.3	47	10
Hololob	MS-5	GW	30-35	7/30/2014	20.00	1.19	14.6	7.2	243	153	57	19000	11	2.7	5	400	3900	4000	11135	10000	9.2	0.3	17	0.5
slip Town Compost Facili	ICF-1	GW	90-95	12/19/2011	48.40	2.08	14.1	6.4	500	12	83	NA	1	1	1	100	34300	9200	28	28000	1.2	0.02	67	2.4
slip Town Compost Facili	ICF-1	GW	80-85	12/19/2011	48.40	2.1	14.2	6.6	521	16	120	NA	1	1	2	100	44500	9400	36	25700	1.4	0.02	62	1.9
slip Town Compost Facili	ICF-1	GW	100-105	12/19/2011	48.40	1.89	13.3	6.1	285	19	63	NA	1	1	1	100	10200	5100	58	23100	0.9	0.02	45	2.9
slip Town Compost Facili	ICF-1	GW	70-75	12/19/2011	48.40	1.96	14.9	6.4	539	16	159	NA	1	1	1	100	36500	10500	104	32100	2.1	0.02	91	1.4
slip Town Compost Facili	ICF-1	GW	60-65	12/19/2011	48.40	1.61	14.8	6.6	631	170	253	NA	1	2	5	230	68700	11100	1581	33800	2.5	0.23	82	1
slip Town Compost Facili	ICF-2	GW	80-85	12/19/2011	45.37	4.41	13.9	6.8	132	5	5	NA	1	1	1	100	2200	200	82	24000	0.5	0.02	21	1.5
slip Town Compost Facili	ICF-2	GW	70-75	12/19/2011	45.37	5.62	14.1	6.7	119	5	6	NA	1	1	1	100	3100	400	94	19100	0.7	0.02	18	1.1
slip Town Compost Facili	ICF-2	GW	100-105	12/19/2011	45.37	4.41	13.3	6.4	313	8	11	NA	1	1	1	100	2500	1000	387	45200	0.6	0.02	82	1.1
slip Town Compost Facili	ICF-2	GW	60-65	12/19/2011	45.37	4.31	13.9	6.6	125	6	13	NA	1	1	1	100	5700	1000	1017	16900	1	0.02	17	1.1
slip Town Compost Facili	ICF-2	GW	90-95	12/19/2011	45.37	3.16	12.7	6.8	580	6	22	NA	1	1	1	100	4800	1400	2140	84200	0.6	0.02	166	1
slip Town Compost Facili	ICF-1	GW	50-55	12/20/2011	48.80	2.51	16.3	6.5	779	308	237	NA	4	2	4	620	79900	10200	5210	34800	2.9	0.23	128	0.4
slip Town Compost Facili	ICF-2	GW	50-55	12/20/2011	46.80	2.08	15.8	6.5	304	166	78	NA	6	1	2	28070	14100	2700	8840	16200	2.1	1.14	150	25
Liere Farms	CF-4	GW	120-125	9/13/2011	81.00	4.6	15.6	5.53	169	5	37	9400	1	1	NA	NA	4100	2800	3	11200	0.6	0.02	21	4.3
Liere Farms	CF-4	GW	110-115	9/14/2011	81.00	4.58	18.4	5.33	185	30	41	9000	1	2	NA	NA	3400	4100	15	13800	2.3	0.02	20	5.2
Liere Farms	CF-4	GW	100-105	9/14/2011	81.00	5.58	16.3	5.15	225	16	70	10600	1	2	NA	NA	3800	4100	18	18700	1.4	0.02	35	5.2
Liere Farms	CF-4	GW	90-95	9/14/2011	81.00	5.14	16.8	5.2	200	29	66	9300	2	2	NA	NA	3500	3500	102	18000	2.5	0.02	29	3.6

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Liere Farms	CF-4	GW	80-85	9/14/2011	81.00	3.4	16	4.85	322	132	142	23400	1	4	NA	NA	10300	9100	603	7800	3.7	0.02	47	8.6
Liere Farms	CF-5	GW	130-135	9/28/2011	82.20	7.36	24.8	5.66	115	9	19	6000	1	6	NA	NA	1500	3200	9	8300	5.8	0.02	12	2.9
Liere Farms	CF-5	GW	120-125	10/3/2011	82.20	3.37	13.8	5.64	115	6	23	5200	4	3	NA	NA	3000	2700	5	10400	1.7	0.02	11	2.3
Liere Farms	CF-5	GW	110-115	10/3/2011	82.20	3.39	14	5.36	218	21	128	9200	3	3	NA	NA	5900	2700	97	21900	1.8	0.02	30	6.6
Liere Farms	CF-5	GW	100-105	10/3/2011	82.20	3.44	14	5.25	202	26	104	9400	3	2	NA	NA	4500	3900	201	17700	1.6	0.02	29	5.6
Liere Farms	CF-5	GW	90-95	10/4/2011	82.20	3.05	14.8	5.26	218	29	129	13500	5	4	NA	NA	5300	6500	221	11300	2.3	0.02	24	8.2
Papermill Rd	CB-1	GW	110-115	10/4/2011	47.50	0.1	14.1	6.57	257	5	195	13200	8	2	1	20000	4600	4700	1190	13500	3.2	0.84	30	5
Papermill Rd	CB-1	GW	100-105	10/4/2011	47.50	0.08	14.3	6.73	266	5	95	13500	5	2	1	12800	8500	6300	1520	10000	1.8	1.74	30	5
Papermill Rd	CB-1	GW	90-95	10/4/2011	47.50	0.07	14.5	6.7	319	11	117	14300	6	3	1	16000	11400	5800	1950	12400	1.7	5.04	30	5
Papermill Rd	CB-1	GW	50-55	10/5/2011	47.50	1.83	14.7	6.4	170	43	76	13200	1	4	1	560	6400	1500	147	9600	2.8	1.56	13	1.6
Papermill Rd	CB-1	GW	80-85	10/5/2011	47.50	0.14	14.9	6.91	278	5	141	8600	5	2	1	7570	14100	3400	1070	7900	1.5	7.62	60	2
Papermill Rd	CB-1	GW	70-75	10/5/2011	47.50	0.1	14.7	6.6	690	7	473	25200	23	6	1	25750	28200	9800	2695	23900	3.6	15.2	73	10
Papermill Rd	CB-1	GW	60-65	10/5/2011	47.50	0.11	14.8	6.6	510	21	190	25300	3	5	5	970	26100	7500	4090	20800	3.1	14.4	41	1
Papermill Rd	CB-2	GW	90-95	10/6/2011	39.76	0.1	13.9	6.75	332	18	220	9300	8	4	1	12700	16900	3400	2760	7500	2.7	10.8	60	10
Papermill Rd	CB-2	GW	80-85	10/6/2011	39.76	0.08	14.3	6.78	308	8	139	10200	6	4	1	12600	12600	2900	3390	7500	2	11.6	60	10
Papermill Rd	CB-2	GW	100-105	10/6/2011	39.76	0.58	13.7	6.41	360	24	275	10500	13	4	1	14600	12800	2700	3600	9000	4.4	15.1	60	10
Papermill Rd	CB-2	GW	110-115	10/6/2011	39.76	0.14	13.6	6.45	246	14	228	6600	11	2	1	10600	8900	1700	3740	6800	3.2	9.6	60	10
Papermill Rd	CB-2	GW	70-75	10/6/2011	39.76	0.1	14.5	6.52	515	21	363	19900	11	8	1	18300	30000	8200	5310	13000	2.9	18.4	60	10
Papermill Rd	CB-2	GW	40-45	10/11/2011	39.76	3.74	16.6	6.16	15.8	41	83	5400	2	2	2	640	11000	2700	383	4500	1.2	0.42	8	1.3
Papermill Rd	CB-2	GW	60-65	10/11/2011	39.76	0.72	14	6.64	778	5	410	23100	16	9	1	29000	38500	12300	1890	17300	3.4	10.9	150	25
Papermill Rd	CB-2	GW	50-55	10/11/2011	39.76	1.42	17.1	6.3	420	19	337	13700	9	2	3	11000	26100	6700	2960	11800	1.8	4.31	32	2
Papermill Rd	CB-3	GW	80-85	10/26/2011	44.00	2.04	14.2	6.79	514	487	209	50500	5	5	5	100	2400	25900	740	9900	2.3	3.77	300	50
Papermill Rd	CB-3	GW	90-95	10/26/2011	44.00	1.84	14.1	6.67	506	128	233	1400	5	5	5	100	300	1000	902	1000	2.1	2.93	300	50
Papermill Rd	CB-3	GW	100-105	10/26/2011	44.00	2.82	13.5	6.64	373	92	250	1500	8	4	2	100	300	1000	1009	1000	2.4	3.71	300	50
Papermill Rd	CB-3	GW	110-115	10/26/2011	44.00	2.24	14	6.65	236	33	157	40700	7	2	1	100	1900	7800	1029	17600	2.6	1.08	300	50
Papermill Rd	CB-3	GW	60-65	11/1/2011	44.00	NA	13.6	6.83	330	330	102	13200	9	4	2	28700	32100	4700	457	5300	2.7	NA	150	25
Papermill Rd	CB-3	GW	70-75	11/1/2011	44.00	NA	13.9	6.8	352	684	138	18700	5	5	5	25000	39300	6800	496	6000	2.6	NA	150	25
Papermill Rd	CB-3	GW	50-55	11/1/2011	44.00	NA	13.7	6.78	250	263	131	10000	2	2	3	1150	15600	4500	784	5300	1.8	NA	30	5
Peconic Ave	PA-1	GW	40-45	5/4/2010	36.05	3.77	15	NA	940	61	154	74400	1	2	2	100	9700	6800	10	103000	3.6	0.02	163	3.8
Peconic Ave	PA-2	GW	35 - 45	5/4/2010	36.51	4.79	17.3	NA	664	45	98	64800	1	3	3	120	7000	4600	15	60600	3.5	0.4	97	2.5
Peconic Ave	PA-3	GW	35-45	5/4/2010	38.17	5.92	20.6	NA	1844	129	111	140000	4	6	6	170	60000	9300	15	236000	3.9	0.02	245	15.6
Peconic Ave	PA-4	GW	35-45	5/4/2010	39.00	5.32	16.3	NA	668	13	53	53500	1	1	2	100	7600	5400	4	61600	2.1	0.02	101	2.2
Peconic Ave	PA-5	GW	35-45	5/4/2010	38.63	3.02	22	NA	710	29	95	63900	1	2	1	100	9900	5900	17	73400	3.3	0.02	101	1.8
Peconic Ave	PA-6	GW	35 - 45	5/4/2010	35.64	5.95	17	NA	59	434	6	9200	1	3	2	550	400	1100	162	1000	4.8	0.02	12	2
Peconic Ave	MW-1	GW	40 - 45	6/4/2013	41.43	6.8	15.6	6.3	253	33	77	21000	1	1	1.3	100	2100	2700	2.6	21000	0.5	0.5	33	1
Peconic Ave	PA-1	GW	40 - 45	6/4/2013	42.70	3.8	15.4	6.3	308	9	33	31000	1	1	1.3	100	4900	3400	1.4	19000	0.54	0.5	31	1.5
Peconic Ave	MW-2	GW	40 - 45	6/5/2013	47.25	4.4	21.3	6.15	508	25	37	37000	1	1	2.6	150	4800	7100	86	63000	1.5	0.5	81	1.1
Peconic Ave	PA-6	GW	34 - 44	6/5/2013	40.85	7.7	17.3	6.4	247	117	21	39000	1	1.2	1.2	130	1600	3200	12	15000	0.69	0.5	23	2
Peconic Ave	PA-5	GW	34 - 44	6/6/2013	43.00	NA	16.1	6.9	280	25301	96	26000	16	38	46	71000	9800	5800	1650	26000	19	NA	NA	NA
Peconic Ave	MW-1	GW	40 - 50	11/21/2013	42.58	7.18	13.9	6.8	293	22	77	30000	1	1	5	100	2100	4200	3.7	16000	0.74	0.5	30	3.6
Peconic Ave	PA-2R	GW	39 - 49	11/21/2013	42.88	3.4	12.7	6.8	577	3008	268	48000	2.4	5.8	10	6800	13000	8100	116	41000	5.1	0.5	70	5
Peconic Ave	PA-3R	GW	39 - 49	11/21/2013	43.81	2.45	15.4	6.7	663	17026	127	30000	28	23	44	81000	27000	6600	4121	71000	18	0.5	101	5
Peconic Ave	PA-4R	GW	44 - 54	11/21/2013	45.53	2.6	13.5	7.2	951	6025	120	86000	12	9.1	16	31000	46000	14000	531	55000	13	0.5	80	5
Peconic Ave	MW-2	GW	40 - 50	11/22/2013	48.35	3.38	15.9	7.1	591	83	52	44000	1	1	5	100	8200	6400	139	52000	1.5	0.5	88	1

Peconic Ave	MW-3R	GW	45 - 55	11/22/2013	46.89	4.8	17	7.3	586	32	97	44000	1	1	5	100	9900	7400	7.5	44000	1.9	0.5	53	1
Peconic Ave	PA-6	GW	40 - 45	11/22/2013	41.70	7.6	13.5	7.3	218	164	16	31000	1	4.2	5	810	1300	2900	27	6500	1.5	0.5	9.2	0.52
Peconic Ave	PA-3R	GW	39 - 49	6/10/2014	42.76	NA	NA	7.6	944	3982	147	39000	10	5.2	19	54000	97000	7200	1587	76000	6.6	0.58	69	5
Peconic Ave	PA-4R	GW	44 - 54	6/10/2014	44.56	NA	NA	7.5	1145	4063	116	102000	16	8.4	32	28000	74000	15000	266	76000	9.7	0.5	90	6.8
Peconic Ave	MW-1	GW	40 - 50	6/11/2014	41.61	7.6	14.4	6.9	288	4260	131	29000	3.1	8.6	15	7200	3700	5000	334	14000	5.4	0.5	34	4.4
Peconic Ave	MW-2	GW	40 - 50	6/11/2014	47.40	1.54	16.5	6.9	321	2866	37	27000	2.7	7.7	9.9	6600	4100	5300	361	22000	3.9	0.5	38	1.1
Peconic Ave	MW-3R	GW	45 - 55	6/11/2014	45.92	5.7	17.3	6.8	533	5424	138	45000	3.6	21	17	14000	7400	8800	267	33000	7.8	0.5	57	1.7
Peconic Ave	PA-1	GW	40 - 50	6/11/2014	41.24	NA	NA	6.9	704	400	148	68000	1	1.5	7.6	800	26000	11000	24	45000	2.1	0.5	84	4.3
Peconic Ave	PA-2R	GW	39 - 49	6/11/2014	41.81	NA	NA	6.8	612	2410	281	49000	1.9	3.9	12	4000	18000	8400	173	37000	4.3	0.5	85	4
Peconic Ave	PA-6	GW	34 - 44	6/11/2014	40.75	NA	15.5	7.2	337	810	28	25000	1	4.1	5.8	1400	1500	2900	59	34000	1.6	0.5	56	0.83
Peconic Ave	PA-5	GW	34 - 44	6/12/2014	42.90	NA	NA	NA	NA	4742	94	34000	3.8	10	16	14000	20000	5600	368	46000	5.9	NA	66	9.4
Peconic Ave	PA-6	GW	35 - 45	6/17/2014	43.22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Peconic Ave	MW-1	GW	40 - 50	10/15/2014	42.74	7.83	14.8	6.8	292	13188	214	30000	13	19	32	18000	5200	5600	1480	12000	13	0.5	28	3.8
Peconic Ave	MW-2	GW	40 - 50	10/15/2014	48.53	NA	18.4	6.8	695	5052	87	41000	4	14	21	8900	10000	8200	334	69000	7.2	0.5	105	1
Peconic Ave	PA-2R	GW	40 - 50	10/15/2014	43.02	2.2	15.8	6.8	714	3282	396	58000	2.5	5.7	17	5400	36000	12000	113	37000	5.9	0.5	81	5.6
Peconic Ave	PA-3R	GW	40 - 50	10/15/2014	43.90	2.3	17.1	6.9	786	1662	96	42000	11	2.4	9.9	34000	37000	6500	2620	44000	4.9	0.5	104	10
Peconic Ave	PA-4R	GW	44 - 54	10/15/2014	45.72	3.55	16.5	6.9	988	1674	61	78000	6.9	3.3	19	5200	31000	12000	100	61000	8	0.5	104	5.1
Peconic Ave	PA-6	GW	35 - 45	10/15/2014	41.92	NA	NA	7.3	175	1510	18	21000	1.4	9.9	6.7	2800	960	2900	143	4300	3.1	0.5	16	2
Peconic Ave	MW-3R	GW	45 - 55	10/17/2014	47.03	2.9	17.5	6.7	645	1787	102	60000	1	5	17	2850	9500	10000	104	58000	5.3	0.5	81	5
Peconic Ave	PA-3R	GW	40 - 50	5/12/2015	42.70	2.91	18	6.6	768	109	49	28000	6.5	1	14	22000	77000	3900	1300	75000	2.3	0.5	92	12.5
Peconic Ave	PA-5	GW	35 - 45	5/12/2015	43.75	NA	NA	6.9.	355	3213	133	29000	2.6	7.1	8.7	9100	9400	4900	265	26000	6.2	0.5	39	6.9
Peconic Ave	PA-6	GW	35 - 45	5/12/2015	40.76	3.5	16.4	NA	NA	1098	96	22000	1	8.4	21	2300	2000	4300	83	175000	2.6	0.5	277	1.5
Peconic Ave	MW-1	GW	40 - 50	5/13/2015	41.53	7	15.7	6.6	318	2916	167	25000	3	4.5	12	4200	7900	4300	341	27000	3.7	0.5	52	5
Peconic Ave	MW-2	GW	40 - 50	5/13/2015	47.26	NA	NA	NA	NA	9544	85	41000	6.3	20	25	18000	7400	9100	738	70000	9.6	0.5	121	1.2
Peconic Ave	MW-3	GW	45 - 55	5/13/2015	45.82	2.6	16.8	6.4	561	7350	141	42000	3.5	32	31	17000	9900	8400	230	50000	9.5	0.5	70	5
Peconic Ave	PA-1	GW	38 - 48	5/13/2015	41.11	NA	NA	NA	NA	1335	178	62000	1.1	3.2	10	2400	24000	10000	44	31000	3.5	0.5	63	4.4
Peconic Ave	PA-2R	GW	40 - 50	5/13/2015	43.43	3.45	15.6	NA	NA	2557	304	55000	2.2	4	11	4500	28000	10000	61	27000	4.3	0.5	61	4.8
Peconic Ave	PA-4R	GW	45 - 55	5/13/2015	44.50	NA	NA	6.9	850	5712	70	76000	13	8.5	32	16000	45000	13000	183	49000	8.6	0.5	72	5
Peconic Ave	PA-2R	GW	39 - 49	5/26/2015	42.63	NA	NA	6.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Peconic Ave	PA-5	GW	35 - 45	5/26/2015	43.75	NA	NA	7	358	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Peconic Ave	PA-4R	GW	45 - 55	5/28/2015	44.64	NA	NA	7.2	825	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Peconic Ave	PA-5	GW	35 - 45	5/28/2015	43.75	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Peconic Ave	MW-1	GW	40 - 50	7/20/2015	42.08	7.55	14.9	6.2	328	37	153	23500	1	1	5	100	6500	3600	7	26300	0.6	0.5	54	3
Peconic Ave	PA-2R	GW	39 - 49	7/20/2015	41.90	2.2	15.8	6.3	805	36	184	74000	1	1	5	100	37000	14000	3	40000	1.9	0.5	81	6.4

Peconic Ave	PA-3R	GW	40 - 50	7/20/2015	43.28	2.28	16.1	6.4	613	62	51	34000	9	1	5	39000	20000	5100	1630	54000	3.1	0.5	75	5
Peconic Ave	PA-4R	GW	45 - 55	7/20/2015	45.06	3.4	15.2	6.6	775	37	37	64000	1	1	6	160	24000	10000	5	53000	2.8	0.5	86	4.1
Peconic Ave	MW-2	GW	40 - 50	7/21/2015	47.83	3.34	178.3	6.1	566	19	45	36000	1	1	5	100	5700	7300	75	55800	1.7	0.5	89	1.5
Peconic Ave	MW-3	GW	45 - 55	7/21/2015	46.38	4.5	16	6.4	450	47	64	35100	1	1	5	100	6500	6000	8	34600	1	0.5	48	2.3
Peconic Ave	PA-5	GW	35 - 45	7/22/2015	44..3	NA	NA	6.2	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	65	12
Peconic Ave	PA-6	GW	35 - 45	7/22/2015	41.22	8.6	14.4	6.8	605	52	54	27000	1	1	5	110	1400	3100	2	90000	0.7	0.5	143	1
Peconic Ave	PA-1	GW	38 - 48	7/23/2015	41.71	NA	20.3	6.2	664	1186	181	67000	1	3	10	2350	24000	11000	63	37000	3.9	0.5	75	5.4
Peconic Ave	PA-4R	GW	44 - 54	7/23/2015	45.06	NA	17.8	6.6	717	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Peconic Ave	PA-5	GW	35 - 45	7/23/2015	44..3	NA	NA	6.2	500	186	46	39000	1	2	5	610	9900	5800	15	39000	2.2	0.5	NA	NA
Ringhoff	RC-1	GW	90-95	2/21/2012	41.93	NA	NA	6.4	118	5	8	2000	NA	1	NA	100	600	1300	3	15500	0.5	0.5	24	1.2
Ringhoff	RC-1	GW	80-85	2/21/2012	41.93	NA	NA	5.9	648	10	166	8000	NA	1	NA	100	3500	6100	24	87700	1	0.5	180	2.3
Ringhoff	RC-1	GW	50-55	2/21/2012	41.93	NA	NA	5.6	335	35	11	7800	NA	1	NA	100	3500	2300	47	42700	1.2	0.5	84	3.1
Ringhoff	RC-1	GW	70-75	2/21/2012	41.93	NA	NA	5.7	480	15	166	8200	NA	1	NA	100	4600	3300	70	65400	0.7	0.5	129	2.4
Ringhoff	RC-1	GW	60-65	2/21/2012	41.93	NA	NA	5.7	467	16	124	5900	NA	1	NA	100	3900	2300	81	68900	1.2	0.5	123	3.8
Ringhoff	RC-2	GW	90-95	2/28/2012	38.65	5.18	12.6	6.4	215	5	66	3800	NA	1	NA	100	6800	2900	64	22300	0.6	0.5	54	0.5
Ringhoff	RC-2	GW	80-85	2/28/2012	38.65	6.29	12.7	6.4	218	6	42	1900	NA	1	NA	100	4300	1600	155	29500	0.5	0.5	52	0.5
Ringhoff	RC-2	GW	60-65	2/28/2012	38.65	5.77	13.5	5.7	206	29	158	4200	NA	1	NA	100	6500	3800	1560	18200	1.8	0.5	39	4
Ringhoff	RC-2	GW	70-75	2/28/2012	38.65	6.47	12.8	6.2	208	5	48	1600	NA	1	NA	100	5200	600	1970	28700	0.5	0.5	40	2.7
Ringhoff	RC-2	GW	40-45	3/6/2012	38.74	6.57	14.3	6.5	482	29	67	11700	NA	1	NA	100	3600	3000	128	70400	1.6	0.5	102	4.7
Ringhoff	RC-2	GW	50-55	3/6/2012	38.74	9.09	14.1	5.7	205	49	291	7800	NA	1	NA	100	9900	461000	461	10300	1.5	0.5	24	6.7
Ringhoff	RC-3	GW	70-75	3/6/2012	35.69	3.4	14.1	5.3	425	636	63	8400	NA	1	NA	100	55700	7500	793	12400	2.1	0.5	21	14
Ringhoff	RC-3	GW	80-85	3/6/2012	35.69	1.07	14.4	5.6	348	167	461	8500	NA	1	NA	100	28000	4000	2650	20100	1.2	0.76	46	14.5
Ringhoff	RC-3	GW	90-95	3/6/2012	35.69	11.49	14.5	5.9	375	37	872	11100	NA	3	NA	100	30500	5000	2730	18200	6.3	1.58	40	17.9
Ringhoff	RC-3	GW	40-45	3/20/2012	35.69	2.64	16.3	5.3	253	280	107	20000	NA	2	NA	100	5200	6300	111	10300	1.5	0.5	19	8.9
Ringhoff	RC-3	GW	60-65	3/20/2012	35.69	0.65	15.2	5.1	352	546	66	9300	NA	2	NA	100	46700	5800	549	9100	1.7	0.5	17	9.6
Ringhoff	RC-3	GW	50-55	3/20/2012	35.69	2.27	15.6	4.8	342	892	50	20400	NA	3	NA	100	24600	6200	677	10400	2.6	0.5	19	11.5
Speonk	CF-1	GW	80-85	1/4/2012	41.00	8.75	10.2	6.12	62	5	9	1500	1	1	1	100	500	1900	1	5300	0.5	0.5	7	0.5
Speonk	CF-1	GW	90-95	1/4/2012	41.00	9.93	10.2	6.2	48	5	7	900	1	1	1	100	400	1200	1	4200	0.5	0.5	6	0.5
Speonk	CF-1	GW	100-105	1/4/2012	41.00	9.36	9.2	6.1	61	5	8	1500	1	1	1	100	400	1700	1	4700	0.5	0.5	7	0.5
Speonk	CF-1	GW	70-75	1/31/2012	41.00	6.52	11.7	5.7	49	7	9	1700	1	1	1	100	600	1500	1	4200	0.5	0.5	7	0.5
Speonk	CF-1	GW	60-65	1/31/2012	41.00	6.44	11.7	5.6	43	12	8	1400	1	1	1	100	500	1300	3	3800	0.5	0.5	7	0.5
Speonk	CF-1	GW	50-55	1/31/2012	41.00	6.24	11.8	5.4	74	28	17	2700	1	1	1	100	900	2900	15	5600	0.5	0.5	10	0.5
Speonk	CF-2	GW	60-65	2/6/2012	41.65	6.27	13.3	6.78	61	6	12	1700	1	1	1	100	600	1700	2	4500	0.5	0.5	8	0.5
Speonk	CF-2	GW	50-55	2/6/2012	41.65	5.99	12.9	6.71	69	19	18	1800	2	1	1	100	700	1700	39	5700	0.5	0.5	9	0.5
Speonk	CF-2	GW	70-75	2/6/2012	41.65	5.98	13	6.84	58	5	11	2700	1	1	1	100	600	1500	1	4200	0.5	0.5	7	0.5
Speonk	CF-2	GW	80-85	2/6/2012	41.65	6.45	13	6.8	69	5	12	1700	1	1	1	100	600	2200	1	5600	0.5	0.5	8	0.5
Speonk	CF-2	GW	90-95	2/6/2012	41.65	7.04	13.4	6.98	50	15	7	1000	1	1	1	100	4000	1400	1	4100	0.5	0.5	5	0.5
Speonk	CF-2	GW	100-105	2/6/2012	41.65	6.78	NA	7.32	60	5	7	1300	2	1	1	100	400	1600	1	4400	0.5	0.5	5	0.6
Speonk	CF-3	GW	80-85	2/14/2012	41.60	7.08	11.8	8.71	175	18	15	2100	1	1	1	100	700	2700	1	5700	0.6	0.5	8	0.5
Speonk	CF-3	GW	90-95	2/14/2012	41.60	8.41	11.6	7.55	53	5	7	1100	1	1	1	100	400	1500	1	4200	0.5	0.5	6	0.9
Speonk	CF-3	GW	100-105	2/14/2012	41.60	8.43	11.4	9.93	69	5	9	1800	1	1	1	100	400	1900	1	4900	0.5	0.5	6	0.8
Speonk	CF-3	GW	70-75	2/15/2012	41.60	7.54	11.4	7.17	74	8	14	2500	1	1	1	100	700	2000	2	5300	0.5	0.5	9	0.5
Speonk	CF-3	GW	60-65	2/15/2012	41.60	7.79	12.2	6.78	65	25	12	2400	1	1	1	100	600	1800	4	4600	0.5	0.5	8	0.5
Speonk	CF-3	GW	50-55	2/15/2012	41.60	6.71	12.5	6.55	77	32	2.1	2600	1	1	1	100	800	1700	90	6100	1.1	0.5	11	0.5

Appendix B

Photograph 1 – October 2016
Leachate Study Location
Recycled Earth Site

Photograph 2- November 2016
Lysimeter Installation
Recycled Earth Site

Photograph 3- November 2016
1st Grind Mulch
Recycled Earth Site

Photograph 4 - June 2017
2nd Grind Mulch Pile
Recycled Earth

Photograph 5 – November 2016
Leachate Study Location
Edgewood Site

Photograph 6 – November 2016
Construction of Leachate Study Mulch Pile
Edgewood Site

Photograph 7 – November 2016
Lysimeter Construction
Edgewood site

Photograph 8 - November 2016
Mulch Pile with Lysimeter Installed
Edgewood Site

Photograph 9 - January 2017
Lysimeter Assessment
Edgewood Site

Photograph 10 - November 2016
Vertical Groundwater Study Temp Well Install
Edgewood Site

Photograph 11 – November 2016
Pilot Study Area
Ridge Site

Photograph 12 – November 2016
Mulch Pad Construction
Ridge Site

Photograph 13 – November 2016
Mulch Pile Construction Profile
Ridge Site

Photograph 14 – December 2016
Lined Pile (#4) construction with leachate collection trench and lysimeter
Ridge Site

Photograph 15 – December 2016
Mulch off-load and creation of coarse grind pile
Ridge Site

Photograph 16 – December 2016
Mulch off-load and creation of piles
Ridge Site

Photograph 17 – December 2016
Covered Pile with TopTex Composting Fleece
Ridge Site

Photograph 18 – December 2016
Lined pile #4 with covered trench, covered pile #3 in background
Ridge Site

Photograph 19– November 2016
Pilot Study Monitoring Well Installation
Ridge Site

Photograph 20 – December 2016
Mulch Comparison – Coarse (Left) Fine (Right)
Ridge Site

Photograph 21– December 2016
Temperature reading
Ridge Site

Appendix C
(Appended on CD)

Appendix D

Soil Boring Log

CLIENT:	Parsons	**INSPECTOR:**	C. Watson	**BORING/WELL I**	**MW-1**
PROJECT NAME:	NYSDEC Organic Mulch	**DRILLER:**	Parratt Wolff	**LOCATION DESCRIPTION**	
ROJECT LOCATION:	Long Island, NY	**WEATHER:**	Rain, 40 degrees F	Downgradient of Mulch Pile #1	
PROJECT NUMBER:		**CONTRACTOR:**	Parratt Wolff		
GROUNDWATER OBSERVATIONS		**RIG TYPE:**	Split Spoon	**LOCATION PLAN**	
		DATE/TIME START:	11/15/2016 8:40		
WATER LEVEL:	22'	**DATE/TIME FINISH:**	11/15/2016 10:00		
DATE:	11/15/16	**WEIGHT OF HAMMER:**			
TIME:	--	**DROP OF HAMMER:**			
MEAS. FROM:	BGS	**TYPE OF HAMMER:**			

SAMPLE DEPTH	SAMPLE I.D.	ADV/ REC.	PID (ppm)	FIELD IDENTIFICATION OF MATERIAL
1			0.0 0.0	(0.0 - 5.0): Moist, Brown, M-F SAND, little M-F rounded gravel
2			0.0 0.0	
3			0.0 0.0	
4			0.0 0.0	
5			0.0 0.0	
6			0.0 0.0	
7			0.0 0.0	(5.0-10.0): Moist, light brown, M-F SAND
8			0.0 0.0	
9			0.0 0.0	
10			0.0 0.0	
11			0.0 0.0	(10.0-15.0): Moist, light brown, M-F SAND, some coarse Sand, trace F Gravel
12			0.0 0.0	
13			0.0 0.0	
14				
15				
16			0.0 0.0	(15.0-16.0): Moist, light brown, M-F SAND, some coarse Sand, trace F Gravel
17			0.0 0.0	(16.0-18.0): Moist, light brown (little orange), M-F SAND, some coarse SAND, trace F gravel
18			0.0 0.0	(18.0-20.0): Moist, light brown, M-F SAND, some coarse SAND, trace F gravel
19			0.0 0.0	
20			0.0 0.0	
21			0.0 0.0	(20.0-22.0): Moist, light brown, M-F SAND, some coarse SAND, trace F gravel
22			0.0 0.0	(22.0-24.0): Wet, light brown, M-F SAND, some coarse SAND, trace F gravel
23			0.0 0.0	(24.0-26.0): Crushed Gravel (2" recovery)
24			0.0 0.0	
25			0.0 0.0	
26			0.0 0.0	(26.0-32.0): Wet, light brown, M-F SAND, some coarse Sand, trace F gravel
27			0.0 0.0	
28			0.0 0.0	
29			0.0 0.0	
30			0.0	
31			0.0 0.0	
32			0.0 0.0	
33				

Remarks: Well installed - Screen 17-32'

Sample Types	Consistency vs. Blowcount / Foot				
S -- Split Spoon	Granular (Sand & Gravel)		Fine Grained (Silt & Clay)		and - 35 -50%
U -- Undisturbed Tube	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-	some - 20-35%
C -- Rock Core	Loose: 4-10	V. Dense:: >50	Soft: 2-4	V. Stiff: 15-	little - 10-20%
A -- Auger Cuttings	M. Dense: 10-30		M. Stiff: 4-8	Hard: > 3	trace - <10%
					moisture, density, color, gradation

Soil Boring Log

CLIENT:	Parsons	**INSPECTOR:**	C. Watson	**BORING/WELL**	**MW-2**
PROJECT NAME:	NYSDEC Organic Mulch	**DRILLER:**	Parratt Wolff	**LOCATION DESCRIPTION**	
OJECT LOCATION:	Long Island, NY	**WEATHER:**	Rain, 40 degrees F	Downgradient of Mulch Pile #2	
PROJECT NUMBER:		**CONTRACTOR:**	Parratt Wolff		
GROUNDWATER OBSERVATIONS		**RIG TYPE:**	Split Spoon	**LOCATION PLAN**	
		DATE/TIME START:	11/15/2016 13:45		
WATER LEVEL:	20'	**DATE/TIME FINISH:**	11/15/2016 14:30		
DATE:	11/15/16	**WEIGHT OF HAMMER:**			
TIME:	--	**DROP OF HAMMER:**			
MEAS. FROM:	BGS	**TYPE OF HAMMER:**			

SAMPLE DEPTH	SAMPLE I.D.	ADV/ REC.	PID (ppm)	FIELD IDENTIFICATION OF MATERIAL
1				Sampling beginning @ 18' bgs
2				
3				
4				
5				
6				
7				--
8				
9				
10				
11				--
12				
13				
14				
15				
16				--
17				
18		24/24	0.0 0.0	(18.0-20.00): Moist, light brown, M-F SAND, some coarse Sand, trace F gravel
19			0.0 0.0	
20		24/24	0.0 0.0	(20.0-22.0): Wet, light brown, M-F SAND, some coarse Sand, trace F gravel
21			0.0 0.0	
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				

Remarks: Logging of soils beginning @ 18' to find saturated zone
Well installed - Screen 15-30'

Sample Types	Consistency vs. Blowcount / Foot							
	Granular (Sand & Gravel)				Fine Grained (Silt & Clay)			
S -- Split Spoon	V. Loose:	0-4	Dense:	30-50	V. Soft: <2	Stiff: 8-		and - 35 -50%
U -- Undisturbed Tube	Loose:	4-10	V. Dense::	>50	Soft: 2-4	V. Stiff: 15-		some - 20-35%
C -- Rock Core	M. Dense:	10-30			M. Stiff: 4-8	Hard: > 3		little - 10-20%
A -- Auger Cuttings								trace - <10%
								moisture, density, color, gradation

Soil Boring Log

CLIENT:	Parsons	**INSPECTOR:**	C. Watson	**BORING/WELL**	**MW-3**
PROJECT NAME:	NYSDEC Organic Mulch	**DRILLER:**	Parratt Wolff	**LOCATION DESCRIPTION**	
OJECT LOCATION:	Long Island, NY	**WEATHER:**	45 degrees F	Downgradient of Mulch Pile #3	
PROJECT NUMBER:		**CONTRACTOR:**	Parratt Wolff		
GROUNDWATER OBSERVATIONS		**RIG TYPE:**	Split Spoon	**LOCATION PLAN**	
		DATE/TIME START:	11/16/2016 7:58		
WATER LEVEL:	21.8'	**DATE/TIME FINISH:**	11/16/2016 9:00		
DATE:	11/16/16	**WEIGHT OF HAMMER:**			
TIME:	--	**DROP OF HAMMER:**			
MEAS. FROM:	BGS	**TYPE OF HAMMER:**			

SAMPLE DEPTH	SAMPLE I.D.	ADV/ REC.	PID (ppm)	FIELD IDENTIFICATION OF MATERIAL
1				Sampling beginning @ 18' bgs
2				
3				
4				
5				
6				
7				--
8				
9				
10				
11				--
12				
13				
14				
15				
16				--
17				
18				
19				
20		24/24	0.0 0.0	(20.0-21.8): Moist, light brown, M-F SAND, some C Sand, trace F gravel
21			0.0 0.0	(21.8-22) Wet, light brown, M-F SAND, some C Sand, trace F gravel
22				--
23				
24				
25				
26				--
27				
28				
29				
30				
31				
32				
33				

Remarks: Logging of soils beginning @ 20' to find saturated zone
Well installed - Screen 17-32'

Sample Types	Consistency vs. Blowcount / Foot				
	Granular (Sand & Gravel)		Fine Grained (Silt & Clay)		
S -- Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-	and - 35 -50%
U -- Undisturbed Tube	Loose: 4-10	V. Dense:: >50	Soft: 2-4	V. Stiff: 15-	some - 20-35%
C -- Rock Core	M. Dense: 10-30		M. Stiff: 4-8	Hard: > 3	little - 10-20%
A -- Auger Cuttings					trace - <10%
					moisture, density, color, gradation

Soil Boring Log

CLIENT:	Parsons	**INSPECTOR:**	C. Watson	**BORING/WELL I**	**MW-4**
PROJECT NAME:	NYSDEC Organic Mulch	**DRILLER:**	Parratt Wolff	**LOCATION DESCRIPTION**	
ROJECT LOCATION:	Long Island, NY	**WEATHER:**	45 degrees F	Downgradient of Mulch Pile #4	
PROJECT NUMBER:		**CONTRACTOR:**	Parratt Wolff		
GROUNDWATER OBSERVATIONS		**RIG TYPE:**	Split Spoon	**LOCATION PLAN**	
		DATE/TIME START:	11/16/2016 13:00:00 AM		
WATER LEVEL:	22'	**DATE/TIME FINISH:**	11/16/2016 13:50:00 AM		
DATE:	11/16/16	**WEIGHT OF HAMMER:**			
TIME:	--	**DROP OF HAMMER:**			
MEAS. FROM:	BGS	**TYPE OF HAMMER:**			

SAMPLE DEPTH	SAMPLE I.D.	ADV/ REC.	PID (ppm)	FIELD IDENTIFICATION OF MATERIAL
1				Sampling beginning @ 18' bgs
2				
3				
4				
5				
6				
7				--
8				
9				
10				
11				--
12				
13				
14				
15				
16				--
17				
18				
19				
20		24/6	0.0 0.0	(20.0-22.0): Moist, light brown, M-F - C SAND, trace F gravel
21			0.0 0.0	
22		24/24	0.0 0.0	(22.0-24.0): Wet, light brown, M-F - C SAND, trace F gravel
23			0.0 0.0	
24				--
25				
26				--
27				
28				
29				
30				
31				
32				
33				

Remarks: Logging of soils beginning @ 20' to find saturated zone
Well installed - Screen 17-32'

Sample Types	Consistency vs. Blowcount / Foot				
S -- Split Spoon	Granular (Sand & Gravel)		Fine Grained (Silt & Clay)		and - 35 -50%
U -- Undisturbed Tube	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-	some - 20-35%
C -- Rock Core	Loose: 4-10	V. Dense:: >50	Soft: 2-4	V. Stiff: 15-	little - 10-20%
A -- Auger Cuttings	M. Dense: 10-30		M. Stiff: 4-8	Hard: > 3	trace - <10%
					moisture, density, color, gradation

Soil Boring Log

CLIENT:	Parsons	**INSPECTOR:**	C. Watson	**BORING/WELL**	**TMW-UP**
PROJECT NAME:	NYSDEC Organic Mulch	**DRILLER:**	Parratt Wolff	**LOCATION DESCRIPTION**	
OJECT LOCATION:	Long Island, NY	**WEATHER:**	37-55 degrees F	Upgradient of mulch piles, middle of site	
PROJECT NUMBER:		**CONTRACTOR:**	Parratt Wolff		
GROUNDWATER OBSERVATIONS		**RIG TYPE:**	GeoProbe	**LOCATION PLAN**	
		DATE/TIME START:	11/1/2016 8:00		
WATER LEVEL:	35'	**DATE/TIME FINISH:**	11/1/2016 9:45		
DATE:	11/1/16	**WEIGHT OF HAMMER:**			
TIME:	--	**DROP OF HAMMER:**			
MEAS. FROM:	BGS	**TYPE OF HAMMER:**			

SAMPLE DEPTH	SAMPLE I.D.	ADV/ REC.	PID (ppm)	FIELD IDENTIFICATION OF MATERIAL
1		Hand Cleared	0.0 0.0	0-5' Moist, brown, MC SAND, some F round Gravel
2			0.0 0.0	
3			0.0 0.0	
4			0.0 0.0	
5			0.0 0.0	(4.0-35.0): Moist, light brown/tan, MC SAND, trace F Gravel
6			0.0 0.0	
7			0.0 0.0	
8			0.0 0.0	
9			0.0 0.0	
10			0.0 0.0	
11			0.0 0.0	
12			0.0 0.0	
13			0.0 0.0	
14			0.0 0.0	
15			0.0 0.0	
16			0.0 0.0	
17			0.0 0.0	
18			0.0 0.0	
19			0.0 0.0	
20			0.0 0.0	
21			0.0 0.0	
22			0.0 0.0	
23			0.0 0.0	
24			0.0 0.0	
25			0.0 0.0	
26			0.0 0.0	
27			0.0 0.0	
28			0.0 0.0	
29			0.0 0.0	
30			0.0	
31			0.0 0.0	
32			0.0 0.0	
33			0.0 0.0	
34			0.0 0.0	
35			0.0 0.0	(35.0-36.0): Wet, light brown/tan, MC SAND, trace F Gravel
36			0.0 0.0	

Remarks:

Sample Types	Consistency vs. Blowcount / Foot							
	Granular (Sand & Gravel)				Fine Grained (Silt & Clay)			
S -- Split Spoon	V. Loose:	0-4	Dense:	30-50	V. Soft: <2	Stiff: 8-		and - 35 -50%
U -- Undisturbed Tube	Loose:	4-10	V. Dense::	>50	Soft: 2-4	V. Stiff: 15-		some - 20-35%
C -- Rock Core	M. Dense:	10-30			M. Stiff: 4-8	Hard: >		little - 10-20%
A -- Auger Cuttings								trace - <10%
								moisture, density, color, gradation

Soil Boring Log

CLIENT: Parsons
PROJECT NAME: NYSDEC Organic Mulch
OJECT LOCATION: Long Island, NY
PROJECT NUMBER:

INSPECTOR: C. Watson
DRILLER: Parratt Wolff
WEATHER: 37-55 degrees F
CONTRACTOR: Parratt Wolff
RIG TYPE: GeoProbe
DATE/TIME START: 11/1/2016 13:55:00 PM
DATE/TIME FINISH: 11/1/2016 15:30 PM
WEIGHT OF HAMMER:
DROP OF HAMMER:
TYPE OF HAMMER:

BORING/WELL TMW-DOWN

LOCATION DESCRIPTION
Downgradient of mulch piles, middle of site

LOCATION PLAN

GROUNDWATER OBSERVATIONS

WATER LEVEL: 35'
DATE: 11/1/16
TIME: --
MEAS. FROM: BGS

SAMPLE DEPTH	SAMPLE I.D.	ADV/ REC.	PID (ppm)	FIELD IDENTIFICATION OF MATERIAL
1		Hand Cleared		Sampling beginning at 16' bgs
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16			0.0 0.0	(16.0-35.0): Moist, light brown/tan, MC SAND, trace F round gravel
17			0.0 0.0	
18			0.0 0.0	
19			0.0 0.0	
20			0.0 0.0	
21			0.0 0.0	
22			0.0 0.0	
23			0.0 0.0	
24			0.0 0.0	
25			0.0 0.0	
26			0.0 0.0	
27			0.0 0.0	
28			0.0 0.0	
29			0.0 0.0	
30			0.0	
31			0.0 0.0	
32			0.0 0.0	
33			0.0 0.0	
34			0.0 0.0	
35			0.0 0.0	(35.0-36.0): Wet, light brown/tan, MC SAND, trace F round gravel
36			0.0 0.0	

Remarks:

Sample Types	Consistency vs. Blowcount / Foot						
S -- Split Spoon	Granular (Sand & Gravel)			Fine Grained (Silt & Clay)			and - 35 -50%
U -- Undisturbed Tube	V. Loose: 0-4	Dense:	30-50	V. Soft: <2	Stiff: 8-		some - 20-35%
C -- Rock Core	Loose: 4-10	V. Dense:: >50		Soft: 2-4	V. Stiff: 15-		little - 10-20%
A -- Auger Cuttings	M. Dense: 10-30			M. Stiff: 4-8	Hard: > 3		trace - <10%
							moisture, density, color, gradation

Appendix E

LOW FLOW GROUND WATER SAMPLING - DATA SHEET

SHEET___1__OF___1__

PROJECT SITE/LOCATION: __Organic Mulch____
DATE: ___9/14/17___
WEATHER: ______

CONSULTING FIRM: ___PARSONS___
FIELD PERSONNEL: ______

MONITOR WELL #: ______MW-1________
WELL PERMIT #: __________________
WELL DEPTH: __32___ feet
WELL DIAMETER: ___2___ inches
SCREENED/OPEN INTERVAL: __17-32____

PID/FID READINGS:
BACKGROUND: ___0___ ppm
BENEATH OUTER CAP: ___0___ ppm
BENEATH INNER CAP: ___0___ ppm

PUMPING INFORMATION:
PUMP INTAKE DEPTH: __24____ feet below TOC
DEPTH TO WATER BEFORE PUMP INSTALLATION: ___20.25___ feet below TOC
MAKE/MODEL OF PUMP: ___GeoPump___

Time	PURGING	SAMPLING	pH (units)		SPECIFIC CONDUCTIVITY (mS/cm)		REDOX POTENTIAL (mV)		DISSOLVED OXYGEN (mg/L)		TURBIDITY (NTU)		TEMPERATURE (degrees C)		PUMPING RATE	DEPTH TO WATER
			READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	ml/min	(ft below TOC)
830			6.64	--	0.631	--	179.1	--	8.45	--	8.3	--	15.38	--	200	20.25
835			6.55	-0.09	0.296	-0.34	197.3	18.20	7.74	-0.71	8.7	0.40	14.85	-0.53	200	20.25
840			6.40	-0.15	0.133	-0.16	216.1	18.80	7.26	-0.48	5.8	-2.90	14.83	-0.02	200	20.25
845			6.37	-0.03	0.101	-0.03	243.0	26.90	6.77	-0.49	3.3	-2.50	15.09	0.26	200	20.25
850			6.35	-0.02	0.096	-0.01	250.8	7.80	6.66	-0.11	3.1	-0.20	15.19	0.10	200	20.25
855			6.32	-0.03	0.096	0.00	251.2	0.40	6.40	-0.26	3.5	0.40	15.26	0.07	200	20.25
900		x	6.30	-0.02	0.095	0.00	252.8	1.60	6.21	-0.19	3.0	-0.50	15.35	0.09	200	20.25

SAMPLING INFORMATION:	QA/QC INFORMATION:	ADDITIONAL OBSERVATIONS/COMMENTS:
Sample ID: MW-1-09142017	Duplicate Collected?: No	Clarity: Clear
Sample Time: 0900	MS/MSD Collected?: No	Odor: --
Comments: --	Filtering?: Yes	Other: --

***INDICATOR PARAMETERS HAVE STABILIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:**
pH: ± 0.1 units ; Spec. Conductivity: ± 3% ; ORP: ± 10mV ; D.O.: ± 10% ; Turbidity: ± 10% (or <1 NTU) ; Temperature: ± 3%.

ANALYST NAME & SIGNATURE: DATE:
REVIEWER NAME & SIGNATURE: DATE:

LOW FLOW GROUND WATER SAMPLING - DATA SHEET

SHEET___1__OF___1__

PROJECT SITE/LOCATION: __Organic Mulch____ | CONSULTING FIRM: ___PARSONS___

DATE: ___9/14/17___ | FIELD PERSONNEL: ______

WEATHER: ______

MONITOR WELL #: ______MW-2________ | WELL DEPTH: __30___ feet

WELL PERMIT #: ___________________ | WELL DIAMETER: __2____ inches | SCREENED/OPEN INTERVAL: __15-30____

PID/FID READINGS:
BACKGROUND: ___0___ ppm
BENEATH OUTER CAP: ____0___ ppm
BENEATH INNER CAP: ___0___ ppm

PUMPING INFORMATION:
PUMP INTAKE DEPTH: __23____ feet below TOC
DEPTH TO WATER BEFORE PUMP INSTALLATION: ___19.21___ feet below TOC
MAKE/MODEL OF PUMP: ___GeoPump___

Time	PURGING	SAMPLING	pH (units) READING	pH CHANGE	SPECIFIC CONDUCTIVITY (mS/cm) READING	CHANGE	REDOX POTENTIAL (mV) READING	CHANGE	DISSOLVED OXYGEN (mg/L) READING	CHANGE	TURBIDITY (NTU) READING	CHANGE	TEMPERATURE (degrees C) READING	CHANGE	PUMPING RATE ml/min	DEPTH TO WATER (ft below TOC)
955			5.98	--	0.097	--	214.5	--	6.94	--	27.9	--	15.16	--	200	19.21
1000			5.34	-0.64	0.083	-0.01	266.8	52.30	6.55	-0.39	8.8	-19.10	14.28	-0.88	200	19.21
1005			5.34	0.00	0.081	0.00	279.6	12.80	6.22	-0.33	6.3	-2.50	14.81	0.53	200	19.21
1010			5.32	-0.02	0.081	0.00	281.2	1.60	6.07	-0.15	4.5	-1.80	14.85	0.04	200	19.21
1015			5.32	0.00	0.081	0.00	384.6	103.40	6.06	-0.01	4.4	-0.10	14.80	-0.05	200	19.21
1020		x	5.32	0.00	0.081	0.00	387.6	3.00	6.08	0.02	4.0	-0.40	14.76	-0.04	200	19.21

SAMPLING INFORMATION:	QA/QC INFORMATION:	ADDITIONAL OBSERVATIONS/COMMENTS:
Sample ID:	Duplicate Collected?: No	Clarity: Clear
Sample Time: 0900	MS/MSD Collected?: No	Odor: --
Comments: --	Filtering?: NO	Other: --

*INDICATOR PARAMETERS HAVE STABILIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:
pH: ± 0.1 units ; Spec. Conductivity: ± 3% ; ORP: ± 10mV ; D.O.: ± 10% ; Turbidity: ± 10% (or <1 NTU) ; Temperature: ± 3%.

ANALYST NAME & SIGNATURE: | DATE:

REVIEWER NAME & SIGNATURE: | DATE:

LOW FLOW GROUND WATER SAMPLING - DATA SHEET

SHEET___1___OF___1__

PROJECT SITE/LOCATION: __Organic Mulch____
CONSULTING FIRM: ___PARSONS___
DATE: ___9/14/17___
FIELD PERSONNEL: ______
WEATHER: ______

MONITOR WELL #: ______MW-3________
WELL DEPTH: __32___ feet
WELL PERMIT #: __________________
WELL DIAMETER: ___2___ inches
SCREENED/OPEN INTERVAL: __17-32____

PID/FID READINGS:
BACKGROUND: ___0___ ppm
BENEATH OUTER CAP: ___0___ ppm
BENEATH INNER CAP: ______ ppm

PUMPING INFORMATION:
PUMP INTAKE DEPTH: __24____ feet below TOC
DEPTH TO WATER BEFORE PUMP INSTALLATION: ___21.20___ feet below TOC
MAKE/MODEL OF PUMP: ___GeoPump___

Time	PURGING	SAMPLING	pH (units)		SPECIFIC CONDUCTIVITY (mS/cm)		REDOX POTENTIAL (mV)		DISSOLVED OXYGEN (mg/L)		TURBIDITY (NTU)		TEMPERATURE (degrees C)		PUMPING RATE	DEPTH TO WATER
			READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	ml/min	(ft below TOC)
1045			6.14	--	0.065	--	316.7	--	5.02	--	3.4	--	15.83	--	200	21.20
1050			5.82	-0.32	0.061	-0.004	322.4	5.70	5.24	0.22	2.4	-1.00	15.43	-0.40	200	21.20
1055			5.62	-0.20	0.060	-0.001	326.7	4.30	5.12	-0.12	1.5	-0.90	15.13	-0.30	200	21.20
1100			5.58	-0.04	0.060	0.000	330.4	3.70	5.06	-0.06	1.1	-0.40	14.95	-0.18	200	21.20
1105			5.56	-0.02	0.060	0.000	332.2	1.80	5.10	0.04	1.3	0.20	14.84	-0.11	200	21.20
1110			5.56	0.00	0.060	0.000	334.2	2.00	5.11	0.01	1.2	-0.10	14.80	-0.04	200	21.20
1115		x	5.56	0.00	0.060	0.000	336.8	2.60	5.09	-0.02	1.5	0.30	14.82	0.02	200	21.20

SAMPLING INFORMATION:	QA/QC INFORMATION:	ADDITIONAL OBSERVATIONS/COMMENTS:
Sample ID: MW-3-09142017	Duplicate Collected?: No	Clarity: Clear
Sample Time: 1115	MS/MSD Collected?: No	Odor: --
Comments: --	Filtering?: yes	Other: --

*INDICATOR PARAMETERS HAVE STABILIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:
pH: ± 0.1 units ; Spec. Conductivity: ± 3% ; ORP: ± 10mV ; D.O.: ± 10% ; Turbidity: ± 10% (or <1 NTU) ; Temperature: ± 3%.

ANALYST NAME & SIGNATURE: DATE:
REVIEWER NAME & SIGNATURE: DATE:

LOW FLOW GROUND WATER SAMPLING - DATA SHEET

SHEET ___1___OF___1__

PROJECT SITE/LOCATION: __Organic Mulch____
DATE: ___9/14/17___
WEATHER: ______

CONSULTING FIRM: ___PARSONS___
FIELD PERSONNEL: ______

MONITOR WELL #: ______MW-4________
WELL PERMIT #: __________________
WELL DEPTH: __32___ feet
WELL DIAMETER: __2____ inches
SCREENED/OPEN INTERVAL: ___17-32___

PID/FID READINGS:
BACKGROUND: ___0___ ppm
BENEATH OUTER CAP: ___0___ ppm
BENEATH INNER CAP: ___0___ ppm

PUMPING INFORMATION:
PUMP INTAKE DEPTH: ___24___ feet below TOC
DEPTH TO WATER BEFORE PUMP INSTALLATION: ___21.06___ feet below TOC
MAKE/MODEL OF PUMP: ___GeoPump___

Time	PURGING	SAMPLING	pH (units)		SPECIFIC CONDUCTIVITY (mS/cm)		REDOX POTENTIAL (mV)		DISSOLVED OXYGEN (mg/L)		TURBIDITY (NTU)		TEMPERATURE (degrees C)		PUMPING RATE	DEPTH TO WATER
			READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	ml/min	(ft below TOC)
1135			5.76	--	0.062	--	322.0	--	4.71	--	24.50	--	16.26	--	200	21.06
1140			5.67	-0.09	0.060	0.00	326.0	4.00	4.82	0.11	35.20	10.70	15.52	-0.74	200	21.06
1145			5.70	0.03	0.060	0.00	327.0	1.00	4.79	-0.03	6.20	-29.00	15.50	-0.02	200	21.06
1150			5.74	0.04	0.060	0.00	330.2	3.20	4.69	-0.10	5.70	-0.50	15.38	-0.12	200	21.06
1155			5.74	0.00	0.060	0.00	331.7	1.50	4.48	-0.21	4.90	-0.80	15.35	-0.03	200	21.06
1200			5.73	-0.01	0.060	0.00	332.0	0.30	4.45	-0.03	5.0	0.10	15.35	0.00	200	21.06
1205			5.73	0.00	0.060	0.00	332.2	0.20	4.44	-0.01	5.6	0.60	15.27	-0.08	200	21.06

SAMPLING INFORMATION:	QA/QC INFORMATION:	ADDITIONAL OBSERVATIONS/COMMENTS:
Sample ID: MW-4-09142017	Duplicate Collected?: No	Clarity: Clear
Sample Time: 1205	MS/MSD Collected?: No	Odor: --
Comments: --	Filtering?: Yes	Other: --

***INDICATOR PARAMETERS HAVE STABILIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:**
pH: ± 0.1 units ; Spec. Conductivity: ± 3% ; ORP: ± 10mV ; D.O.: ± 10% ; Turbidity: ± 10% (or <1 NTU) ; Temperature: ± 3%.

ANALYST NAME & SIGNATURE: DATE:
REVIEWER NAME & SIGNATURE: DATE:

LOW FLOW GROUND WATER SAMPLING - DATA SHEET

SHEET___1__OF___1__

PROJECT SITE/LOCATION: __Organic Mulch____
DATE: ___11/17/16___
WEATHER: ______
CONSULTING FIRM: ___PARSONS___
FIELD PERSONNEL: ___CW____

MONITOR WELL #: ______MW-1________
WELL PERMIT #: ___________________
WELL DEPTH: __32___ feet
WELL DIAMETER: ___2___ inches
SCREENED/OPEN INTERVAL: __17-32____

PID/FID READINGS:
BACKGROUND: ___0___ ppm
BENEATH OUTER CAP: ___0___ ppm
BENEATH INNER CAP: ______ ppm

PUMPING INFORMATION:
PUMP INTAKE DEPTH: ___23.8___ feet below TOC
DEPTH TO WATER BEFORE PUMP INSTALLATION: ___21.41___ feet below TOC
MAKE/MODEL OF PUMP: ___GeoPump___

WATER QUALITY INFORMATION:
INSTRUMENT MAKE/MODEL: Horiba
SERIAL #:
TEMP. CORRECTION VALUE:

Time	PURGING	SAMPLING	pH (units)		SPECIFIC CONDUCTIVITY (mS/cm)		REDOX POTENTIAL (mV)		DISSOLVED OXYGEN (mg/L)		TURBIDITY (NTU)		TEMPERATURE (degrees C)		PUMPING RATE	DEPTH TO WATER
			READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	ml/min	(ft below TOC)
930	x		6.36	--	0.155	--	168.0	--	10.14	--	95.7	--	13.91	--	300	21.41
935	x		6.03	-0.33	0.156	0.001	189.0	21.00	8.69	-1.45	69.4	-26.30	13.27	-0.64	300	21.41
940	x		5.97	-0.06	0.178	0.022	195.0	6.00	8.11	-0.58	55.7	-13.70	13.13	-0.14	300	21.41
945	x		5.68	-0.29	0.185	0.007	197.0	2.00	8.22	0.11	30.3	-25.40	12.77	-0.36	300	21.41
950	x		5.66	-0.02	0.184	-0.001	201.0	4.00	8.18	-0.04	24.5	-5.80	12.78	0.01	300	21.41
955	x		5.64	-0.02	0.181	-0.003	201.0	0.00	8.06	-0.12	10.6	-13.90	12.90	0.12	300	21.41
1000	x		5.63	-0.01	0.184	0.003	202.0	1.00	8.02	-0.04	8.7	-1.90	12.87	-0.03	300	21.41
1005	x		5.63	0.00	0.183	-0.001	204.0	2.00	7.98	-0.04	7.9	-0.80	13.00	0.13	300	21.41
1010		x	5.63	0.00	0.183	0.000	204.0	0.00	7.94	-0.04	8.3	0.40	13.07	0.07	300	21.41

SAMPLING INFORMATION:	QA/QC INFORMATION:	ADDITIONAL OBSERVATIONS/COMMENTS:
Sample ID: MW-1-11172016	Duplicate Collected?: No	Clarity: Clear
Sample Time: 1010	MS/MSD Collected?: No	Odor: --
Comments: --	Filtering?: Yes	Other: --

***INDICATOR PARAMETERS HAVE STABILIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:**
pH: ± 0.1 units ; Spec. Conductivity: ± 3% ; ORP: ± 10mV ; D.O.: ± 10% ; Turbidity: ± 10% (or <1 NTU) ; Temperature: ± 3%.

ANALYST NAME & SIGNATURE: Chris Watson — DATE: 11/17/2016
REVIEWER NAME & SIGNATURE: Kevin McMullen — DATE: 11/1/2017

LOW FLOW GROUND WATER SAMPLING - DATA SHEET

SHEET___1__OF___1__

PROJECT SITE/LOCATION: __Organic Mulch____	CONSULTING FIRM: ___PARSONS___
DATE: ___11/17/16___	FIELD PERSONNEL: ___CW____
WEATHER: ______	

MONITOR WELL #: ______MW-2________	WELL DEPTH: __30___ feet	
WELL PERMIT #: __________________	WELL DIAMETER: __2____ inches	SCREENED/OPEN INTERVAL: __15-30____

PID/FID READINGS:	PUMPING INFORMATION:	WATER QUALITY INFORMATION:
BACKGROUND: ___0___ ppm	PUMP INTAKE DEPTH: ______ feet below TOC	INSTRUMENT MAKE/MODEL: Horiba
BENEATH OUTER CAP: ___0___ ppm	DEPTH TO WATER BEFORE PUMP INSTALLATION: ___20.09___ feet below TOC	SERIAL #:
BENEATH INNER CAP: ______ ppm	MAKE/MODEL OF PUMP: ___GeoPump___	TEMP. CORRECTION VALUE:

Time	PURGING	SAMPLING	pH (units)		SPECIFIC CONDUCTIVITY (mS/cm)		REDOX POTENTIAL (mV)		DISSOLVED OXYGEN (mg/L)		TURBIDITY (NTU)		TEMPERATURE (degrees C)		PUMPING RATE	DEPTH TO WATER
			READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	ml/min	(ft below TOC)
1115	x		5.59	--	0.052	--	199.0	--	10.27	--	94.3	--	14.49	--	300	20.09
1120	x		5.48	-0.11	0.084	0.032	285.0	86.00	8.96	-1.31	62.6	-31.70	13.67	-0.82	300	20.09
1125	x		5.58	0.10	0.076	-0.008	266.0	-19.00	8.87	-0.09	47.0	-15.60	13.58	-0.09	300	20.09
1130	x		5.72	0.14	0.062	-0.014	254.0	-12.00	8.77	-0.10	24.8	-22.20	13.51	-0.07	300	20.09
1135	x		5.86	0.14	0.066	0.004	239.0	-15.00	8.91	0.14	10.7	-14.10	13.48	-0.03	300	20.09
1140	x		5.88	0.02	0.065	-0.001	232.0	-7.00	8.88	-0.03	2.7	-8.00	13.47	-0.01	300	20.09
1145	x		5.87	-0.01	0.065	0.000	229.0	-3.00	8.90	0.02	0.0	-2.70	13.55	0.08	300	20.09
1150		X	5.87	0.00	0.065	0.000	226.0	-3.00	8.87	-0.03	0.0	0.00	13.49	-0.06	300	20.09

SAMPLING INFORMATION:	QA/QC INFORMATION:	ADDITIONAL OBSERVATIONS/COMMENTS:
Sample ID: MW-2-11172016	Duplicate Collected?: No	Clarity: Clear
Sample Time: 1150	MS/MSD Collected?: No	Odor: --
Comments: --	Filtering?: yes	Other: --

*INDICATOR PARAMETERS HAVE STABILIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:
pH: ± 0.1 units ; Spec. Conductivity: ± 3% ; ORP: ± 10mV ; D.O.: ± 10% ; Turbidity: ± 10% (or <1 NTU) ; Temperature: ± 3%.

ANALYST NAME & SIGNATURE: Chris Watson	DATE: 11/17/2016
REVIEWER NAME & SIGNATURE: Kevin McMullen	DATE: 11/1/2017

LOW FLOW GROUND WATER SAMPLING - DATA SHEET

SHEET___1__OF___1__

PROJECT SITE/LOCATION: __Organic Mulch____
CONSULTING FIRM: ___PARSONS___
DATE: ___11/17/16___
FIELD PERSONNEL: ___CW____
WEATHER: ______

MONITOR WELL #: ______MW-3________
WELL DEPTH: ___32__ feet
WELL PERMIT #: ___________________
WELL DIAMETER: ___2___ inches
SCREENED/OPEN INTERVAL: __17-32____

PID/FID READINGS:
BACKGROUND: ___0___ ppm
BENEATH OUTER CAP: ___0___ ppm
BENEATH INNER CAP: ___0___ ppm

PUMPING INFORMATION:
PUMP INTAKE DEPTH: __24____ feet below TOC
DEPTH TO WATER BEFORE PUMP INSTALLATION: ___22.0__ feet below TOC
MAKE/MODEL OF PUMP: ___GeoPump___

WATER QUALITY INFORMATION:
INSTRUMENT MAKE/MODEL: Horiba
SERIAL #:
TEMP. CORRECTION VALUE:

Time	PURGING	SAMPLING	pH (units)		SPECIFIC CONDUCTIVITY (mS/cm)		REDOX POTENTIAL (mV)		DISSOLVED OXYGEN (mg/L)		TURBIDITY (NTU)		TEMPERATURE (degrees C)		PUMPING RATE	DEPTH TO WATER
			READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	ml/min	(ft below TOC)
1340	x		6.11	--	0.042	--	216.0	--	8.50	--	95.5	--	13.63	--	300	22.00
1345	x		6.12	0.01	0.041	-0.001	218.0	2.00	8.16	-0.34	55.6	-39.90	13.54	-0.09	300	22.00
1350	x		6.14	0.02	0.041	0.000	219.0	1.00	7.98	-0.18	36.2	-19.40	13.51	-0.03	300	22.00
1355	x		6.10	-0.04	0.041	0.000	220.0	1.00	7.72	-0.26	20.2	-16.00	13.41	-0.10	300	22.00
1400	x		5.88	-0.22	0.040	-0.001	222.0	2.00	7.68	-0.04	5.9	-14.30	13.43	0.02	300	22.00
1405	x		5.86	-0.02	0.040	0.000	225.0	3.00	7.64	-0.04	4.6	-1.30	13.45	0.02	300	22.00
1410		x	5.88	0.02	0.040	0.000	227.0	2.00	7.59	-0.05	4.3	-0.30	13.47	0.02	300	22.00

SAMPLING INFORMATION:	QA/QC INFORMATION:	ADDITIONAL OBSERVATIONS/COMMENTS:
Sample ID: MW-3-11172016	Duplicate Collected?: No	Clarity: Clear
Sample Time: 1410	MS/MSD Collected?: No	Odor: --
Comments: --	Filtering?: yes	Other: --

***INDICATOR PARAMETERS HAVE STABILIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:**
pH: ± 0.1 units ; Spec. Conductivity: ± 3% ; ORP: ± 10mV ; D.O.: ± 10% ; Turbidity: ± 10% (or <1 NTU) ; Temperature: ± 3%.

ANALYST NAME & SIGNATURE: Chris Watson — DATE: 11/17/2016
REVIEWER NAME & SIGNATURE: Kevin McMullen — DATE: 11/1/2017

LOW FLOW GROUND WATER SAMPLING - DATA SHEET

SHEET___1__OF___1__

PROJECT SITE/LOCATION: __Organic Mulch____ CONSULTING FIRM: ___PARSONS___
DATE: ___11/17/16___ FIELD PERSONNEL: ___CW____
WEATHER: ______

MONITOR WELL #: ______MW-4________ WELL DEPTH: __32___ feet
WELL PERMIT #: __________________ WELL DIAMETER: __2____ inches SCREENED/OPEN INTERVAL: ___17-32___

PID/FID READINGS:
BACKGROUND: ___0___ ppm
BENEATH OUTER CAP: ___0___ ppm
BENEATH INNER CAP: ______ ppm

PUMPING INFORMATION:
PUMP INTAKE DEPTH: ______ feet below TOC
DEPTH TO WATER BEFORE PUMP INSTALLATION: ___21.9___ feet below TOC
MAKE/MODEL OF PUMP: ___GeoPump___

WATER QUALITY INFORMATION:
INSTRUMENT MAKE/MODEL: Horiba
SERIAL #:
TEMP. CORRECTION VALUE:

Time	PURGING	SAMPLING	pH (units)		SPECIFIC CONDUCTIVITY (mS/cm)		REDOX POTENTIAL (mV)		DISSOLVED OXYGEN (mg/L)		TURBIDITY (NTU)		TEMPERATURE (degrees C)		PUMPING RATE	DEPTH TO WATER
			READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	ml/min	(ft below TOC)
1450	X		6.11	--	0.063	--	211.0	--	10.21	--	75.2	--	14.09	--	300	21.90
1455	X		5.98	-0.13	0.060	-0.003	238.0	27.00	8.25	-1.96	98.9	23.70	13.23	-0.86	300	21.90
1500	X		5.90	-0.08	0.069	0.009	237.0	-1.00	7.19	-1.06	89.9	-9.00	13.14	-0.09	300	21.90
1505	X		5.92	0.02	0.072	0.003	236.0	-1.00	6.89	-1.06	60.6	-29.30	13.14	0.00	300	21.90
1510	X		5.91	-0.01	0.068	-0.004	237.0	1.00	6.66	-0.30	40.2	-20.40	13.06	-0.08	300	21.90
1515	X		5.92	0.01	0.066	-0.002	238.0	1.00	6.77	-0.23	24.6	-15.60	13.05	-0.01	300	21.90
1520	X		5.91	-0.01	0.064	-0.002	239.0	1.00	6.74	0.11	9.2	-15.40	13.08	0.03	300	21.90
1525	X		5.90	-0.01	0.064	0.000	241.0	2.00	6.70	-0.03	10.1	0.90	13.07	-0.01	300	21.90
1530		X	5.89	-0.01	0.064	0.000	242.0	1.00	6.64	-0.04	9.7	-0.40	13.06	-0.01	300	21.90

SAMPLING INFORMATION:	QA/QC INFORMATION:	ADDITIONAL OBSERVATIONS/COMMENTS:
Sample ID: MW-4-11172016	Duplicate Collected?: No	Clarity: Clear
Sample Time: 1530	MS/MSD Collected?: No	Odor: --
Comments: --	Filtering?: yes	Other: --

***INDICATOR PARAMETERS HAVE STABILIZED WHEN <u>3 CONSECUTIVE READINGS ARE WITHIN</u>:**
pH: ± 0.1 units ; Spec. Conductivity: ± 3% ; ORP: ± 10mV ; D.O.: ± 10% ; Turbidity: ± 10% (or <1 NTU) ; Temperature: ± 3%.

ANALYST NAME & SIGNATURE: Chris Watson	DATE: 11/17/2016
REVIEWER NAME & SIGNATURE: Kevin McMullen	DATE: 11/1/2017

LOW FLOW GROUND WATER SAMPLING - DATA SHEET

SHEET__1__OF__1__

PROJECT SITE/LOCATION: __Organic Mulch____
DATE: ___03/23/17___
WEATHER: __30 degrees, Clear/Sunny____
CONSULTING FIRM: ___PARSONS___
FIELD PERSONNEL: ___AFM____

MONITOR WELL #: ______MW-1________
WELL PERMIT #: __________________
WELL DEPTH: __32___ feet
WELL DIAMETER: ___2___ inches
SCREENED/OPEN INTERVAL: __17-32____

PID/FID READINGS:
BACKGROUND: ___0___ ppm
BENEATH OUTER CAP: ___0___ ppm
BENEATH INNER CAP: __0____ ppm

PUMPING INFORMATION:
PUMP INTAKE DEPTH: __23.8____ feet below TOC
DEPTH TO WATER BEFORE PUMP INSTALLATION: ___21.32___ feet below TOC
MAKE/MODEL OF PUMP: ___Peri Pump___

WATER QUALITY INFORMATION:
INSTRUMENT MAKE/MODEL: Horiba
SERIAL #:
TEMP. CORRECTION VALUE:

Time	PURGING	SAMPLING	pH (units)		SPECIFIC CONDUCTIVITY (mS/cm)		REDOX POTENTIAL (mV)		DISSOLVED OXYGEN (mg/L)		TURBIDITY (NTU)		TEMPERATURE (degrees C)		PUMPING RATE	DEPTH TO WATER
			READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	ml/min	(ft below TOC)
1100	X		6.27	--	0.082	--	291.0	--	8.31	--	0.0	--	8.39	--	200	21.36
1105	X		6.27	0.00	0.080	-0.002	292.0	1.00	8.67	0.36	0.0	0.00	8.46	0.07	200	21.38
1110	X		6.28	0.01	0.080	0.000	294.0	2.00	8.78	0.11	0.0	0.00	8.51	0.05	200	21.39
1115	X		6.28	0.00	0.082	0.002	294.0	0.00	8.78	0.11	0.0	0.00	8.52	0.01	200	21.40
1120	X		6.28	0.00	0.082	0.000	295.0	1.00	8.77	0.00	0.0	0.00	8.55	0.03	200	21.41
1125	X		6.28	0.00	0.082	0.000	295.0	0.00	8.81	-0.01	0.0	0.00	8.55	0.00	200	21.41
1130		X	6.28	0.00	0.082	0.000	295.0	0.00	8.81	0.04	0.0	0.00	8.55	0.00	200	21.40

SAMPLING INFORMATION:	QA/QC INFORMATION:	ADDITIONAL OBSERVATIONS/COMMENTS:
Sample ID: MW-1-03232017	Duplicate Collected?: Yes	Clarity: Clear
Sample Time: 1130	MS/MSD Collected?: Yes	Odor: NONE
Comments: --	Filtering?: Yes	Other: --

*INDICATOR PARAMETERS HAVE STABILIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:
pH: ± 0.1 units ; Spec. Conductivity: ± 3% ; ORP: ± 10mV ; D.O.: ± 10% ; Turbidity: ± 10% (or <1 NTU) ; Temperature: ± 3%.

ANALYST NAME & SIGNATURE: Aaron Feshbach-Meriney — DATE: 03/23/2017
REVIEWER NAME & SIGNATURE: Kevin McMullen — DATE: 11/1/2017

LOW FLOW GROUND WATER SAMPLING - DATA SHEET

SHEET___1__OF___1__

PROJECT SITE/LOCATION: __Organic Mulch____
DATE: ___03/23/17___
WEATHER: __30 degrees, Clear/Sunny____

CONSULTING FIRM: ___PARSONS___
FIELD PERSONNEL: ___AFM____

MONITOR WELL #: ______MW-2________
WELL PERMIT #: ___________________
WELL DEPTH: __30___ feet
WELL DIAMETER: __2____ inches
SCREENED/OPEN INTERVAL: __15-30____

PID/FID READINGS:
BACKGROUND: ___0___ ppm
BENEATH OUTER CAP: ___0___ ppm
BENEATH INNER CAP: __0____ ppm

PUMPING INFORMATION:
PUMP INTAKE DEPTH: __22.75___ feet below TOC
DEPTH TO WATER BEFORE PUMP INSTALLATION: ___20.25___ feet below TOC
MAKE/MODEL OF PUMP: ___Peri Pump___

WATER QUALITY INFORMATION:
INSTRUMENT MAKE/MODEL: Horiba
SERIAL #:
TEMP. CORRECTION VALUE:

Time	PURGING	SAMPLING	pH (units)		SPECIFIC CONDUCTIVITY (mS/cm)		REDOX POTENTIAL (mV)		DISSOLVED OXYGEN (mg/L)		TURBIDITY (NTU)		TEMPERATURE (degrees C)		PUMPING RATE	DEPTH TO WATER
			READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	ml/min	(ft below TOC)
1310	X		5.85	--	0.073	--	264.0	--	9.59	--	0.0	--	9.16	--	150	20.40
1315	X		5.82	-0.03	0.073	0.000	269.0	5.00	9.30	-0.29	0.0	0.00	9.29	0.13	150	20.42
1320	X		5.82	0.00	0.071	-0.002	274.0	5.00	9.14	-0.16	0.0	0.00	9.45	0.16	150	20.42
1325	X		5.81	-0.01	0.071	0.000	278.0	4.00	8.71	-0.16	0.0	0.00	9.64	0.19	150	20.42
1330	X		5.82	0.01	0.070	-0.001	279.0	1.00	8.71	-0.43	0.0	0.00	9.73	0.09	150	20.42
1335		X	5.82	0.00	0.070	0.000	281.0	2.00	8.72	0.00	0.0	0.00	9.77	0.04	150	20.42

SAMPLING INFORMATION:	QA/QC INFORMATION:	ADDITIONAL OBSERVATIONS/COMMENTS:
Sample ID: MW-2-03232017	Duplicate Collected?: No	Clarity: Clear
Sample Time: 1335	MS/MSD Collected?: No	Odor: NONE
Comments: --	Filtering?: Yes	Other: --

*INDICATOR PARAMETERS HAVE STABILIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:
pH: ± 0.1 units ; Spec. Conductivity: ± 3% ; ORP: ± 10mV ; D.O.: ± 10% ; Turbidity: ± 10% (or <1 NTU) ; Temperature: ± 3%.

ANALYST NAME & SIGNATURE: Aaron Feshbach-Meriney — DATE: 03/23/2017
REVIEWER NAME & SIGNATURE: Kevin McMullen — DATE: 11/1/2017

LOW FLOW GROUND WATER SAMPLING - DATA SHEET

SHEET___1__OF___1__

PROJECT SITE/LOCATION: __Organic Mulch____ **CONSULTING FIRM:** ___PARSONS___
DATE: ___03/23/17___ **FIELD PERSONNEL:** ___AFM____
WEATHER: __30 degrees, Clear/Sunny____

MONITOR WELL #: ______MW-3________ **WELL DEPTH:** ___32__ feet
WELL PERMIT #: __________________ **WELL DIAMETER:** ___2___ inches **SCREENED/OPEN INTERVAL:** __17-32____

PID/FID READINGS:
BACKGROUND: ___0___ ppm
BENEATH OUTER CAP: ____0___ ppm
BENEATH INNER CAP: __0____ ppm

PUMPING INFORMATION:
PUMP INTAKE DEPTH: __24.0__ feet below TOC
DEPTH TO WATER BEFORE PUMP INSTALLATION: ___22.32___ feet below TOC
MAKE/MODEL OF PUMP: ___Peri Pump___

WATER QUALITY INFORMATION:
INSTRUMENT MAKE/MODEL: Horiba
SERIAL #:
TEMP. CORRECTION VALUE:

Time	PURGING	SAMPLING	pH (units)		SPECIFIC CONDUCTIVITY (mS/cm)		REDOX POTENTIAL (mV)		DISSOLVED OXYGEN (mg/L)		TURBIDITY (NTU)		TEMPERATURE (degrees C)		PUMPING RATE	DEPTH TO WATER
			READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	ml/min	(ft below TOC)
1430	X		5.65	--	0.042	--	274.0	--	9.67	--	0.0	--	11.60	--	200	22.32
1435	X		5.93	0.28	0.037	-0.005	272.0	-2.00	9.66	-0.01	0.0	0.00	11.60	0.00	200	22.32
1440	X		6.01	0.08	0.036	-0.001	273.0	1.00	9.65	-0.01	0.0	0.00	11.61	0.01	200	22.32
1445	X		6.03	0.02	0.035	-0.001	274.0	1.00	9.65	-0.01	0.0	0.00	11.62	0.01	200	22.32
1450	X		6.04	0.01	0.035	0.000	276.0	2.00	9.65	0.00	0.0	0.00	11.69	0.07	200	22.32
1455		X	6.04	0.00	0.035	0.000	278.0	2.00	9.65	0.00	0.0	0.00	11.68	-0.01	200	22.32

SAMPLING INFORMATION:	QA/QC INFORMATION:	ADDITIONAL OBSERVATIONS/COMMENTS:
Sample ID: MW-3-03232017	Duplicate Collected?: No	Clarity: Clear
Sample Time: 1455	MS/MSD Collected?: No	Odor: NONE
Comments: --	Filtering?: yes	Other: --

***INDICATOR PARAMETERS HAVE STABILIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:**
pH: ± 0.1 units ; Spec. Conductivity: ± 3% ; ORP: ± 10mV ; D.O.: ± 10% ; Turbidity: ± 10% (or <1 NTU) ; Temperature: ± 3%.

ANALYST NAME & SIGNATURE: Aaron Feshbach-Meriney	DATE: 03/23/2017
REVIEWER NAME & SIGNATURE: Kevin McMullen	DATE: 11/1/2017

LOW FLOW GROUND WATER SAMPLING - DATA SHEET

SHEET___1__OF___1__

PROJECT SITE/LOCATION: __Organic Mulch____ | CONSULTING FIRM: ___PARSONS___

DATE: ___03/23/17___ | FIELD PERSONNEL: ___AFM____

WEATHER: __30 degrees, Clear/Sunny____

MONITOR WELL #: ______MW-4________ | WELL DEPTH: __32___ feet

WELL PERMIT #: __________________ | WELL DIAMETER: __2____ inches | SCREENED/OPEN INTERVAL: ___17-32___

PID/FID READINGS:
BACKGROUND: ___0___ ppm
BENEATH OUTER CAP: ___0___ ppm
BENEATH INNER CAP: __0____ ppm

PUMPING INFORMATION:
PUMP INTAKE DEPTH: __24.70__ feet below TOC
DEPTH TO WATER BEFORE PUMP INSTALLATION: ___22.20___ feet below TOC
MAKE/MODEL OF PUMP: ___Peri Pump___

WATER QUALITY INFORMATION:
INSTRUMENT MAKE/MODEL: Horiba
SERIAL #:
TEMP. CORRECTION VALUE:

Time	PURGING	SAMPLING	pH (units)		SPECIFIC CONDUCTIVITY (mS/cm)		REDOX POTENTIAL (mV)		DISSOLVED OXYGEN (mg/L)		TURBIDITY (NTU)		TEMPERATURE (degrees C)		PUMPING RATE	DEPTH TO WATER
			READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	ml/min	(ft below TOC)
1530	X		5.99	--	0.039	--	269.00	--	8.55	--	0.0	--	11.80	--	250	22.22
1535	X		6.01	0.02	0.039	0.000	268.00	-1.00	8.57	0.02	0.0	0.00	11.79	-0.01	250	22.22
1540	X		6.02	0.01	0.039	0.000	269.00	1.00	8.57	0.00	0.0	0.00	11.74	-0.05	250	22.22
1545	X		6.03	0.01	0.039	0.000	273.00	4.00	8.58	0.00	0.0	0.00	11.79	0.05	250	22.22
1550	X		6.04	0.01	0.039	0.000	277.00	4.00	8.58	0.01	0.0	0.00	11.82	0.03	250	22.22
1555	X		6.03	-0.01	0.039	0.000	280.00	3.00	8.58	0.00	0.0	0.00	11.82	0.00	250	22.22
1600		X	6.03	0.00	0.039	0.000	282.0	2.00	8.6	0.00	0.0	0.00	11.83	0.01	250	22.22

SAMPLING INFORMATION:	QA/QC INFORMATION:	ADDITIONAL OBSERVATIONS/COMMENTS:
Sample ID: MW-4-03232017	Duplicate Collected?: No	Clarity: Clear
Sample Time: 1600	MS/MSD Collected?: No	Odor: NONE
Comments: --	Filtering?: yes	Other: --

*INDICATOR PARAMETERS HAVE STABILIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:
pH: ± 0.1 units ; Spec. Conductivity: ± 3% ; ORP: ± 10mV ; D.O.: ± 10% ; Turbidity: ± 10% (or <1 NTU) ; Temperature: ± 3%.

ANALYST NAME & SIGNATURE: Aaron Feshbach-Meriney | DATE: 03/23/2017

REVIEWER NAME & SIGNATURE: Kevin McMullen | DATE: 11/1/2017

LOW FLOW GROUND WATER SAMPLING - DATA SHEET

SHEET___1__OF___1__

PROJECT SITE/LOCATION: __Organic Mulch____
DATE: ___06/28/17___
WEATHER: __80 degrees, Clear/Sunny____

CONSULTING FIRM: ___PARSONS___
FIELD PERSONNEL: ___AFM/CW____

MONITOR WELL #: ______MW-1________
WELL PERMIT #: ___________________
WELL DEPTH: __32___ feet
WELL DIAMETER: ___2___ inches
SCREENED/OPEN INTERVAL: __17-32____

PID/FID READINGS:
BACKGROUND: ___0___ ppm
BENEATH OUTER CAP: ____0___ ppm
BENEATH INNER CAP: __0____ ppm

PUMPING INFORMATION:
PUMP INTAKE DEPTH: __23.8____ feet below TOC
DEPTH TO WATER BEFORE PUMP INSTALLATION: ___19.81___ feet below TOC
MAKE/MODEL OF PUMP: ___Peri Pump___

WATER QUALITY INFORMATION:
INSTRUMENT MAKE/MODEL: Horiba
SERIAL #:
TEMP. CORRECTION VALUE:

Time	PURGING	SAMPLING	pH (units)		SPECIFIC CONDUCTIVITY (mS/cm)		REDOX POTENTIAL (mV)		DISSOLVED OXYGEN (mg/L)		TURBIDITY (NTU)		TEMPERATURE (degrees C)		PUMPING RATE	DEPTH TO WATER
			READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	ml/min	(ft below TOC)
1505	X		5.64	--	0.064	--	325.0	--	4.86	--	2.7	--	12.79	--	350	19.81
1510	X		5.53	-0.11	0.063	-0.001	339.0	14.00	4.55	-0.31	0.0	-2.70	12.39	-0.40	350	19.83
1515	X		5.54	0.01	0.062	-0.001	349.0	10.00	4.51	-0.04	0.8	0.80	12.19	-0.20	350	19.84
1520	X		5.48	-0.06	0.062	0.000	356.0	7.00	4.46	-0.04	0.8	0.00	12.31	0.12	350	19.84
1525	X		5.49	0.01	0.063	0.001	358.0	2.00	4.45	-0.05	0.9	0.10	12.36	0.05	350	19.84
1530		X	5.49	0.00	0.063	0.000	360.0	2.00	4.41	-0.01	1.0	0.10	12.32	-0.04	350	19.84

SAMPLING INFORMATION:	QA/QC INFORMATION:	ADDITIONAL OBSERVATIONS/COMMENTS:
Sample ID: MW-1-06282017	Duplicate Collected?: no	Clarity: Clear
Sample Time: 1530	MS/MSD Collected?: no	Odor: NONE
Comments: --	Filtering?: yes	Other: --

***INDICATOR PARAMETERS HAVE STABILIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:**
pH: ± 0.1 units ; Spec. Conductivity: ± 3% ; ORP: ± 10mV ; D.O.: ± 10% ; Turbidity: ± 10% (or <1 NTU) ; Temperature: ± 3%.

ANALYST NAME & SIGNATURE: Aaron Feshbach-Meriney	DATE: 06/28/2017
REVIEWER NAME & SIGNATURE: Kevin McMullen	DATE: 11/1/2017

LOW FLOW GROUND WATER SAMPLING - DATA SHEET

SHEET___1___OF___1__

PROJECT SITE/LOCATION: __Organic Mulch____
CONSULTING FIRM: ___PARSONS___
DATE: ___06/28/17___
FIELD PERSONNEL: ___AFM____
WEATHER: __70 degrees, Clear/Sunny____

MONITOR WELL #: ______MW-2________
WELL DEPTH: __30___ feet
WELL PERMIT #: ___________________
WELL DIAMETER: __2____ inches
SCREENED/OPEN INTERVAL: __15-30____

PID/FID READINGS:
BACKGROUND: ___0___ ppm
BENEATH OUTER CAP: ____0___ ppm
BENEATH INNER CAP: __0____ ppm

PUMPING INFORMATION:
PUMP INTAKE DEPTH: __22.75___ feet below TOC
DEPTH TO WATER BEFORE PUMP INSTALLATION: ___18.75___ feet below TOC
MAKE/MODEL OF PUMP: ___Peri Pump___

WATER QUALITY INFORMATION:
INSTRUMENT MAKE/MODEL: Horiba
SERIAL #:
TEMP. CORRECTION VALUE:

Time	PURGING	SAMPLING	pH (units)		SPECIFIC CONDUCTIVITY (mS/cm)		REDOX POTENTIAL (mV)		DISSOLVED OXYGEN (mg/L)		TURBIDITY (NTU)		TEMPERATURE (degrees C)		PUMPING RATE	DEPTH TO WATER
			READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	ml/min	(ft below TOC)
1405	X		5.50	--	0.048	--	318.0	--	6.00	--	6.7	--	18.75	--	400	18.75
1410	X		5.42	-0.08	0.032	-0.016	324.0	6.00	5.71	-0.29	2.2	-4.50	18.75	0.00	400	18.75
1415	X		5.27	-0.15	0.050	0.018	342.0	18.00	4.83	-0.88	0.0	-2.20	18.75	0.00	400	18.75
1420	X		5.21	-0.06	0.050	0.000	352.0	10.00	4.78	-0.88	0.0	0.00	18.75	0.00	400	18.75
1425	X		5.13	-0.08	0.050	0.000	355.0	3.00	4.80	-0.05	0.0	0.00	18.75	0.00	400	18.75
1430		X	5.12	-0.01	0.050	0.000	358.0	3.00	4.81	0.02	0.0	0.00	18.75	0.00	400	18.75

SAMPLING INFORMATION:	QA/QC INFORMATION:	ADDITIONAL OBSERVATIONS/COMMENTS:
Sample ID: MW-2-03232017	Duplicate Collected?: No	Clarity: Clear
Sample Time: 1335	MS/MSD Collected?: No	Odor: NONE
Comments: --	Filtering?: Yes	Other: --

*INDICATOR PARAMETERS HAVE STABILIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:
pH: ± 0.1 units ; Spec. Conductivity: ± 3% ; ORP: ± 10mV ; D.O.: ± 10% ; Turbidity: ± 10% (or <1 NTU) ; Temperature: ± 3%.

ANALYST NAME & SIGNATURE: Aaron Feshbach-Meriney
DATE: 03/23/2017
REVIEWER NAME & SIGNATURE: Kevin McMullen
DATE: 11/1/2017

LOW FLOW GROUND WATER SAMPLING - DATA SHEET

PROJECT SITE/LOCATION: __Organic Mulch____
CONSULTING FIRM: ___PARSONS___
DATE: ___06/28/17___
FIELD PERSONNEL: ___AFM/CW____
WEATHER: __70 degrees, Clear/Sunny____

MONITOR WELL #: ______MW-3________
WELL DEPTH: ___32__ feet
WELL PERMIT #: ___________________
WELL DIAMETER: ___2___ inches
SCREENED/OPEN INTERVAL: __17-32____

PID/FID READINGS:
BACKGROUND: ___0___ ppm
BENEATH OUTER CAP: ____0___ ppm
BENEATH INNER CAP: __0____ ppm

PUMPING INFORMATION:
PUMP INTAKE DEPTH: __24.0__ feet below TOC
DEPTH TO WATER BEFORE PUMP INSTALLATION: ___20.80___ feet below TOC
MAKE/MODEL OF PUMP: ___Peri Pump___

WATER QUALITY INFORMATION:
INSTRUMENT MAKE/MODEL: Horiba
SERIAL #:
TEMP. CORRECTION VALUE:

Time	PURGING	SAMPLING	pH (units)		SPECIFIC CONDUCTIVITY (mS/cm)		REDOX POTENTIAL (mV)		DISSOLVED OXYGEN (mg/L)		TURBIDITY (NTU)		TEMPERATURE (degrees C)		PUMPING RATE	DEPTH TO WATER
			READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	ml/min	(ft below TOC)
1300	X		6.11	--	0.029	--	286.0	--	6.27	--	6.5	--	15.38	--	400	20.80
1305	X		5.81	-0.30	0.032	0.003	308.0	22.00	5.33	-0.94	1.9	-4.60	12.76	-2.62	400	20.82
1310	X		5.79	-0.02	0.032	0.000	315.0	7.00	5.42	0.09	0.0	-1.90	12.62	-0.14	400	20.82
1315	X		5.76	-0.03	0.032	0.000	322.0	7.00	5.37	0.09	0.0	0.00	12.63	0.01	400	20.82
1320	X		5.77	0.01	0.032	0.000	325.0	3.00	5.37	-0.05	0.0	0.00	12.65	0.02	400	20.82
1325	X		5.79	0.02	0.033	0.001	330.0	5.00	5.44	0.00	0.1	0.10	12.68	0.03	400	20.82
1330		X	5.78	-0.01	0.033	0.000	331.0	1.00	5.47	0.07	0.6	0.50	12.63	-0.05	400	20.82

SAMPLING INFORMATION:	QA/QC INFORMATION:	ADDITIONAL OBSERVATIONS/COMMENTS:
Sample ID: MW-3-06282017	Duplicate Collected?: No	Clarity: Clear
Sample Time: 1330	MS/MSD Collected?: No	Odor: NONE
Comments: --	Filtering?: yes	Other: --

*INDICATOR PARAMETERS HAVE STABILIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:
pH: ± 0.1 units ; Spec. Conductivity: ± 3% ; ORP: ± 10mV ; D.O.: ± 10% ; Turbidity: ± 10% (or <1 NTU) ; Temperature: ± 3%.

ANALYST NAME & SIGNATURE: Aaron Feshbach-Meriney	DATE: 06/28/2017
REVIEWER NAME & SIGNATURE: Kevin McMullen	DATE: 11/1/2017

LOW FLOW GROUND WATER SAMPLING - DATA SHEET

SHEET___1___OF___1__

PROJECT SITE/LOCATION: __Organic Mulch____
CONSULTING FIRM: ___PARSONS___
DATE: ___06/28/17___
FIELD PERSONNEL: __AFM/CW____
WEATHER: __70 degrees, Clear/Sunny____

MONITOR WELL #: ______MW-4________
WELL DEPTH: __32___ feet
WELL PERMIT #: __________________
WELL DIAMETER: __2____ inches
SCREENED/OPEN INTERVAL: ___17-32___

PID/FID READINGS:
BACKGROUND: ___0___ ppm
BENEATH OUTER CAP: ___0___ ppm
BENEATH INNER CAP: __0____ ppm

PUMPING INFORMATION:
PUMP INTAKE DEPTH: __24.70__ feet below TOC
DEPTH TO WATER BEFORE PUMP INSTALLATION: ___20.68___ feet below TOC
MAKE/MODEL OF PUMP: ___Peri Pump___

WATER QUALITY INFORMATION:
INSTRUMENT MAKE/MODEL: Horiba
SERIAL #:
TEMP. CORRECTION VALUE:

Time	PURGING	SAMPLING	pH (units)		SPECIFIC CONDUCTIVITY (mS/cm)		REDOX POTENTIAL (mV)		DISSOLVED OXYGEN (mg/L)		TURBIDITY (NTU)		TEMPERATURE (degrees C)		PUMPING RATE	DEPTH TO WATER
			READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	READING	CHANGE	ml/min	(ft below TOC)
1145	X		6.12	--	0.050	--	222.00	--	9.30	--	13.0	--	13.23	--	400	20.68
1150	X		5.88	-0.24	0.046	-0.004	243.00	21.00	7.81	-1.49	0.0	-13.00	13.79	0.56	400	20.68
1155	X		5.87	-0.01	0.046	0.000	255.00	12.00	7.45	-0.36	4.3	4.30	12.41	-1.38	400	20.68
1200	X		5.80	-0.07	0.043	-0.003	268.00	13.00	6.87	-0.36	4.1	-0.20	12.17	-0.24	400	20.68
1205	X		5.76	-0.04	0.042	-0.001	279.00	11.00	6.53	-0.58	3.8	-0.30	12.06	-0.11	400	20.68
1210	X		5.66	-0.10	0.040	-0.002	291.00	12.00	6.50	-0.34	4.0	0.20	12.07	0.01	400	20.68
1215	X		5.66	0.00	0.040	0.000	296.0	5.00	6.5	-0.03	3.9	-0.10	12.04	-0.03	400	20.68
1220		X	5.67	0.01	0.040	0.000	298.0	2.00	6.45	-0.03	3.9	0.00	12.00	-0.04	400	20.68

SAMPLING INFORMATION:	QA/QC INFORMATION:	ADDITIONAL OBSERVATIONS/COMMENTS:
Sample ID: MW-4-06282017	Duplicate Collected?: No	Clarity: Clear
Sample Time: 1220	MS/MSD Collected?: No	Odor: NONE
Comments: --	Filtering?: yes	Other: --

***INDICATOR PARAMETERS HAVE STABILIZED WHEN 3 CONSECUTIVE READINGS ARE WITHIN:**
pH: ± 0.1 units ; Spec. Conductivity: ± 3% ; ORP: ± 10mV ; D.O.: ± 10% ; Turbidity: ± 10% (or <1 NTU) ; Temperature: ± 3%.

ANALYST NAME & SIGNATURE: Aaron Feshbach-Meriney	DATE: 06/28/2017
REVIEWER NAME & SIGNATURE: Kevin McMullen	DATE: 11/1/2017