ENVIRONMENTAL MONITORING PLAN

WASTE MANAGEMENT OF NEW YORK

High Acres Landfill & Recycling Center
Fairport, New York
New York State Approved Landfill

Prepared for

Waste Management of New York
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1.0 INTRODUCTION

This document presents Waste Management of New York, LLC's (WMNY's) updated Environmental Monitoring Plan (EMP) for the High Acres Landfill and Recycling Center (HAL&RC) (see Figure 1-1 for location). It is being submitted in conjunction with an application to the New York State Department of Environmental Conservation (NYSDEC) for a solid waste management facility permit modification for the Parkway Expansion – Phase III (Phase III) and vertical expansion of the existing Western Expansion (WEX), Parkway Expansion – Phase I, and Parkway Expansion – Phase II landfill pursuant to the requirements of 6 NYCRR Part 360 – Solid Waste Management Facilities (Part 360 or §360). As such this EMP provides the information necessary to monitor the environmental conditions for the WEX, Phase I, Phase II and Phase III expansions of the landfill and the High Acres Closed Landfill area. Figure 1-2 for the Site Plan show the locations of the various sections of the Facility.

The HAL&RC located on the south side of Perinton Parkway in Fairport, Monroe County, New York.

This EMP is based on a detailed understanding of site conditions obtained from several hydrogeologic studies at the Facility and from data collected over fifteen years of groundwater monitoring. This document has been prepared to meet the requirements of applicable federal, state, and local municipal regulations, Facility permits and WMNY's corporate policies. Periodic revisions to this plan will occur with changing regulations, permit conditions, or WMNY's corporate policies. Any revisions to this EMP will be submitted to the NYSDEC for review and approval prior to implementation.

SUBTITLE D CONTEXT

The detection monitoring efforts outlined in this EMP will be performed to verify attainment of performance objectives for the site at appropriate points of compliance, in accordance with the Code of Federal Regulations (CFR), Solid Waste Disposal Facility Criteria (and its revisions), initially promulgated on October 9, 1991 in 40 CFR Part 258 (Subtitle D). The regulations include requirements for the location, design, and installation of groundwater monitoring systems and set standards for groundwater sampling and analysis. The regulations also provide specific statistical methods and decision standards for identifying significant changes in groundwater quality. The program described herein is designed to fully comply with the intent of Subtitle D.

STATE SPECIFIC CONTEXT

This EMP identifies applicable Federal and State requirements for the adequate monitoring of the landfill and proposes a comprehensive monitoring plan to meet the objectives of these regulations. The monitoring and reporting program described in this Plan was designed to satisfy the requirements of 6 NYCRR Part 360: Solid Waste Management Facilities (Part 360), as administered by the New York State Department of Environmental Conservation (NYSDEC).

In addition the EMP provides for assessment of groundwater conditions related to the High Acres Closed Landfill (HACL) and the performance of WMNY's NYSDEC-approved remedial measures provided for that portion of the Facility.

1.1 EMP Organization

Section 2.0 provides a review of the geologic and hydrogeologic conditions at the Facility, a brief summary of the HAL&RC as a general reference for the EMP and a summary description of the environmental safeguards that have been implemented, or will be implemented, at the Site. Section 3 provides a description of the groundwater monitoring system through the completion of the Phase III Expansion area.

Sections 4.0, 5.0, and 6.0 discuss additional monitoring covered under this plan (leachate, surface water, sediment and landfill gas, respectively). Section 7 describes the procedures used to evaluate the data obtained by the monitoring program. Section 8.0 presents the Site Analytical Plan. The Laboratory Analysis Plan is presented in Section 9.0, and Section 10.0 discusses the data quality review, reporting and recordkeeping procedures.

1.2 General Site Background Information

The HAL&RC is located in Monroe and Wayne Counties, New York, as shown on Figure 1-1, and encompasses a total of approximately 869 acres of contiguous property owned by WMNY within the Towns of Macedon and Perinton (east of the City of Rochester). The facility is bounded by the New York State Barge Canal (Erie Canal) and the CSX (formerly Conrail) rail line to the south, the Macedon Town line to the east and Perinton Parkway to the north. The site vicinity map is provided on Figure 1-2.

The primary HAL&RC Facility operations, including the WEX and the HACL, occur within the 216-acre primary site parcel situated wholly within the Town of Perinton. Waste Management initiated operation of the WEX Landfill in December 1994. The Parkway Expansion Phase I and the Parkway Expansion Phase II areas are contiguous with and located to the east and north of the WEX and the HACL. The Parkway Expansion Phase III area is contiguous with and situated to the east of the Parkway Expansion Phase II and the HACL along the western edge of the Town of Macedon, Wayne County, New York.

The HACL occupies approximately 72 acres in the southeast portion of the facility. This landfill operated from 1970 until closure by WMNY in 1995 and is presently maintained by WMNY pursuant to its NYSDEC-approved Part 360 Post Closure Plan (PCP).

The High Acres Power Production Plant is located to the southwest of the HACL. Decomposition gases (primarily methane) produced by the landfills are collected and transmitted to either the Power Production Plant (where the gases are burned under controlled conditions and used to produce electricity which is distributed to the local power grid), or flared in accordance with the facility Title V permit.

2.0 HYDROGEOLOGIC SETTING

Since 1977 WMNY has provided several detailed geologic and hydrogeologic investigations of the HAL&RC area to NYSDEC in support of landfill expansion permit applications. Significant initial investigations include Wehran Engineering, 1984, 1984a and 1986 and Eckenfelder, Inc. 1990, 1990a and 1990b. The Part 360 Hydrogeologic Investigation (Eckenfelder, Inc. 1992) provided by WMNY in 1992 for initial permitting of the Western Expansion Landfill described the detailed geologic and hydrogeologic site characterization for that landfill area and developed the conceptual model of the hydrogeology of the site and defined the Critical Stratigraphic Section. All subsequent hydrogeological investigations for the Phase I, Phase II and Phase III expansion areas have confirmed the validity of the model.

The geologic and hydrogeologic discussions presented in this EMP provide a brief description of regional and site conditions. Detailed discussions of the geological conditions are presented in the Hydrogeologic Report (Part III) of the WEX, and Parkway Expansion Phase I, II and III expansion permit applications. Figure 2-1 presents a schematic three dimensional illustration of the geological and hydrogeological setting of the Facility.

2.1 Regional Geology and Hydrogeology

The HAL&RC site is located within the mid-central portion of the Ontario Lowlands Physiographic Province, as described by Isachsen et al. (1991). The dominant features of the Province are relatively low, planar surfaces that rise gently eastward and southward. Superimposed on those surfaces are approximately 10,000 drumlins - generally north-south oriented, elongated ridges that rise to heights of approximately 100 to 300 feet above the surrounding plain.

The surficial geology in the region is mapped by the New York State Geological Survey primarily as glacial till and glacial outwash deposited during the Wisconsin ice sheet event that covered much of New York State. Following deposition of glacial till and formation of the drumlin features during ice sheet advance, numerous glacial streams and lakes were formed from the meltwaters of the retreating ice sheet. Glaciofluvial (outwash) deposits left by these streams are composed of unconsolidated sand and gravel which were commonly deposited in lowland areas between drumlins. Drumlins obstructed and diverted the flow of the meltwater streams and, therefore, it is not uncommon to find outwash deposits at the north end of drumlins where a meltwater stream was diverted from its path or as channel fills along the flanks of the drumlins. The geologic conditions at the Facility match this regional pattern.

Bedrock in the region consists of Devonian and Silurian age (350 to 440 million year old) shale, siltstone, sandstone, limestone, and dolomite that contains minor to significant deposits of salt and gypsum. These bedrock formations dip to the south at a low angle (approximately 50 ft/mile). The Silurian-age Vernon Shale (Lower, Middle, and Upper) underlies the HAL&RC site. The Vernon Shale is a 300-foot thick lithified mud-like deposit that contains beds and lenses of salt and gypsum. Bedrock outcrops are fairly limited due to the widespread cover of surficial glacial deposits. No outcrops of the Vernon Shale are found on the HAL&RC site.

Groundwater in the region is found primarily in the pore spaces of the unconsolidated glacial deposits and in the fractures, joints, and bedding planes of the underlying rock. Groundwater occurs near the ground surface over much of the region as an unconfined aquifer within the upper sections of the glacial materials. The shape of the unconfined water table generally mimics the topography with flow directions from areas of higher ground elevation to areas of lower ground elevation. Because the outwash materials are discontinuous between the less permeable drumlins (which in effect rise up through them) the flow of water within the saturated outwash materials is, to some degree, channeled through the valleys between the drumlins. The glacial till that forms the drumlins and underlies the outwash deposits generally has a low hydraulic conductivity, making it an unlikely source for useable quantities of groundwater. Though glacial outwash deposits, such as kames and eskers, may yield useable quantities of water, these features are very limited in extent in the region (Eckenfelder 1992).

2.2 Local Geology and Hydrogeology

The site investigations at the Facility have determined that two general types of unconsolidated geologic units underlie the HAL&RC site: outwash deposits overlying glacial till (an upper weathered glacial till and basal glacial till).

The main original features of the Facility area included thin outwash materials to the west and northeast of a central drumlin which was located in the Phase I and Phase II areas and beneath the central section of the HACL. Most of these materials (outwash and central drumlin) have been removed during construction of the WEX and Phase I Expansion areas. A small area of thicker outwash material (channel fill) is located along the western flank of the remnants of the central drumlin which is located beneath the HACL. Two other drumlins are located to the north on the permitted landfill areas and along the eastern boundary of the facility.

The glacial till occurs as a thick continuous blanket over the top of the decomposed bedrock unit. The upper five feet to 25 feet of the glacial till at the HAL&RC site has been weathered which has resulted in this upper till having a higher hydraulic conductivity than the deeper, unweathered basal glacial till.

A layer of decomposed bedrock is evident beneath the HAL&RC site. This material, resulting from a long period of either chemical or surficial weathering of the Vernon Shale is found across the majority of the HAL&RC site. The decomposed bedrock consists of a clayey soil with some sand and gravel.

Silurian-age Vernon Shale is the uppermost bedrock formation underlying the HAL&RC site. The Vernon Shale consists of red, green, and gray-black shales, gray gypsiferous shales, and gray dolomitic shales. Bedding planes dip gently southwards, sub-parallel to the overall ground surface. Fractures typically occur along bedding planes. Vertical fractures also dissect the rock mass.

Groundwater at the HAL&RC site occurs in both the unconsolidated sediments and in bedrock. The following five hydrostratigraphic units make up the hydrogeologic system at the HAL&RC site:

- Unconfined overburden water-bearing zone;
- Unweathered basal glacial till and decomposed bedrock aquitard;
- Confined fractured rock water-bearing zone;
- Competent rock aquitard; and,
- Confined competent rock water-bearing zone.

Details regarding these units are provided in each of the Expansion Area Permit Applications. Based on the hydrogeological model, described above, the Critical Stratigraphic Section (as defined at §360-1.2(b)(47)) for the Facility is:

- The upper glacial outwash/weathered glacial till unconfined water bearing zone and
- The fractured rock water bearing zone.

The upper Vernon Shale aquitard forms the basal member of the critical stratigraphic section. In addition there is an upward hydraulic gradient from the deeper sections of the Vernon shale (the competent bedrock water-bearing zone) to the fractured bedrock water-bearing zone. The Critical

Stratigraphic Section, described above, does not include the competent bedrock water-bearing zone. Groundwater contours for the Overburden and Shallow Fractured Bedrock are shown on Figure 2-2 and 2-3 respectively.

2.3 CONCEPTUAL HYDROGEOLOGIC MODEL

The conceptual hydrogeologic model for the HAL&RC site consists of three water-bearing zones and two lower permeability units (aquitards). This conceptual hydrogeologic model is depicted on Figure 2-1. In descending order, the hydrogeologic units include an overburden water-bearing zone, contained primarily in the weathered glacial till and in surficial outwash deposits (where present), an aquitard within the un-weathered basal till and decomposed bedrock, a water-bearing zone within the fractured upper portion of the bedrock, an aquitard consisting of relatively unfractured shale, and a water-bearing zone contained within a laterally continuous interval within the competent shale. The properties of the various units are summarized as:

Summary of Hydrogeologic Properties for the Hydrogeologic Model of the High Acres Landfill and Recycling Center

Hydrostratigraphic Unit	Stratigraphic Unit	Predominant Flow Direction	Hydraulic Conductivity	Groundwater Flow Velocity
Shallow Overburden Water-Bearing Zone	Weathered Glacial Till Glacial Outwash	Horizontal (Variable)	8.9×10^{-6} cm/sec (WGT)	15 ft/year (WGT)
			8.4×10^{-3} cm/sec (OW)	700 ft/year (OW)
Overburden Aquitard	Basal Glacial Till/Decomposed Bedrock	Vertical (Downward)	1.1×10^{-6} cm/sec	4 ft/year
Fractured Rock Water-Bearing Zone	Upper Fractured Bedrock	Horizontal (south)	1.50×10^{-2} cm/sec	600 - 1,250 ft/yr
Competent Rock Aquitard	Unfractured Bedrock	Vertical (Upward)	5×10^{-8} cm/sec	3 ft/year
Competent Rock Water-Bearing Zone	Fracture Zone in Competent Bedrock	Horizontal (Variable)	Undefined	Undefined
Notes: WGT = Weathered Glacial Till OW = Glacial Outwash				

Groundwater suppression will induce inward gradients from the Unconfined Overburden Aquifer to the underdrain systems. When groundwater suppression is stopped the groundwater flow regime will return to conditions similar to conditions prior to landfill cell construction.

Estimates of the minimum time for groundwater potentially impacted by a leachate release to migrate though the glacial till to the fractured bedrock are at least six to eight years. In all likelihood the timeframe could be much longer because of the presence of thicker sections of basal till and the decomposed rock stratum.

3.0 GROUNDWATER MONITORING

Table 3-1 lists each of the environmental monitoring points by type and location. This table indicates the sequence of groundwater monitoring well installation and well decommissioning for each of the phases of landfill development. In addition, this table also lists the surface water, sediment, primary and secondary leachate collection system, underdrain monitoring points and gas migration probes. Figure 3-1 presents the locations of all the monitoring points at the Facility through the completion of the Phase III Expansion. Table 3-2 presents the parameter lists, Analysis methods and Reporting Levels for Part 360 Routine and Baseline sampling events and the Part 360 Expanded Parameter sampling events for groundwater, surface water, sediment, leachate and gas condensate. Table 3-3 presents construction information regarding existing wells.

3.1 Sampling and Analysis Objectives

The objectives of the sampling and analysis of groundwater are to determine whether or not the landfilled areas are impacting groundwater in a detrimental fashion or, in the case of the HACL, whether or not the residual effects of groundwater impacts are continuing to improve.

3.2 Groundwater Monitoring Network

3.2.1 Monitoring Well Network Western Expansion and Parkway Expansion Phase I

The monitoring program for the WEX and Phase I areas includes the following monitoring wells.

LANDFILL AREA	OVERBURDEN WELLS	SHALLOW AND DEEP BEDROCK WELLS	COMMENT
Western Expansion Area	MW101A	MW101B	Upgradient
	MW102A	MW102B	Upgradient
	MW103A	MW103B	
	MW104A	MW104B	
	MW121A	MW105B	
	MW117A	MW117B	
	MW105A		
Phase I Expansion Area	MW112A	MW112B	Upgradient
	MW113A	MW113B	Upgradient
	MW114AR	MW114BRR	To be Decommissioned for Phase II
	MW984A	MW984B	

3.2.2 Monitoring Well Network High Acres Parkway Expansion Phase II

The monitoring well network for the Phase II Expansion area includes the following additional wells:

LANDFILL AREA	OVERBURDEN WELLS	SHALLOW AND DEEP BEDROCK WELLS	COMMENT
Phase II Expansion Area	MW981A	MW981B	Upgradient
	MW982A	MW982B	Upgradient
	MW983A	MW983B	To be Decommissioned for Phase III Stage 1
	MW15AR	MW15BR	
	MW312A	MW312B	
	MW16A	MW16B	

3.2.3 Monitoring Well Network High Acres Parkway Expansion Phase III

It is currently envisioned that construction and filling of the Phase III area will continue for 25 to 30 years and will be completed in two main stages:

- Stage 1. Construction of Cell 11, Cell 12, Overliner Cell 11V, and Overliner Cell 13v;
- Stage 2. Construction of Cells 13 through 17.

Because of the extended time frame for landfill construction and development the groundwater monitoring well network for the Phase III area will be constructed in two stages as listed below:

LANDFILL AREA	OVERBURDEN WELLS	SHALLOW AND DEEP BEDROCK WELLS	COMMENTS
Phase III Expansion Area Stage 1	MW313A	MW313B	To be Decommissioned for Phase III Stage 2
	MW314A	MW314B	
	MW315A	MW315B	
	MW316A	MW316B	
	MW317A	MW317B	
	MW318A	MW318B	
Phase III Expansion Area Stage 2	MW320A	MW320B	
	MW321A	MW321B	
	MW322A	MW322B	
	MW323A	MW323B	
	MW324A	MW324B	
	MW325A	MW325B	

3.2.4 Monitoring Well Network High Acres Closed Landfill

HAL&RC presently monitors a total of 22 groundwater-monitoring wells installed around the perimeter of the HACL (in accordance with WMNY's previous NYSDEC-approved EMP for this landfill) (see Figure 3-1 for locations). This existing, NYSDEC-approved monitoring well network consists of 12 overburden wells, 9 fractured bedrock wells and two competent bedrock wells. The well designations are provided below by aquifer:

HIGH ACRES CLOSED LANDFILL			
Overburden	Shallow Bedrock	Deep Bedrock	Comment
MW26A	MW26B		To Be Decommissioned for Phase II
MW15A			
MW114AR	MW114BRR		
MW16A	MW16B		To Be Decommissioned for Phase III
MW17A			
MW18A	MW18B	MW22CR	
MW19A		MW23C	
MW20A	MW20B		
MW21A	MW21B		
MW22A	MW22B		
MW24A	MW24B		
MW25A			

3.3 Operational Groundwater Monitoring Parameters

To achieve these objectives, the groundwater monitoring wells (overburden and shallow bedrock) will be sampled quarterly and the samples will be analyzed three times for the Routine Parameter list and once for the Part 360 Baseline Parameters (October 1993 list provided in Table 3-2). The Baseline Parameter list event will be rotated annually to ensure representative sampling.

3.4 Groundwater Sample Frequency

All monitoring wells will be sampled four times per year and analyzed three times for the Part 360 Routine Parameter list and once for the Part 360 Baseline Parameters (October 1993 list provided in Table 3-2). As discussed previously, the Baseline Parameter event will be rotated annually to ensure representative sampling.

New monitoring wells will be sample four times before placement of waste in the adjacent landfill cell. The first sampling event will be for the Part 360 Expanded list of parameters. The following three sampling events will be for the Part 360 Baseline list of parameters.

3.5 Groundwater Pressure Measurements

During each groundwater sampling event, and prior to sampling taking place depth to groundwater measurements will be taken in each monitoring well. In addition, groundwater pressure measurements will be taken in the piezometer nests located to the north and south of the HACL Southern Remedial system slurry wall.

3.6 Monitoring Point Inspection Program

Well inspections will be performed during operational groundwater quality monitoring events. The conditions of the well and its surrounding area will be observed and recorded on a well inspection form by the sampling team.

3.7 Monitoring Well Installation

New groundwater monitoring wells will be installed in accordance with NYSDEC requirements and WMNY monitoring well installation policies (See Appendix A for monitoring well installation details).

3.8 Monitoring Well Decommissioning

As required by NYSDEC, decommissioning of monitoring wells as the various Expansion areas are developed will be completed by overdrilling and tremie grouting to surface with cement / bentonite grout. Documentation regarding the well decommissioning activities will be submitted to the NYSDEC. The schedule for removal of these eleven wells from the operational water quality monitoring program is based on WMNY's future cell construction schedule requirements. Table 3-1 provides a summary of all wells in the groundwater monitoring system, and also provides details regarding the inclusion of new wells and the decommissioning sequence for the wells at the Facility. Appendix B describes the monitoring well decommissioning procedures.

4.0 LEACHATE MONITORING

4.1 Leachate Collection and Monitoring System

Each landfill cell in the WEX Phase I, II, and III expansion areas is, or will be, constructed with a Primary and Secondary liner system and leachate sampling equipment. Primary and Secondary Leachate samples will be obtained as each cell becomes operational and through closure. In addition, leachate from the HACL will be sampled at leachate sampling point L-1 (Manhole #4) and leachate from the western most manhole (MH-3A) will be sampled in accordance with Monroe County Sewer Use Permit No. 559.

4.2 Leachate Sampling Parameters

Leachate samples from the Primary and the Secondary liner systems will be analyzed for the Part 360 Expanded Parameter List (October 1993) as presented in Table 3-2.

The leachate sample from sample point L1 (Manhole #4) will be analyzed for the Part 360 Baseline Parameters.

4.3 Leachate Monitoring Schedule

Primary and Secondary leachate samples will be obtained annually from the WEX and Parkway Expansions Phase I, II, and III Primary and Secondary Leachate sumps. Manhole MH-3A will be sampled monthly. Samples from leachate sample point L-1 Manhole #4 will be collected annually.

5.0 SURFACE WATER AND SEDIMENT MONITORING

5.1 Surface Water Monitoring

5.1.1 Surface Water Sampling Point Locations

The surface water sampling points are shown on Figure 3-1 and Table 3-1. If no water is discharging from the ponds, samples will be taken directly from the ponds except for sedimentation pond WPOND, the western sedimentation basin associated with the HACL.

Operational monitoring of the sedimentation basins will consist of surface water samples collected from the discharge points from sedimentation basin SW101, SW102, WPOND and EPOND. Surface water samples will also be collected from the unnamed stream located west of the WEX. Grab samples will be taken within the stream channel at each of the three stream sampling locations. The three stream sampling points will consist of one immediately north (upstream) of Perinton Parkway (ST-01), one immediately south (downstream) of Perinton Parkway (ST-02), and one (ST-03) immediately downstream of the discharge point for sedimentation basin SW101. These monitoring locations are shown on Figure 3-1.

Two Sedimentation basins will be constructed for the Phase III Expansion area. These are Sedimentation Basin No 5 (SW105 - at the northeast corner of the Phase III area) and Sedimentation Basin No 6 (SW106) - along the south side of the Phase III area). Surface water sampling will be completed at these sedimentation basins during land filling of the Phase III area.

5.1.2 Surface Water Sampling Parameters

Operational monitoring of the sedimentation basin and stream samples will consist of surface water samples collected quarterly. Specific conductance, pH, Eh, dissolved oxygen and temperature measurements will be taken in the field immediately following sampling. The samples will analyzed three times per year for the Part 360 Routine Parameters and once per year for Part 360 Baseline Parameters, with the Baseline event being rotated yearly.

5.1.3 Surface Water Sampling Schedule

Surface water samples will be collected quarterly from the discharge points from the sedimentation basins and the unnamed stream sampling points located west of the WEX.

5.2 Sediment Monitoring

5.2.1 Sediment Sampling Point Locations

Sediment samples will be taken from the unnamed stream located west of the WEX and will be collected concurrently with the stream surface water samples. Grab sediment samples will be obtained from within the stream channel at each of the three stream sampling locations. The three stream sediment sampling points will consist of SD-01, immediately north (upstream) of Perinton Parkway, SD-02 immediately south (downstream) of Perinton Parkway, and SD-03 immediately downstream of the discharge point for sedimentation basin SW101. Sampling locations are shown on Figure 3-1.

5.2.2 Sediment Sampling Parameters

The analytical program for the sediment samples will consist of one event of Part 360 Baseline Parameters and three events of Part 360 Routine Parameters, with the Baseline event rotated annually.

5.2.3 Sediment Sampling Schedule

Sediment samples will be collected quarterly from the unnamed stream sampling points located west of the WEX.

5.3 Groundwater Suppression System Sampling

If flows in the Secondary collection systems are within the allowable standards (20 gallons per day per acre averaged over 30 days) groundwater discharging from the WEX Area and the Parkway Expansion Phase I, II and III area underdrain systems will be sampled at the underdrain locations shown on Figure 3-1.

The Underdrain samples will be analyzed for the Part 360 Baseline Parameter List.

The Underdrains will be collected semi-annually until groundwater suppression is terminated.

If the flow rates in the Secondary collection systems are above the allowable flow rates (20 gallons per day per acre averaged over 30 days) the underdrains will be sampled as described in Section 7.1.5.2.

The collection of a sample for any given event will be dependent upon a measurable discharge from the underdrain at the time of sampling. If the weekly flow measurements indicate that the discharge is somewhat cyclic, then the sampling event will be rescheduled such that a sample may be obtained. However, if the flow measurements indicate a sporadic discharge, such that measurable flow rates may not be predicted, a sample will only be collected if there is a discharge from the main at the time of sampling.

6.0 LANDFILL GAS AND GAS CONDENSATE MONITORING

A landfill gas monitoring program will continue to be provided along the perimeters of the Western Expansion Landfill, the Parkway Expansion Phase I, II, III, and the HACL. Part 360-2.17(f)(1) requires that the concentration of methane and other explosive gases generated by a landfill must not exceed:

1 Twenty five percent of the lower explosive limit for gases in structures on or off-site excluding gas control or recovery components; and,

2 The lower explosive limit for the gases at or beyond the property boundary.

Upon detection of methane or other explosive gas levels exceeding the limits specified above, the approved Contingency Plan (Part VI of this permit application) will be initiated and actions will be taken to ensure safety and protection of human health. The NYSDEC will be immediately notified and the following steps taken:

- Within seven days of detection submit to the NYSDEC the methane gas levels detected and provide a description of the steps taken to protect human health, and,

- Within 45 days of detection submit a plan to implement a remediation plan for the methane gas releases and schedule for the implementation of this plan within 60 days beyond the date of the detection. This plan will describe the nature and extent of the problem and the proposed remedy.

6.1 Landfill Gas Monitoring Points

Landfill gas migration monitoring will continue to be provided by monitoring a network of permanent landfill gas probes installed around the perimeters of the landfills, at approximate 500-foot spacing. The locations for all the permanent landfill gas probes are shown on Figure 3-1. Table 3-1 lists the gas probes that have been or will be installed at the Facility through completion of the Phase III Expansion. Gas probes GP109 and GP110 coupled with headspace sampling from well MW110A will be used to monitor the landfill perimeter adjacent to the High Acres Administration Buildings.

6.2 Landfill Gas Sampling Parameters

The permanent landfill gas probes at the facility will be monitored for three parameters:

1. Combustible gas concentrations;
2. Pressure; and
3. Liquid level.

All landfill gas probes will be installed in accordance with WMNY’s Corporate "Construction Practices for Permanent Landfill Gas Probes" (see Appendix C for Landfill Gas Probe Construction Details).

6.3 Landfill Gas Sampling Schedule

The permanent landfill gas probes will continue to be monitored on a quarterly basis by HAL&RC during the operation, closure and post closure period for the landfills.

6.4 Landfill Gas Condensate Monitoring

Landfill gas condensate generated by the High Acres Landfill Gas Management System (LGMS) will be monitored as part of this EMP. The LGMS includes two condensate collection points:

- The condensate tank which collects condensate from the WEX Area, the flare and the compressor station. This is sample point C-1.
- The condensate tank, which collects condensate from the HACL LGMS. This is sample point C-2 (alias C-COMP); and,

Condensate sample point locations are shown on Figure 3-1.

Condensate samples will be analyzed for the Part 360 Baseline Parameters (see Table 3-2).

Condensate samples will be obtained on an annual basis

7.0 DATA EVALUATION

7.1 Groundwater

The proposed methods for evaluation of groundwater quality are based on the design of the landfill, detailed understanding of the hydrogeological conditions at the Facility, and review of groundwater data obtained during the last 15 years. The evaluation procedures are in accordance with the requirements of Part 360 and have been approved for HAL&RC by the NYSDEC. The procedures involve statistical methods, non-statistical methods, verification resampling, and QA/QC checks.

As the landfill expansions are implemented through Phase III the operational water quality monitoring program will be expanded to determine if the WEX, Parkway Expansion Phases I, II, III and the HACL are functioning as designed during the operation, closure and post closure period. This program is discussed below. Table 3-1 lists each of the environmental monitoring points by type and location. Table 3-2 presents the lists for Part 360 Routine, Baseline and Expanded parameters.

7.1.1 Historical Data Analysis

Groundwater chemistry data from the HAL&RC Facility monitoring wells and experience gained during operation of the WEX and HACL, prior to 2000, indicated that the standard method of defining the Existing Water Quality (EWQ) for the Facility is not applicable.

Part 360 defines the Existing Water Quality (EWQ) for each hydrogeologic regime as the arithmetic mean, per parameter, of all analytical data collected from wells within that flow regime. Using the Shapiro-Wilkes test, it has been determined (HAL&RC EMP April 2000) that the data for the WEX and Phase I monitoring wells are not normally or log-normally distributed within each aquifer, therefore the use of arithmetic means to determine EWQ for the Facility is not valid for this facility.

To determine the most appropriate statistical procedures for HAL&RC, an assessment of the groundwater chemistry results from 1989 through 2000 was completed by, Dr Robert Gibbons in 2000. Dr Gibbons recommended the use of the DUMPStat software to statistically assess the groundwater conditions at the HAL&RC. For the WEX and Phase I areas Dr Gibbons recommended the use of Shewart CUSUM control charts for each monitoring well and, for the HACL he recommended the use of Time Series graphs to determine statistically significant trends at each monitoring well for which at least eight data sets are available.

These procedures have been incorporated into the groundwater review process for each sampling event since the Revised EMP for HAL&RC was accepted by the NYSDEC in 2000.

To provide for additional assessment of the groundwater data at the HAL&RC additional steps have been included in the groundwater quality review process. These steps are described below.

7.1.2 Procedures for Evaluating Groundwater Quality

Figure7-1 present schematic flow diagrams that incorporate procedures that will be followed to determine if a significant impact to groundwater has occurred due to a release of leachate from the WEX the Phase I, II and III Expansion Areas or the HACL.

As discussed previously, four sampling events will be completed at each new monitoring well prior to placement of waste in the adjacent landfill cell. Until eight data sets are available from any new well (such that the use of statistics is valid) the results of each sampling event (events 5, 6 and 7) will be reviewed for the reported detection of VOCs and inorganic groundwater quality will be assessed using Piper and Stiff diagrams and time series graphs for each sampling event. This procedure is reasonable because the groundwater travel time from any cell to the monitoring wells is significantly greater than the year required to obtain data sets from events 5 through 8 such that valid statistics can be used.

The procedures to be used for wells with eight data sets or more are described below and illustrated on Figure 7-1.

Step 1. Statistical Comparison. Using DUMPStat, complete a statistical assessment of the data from each monitoring well (an intrawell comparison) to determine if the results indicate a statistically significant exceedance. For the WEX and Phase I, II and III area use Shewart CUSUM Control charts. For the HACL monitoring wells use DUMPStat to review time series graphs to determine statistically significant trends

Step 2 Basic Geochemical Screening Evaluation. The second step provides for a geochemical screening to identify any evidence of impact or unusual change from historical data other than a statistical comparison and includes:

1. Determine if there are any VOC detections above the Practical Quantitation Limits. Verified detection of VOCs will be deemed a positive result;
2. Determine if there are any unusual inorganic detections (parameters not previously detected. above MCLs and /or applicable NYSDEC groundwater standards);

3. If the statistical comparison of one or more of the screening methods described above is positive the data will be reviewed to determine if the results are consistent with previous data sets for a given well or hydrogeologic flow regime. (e.g. consistent trends, similar VOC detections, seasonal or climatic effects). This will be accomplished by completion of time series graphs, Piper, and Stiff diagrams of the major anions and cations for data sets from each well, to see if there are multiple inorganic trends or indications of potential leachate impacts.

   Trends will be assessed visually to look for potential outliers or potential errors. Consistent multiple upward trends of typical leachate parameters with values above previous values for the parameter concerned will be viewed as suspect and as positive result. Potential outliers or errors will be noted and reported as such;
4. Groundwater gradients will be reviewed to determine if a potentially affected well is upgradient or downgradient of the landfilled area.
5. Check Secondary Liner Collection System flow rates and compare to allowable flow rates (20 gallons per day per acre averaged over 30 days) and compare to previous flow rates. This will be accomplished by the use of time series graphs and flow rate measurement data. If flow rates are greater than the allowable flow rates the result will be deemed positive;
6. Check underdrain flow rates (if underdrains are operating) and chemistry. Chemistry will be reviewed against previous data. It should be noted that the chemistry in the underdrains can easily be influenced by runoff and rainfall events. As such the underdrains are not considered to form appropriate compliance points, rather they provide for early indications of potential impacts.

If the data do not fail the statistical procedure and there are no other indications of leachate impacts a report regarding the sampling event will be submitted to the NYSDEC.

Step 3. If the data do fail the statistical procedure but are consistent with historical data a report regarding the sampling event will be submitted to the NYSDEC. If the data do fail the statistical procedure but are inconsistent with historical data Step 4 will be initiated.

Step 4. Verification Resampling. Verification sampling will be completed to ensure sample independence. Verification re-sampling increases the reliability of a statistical procedure to predict a significant increase by reducing the false positive rate. Verification re-sampling provides for the collection of a second sample at the location that exhibited a potentially significant increase for a parameter(s). The sample would be analyzed only for the parameter(s) that triggered the significant increase. This verification re-sampling would be performed prior to the next sampling event and the analytical data would be provided on an expedited basis to ensure timely evaluation of the re-verification data. If the resampled data does not verify the inconsistent data, a written report will be submitted to NYSDEC that discusses the results of the sampling event, the inconsistent data and the results of the resampling.

Step 5. Data Validation If the inconsistent data are verified with the resample data, quality control checks will be completed. These may include laboratory QA/QC checks, proper field sampling protocol checks, review of sample turbidity levels, acceptable anion/cation balance, review of groundwater gradients etc. If the Data Validation validates the results Step 6 will be completed.

If the inconsistent data is determined to be the result of quality control errors (they do not pass the QA/QC checks) a written report will be submitted to NYSDEC describing the results of the geochemical screening evaluation and the quality control methods used to determine whether or not the results indicated an unusual condition.

Step 6 Alternate Source Demonstration

Based on the above data a determination will be made as to whether or not an Alternate Source (road salt, runoff mixing of groundwater from the various aquifers, landfill gas etc) could be the cause of the exceedances (an Alternate Source Demonstration). The procedures used would be based on the Alternate Source Review flow chart provided on Figures 7-1 and 7-2. Actual conditions and circumstances would dictate the most appropriate procedures to use from these figure.

If the inconsistent data and the Verification Sampling results pass the quality control checks (field procedures and laboratory procedure) and no Alternate Source can be demonstrated, a report will be submitted to NYSDEC that describes the results of the statistical assessment and the geochemical assessment and indicates which parameters have shown a potential significant increase.

7.1.3 Assessment Monitoring

Following initial determination of a potentially significant increase related to leachate release the next quarterly round of samples from all monitoring points will be analyzed for the Part 360 Baseline parameters. This program will be called Assessment Monitoring. Subsequent sampling and analysis for Part 360 Baseline parameters will be conducted at least semi-annually until the significant increase is determined not to be landfill-derived or the Department determines such monitoring is not needed to protect public health or the environment.

If it is determined (using the procedures described in Steps 1 though 7 above) that there is a significant increase for one or more of the parameters during Assessment Monitoring for the Baseline parameters (excluding the field parameters) at any monitoring well, within 14 days a report will be submitted to the Department indicating which parameters have shown significant increases from existing water quality levels (as defined by the DUMPStat statistical procedures described above).

Upon determination of the determination of a significant increase (based on the Baseline parameter data) a report will be submitted to the Department that demonstrates that a source other than the facility caused the contamination (an Alternate Source Demonstration) or that the significant increase resulted from error in sampling, analysis, or natural variation in groundwater quality. A report documenting this demonstration will be submitted to the department for approval. If a successful demonstration is made, documented and approved by the Department, the operational water quality monitoring will be resumed.

If a successful demonstration is not made, a Contingency Monitoring Program will be initiated.

7.1.4 Alternate Source Demonstration.

A typical logic diagram for an Alternate Source Demonstration during Assessment monitoring is provided on Figure 7-2. The process reviews potential causes of the changes in groundwater quality such as surface water runoff, landfill gas migration, changes in background conditions, changes due to landfill construction, road salt runoff etc. If such a condition is determined to be the cause of the anomalous condition, as discussed above, a report will be completed and submitted to NYSDEC that describes the results of the geochemical evaluation and the Alternate Source Demonstration.

Additionally, the underdrain and Secondary leachate collection system records and chemistry will be further reviewed to determine if there are any indications of a potential release of leachate from the landfill. Analytical data obtained from leachate samples (primary and secondary) will be compared to the groundwater quality data by the use of Piper and Stiff diagrams and constituent ratios. If the parameters identified as illustrating a statistically significant difference are not found in the leachate [assuming that the laboratory reporting limit in the leachate for the parameter(s) of concern is/are consistent with the groundwater detection limit(s)], the increase will be considered as being not landfill derived and the results reported to NYSDEC.

7.1.5 Contingency Water Quality Monitoring

7.1.5.1 Groundwater Monitoring

A flow chart outlining the proposed Contingency Water Quality Monitoring Program (CWQ) is presented on Figure 7-3. Based on circumstances a modified program may be submitted to the Department for approval.

As required by Part 360 regulations, Section 360-2.11(c)(5)(iii) within 90 days of implementing a CWQ monitoring program based on detection of a significant increase in the groundwater concentration of one or more parameters, during CWQ monitoring, groundwater samples will be collected from the downgradient well(s) that initiated the CWQ monitoring and the two adjacent downgradient wells in the effected stratigraphic unit(s), hereafter referred to as the focused monitoring well locations for the Part 360 Expanded Parameters.

Within 14 days of receiving the data obtained from the above sampling, the NYSDEC will be notified of any Expanded Parameters that have been detected. Pursuant to Part 360, if any Expanded Parameter constituents are detected, two independent samples from all monitoring wells and the underdrains (Western Expansion Cells and Parkway Expansion Cells) will be collected and analyzed for the detected constituents. The two samples will be collected within two weeks of each other and within 30 days of receiving the Expanded Parameter data. The results of the two analyses will be compared to the previous values obtained from the wells.

Following review of the Expanded Parameter analytical data, on-going CWQ monitoring for the underdrains, and the groundwater monitoring wells in which Expanded Parameters were detected will consist of monitoring every three months for the Part 360 Baseline Parameters list plus any detected Part 360 Expanded Parameters. An annual analysis for the complete Part 360 Expanded Parameters will also be performed at the locations where Expanded Parameters were detected.

Monitoring wells in which no Expanded Parameters were detected will be sampled and analyzed for the normal operational monitoring parameters.

Groundwater protection standards for the detected Expanded Parameters will be established in accordance with Part 360-2.11 (c)(5)(iii)(f).

If the concentrations of any of the Expanded Parameters, included in the above monitoring program, are shown to be at or below the applicable groundwater protection standard for two consecutive sampling events, the NYSDEC will be notified and a petition to remove that parameter(s) from the CWQ monitoring program will be submitted for approval.

If the concentrations of all the parameters are shown to be at or below the groundwater Protection Standard for two consecutive sampling events, the NYSDEC will be notified and a petition to return to Operational Water Quality monitoring will be presented for approval.

If the concentrations of any Expanded Parameters are above the groundwater protection standard established in accordance with Part 360-2.11 (c)(5)(iii)(f), then CWQ monitoring will continue unless it can be shown that those parameters are naturally above groundwater protection standards.

However, if one or more Expanded Parameters are detected at significant levels above the groundwater protection standards, in any sampling event, the NYSDEC will be notified within 14 days of this finding and the Expanded Parameters that have exceeded the groundwater protection standard will be identified. In addition, in accordance with 6NYCRR Part 360-2.11(c)(5)(iii)(e), efforts will be undertaken to either:

1. Characterize the nature and extent of the release and initiate an assessment of corrective actions or;
2. Submit documentation that a source other than the landfill caused the contamination, or that the significant increase resulted from an error in sampling, analysis, or natural variation in groundwater quality.
3.

7.1.5.2 Secondary Leachate Collection System Flow Rates

If the leakage rate into the Secondary Leachate Collection System exceeds 20 Gallons Per acre Per Day (GPAD) on a thirty-day average for two consecutive months an investigation into the cause of the increased leakage rate will be initiated. If the cause is identified and remediated (following the procedures in the Facility Contingency Plan) the landfill will return to operational monitoring. If the cause of the increase cannot be determined, then during the next sampling event the underdrain sump of the affected cell (if there is flow) will be sampled and analyzed for the Expanded Parameters list of analytes.

Within 14 days of receiving the analytical data obtained from the above sampling, the NYSDEC will be notified of any Expanded Parameters that have been detected. Pursuant to Part 360, if any Expanded Parameter constituents are detected, two independent samples (collected within two weeks of each other) from all monitoring wells down gradient of the affected cell will be collected and analyzed for the detected Expanded Parameters. These samples will be collected at the next scheduled sampling event after receiving the parameter data.

Following review of the Expanded Parameter analytical data, the CWQ monitoring for the underdrain/geomembrane drainage blanket of the affected cell and all groundwater monitoring wells in which Expanded Parameters were detected, will consist of monitoring every three months (Quarterly) for the Part 360 Baseline Parameters plus any detected Part 360 Expanded Parameters.

Monitoring wells in which no Expanded Parameters were detected will be sampled and analyzed for the normal operational monitoring parameters. Groundwater protection standards for the detected Expanded Parameters will be established in accordance with Part 360-2.11 (c)(5)(iii)(f).

If the concentrations of any of the Expanded Parameters in the groundwater and the underdrain samples, included in the above monitoring program, are shown to be at or below the applicable groundwater protection standards for two consecutive sampling events, the NYSDEC will be notified and a petition to remove that parameter(s) from the CWQ monitoring program will be submitted for approval.

If the concentrations of all the Expanded Parameters in the groundwater and underdrain/GDL samples are shown to be at or below the applicable groundwater protection standards for two consecutive sampling events, the NYSDEC will be notified and a petition to return to operational water quality monitoring will be presented for approval.

If the concentrations of any Expanded Parameters in the groundwater and underdrain/GDL samples are above the groundwater protection standards, then CQW monitoring will continue as previously described.

However, if one or more Expanded Parameters are detected at significant levels above the groundwater protection standards, in any sampling event, the NYSDEC and the Town of Perinton officials will be notified of this finding to identify the Expanded Parameters that have exceeded the groundwater protection standard. In addition, in accordance with 6NYCRR Part 360-2.11(c)(5)(iii)(e), efforts will be undertaken to either:

A) Characterize the nature and extent of the release and initiate an assessment of corrective actions or;
B) Submit documentation that a source other than the landfill caused the contamination, or that the significant increase resulted from an error in sampling, analysis, or variation in groundwater quality.

7.2 Surface Water and Sediment

The results of surface water quality sampling and analysis will be compared with historical data from the same sampling point using time series analysis to look for overall changes in surface water quality. Data tables will be completed that list historical data and the current sampling event data and the table reviewed for general concentration trends, abnormal detections, outliers and compliance with the requirements of the General SPDES Permit (see Appendix A). Sample analytical data will be reviewed for systematic changes in downgradient water quality.

The results of sediment analysis will be compared with historical data from the same sampling point using time series analysis to look for overall changes in sediment quality. Data tables will be completed that list historical data and the current sampling event data and the table reviewed for general concentration trends, abnormal detections, and outliers.

7.3 Leachate

Changes in leachate quality will be assessed using time series analysis and Piper and Stiff diagrams. The plotted positions of the leachate chemistry on Piper and Stiff diagrams will be used for assessment of impacts to groundwater and underdrain water quality by comparison of the groundwater plotted positions with that of the leachate samples. Data tables will be prepared that provide the results of the analyses and allow comparison with historical data.

7.4 Groundwater Suppression System

Changes in underdrain water quality will be assessed using time series analysis and Piper and Stiff diagrams. The plotted positions of the underdrain water quality will be used for assessment of potential impacts to groundwater using the same comparison methods described above for leachate. Data tables will be prepared that provide the results of the analyses and allow comparison with historical data.

8.0 SITE ANALYTICAL PLAN

The following sections of this EMP constitute the Site Analytical Plan (SAP) as required under Part 360-2.11(d) and is subdivided consistent with the regulations. Accordingly, the five sections include: Data Quality Objectives, Analytical Quality Assurance/Analytical Quality Control, Field Sampling Procedures, Laboratory Procedures, and Data Quality Assessment.

8.1 Data Quality Objectives

Data quality objectives are qualitative and quantitative statements, which specify the quality of the data required to support the goals of the monitoring program and are determined based upon the end use of the data. The end use of the data collected under this monitoring plan will be to document or monitor the integrity of the landfill systems and remedial measures and to demonstrate to the regulatory agency that there is no adverse impact to the environment related to operation of the Facility. The data quality objectives will be met by establishing standardized field and lab procedures. Given that most of these procedures are specified within the regulations, the data quality objectives are essentially already established by the NYSDEC and will thus be attained by following the regulations. The goals of the various components of the regulations designed to meet the data quality objectives are discussed below.

8.1.1 Monitoring Programs

The overall objective of the monitoring program is to demonstrate that the landfills and remedial measures are operating as designed and to be able to distinguish landfill derived impacts to water quality from existing water quality. A monitoring program, established to meet this objective, has been developed to include:

<u>Existing Water Quality</u>

The goal for Existing Water Quality monitoring is to collect and analyze representative groundwater samples such that the data can be used to establish a benchmark for comparison to future sampling events. This will allow potential new impacts to the groundwater and surface water to be differentiated from old impacts (HACL). The collected data will be processed and evaluated to account for both spatial and temporal variability within a given hydrostratigraphic unit using DUMPStat and the procedures described in Section 7.0.

Operational Water Quality

The goal of the operational water quality monitoring program is to collect and analyze groundwater samples, and evaluate the resulting data, such that landfill derived impacts to water quality may be distinguished from the existing water quality defined by the procedures defined above, old impacts and potentially anthropogenic impacts unrelated to landfill activities (farming, road salt etc.). The methods used to evaluate impacts to groundwater and surface water are described in Section 7.0.

By collecting and analyzing the samples in accordance with standardized methods and procedures, the data will be technically defensible and balanced with respect to the occurrence of false positives and false negatives such that the resulting conclusions are defensible and acceptable to all parties; thus meeting the data quality objectives.

Contingency Water Quality

The goal of the Contingency Water Quality program is similar to that for the Operational Monitoring program. Data collected under this program, however, are related to more sensitive analytical parameters whose mere presence can trigger additional monitoring and investigation. By following established analytical procedures, the generated data will be sufficiently sensitive, accurate, and reproducible; thus meeting the data quality objectives.

8.1.2 Regulatory Programs and Standards

This EMP is written in accordance with Part 360-2.11(c) and (d) and forms the basis for the environmental monitoring program for HAL&RC. The most current New York State Ambient Water Quality Standards and Guidance Values will be used, in part, to provide a comparative basis for the evaluation of the results of the environmental monitoring program. Applicable water quality regulations, standards, and criteria include:

Applicable to Evaluation of Groundwater Monitoring Results

- Official Compilation of Codes, Rules, and Regulations of the State of New York, Chapter X, Division of Water Resources, Article 2, Part 703.5 (Classes and Quality Standards for Ground Waters as Applicable to Class GA Waters).
- Maximum Contaminant Levels (MCL's) as established under 40 CFR Part 141 (Safe Drinking Water Act).

Applicable to Evaluation of Surface Water Monitoring Results

- Official Compilation of Codes, Rules, and Regulations of the State of New York, Chapter X, Division of Water Resources, Article 2, Title 6, Part 701, Classification and Standards of Quality and Purity.

8.1.3 Analytical Parameters and Detection Limits

The analytical parameters incorporated into this EMP have been subdivided into three groups: Routine Parameters, Baseline Parameters and Expanded Parameters as defined by Part 360-2.11(d)(6). The analytical methods and detection limits to be employed for this EMP are presented in Table 3-2.

8.2 Analytical Quality Assurance/Analytical Quality Control

The following section presents and discusses the analytical objectives and procedures, which will be employed to meet the data quality objectives.

8.2.1 Analytical Goals and Protocols

In order to meet the data quality objectives, it is essential that the samples collected in the field, and destined for laboratory analysis, be representative of the conditions present at the time of sampling. The goal of the analytical program included as a part of this EMP, including sampling, field measurement, and laboratory analysis, is to collect, document, and analyze the environmental samples in accordance with established methods and procedures such that the resulting data is representative of the sample matrix in the field and can be used for comparison to existing environmental conditions and standards. This goal will be accomplished through the assignment of qualified personnel, adherence to established quality control procedures, and the use of standardized methods and protocols for the collection, shipping, and analysis of the environmental samples.

8.2.2 Project Personnel and Responsibilities

The EMP will be implemented and managed by WMNY under the regulatory authority of the NYSDEC. WMNY will be assisted by Severn Trent Laboratories, Inc. (Amherst, New York) or another approved sampling contractor, for the collection and shipment of the samples to the laboratory. Analysis of the samples will be completed by a laboratory certified by the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program for the analysis of samples by the Analytical Services Protocol (ASP). All analyses will be conducted in accordance with the NYSDEC ASP. Analysis of the samples will be completed by Severn Trent

Laboratories, Amherst, New York or another NYSDOH approved laboratory. The following individuals have been identified for participation in this monitoring plan:

Responsibility	Current Affiliation	Name	Phone Number
Market Area Engineer	WMNY	Rebecca Zayatz	(716) 754-0279
District Manager and Sampling Program Manager	WMNY	Jeff Kocian	(585)-223-6132
Field Sampling	STL or approved contractor	Roger Senf	(716) 691-2600
Analytical Contact	STL or certified laboratory	Ryan Van Dette	(716) 691-2600

If personnel change over time, a revised project personnel table will be provided to the NYSDEC.

8 2.3 Quality Control Procedures and Objectives for Measurement

To ensure that the data generated as a part of the EMP fulfills the needs of the data quality objectives, quality assurance practices will be maintained both in the field and in the laboratory. Field procedures will be performed in accordance with the Field Sampling Procedures presented in Section 8.3.

Severn Trent Laboratories Inc is Certified under the National Environmental Laboratory Accreditating Council Program (NELAC Program) on an annual basis and audited every two years by NYSDEC. As such all laboratory procedures utilized by STL have been pre-approved by the NYSDEC. Laboratory procedures will adhere to established analytical method protocols and STL's Standard Operating Procedures (SOPs). All data generation, review, and reporting by STL will be accomplished in accordance with the appropriate analytical methodology and STL's SOPs. Quality control procedures and standards related to the field and laboratory are discussed in greater detail below.

Field Methodologies

It is essential to any monitoring program that samples collected in the field and destined for laboratory analyses be representative of the conditions present within the specific sampled matrix (i.e., groundwater, surface water, leachate etc.) at the time of sampling. To ensure sample representativeness and completeness, all sampling procedures will be in accordance with the Field Sampling Procedures (Section 8.3).

For field-generated data such as water temperature, specific conductivity, pH measurements and Turbidimeter, the accuracy, precision, and comparability of the data will be within the limits of the field instrument when calibrated, used, and maintained according to the instrument manufacturer's directions and those procedures described in this SAP.

Field Precision

The precision for field measurements is as follows:

- pH meter - consecutive readings should agree within +/-0.2 pH units after the instrument has been field calibrated with standard buffers.
- Conductivity meter - consecutive readings of a thermally stable sample should agree within +5 percent after the instrument has been calibrated.
- Thermometer - consecutive measurements of a given sample should agree to within +/-1 degree Celsius.
- Eh Meter - consecutive readings should agree to within +/- 0.25 Mv. after meter calibration.
- Dissolved Oxygen Meter - consecutive readings should agree to within +/- 0.2 mg/l after meter calibration.
- Turbidimeter - consecutive readings should agree to within +/- 20% after meter calibration.

Field Accuracy

The objective for accuracy of field measurements is to achieve and maintain factory equipment specifications for the field equipment. Field measurements cannot be assessed for accuracy by spiking the medium with the analytical parameter and measuring the increase in response; therefore, these instruments can only be assessed for accuracy by the response to a known sample (such as calibration standard) used to standardize them. For example, the pH meter is calibrated with buffer solutions traceable to the National Institute of Standards and Technology (NIST, formerly the National Bureau of Standards).

Laboratory Methodologies

Parameters to be tested for as a part of this EMP include the Part 360 (October 1993) Routine Parameters, Baseline Parameters and Expanded Parameters. Samples will be analyzed following the methods in the NYSDEC ASP or an equivalent method. The analytical methods and laboratory practical quantitation limits are provided in Table 3-2. The quality control procedures and objectives for measurement related to the laboratory are presented in STL's Laboratory

Quality Manual. A discussion related to some of these quality assurance measurements is provided below.

Precision

Precision is an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Specifically, it is a quantitative measurement of the variability of a group of measurements compared to their average value. Precision is usually stated in terms of standard deviation, but other estimates such as the coefficient of variation (relative standard deviation), range (maximum value minus minimum value), and relative range are common.

Analytical precision will be assessed by analyzing matrix spike (MS) and matrix spike duplicate (MSD) samples organics and matrix spike and laboratory duplicate samples (inorganics) and determining the RPD. For all Part 360 Baseline and Expanded Parameter analyses a matrix spike/matrix spike duplicate or laboratory duplicate pair will be collected at a frequency of not less than five percent (one per twenty samples) or one per sampling event, whichever is more frequent. Total system precision, including field precision will be determined by analyzing duplicate samples collected in the field at the same location. The formula for calculating RPD is as follows:

$$RPD = \{(V1 - V2)/(V1+V2)/2\} \times 100$$

Where:	RPD	=	Relative Percent Difference
	V1, V2	=	The 2 values obtained by analyzing the duplicate samples or spike and spike recovery values.
	$\lvert V1 - V2\rvert$	=	The absolute value of the difference between the two measurements.
	(V1 + V2)/2	=	Concentration of analyte obtained by analyzing the sample duplicate or spike recovery.

Accuracy

Accuracy is a measure of the difference between a measured value and the "true" or accepted reference value. The accuracy of an analytical procedure is best determined by the analysis of a sample containing a known quantity of material and is expressed as the percent of the known quantity, which is recovered, or measured. The recovery of a given analyte is dependent upon the sample matrix, method of analysis, and the specific compound or element being determined. The concentration of the analyte relative to the detection limit of the analytical method is also a major factor in determining the accuracy of the measurement. Additionally, initial and continuing calibrations must be performed and accomplished within the established method control limits to define the instrument accuracy before analytical accuracy can be determined for any sample set. Sampling accuracy may be determined through the assessment of the analytical results of field blanks (non-dedicated equipment only) and trip blanks (volatile organics only) for each sample set.

Accuracy is normally measured as the percent recovery (%R) of a known amount of analyte. The %R for a matrix spike is calculated as follows:

$$\%R = \frac{SSR - SR}{SA} \times 100$$

Where: %R = Percent recovery.
SSR = Concentration of Analyte obtained by analyzing the sample plus the spike.
SR = The background value; i.e., the concentration of the analyte obtained by analyzing the sample.
SA = Concentration of the analyte spike added to the sample.

Percent recovery of a laboratory control sample is determined by dividing the measured value by the known value and multiplying by 100.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter, which is most concerned with the proper design of the sampling program. Samples must be representative of the environmental media being sampled. Selection of sample locations and sampling procedures will incorporate consideration of obtaining the most representative sample possible.

Field and laboratory procedures will be performed in such a manner as to ensure, to the degree that is technically possible, that the data derived represents the in-place quality of the material sampled. Every effort will be made to ensure chemical compounds will not be introduced into the sample via sample containers, handling, and analysis. Dedicated sampling devices will be employed whenever possible, and NYSDEC and EPA sampling guidelines will be followed. Analysis of field blanks (as needed), trip blanks (volatile organics only) and method blanks will also be performed to monitor for possible sample contamination from field and laboratory procedures.

The assessment of representativeness also must consider the degree of heterogeneity in the material from which the samples are collected. The analytical laboratory will follow acceptable procedures to assure the samples are adequately homogenized prior to taking aliquots for analysis, so the reported results are representative of the sample received.

Finally, samples will be taken and Chain of Custody procedures will be followed to document that contamination of samples has not occurred during container preparation, shipment, and sampling. Details of chain-of-custody, and blank/duplicate procedures will be discussed in sections to follow.

Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid (USEPA, 1987). The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested. Completeness is defined as follows for all sample measurements:

$$\%C = \frac{V}{T} \times 100$$

Where: %C = Percent completeness.
V = Number of measurements judged valid.
T = Total number of measurements.

Comparability

Comparability expresses the degree of confidence with which one data set can be compared to another. The comparability of all data collected for this EMP will be ensured by:

- Using identified standard methods for both sampling and analysis phases;
- Requiring traceability of all analytical standards and/or source materials to USEPA or NIST;
- Requiring that all calibrations be verified with an independently prepared standard from a source other than that used for calibration (if applicable);
- Using standard reporting units and reporting formats including the reporting of QC data;
- Performing a complete data validation on a representative fraction of the analytical

results, including the use of data qualifiers in all cases where appropriate; and

- Requiring that all validated flags be used at any time an analytical result is used for any purpose whatsoever.

These steps will ensure all future users of either the data or the conclusions drawn from them will be able to judge the comparability of these data and conclusions.

8.2.4 Frequency and Type of Quality Control Samples

The frequency and type of quality control samples to be collected as a part of this EMP will include the following:

Trip Blanks

One trip blank will be analyzed for each cooler containing samples to be analyzed for volatile organics. Coolers, which do not contain samples for volatile organics analysis, will not require a trip blank to be analyzed. The trip blanks will be prepared by the laboratory and placed in the coolers prior to sample collection.

Matrix Spike/Matrix Spike Duplicates

For routine parameter analysis, one matrix spike and one matrix spike duplicate/laboratory duplicate sample will be analyzed per laboratory batch as required by the analytical methods. For Baseline or Expanded Parameter analysis, one matrix spike and matrix spike duplicate/laboratory duplicate will be collected at a frequency of one per every twenty samples or one per event, whichever is more frequent. These samples will be collected from a randomly selected location, which is known to produce sufficient volumes of water.

Equipment Blanks

The sampling plan calls for the use of dedicated sampling equipment. Therefore, equipment blanks will not be collected.

8.2.5 Standard Operating Procedures

Standard operating procedures for the field sampling are discussed in Section 8.3. Standard operating procedures related to the laboratory have been pre-approved by the NYSDEC as part of the Certification of STL.

8.3 Field Sampling Procedures

The following section describes the procedures to be followed when collecting and shipping samples for laboratory analysis.

8.3.1 Procedures Prior to Sampling

General procedures followed prior to sample collection at each sampling point are as follows:

1. Locate the sampling point.
2. Observe and record the condition of the sampling point and its surrounding area on a Field Information Form or dedicated field book. Information to be noted includes:
   - The condition of monitoring point's identification sign;
   - Recent disturbance in vicinity of sampling point;
   - Condition of the security system for sampling point;
   - Well, tank, or manhole integrity including condition of any cement footing or protective casing. In addition, note physical surroundings, obstructions, or kinks in well casing, water in annular space, grease around top of well on threaded cap, etc.;
   - Weather conditions (i.e., wind direction when sampling for volatiles and note if sampling was performed downwind of an active area); and
   - Evidence of contamination.

Prior to ground-water well purging and sampling, an accurate water level measurement is taken with a portable, conventional electric probe indicator or fiberglass tape that is rinsed with deionized water before each use. A permanent datum is provided at each well location. The water level measurement is recorded on the Field Information sheet or in the field book. Additionally, if previous analytical results suggest the potential presence of non-aqueous phase liquids (NAPLs), the well will be checked for immiscible layers prior to evacuation.

Wells which are not equipped with bladder pumps will have the total well depth determined once per year to ensure that the wells are not silting in. The annual readings will be provided in tabular format. Corrective action may be required on the well if it is determined that excessive siltation has occurred in a well.

8.3.2 Sample Collection

Groundwater Sampling

HAL&RC groundwater monitoring well sampling systems dedicate all purging and sampling equipment to each well, thus preventing any potential cross-contamination between wells that may be otherwise incurred during conventional water sampling. Samples will be extracted using dedicated Well Wizard sampling pumps.

Upon arrival at the sampling location the general condition of the sample location and its surroundings will be recorded on a Field information Form. In addition, general sampling point integrity, weather conditions, visible contamination, odors, and unusual surface conditions will be observed. The equivalent of three standing water volumes, measured from the depth of water to base of the well, will be evacuated from each well prior to sampling to ensure that samples are drawn from the formation, not from stagnant water left in the well between sampling events.

In addition, any unusual conditions (colors, odors, surface sheens, etc.) noticed during well development, purging or sampling will be reported in the field log and noted in the deliverables package to the NYSDEC

The purge water will be collected at each location and disposed of in an area away from the well head. If the well does not yield three volumes, it will be pumped dry and allowed to recharge overnight. If a monitoring well does not recharge within a reasonable time period (24 hours; 72 hours for wells screened in till), the well will be considered dry for the sampling event. The WMNY Program Manager and/or Sampling Coordinator will be notified when a normally yielding well is determined to be dry during a sampling event.

In the event that excessively turbid samples (50 NTU or greater) are routinely collected, or the purge volumes are prohibitive (greater than three well volumes to achieve turbidity less than 50 NTU), WMNY will use micro-purging. Micro-purging is a technique where the well is pumped at a very low flow rate, using dedicated equipment (the Well Wizard bladder pump), before sampling in order to minimize turbidity or eliminate high volume purging. This technique has been demonstrated to produce representative samples with little or no increase in turbidity, while significantly limiting the required purge volume. The NYSDEC will be notified prior to initiating such a change.

During the purging of each monitoring well, the field parameters, pH temperature, turbidity and specific conductivity, will be checked after each well volume and recorded in the field notebook. This will continue until the field parameters have stabilized. It is expected that the parameters will stabilize after three well volumes have been evacuated. Should the field parameters stabilize before three well volumes, the three well volume protocol will still be followed.

Following purging, samples will first be collected for volatile organic analysis. Field measurements consisting of specific conductance, Eh, pH, turbidity, and ground-water temperature measurements will be measured and recorded after collection of the volatile sample. Procedures provided with the instruments will be used for calibration and testing. All results will be recorded on the Field Information Form or in the dedicated field book.

For the field measurements of Eh, pH, specific conductivity, dissolved oxygen and turbidity, an appropriately calibrated meter such as a Cole Palmer ORPTESTR, Myron L (pH & sc), YSI Model 55 DO Meter and DRT-15C field turbidity meters will be utilized. The frequency of calibration of all field parameter measuring equipment will be in accordance with the manufacturers requirements. If the values obtained are not within the normal range, the WMNY Program Manager will be notified immediately as it may be necessary to resample. The initial sample will not be discarded. Additional samples may be requested by the WMNY Program Manager to ascertain the cause of abnormal readings.

The collected groundwater samples will not be filtered. However, in the event that the turbidity of the sample can not be reduced to 50 nephelometric turbidity units (NTUs) through sampling techniques or well development, the NYSDEC may be petitioned to allow for the the use of micropurging and / or collection and analysis of both filtered and unfiltered samples for inorganic parameters. Once the sample has been collected the sample point will be secured and all sampling disposables will be removed from the area and properly disposed.

The groundwater parameters which are collected at any site are collected based upon their volatilization sensitivity. The following order is followed by STL.

1. Volatile Organics
2. Field Readings
3. Total Organic Carbon
4. Extractable Organics

5. Total Metals
8. Dissolved Metals
6. Phenols
7. Cyanides
8. Wet Chemistry
9. Others

Note: Other samples may be collected and analyzed in addition to those listed above.
Note: If the monitoring well is very turbid, collections of samples for total metals and dissolved metals shall be performed immediately after volatile organics to minimize the influence of turbidity.

Surface Water Sampling

Upon arrival at the sampling location the general condition of the sample location and its surroundings will be recorded on a Field information Form. In addition, general sampling point integrity, weather conditions, visible contamination, odors, and unusual surface conditions will be observed. Surface water samples will be obtained as grab samples. Samples will be obtained from near the water surface. Specific conductance, Eh, pH, turbidity, dissolved oxygen (D.O.), and temperature measurements will be taken immediately following sampling.

Surface water samples will not be collected during precipitation events. The sampling conditions will be evaluated by the sampling team immediately prior to sample collection. A suitable work area will be set up as close to the sampling station as possible. Individual sample containers will be filled in the same priority order as detailed for groundwater.

The sampling time and date will be noted in the field notebook or on the sampling logs, along with the field parameter data, and any observations noted for the sample (color, odor, etc.). A small quantity of water will be obtained and visually inspected for immiscible materials. Field measurements for pH, specific conductance, turbidity, redox and dissolved oxygen will be performed at each surface water sampling location, following the collection of the laboratory samples. The sample containers will then be placed in a cooler containing wet ice or ice packs for transportation to the laboratory.

Stream surface water samples will be collected in a manner that will minimize disturbance of the stream bed and avoid incorporation of stream bed materials into the sample. Samples will be collected in a sequence starting with the most downstream location and proceeding upstream. At each location, sampling team members will always position themselves downstream of the sample point and will take care not to stir up sediment or soils when collecting the water samples.

Samples will be collected by direct submersion of the laboratory containers in the water. If, however, the sample location does not lend itself to easy access then an extendable pond sampler or Kemmerer sampler may be used to collect samples. If non-dedicated equipment is used the equipment will be cleaned between sampling locations.

Sediment Sampling

Upon arrival at the sampling location the general condition of the sample location and its surroundings will be recorded on a Field information Form. In addition, general sampling point integrity, weather conditions, visible contamination, odors, and unusual surface conditions will be observed. Sediment samples will be obtained from the upper five centimeters of sediment. Sediment samples at any location will be collected once the surface water sampling at the location has been completed. As with surface water samples, the sequence for collection of sediment samples will be from the most downstream location to the most upstream location.

The sediment samples will consist of the top five centimeters of sediment. Samples will be collected in such a manner as to minimize disturbance of the sediment and minimize washing of the sediment as it is retrieved through the water column. Washing of the sample as it is retrieved through the water column could result in the collection of a non-representative sample due to the loss of sediment fines.

A single grab sample will be collected from the center of the stream and submitted for analysis. All samples collected for the analysis of volatile organic compounds will be grab samples.

The mixing bowl and all non dedicated sampling equipment will be cleaned by washing with a non- phosphate detergent and rinsing with distilled/deionized water. Once the sample has been collected the sample point will be secured and all sampling disposables will be removed from the area and properly disposed.

Underdrain Sampling

Upon arrival at the sampling location the general condition of the sample location and its surroundings will be recorded on a Field information Form. In addition, general sampling point integrity, weather conditions, visible contamination, odors, and unusual surface conditions will be observed. Underdrain samples will be collected from ports in the discharge piping located in the riser housing for each cell or from a Well Wizard pump installed in the riser pipe from the underdrain. Specific conductance, pH, and temperature measurements will be obtained in the field immediately following sample collection. Once the sample has been collected the sample point will be secured and all sampling disposables will be removed from the area and properly disposed.

Leachate Sampling

Upon arrival at the sampling location the general condition of the sample location and its surroundings will be recorded on a Field information Form. In addition, general sampling point integrity, weather conditions, visible contamination, odors, and unusual surface conditions will be observed. Leachate samples will be collected from ports in the discharge piping located in the riser housing for each cell. Specific conductance, pH, and temperature measurements will be obtained in the field immediately following sample collection. Once the sample has been collected the sample point will be secured and all sampling disposables will be removed from the area and properly disposed.

8.3.3 Sample Preservation, Shipment, and Holding Times

Since multiple analyses will be required, different types of containers and preservatives may be necessary. In these situations, multiple pre-labeled containers will be supplied by the laboratory for each sampling point. The appropriate preservatives will be provided in small vials during sample bottle preparation by the analytical laboratory. The volume requirements, containers, preservatives, and holding times for each parameter are listed in Appendix C.

The appropriate sample bottles that have been prepared in the laboratory with the appropriate preservative will be used to collect samples from each location. Containers for collecting samples for volatile organics and total organic halides analysis will be filled to slightly more than full before the septum and cap are placed on the container to ensure that it is free of head space (sampling personnel will check for air bubbles by inverting the container and tapping it). Following filling and capping the bottles will be inverted to mix the preservatives with the sample.

Immediately after collection, bottles will be placed in insulated shuttles or coolers with ice packs and custody sealed. Volatile organic containers will be arranged such that they do not come into contact with the ice packs. Samples will then be sent to STL, or other approved laboratory, and will arrive within 48 hours of collection. Executed Field Information Forms or photocopied field notes and Chain-of-Custody Forms will be placed inside the sample shipping containers.

8.3.4 Chain-Of-Custody

At the time each sample is taken, a Chain-of-Custody Form will be completed by the sampler and placed in the sample chest. Upon transfer of sample possession to subsequent custodians, the Chain-of-Custody Form will be signed by the person taking custody of the sample container. Upon receipt of samples at the laboratory, the shipping container seal will be broken and the condition of samples, including temperature, will be recorded by the receiver. The Chain-of-Custody Forms will be included in the analytical report prepared by the laboratory and will be considered an integral part of that report.

As part of the chain-of-custody procedure, each sample container will be labeled with the sample number and the parameter to be sampled.

All sampling procedures, measurements, and observations will be recorded on the Chain-of-Custody Forms, including the following information:

- Facility site name, sample point identification number, and other pertinent identifiers;
- Depth to ground water, surface water elevation, leachate level (as appropriate);
- Information regarding purging the well prior to sampling (if appropriate);
- Date and elapsed time from sample start to sample finish (if elapsed hours are greater than one);
- Sample method (dedicated bailer or bladder pump, grab, composite, etc.);
- Type of sample and necessary treatment (e.g. filtering, if necessary);
- Field observations (e.g. well, manhole, or spillway condition);
- Sampler's identify and signature.

Upon receipt of the samples at the laboratory, the date and time of arrival will be noted on the Chain-of-Custody Forms. The laboratory receiver will verify that the seal is intact and custody has not been broken, and make note of sample bottle condition on the forms. These forms will be retained by the laboratory and returned with the results of the analysis.

9.0 LABORATORY ANALYSIS PLAN

This section describes the procedures for completing successful laboratory analysis of the samples that are collected from the site. In accordance with Part 360-2.11(d)(4)(i), STL is certified by NYSDOH, Environmental Laboratory Approval Program (ELAP) to perform ASP laboratory services in the State of New York. STL will maintain this certification through the analysis of performance samples and routine auditing by NYSDOH as required by ELAP. STL has established standard operating procedures (SOPs) relating to the receipt, analysis and reporting of samples. A copy of STL's Laboratory Quality Manual and Site Analytical Plan is available at the laboratory. If a different laboratory is used, a copy of that laboratories quality assurance manual will be submitted to the department.

9.1 Program Quality Assurance/Quality Control Procedures

Trip blanks, equipment blanks, field blanks, and matrix spike samples provide quality assurance/quality control measures for the monitoring program.

9.1.1 Trip Blanks

Trip blanks are a required part of the field sampling QA/QC program. They are used to detect contamination that may be introduced in the field (either atmospheric or from sampling equipment), in transit, or in the bottle preparation, sample log-in, or sample storage stages at the laboratory. Laboratory method blanks are used during the analytical process to detect any laboratory introduced contamination that may occur during analysis.

Trip blanks are samples of organic-free water (e.g. deionized) prepared at the laboratory. They remain with the sample bottles while in transit to the site, during sampling, and during the return trip to the laboratory. Trip blank sample bottles must not be opened at any time during this process. Upon return to the laboratory, trip blanks will be analyzed using the same procedures and methods that are used for the collected field samples.

One trip blank will be analyzed for each cooler containing samples to be analyzed for volatile organics. Coolers, which do not contain samples for volatile organics analysis, will not require a trip blank to be analyzed. The trip blanks will be prepared by the laboratory and placed in the coolers prior to sample collection.

9.1.2 Field Blanks

Field blanks are a required part of the field sampling QA/QC program. The purpose of the field blank is to detect any contamination which might be introduced to the groundwater samples through the air. For WMNY's sites with sampling programs involving VOCs, at least one field blank will be analyzed for the first 20 samples or less. At least one field blank sample will be collected for each day of sampling, and for each subsequent 20 samples, whichever is greater.

Field blanks must be prepared in the field (at the sampling site) using laboratory-supplied bottles and deionized or laboratory reagent-quality water. Each field blank is prepared by pouring the deionized water into the sample bottles at the location of one of the wells in the sampling program. The well at which the field blank is prepared must be identified on the Field Information Form, along with any observations that may help explain anomalous results (e.g., prevailing wind direction, upwind potential sources of contamination, etc.). Once a field blank is collected, it is handled and shipped in the same manner as the rest of the samples. Field blank results will be reported in the laboratory results as separate samples.

9.1.3 Equipment Blanks

The sampling plan calls for the use of dedicated sampling equipment. Therefore, equipment blanks will not be collected.

9.1.4 Matrix Spike / Duplicate

For routine parameter analysis, one matrix spike and one matrix spike duplicate/laboratory duplicate sample will be analyzed per laboratory batch as required by the analytical methods. For Baseline or Expanded Parameter analysis, one matrix spike and matrix spike duplicate/laboratory duplicate will be collected at a frequency of one per every twenty samples or one per event, whichever is more frequent. These samples will be collected from a randomly selected location, which is known to produce sufficient volumes of water.

9.2 Laboratory Quality Control Procedure

The laboratory quality control program describes has been audited, certified and approved by NYSDEC and describes the mechanisms the laboratory employs to ensure that all data reported meets or exceeds all applicable USEPA and NYSDEC requirements. It describes the laboratory's experience, its organizational structure, and procedures in place to ensure quality of the analytical data. The QAPP outlines the sampling, analysis, and reporting procedures used by the laboratory.

The laboratory is responsible for the implementation of and adherence to the quality assurance and quality control requirements outlined in the QAPP.

Audits are an important component of the quality assurance program at the laboratory. Audits are conducted by the laboratory. Internal system and performance audits are conducted periodically to ensure adherence by all laboratory departments to the QAPP. External audits are conducted by accrediting agencies or states. These reports are transmitted to department managers for review and response. Corrective measures must be taken for any finding or deficiency found in an internal or external audit.

Data Quality Reviews (DQR), or equivalent, are requests submitted to the laboratory to formally review results that differ from historical results, or that exceed certain permit requirements or quality control criteria. The laboratory prepares a formal written response to each DQR explaining the discrepancy. The DQR is the first line of investigation following any anomalous result.

STL has established specific procedures and checklists for the receipt, storage, and handling of environmental samples to assure their integrity and security. These procedures are discussed in detail in the STL SOPs and include detailed chain-of-custody records, secured storage and laboratory areas, and the tracking of each sample from it's receipt at the lab through data generation and reporting.

The acceptance criteria and frequency for both initial and continuing calibration of the analytical instruments used by STL are documented in the STL SOPs.

Corrective action will be necessary if precision or accuracy limits are outside the acceptable limits. In such an event, the following corrective actions may be employed, depending upon the particular situation.

- Calculations are rechecked.
- Sample handling, i.e., digestion, concentration, and/or extraction logs are checked for discrepancies in sample handling.
- Analyte concentration is reviewed to determine if it has severely influenced the reliability of the precision or recovery calculations.
- Instrument and method performance is verified by inspecting data on standard reference materials processed in the same data set.

- Quality control data on the other samples in the data set, including surrogate recovery, internal standards, etc., are reviewed to determine if the problem is method related or sample related.
- If original sample is available, the sample is assessed for homogeneity.
- If sample is unavailable and no explanation for poor quality control results can be determined, additional samples will be obtained. If additional sample is unavailable, the results are issued with a qualification as to their accuracy.

STL has established procedures and responsibilities for corrective actions as well as a summary of probable sources and suggested corrective actions. These are presented in the STL SOPs.

STL will complete internal data validation for Routine Parameters in accordance with NYDEC requirements. Data validation for samples analyzed for Baseline or Expanded Parameters will be completed by an independent party that has NYSDEC data validator qualifications.

Twenty percent (20%) of the analytical data generated for those sampling events for which Baseline or Expanded Parameters are analyzed will be validated. All the NYSDEC Category B QA/QC criteria for 20% of the samples will be reviewed. Data will be validated following the QA/QC criteria for each individual method and, where applicable, the USEPA Region II data validation checklists: CLP Organics Data Review and Preliminary Review, SOP No. HW-6, Revision #8 and Evaluation of Metals Data for the Contract Laboratory Program (CLP) based on SOW 3/90, SOP Revision XI. As outlined above, NYSDEC Category B deliverable packages will be provided for 20% of the samples to facilitate this data validation.

The data validation and usability analysis will include:

- A review of field records and analytical data to determine whether the data are accurate and defensible. All AQA/AQC information will be reviewed along with any corrective actions taken during that sampling event;
- Data summaries will be clearly marked to identify any data that are not representative of environmental conditions at the site, or that were not generated in accordance with the site analytical plan.
- The data will be assessed to determine if the data quality objectives were met;
- The results will be compared to previous sampling events;
- Field duplicate results will be evaluated to determine if the samples are representative;
- The results of all field blanks, trip blanks, equipment rinsate blanks, and method blanks will be evaluated with respect to the data sets to provide information concerning

contaminants that may have been introduced during sampling, shipping, or analyzing;

- An evaluation of matrix effects will be completed to assess the performance of the analytical method with respect to the sample matrix, and determine whether the data have been biased high or low due to matrix effects;
- Field and laboratory data will be integrated with geologic, hydrogeologic, and meteorological data (as appropriate) to provide information about the extent of potential contamination;
- The precision, accuracy, representativeness, comparability, completeness, and defensibility of the data will be evaluated with respect to the data quality objectives.

9.3 Practical Quatitation Limits (PQL)

WMNY proposes to utilize laboratory-specific PQLs as the reporting limits of applicable low-detection analytes (especially organics). Details on the methodology that will be used for determining PQLs is included in Appendix B (see Gibbons et. al., 1992). The USEPA developed the concept of the PQL to address the issue of analytical variability. The PQL concept was developed for compliance with the Safe Drinking Water Act (50 FR 46906, Nov. 13, 1985) where it is defined: “The PQL thus represents the lowest level achievable by good laboratories within specified limits during routine laboratory operating conditions.” The EPA states in 52 FR 25699 (July 8, 1987):

> *“The agency developed the PQL concept to define a measurement concentration that is time and laboratory independent for regulatory purposes. Method Detection Limits, although useful to individual laboratories, (do) not provide a uniform measurement concentration that can be used to set standards.”*

The EPA’s defined MDL, as published in 40 CFR 136, has limited application. The Agency acknowledges that “MDLs are not necessarily reproducible over time in a given laboratory, even when the same analytical procedures, instrumentation and sample matrix are used” (50FR 46906, Nov. 13, 1985). Use of MDLs may result in false positives since EPA admits it is an ideal limit that cannot be reliably measured by even the best laboratories. Therefore, in its regulatory programs, EPA has determined that the PQL is a more appropriate measure for compliance purposes.

In contrast to the PQL, which is a measure of analytical precision, the MDL is a hypothesis test that leads to the binary decision of whether or not an analyte is present or absent in a sample. The

MDL is defined by the USEPA as the "minimum concentration of a substance that can be measured and reported with 99 percent confidence that the true value is greater than zero" (50FR46906, Nov. 13, 1985).

For constituents such as VOCs, which are analyzed by gas chromatography/mass spectrometry (GCMS) and that utilize the internal standard calibration methodology, the computation of PQLs can be derived from the calibration function. In the simplest case of spiked calibration samples in distilled water, these values can be computed directly from calibration samples routinely performed by the laboratory. PQLs obtained in this manner empirically model:

1) The relationship between variability and concentration,
2) The effects of multiple instruments and analysts,
3) The effects of groundwater matrices,
4) A balance of false positive and false negative rates at nominal levels,
5) The effects of background instrument response levels,
6) The effects of recovery bias, and,
7) The uncertainty of the calibration line.

The PQL is operationally defined as the concentration at which the instrument response signal is 10 times its standard deviation. The response signal is defined as the ratio of analyte to internal standard peak areas. Ninety-five percent confidence limits for a PQL are also derived. The PQL is estimated directly from calibration data, and uncertainty in parameters of the calibration function are incorporated. The non-constant variance problem is dealt with using a variance stabilizing transformation. Results of these analysis suggest that USEPA estimates of PQLs are reasonably consistent with the 10% rsd definition.

9.4 Analytical Methodologies

The analytical methods to be used for the analysis of each parameter are included in Tables 3-2,

10.0 DATA QUALITY REVIEW, REPORTING AND RECORDKEEPING

Prior to submittal of a monitoring report to the Department, several data evaluation, reporting, and recordkeeping tasks will be implemented. The following sections describe the evaluation, reporting and recordkeeping procedures that are followed upon receipt of the analytical report.

10.1 Data Quality Review

Each analytical report received from the laboratory will undergo two levels of quality management. These quality assessment procedures are described below.

10.1.1 Initial QA/QC Checks

Before the data are subjected to statistical analysis, WMNY will evaluate the data by examining the quality control information accompanying the data report from the laboratory. Relevant quality control data include measures of accuracy (percent recovery), precision (relative percent difference, RPD), and sample contamination (blank determinations). Data that fail any of these checks will be flagged for closer evaluation and a DQR. Results of the DQR will be submitted with the analytical data in the routine monitoring report (See Section 9.2, Laboratory Quality Control Procedures, for a description of DQR). A brief summary of these relevant quality control data follows. A more complete description is contained in the laboratory QAPP.

Accuracy defines the relationship between the laboratory's measurements of a sample's concentration and the "true", but unknown concentration of the sample. Because the "true" concentration is unknown, accuracy must be measured indirectly by determining the percent recovery of a sample called the matrix spike (MS). The MS is analyzed under the same conditions as the groundwater sample and its concentration is determined. Because the MS has a known concentration its percent recovery can be calculated. It is assumed that the groundwater sample behaves exactly like the MS and thus the "true" concentration of the submitted groundwater sample can be back-calculated. Control criteria for percent recovery are taken from regulatory method requirements.

Precision is the assessment of the variability that can be expected in data that result from the analytical procedures employed. It provides a measure of the reproducibility which is estimated through duplicate measurements of a matrix spike. Two matrix spike samples are prepared as described above, a MS and a matrix spike duplicate (MSD). Both spikes are analyzed along with the unknown sample and the RPD between the two spikes is determined. Control criteria for

RPD are taken from regulatory method requirements.

The potential for sample contamination is assessed by measurements of "blank" samples. Blanks are samples of ultra-pure laboratory water that are not spiked with any analytes and are carried through the field sampling and laboratory environments. These samples are known as "field," "lab," and "equipment" blanks. It is assumed that any analytes that occur in the field or laboratory which might add to the concentration of the analyte in the sample will be picked up by the blank samples and measured. If any of the analytes of interest are found in the blank samples it is an indication of potential contamination of the unknown sample.

10.1.2 Qualitative Data Evaluation

Following the initial QA/QC checks, all data will undergo a second level of review by graphing historical time trends and comparing new results with these historical trends to flag visual outliers or other anomalous data. If a clearly anomalous result is found, a DQR will be initiated with the laboratory to ascertain if laboratory error is involved. In addition, field information will be checked for anomalous occurrences or observations that might help to explain the outlier result.

10.2 Data Reporting Requirements

Data obtained from the Operational Water Quality monitoring program will be reported to the NYSDEC within 90 days of concluding the sampling event, unless more rapid reporting is required as a result of significant increases. The reporting of analytical data will be completed in accordance with 6NYCRR Part 360-2.11(c)(5)(iv).

The quarterly reports will include a review of site conditions, tables providing the data and comparisons to NYSDEC groundwater standards, the results of DUMPStat statistical analysis, time series graphs and Piper, Stiff and Ternary diagrams as appropriate, groundwater elevation data, any data quality issues determined by the laboratory or the outside independent data validator for a baseline event and conclusions regarding the presence / absence of significant increases. In addition, leachate quality data (semi-annual), underdrain water quality (for operating underdrains), surface water and sediment quality will be submitted with each quarterly report

An annual report will also be submitted which summarizes the data collected over the previous year, including discussions regarding observed changes in groundwater, surface water, leachate, etc.

The data obtained from the sampling event will accompany the quarterly reports in electronic format on computer disc(s) in a format readable by the department. The analytical results will be provided to NYSDEC under separate cover.

10.3 Data Record Keeping Requirements

All analytical data are maintained by the laboratory indefinitely. The laboratory ensures that, at each stage of a process where a permanent data record is required, security measures are in place to guarantee the integrity of the data. Standard Operating Procedures are in place for computer security, computer data storage and back-up. In addition, all raw chemical data provided by the laboratory will be available for review at the HAL&RC office in Fairport, New York, upon request.

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