Environmental Monitoring Plan - North Marion County Disposal Facility

Marion County Oregon

Prepared for

Marion County Department of Public Works - Environmental Services

June 2013

Prepared by

Parametrix

Environmental Monitoring Plan
North Marion County Disposal Facility
Marion County Oregon

Prepared for

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CITATION

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North Marion County Disposal Facility
Marion County Oregon. Prepared by Parametrix,
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CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a registered professional hydrogeologist licensed to practice as such, is affixed below.

Prepared by Rick Malin
Project Manager

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SECTIONS

ACRONYMS

DEQ	Oregon Department of Environmental Quality
EMP	Environmental Monitoring Plan
GCL	Geo-synthetic clay liner
LCMP	Leachate Control Management Plan
LCRS	Leachate collection and removal system
LGMP	Landfill Gas Monitoring Plan
NMCDF	North Marion County Disposal Facility
NPDES	National Pollutant Discharge Elimination System
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SLCRSs	Secondary Leachate Collection and Removal Systems
TF	Troutdale Formation
VE	Value Engineering
WPCFP	Water Pollution Control Facilities Permit
WQMP	Water Quality Monitoring Plan
WS	Willamette Silt

INTRODUCTION

This Environmental Monitoring Plan (EMP) for the North Marion County Disposal Facility (NMCDF) addresses monitoring plan requirements set forth in Section 14.0 of the NMCDF Solid Waste Disposal Site Permit Number 240 (Permit) issued on May 9, 2007. A copy of the NMCDF Permit is presented in Section 5 of this plan for reference purposes.

Environmental monitoring is required at solid waste disposal facilities to evaluate the performance of engineered control and containment systems (e.g., leachate collection and disposal systems, gas collection, etc.) and the magnitude and significance of any leachate or gas release impacts from the landfill on human health, welfare and safety, and the environment (DEQ 1993). The DEQ's Solid Waste Permit Guidance (DEQ 1996) was referenced in the development of this EMP.

Environmental monitoring at the NMCDF includes water quality (both groundwater and surface water), leachate collection systems (both primary and secondary collection and recovery systems), and landfill gas (both active extraction system monitoring and maintenance and soil gas monitoring. Specific plans that address monitoring these specific elements at the site are presented in this EMP.

The NMCDF has undergone a number of environmental studies and investigations culminating in a Remedial Investigation/Feasibility Study (RI/FS) completed in 1998. The RI/FS addressed the presence of contaminants detected in groundwater samples from the uppermost aquifer at concentrations above state and federal maximum contaminant levels along the western solid waste compliance boundary. In response to the RI/FS, the Oregon Department of Environmental Quality (DEQ) completed a Record of Decision (ROD) in March 1999 that identified remedial actions that would be used to respond to the identified remedial action objectives. Environmental monitoring requirements and elements identified in the ROD are addressed in this EMP. Monitoring associated with the adjacent Land Application Area and the 1973 Landfill Site are also addressed in this EMP.

This EMP presents site-specific plans for the monitoring and evaluation of:

- **Water Quality** – The Water Quality Monitoring Plan (WQMP) describes the existing monitoring network established at the site that will be used to monitor surface water and groundwater quality conditions. Historical and current water quality conditions are described to provide the rationale for the water quality monitoring program.
- **Leachate Control Management** – The Leachate Control Management Plan (LCMP) presents site-specific monitoring procedures used to detect releases from lined portions of the disposal facility equipped with Secondary Leachate Collection and Removal Systems (SLCRSs), before such releases enter the groundwater system.
- **Air Quality** – The Landfill Gas Monitoring Plan (LGMP) presents site-specific procedures and methods that will be used to verify compliance with state regulations and assess subsurface gas migration. The plan describes procedures to guide monitoring of gas in soils and aid monitoring for potential accumulation within or adjacent to select onsite structures. The LGMP also describes operation, maintenance, and monitoring of the active landfill gas extraction and treatment system.

- **Sampling and Analysis Plan** – The Sampling and Analysis Plan (SAP) describes the methods and procedures used to collect and analyze water quality samples from the water quality monitoring network as described in the WQMP and LCMP.

PLAN ORGANIZATION

This EMP consists of the following five sections:

- **Section 1: Water Quality Monitoring Plan (WQMP)**

  The WQMP describes the established site water quality monitoring network. Well documentation and a description of surface water quality monitoring points are presented. Historic and current water quality conditions at the site are described and provide the rationale for the site's water quality monitoring program. Data review procedures and reporting are described in the plan.

- **Section 2: Leachate Control Management Plan (LCMP)**

  The LCMP presents how the primary and secondary leachate collection and recovery systems (LCRSs) at the site will be monitored. The plan describes the design of the site LCRSs and the techniques and procedures to inspect, measure, and sample fluid from the system's monitoring points. Both primary and secondary LCRSs are monitored. These sample points are associated with the site's lined ash monofills. Historic and current water quality conditions at these monitoring points are described and provide the rationale for the leachate control monitoring program.

- **Section 3: Landfill Gas Monitoring Plan (LGMP)**

  The LGMP presents how the site will be monitored for landfill gas and analyzed for methane and explosive gases. The plan describes the sampling procedures and locations for monitoring of subsurface gas migration around the perimeter of the facility and into on-site structures. The LGMP describes gas monitoring recordkeeping and reporting procedures to be employed. Section 3 also includes a manual that details operation and maintenance of the site's active landfill gas control system.

- **Section 4: Sampling and Analysis Plan (SAP)**

  The SAP describes the procedures recommended for obtaining, preparing, documenting, preserving, and shipping water quality samples collected through the WQMP and LCMP and establishes Quality Assurance/Quality Control (QA/QC) requirements for sample acquisition and handling. Water quality analysis is completed by an Oregon accredited environmental laboratory (ORELAP). The SAP includes the site's designated laboratory's quality assurance program manual.

- **Section 5: NMCDF Solid Waste Disposal Site Permit**

  For reference purposes, a copy of the NMCDF Solid Waste Disposal Site Permit Number 240, issued on May 9, 2007, is presented in Section 5 of the document. The expiration date of this permit is November 30, 2015.

The four plans presented in Sections 1 through 4 were developed to function as separate standalone documents.

A water quality database of samples collected at the site since 1988 has been developed and maintained. This database is used and summary tables are presented in NMCDF Annual Environmental Monitoring Reports.

It is anticipated that elements of this EMP will need to be revised from time to time as site conditions and monitoring objectives and procedures change. Consequently, this EMP uses a three-ring binder format to allow for portions of the document to be updated or amended without full plan revision.

The remaining portion of this section to the EMP presents a description of the NMCDF and adjacent areas addressed by the facility's environmental monitoring program. History and operations associated with these areas is also provided.

SITE LOCATION AND OPERATIONS

The NMCDF, formerly known as the Woodburn Landfill, is located in Marion County approximately three miles northwest of Woodburn, Oregon (Figure 1). The site is situated in the French Prairie region of the northern Willamette Valley and has been in operation since September 24, 1974. The facility currently provides the following waste disposal and recycling functions: waste transfer, ash monofilling, material recycling, and backup landfill capability. Figure 2 presents site topography and features and identifies various facility operations.

Marion County is the owner, permittee, and operator of the scales and leachate collection and the former land application system at the NMCDF. The transfer station, backup landfill, material recycling, and the ash monofills had historically been operated by Valley Landfills, Inc., under contract with the county, however, beginning in 2006, the County assumed all of the site operational activities.

There are several permits associated with the NMCDF. Solid waste disposal is permitted under the DEQ Solid Waste Disposal Site Permit Number 240, issued on May 9, 2007. Land application of distillate (treated wastewater) from a variable vacuum distillation system (VVDS) was permitted under DEQ Water Pollution Control Facilities Permit (WPCFP) Number 102364, dated November 5, 2001. Operation of the leachate treatment system was discontinued in June 2004 and the WPCFP permit was terminated by the DEQ effective October 31, 2007. Surface water discharge from the site is permitted by the EPA through the DEQ under a general National Pollutant Discharge Elimination System (NPDES) 1200-Z Permit; site file number 103964; EPA number ORR50-1463. Surface water samples are collected from each of the site's four sample points in accordance with the NPDES permit requirements as described in the NMCDF Stormwater Pollution Control Plan.

SITE BACKGROUND INFORMATION

The NMCDF has been in operation since September 24, 1974, and served as Marion County's northern disposal site primarily for municipal solid waste until 1986 when the Waste-to-Energy facility, located in Brooks, Oregon, began operating. The site originally operated as a trench fill type landfill. However, findings from cover exploration activities suggest that waste was placed in continuous excavations rather than in trenches. The NMCDF now serves as the disposal site for ash generated at the Waste-to-Energy facility, which is placed in lined monofill cells.

The following describes the waste management areas that have been established at the site.

Southwest Fill Area

The 1996 NMCDF Remedial Investigation report (Dames & Moore 1996) indicated that approximately ten unlined trenches, oriented in an east/west direction, were filled in an approximately 15-acre area in the southwest part of the facility. The location of these trenches underlies the bypass/demolition landfill shown on Figure 2. The trenches were originally approximately 60 feet wide but were subsequently enlarged by the site operator by narrowing the intervening berms to maximize waste capacity (Dames & Moore 1996). The estimated volume of waste placed in these trenches ranges from 100,000 to 200,000 cubic yards. The depth of the trench excavations corresponded to the summer water table level.

In 1987, a demolition/by-pass landfill was constructed over a portion of the municipal solid waste fill area in the southwestern portion of the disposal facility (Figure 2). The demolition fill area rises approximately 35 feet above the surrounding ground surface and is bounded by drainage ditches on its south, east and west sides. The demolition/by-pass landfill primarily received demolition material and cannery wastes and became inactive in 1997. It received a final closure cover system in the fall of 1998 and winter of 1999. Landfill gas is currently removed from this fill area by the site's active landfill gas extraction system.

Northwest Fill Area

Ten additional unlined trenches, oriented in a north/south direction, were filled in an approximately 17-acre area in the northwest portion of the disposal facility (Dames & Moore 1996). The location of these excavations is shown on Figure 2 as closed sanitary landfill. Based on cover exploration findings, this fill area also may actually be one continuous excavation. The northwest fill area is bounded to the north by a drainage ditch, to the east by the transfer station and the backup landfill and access roads, to the south by the closed demolition/by-pass landfill, and to the west by a drainage ditch. During 1998, this area was graded to provide positive drainage off the fill trenches and seeded with grass. Additional cover filling and grading was completed in 2001 and again in 2003 to maintain positive drainage over the fill area. Landfill gas is currently being removed from the southern portion of this fill area by the site's active landfill gas extraction system. Treated soil from a former soil treatment facility tenant along with soil excavated during construction of the Cell IV ash monofill is currently being stockpiled in the northern area of this closed fill area as indicated on Figure 2.

Ash Monofills

In 1987, ash monofill Cell I was constructed with a one-foot thick clay bottom layer and a leachate collection system. Cell I is located adjacent to the east boundary of the landfill property near the current gatehouse (Figure 2). Cell I received ash from the Waste-to-Energy incinerator. The final cover system for Cell I was completed in October 1990. Ash monofill Cell II was constructed in 1990 south of and abutting Cell I. Cell II is also lined and has a leachate collection system. Cell II also received ash from the Waste-to-Energy incinerator. Cell II was closed to operation in early 1997 with a final cover system completed by the fall of 1997.

During the summer and fall of 1996, ash monofill Cell III was constructed in the northeast corner of the site (Figure 2) and began receiving waste on March 20, 1997. The Cell III liner system consists of two 60-millimeter smooth HDPE geomembrane liners that are separated by a 28-inch bentonite enhanced soil liner. The leachate collection and removal system (LCRS) for Cell III consists of two identical sumps, one for each half of the cell (north and south sub-cells). Each sump is constructed with two collection levels: Primary and

Secondary. The Primary LCRS is located on top of the upper geomembrane and collects the bulk of the leachate. The Secondary LCRS (SLCRS) is located under the soil liner and collects any liquid that penetrates the upper geomembrane and soil liner and/or any construction waters released from clay consolidation (i.e., the bentonite enhanced soil liner). Leachate from both the Primary and Secondary LCRSs are pumped to a lift station and then pumped to the leachate storage lagoon. During the summer of 2005, the northern portion of Cell III (approximately 5 acres) was closed with a final cover.

During the summer and fall of 2002, ash monofill Cell IV was constructed adjacent to the south side of Cell III (Figure 2). The Cell IV liner system consists of two 60-millimeter textured HDPE geomembrane liners that are separated by a geo-synthetic clay liner (GCL) that is adhered to 40-millimeter HDPE liner. The LCRS for Cell IV consists of three identical sumps, one for each third of the cell's fill area. Similar to ash monofill Cell III, each LCRS is constructed with two collection levels: a Primary and a Secondary. The Primary LCRS is located on top of the upper 60-millimeter HDPE liner and collects leachate that drains down through a 12 inch thick gravel drainage layer. This drainage layer is separated from the ash waste fill by 12 inches of native soil, which functions as an operations layer. A geotextile layer separates the operation soil layer from the gravel drainage layer. The SLCRS is located between the GCL and the top of the lower 60-mil HDPE liner. A geo-composite liner is present between the GCL and the SLCRS. The SLCRS collect liquid that penetrates the upper HDPE liner and the GCL. Leachate from both the Primary and Secondary LCRSs are pumped to a lift station, where they mix with leachate produced from Cell III, and then pumped to the leachate storage lagoon. The location of the Cells III and IV lift station and leachate storage lagoon is shown on Figure 2. A 20-millimeter temporary tarp is placed over unused portions of Cell IV for stormwater removal and cell protection.

The County began placing ash in Cell IV on February 10, 2004. Filling began in the northeast corner and is proceeding west along the south face of Cell III. A complete fill-sequencing plan has been incorporated into the NMCDF Operations Plan. A Cell IV filling objective is to dispose of ash in a manner that minimizes the exposed working face and prevents filled areas from coming into contact with precipitation. To meet this objective, the County has incorporated an ongoing "interim cover" tarping program to divert stormwater away from the ash cell and to prevent unnecessary contact with the ash, thereby minimizing the amount of leachate generated. This tarping program was also used during filling of adjacent Cell III.

In 2011 Marion County initiated an ash screening and metal recovery operation within the Cell IV ash monofill. A screening and recovery demonstration was completed in 2010 to determine the economic and operational feasibility of removing ferrous and non-ferrous metal from the ash and utilizing the ash alternative daily cover at the Coffin Butte Landfill. The screening and recovery operation has changed the way ash is handled. Daily management of incoming ash still involves pushing the ash up slope along the active face. However, instead of grading the ash to a final elevation and slope for closure, the ash is managed as a resource in a stockpiling fashion. The ash is pushed up slope into piles where it is allowed to de-water for future processing through the metal recovery screen plant. The active working face and processing area of the Cell IV monofill is graded to contain the precipitation within the ash cell. No ash has been placed in a portion of the southwest corner of Cell IV, which is used as a drainage swale for stormwater from the processing area.

Leachate Storage Lagoon and Treatment System

A lined leachate storage lagoon, located south of ash monofill Cells I and II (Figure 2), was completed in October 1988. The lagoon receives leachate from the leachate collection systems associated with the four ash monofill cells (Cells I through IV). Gas condensate from

the landfill gas flare system is also directed to the lagoon. The leachate generated by the ash monofill cells is characterized by high concentrations of salts (calcium, chloride, potassium, sodium, and sulfate) along with lower concentrations of trace metals (arsenic, barium, cadmium, copper, lead, nickel, selenium, and zinc). Historically, leachate in the lagoon was diluted with water from the spray irrigation water supply well and then spray irrigated onto an approximately 55-acre field located south of the landfill facility (Figure 2). Land application of the diluted leachate was discontinued in September 1997. A floating cover over the lagoon was installed in October 1998 to minimize rainfall from mixing with the leachate in the lagoon.

A leachate treatment system utilizing variable vacuum distillation (VVDS) was completed in 2002 and began regular operation in February of 2003. The VVDS was designed to remove leachate contaminants by distillation under a vacuum using mechanical vapor recompression resulting in a distillate (distilled water). Distillate from the VVDS was then to be applied to the Land Application Area (Figure 2 former spray irrigation area) using a drip irrigation method. The VVDS operated intermittently between July 2002 and June 2004 and due to ongoing performance issues was shut down on June 20, 2004, and subsequently dismantled and removed.

Beginning in 2006, through its agreement with Waste Connections, the County began transporting and disposing wastewater (leachate) contained in the lagoon to Finley Buttes Landfill and Wasco Landfill in eastern Oregon, both of which are operated by Waste Connections. Under the long-term agreement, Waste Connections loads, transports, treats and disposes approximately 3.5 million gallons of leachate per year. This is an estimated quantity and is dependent upon annual rainfall and the area of open landfill face. The historical annual production of leachate typically ranges from a minimum of 2.5 million gallons to 4.5 million gallons per year, depending on the amount of precipitation received and the surface area of the open active landfill face. Waste Connections is contractually required to transport and dispose of enough leachate by October 31st of each year to attain an elevation of 4.0 feet (3,008,000 gallons) or less in the leachate storage lagoon.

Backup Landfill Cell

A backup landfill cell was constructed along the north side of the site in 1989 (Figure 2). The purpose of the backup landfill is to receive unburned waste if operations at the Waste-to-Energy incinerator were halted for any length of time. The backup landfill has not been used. It is anticipated that the backup landfill cell will be modified and used in the future for disposal of ash.

Active Waste Management Areas

There are currently two active waste management areas at the facility. These two areas are:

1. Ash monofill Cell IV, located just south of Cell III (Figure 2). This ash monofill cell began to receive waste on February 10, 2004. Filling began in the cell's northeast corner and is proceeding west along the south face of Cell III. A complete fill-sequencing plan is contained in the NMCDF Operations Plan.
2. The transfer station and materials recycling area are located in the central area of the site (Figure 2). The transfer station was constructed in 1986 and expanded in 2007 to accommodate the increase in waste volume. The transfer station serves as the central collection point for self-hauling north-County residents and businesses.

Off-Site Management Areas

Off-site management areas include the 1973 Landfill Site and the Land Application Area. A brief description of the off-site NMCDF management areas are described below.

1973 Landfill Site

The closed 1973 Landfill is located approximately a half-mile southwest of the North Marion County Disposal Facility (Figure 1). The site is owned by Marion County. The former Marion County Department of Public Works Woodburn Shop is located adjacent to the southeast corner of the site (Figure 2). The approximately ten-acre solid waste disposal site began operation as an open burn-type landfill in the early 1950s. Waste disposal filling reportedly began in the southwest corner of the site where a swale apparently existed. Following waste incineration, the resulting ash was pushed to form a berm along and adjacent to Senecal Creek. Recycling of metal and other items was also conducted at the site during this time. Sometime during the period of 1966 to 1967 waste handling operations at the site switched from open burning to trench filling. Trench filling apparently started in the western area of site with filling progressing to the east. The fill trenches were reportedly 20 to 25 feet deep. The final fill trench is reportedly located just west of the Public Works Shop. Waste disposal at the site ceased in 1973 when landfilling at the NMCDF was initiated. The site operated before the solid waste program mandated by the State of Oregon Resource Conservation and Recovery Act was implemented. Consequently, the facility was never issued a solid waste disposal permit.

In response to public concerns raised during public meetings presenting the NMCDF Record of Decision, five monitoring wells (designated PW-1 through PW-5) were voluntarily installed by the county at the 1973 Landfill Site in 1999. Figure 2 shows the locations of the five wells. With the exception of well PW-5, the wells are completed in the upper portion of the Willamette Silt (WS) formation. Deeper well PW-5 is completed in the upper portion of the underlying Troutdale Formation (TF). Following installation in 1999, voluntary sampling of these wells was completed on a semi-annual basis until 2003 when a reduced monitoring frequency was implemented. A Senecal Creek sample point (SC-73) was established in 2000 adjacent to the down-stream corner of the landfill site.

Monitoring of the 1973 Landfill Site was further reduced in 2013 in response to concentration trends showing generally stable or declining trends and Senecal Creek SC-73 samples not indicating any notable change in water quality conditions compared with locations up- and down-stream of the landfill. In a letter dated April 16, 2013 DEQ approved a sample modification request focusing on confirming no impacts are occurring to the TF or Senecal Creek.

Land Application Area

The 55-acre Land Application Area is located immediately south of the NMCDF (Figure 1). The closed bypass/demolition landfill, ash monofill Cells I and II, and the leachate lagoon are located north of the application area. The closed 1973 Landfill Site and Senecal Creek are located west of the application area. Pasture grass (a mixture of tall fescue, perennial rye, white clover, and white oats) was planted in the application area in 1992. The pasture grass is mowed on an annual basis. Land use surrounding the Land Application Area is primarily agricultural (rotating crops) and, to a lesser extent, standing timber, with some rural residential development. Leachate treated by the VVDS was applied to the Land Application Area by means of drip irrigation. Following discontinuation of the VVDS in 2004, the Land

Application Area has been inactive with regards to NMCDF facility activities and used for growing pasture grass.

Prior to construction of the VVDS, leachate from the lined ash monofill cells had been applied to the 55-acre application area utilizing a spray irrigation method. By this method, leachate contained in the storage lagoon was mixed with clean "chase water" pumped from a nearby deep water supply well. This diluted wastewater was then applied, by means of spray irrigation, to the application area (previously referred to as the spray irrigation area). The former spray irrigation system became operational on August 22, 1989, and ceased operation eight years later on September 23, 1997. Spray irrigation of diluted leachate was terminated because elevated levels of chloride were detected in the groundwater beneath the application area.

There are nine existing Land Application Area wells (I-series wells) as shown on Figure 2. Following termination of the WPCFP associated with the land application area in 2007, the County continued voluntary sampling of seven I-series monitoring wells to assess groundwater quality changes over time in the Land Application Area. In 2010, the County transferred ownership of well I-33 to the land owner and the well became inactive. Sample results collected from the former land application area monitoring wells following discontinuation of spray irrigation in 1997 indicated that: the locations where historically highest concentrations were detected have decreased to the point that in a number of cases they are now below other sample points; there continues to be a general overall declining trend for all parameters; and most of the historic application contaminants (salts) have been flushed out. In April 2013 discontinuation of voluntary sampling of the Land Application Area monitoring wells was proposed. In a letter dated April 16, 2013, the DEQ agreed that voluntary post-usage monitoring of groundwater quality conditions of the former Land Application Area is no longer a significant concern.

REFERENCES

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Parametrix. 2007. Environmental Monitoring Plan Update, North Marion County Disposal Facility, Marion County, Oregon. Prepared by Parametrix, Portland, Oregon. October 5, 2007.

FIGURES

Parametrix DATE: January 24, 2011 FILE: N_Marion_Locator.mxd

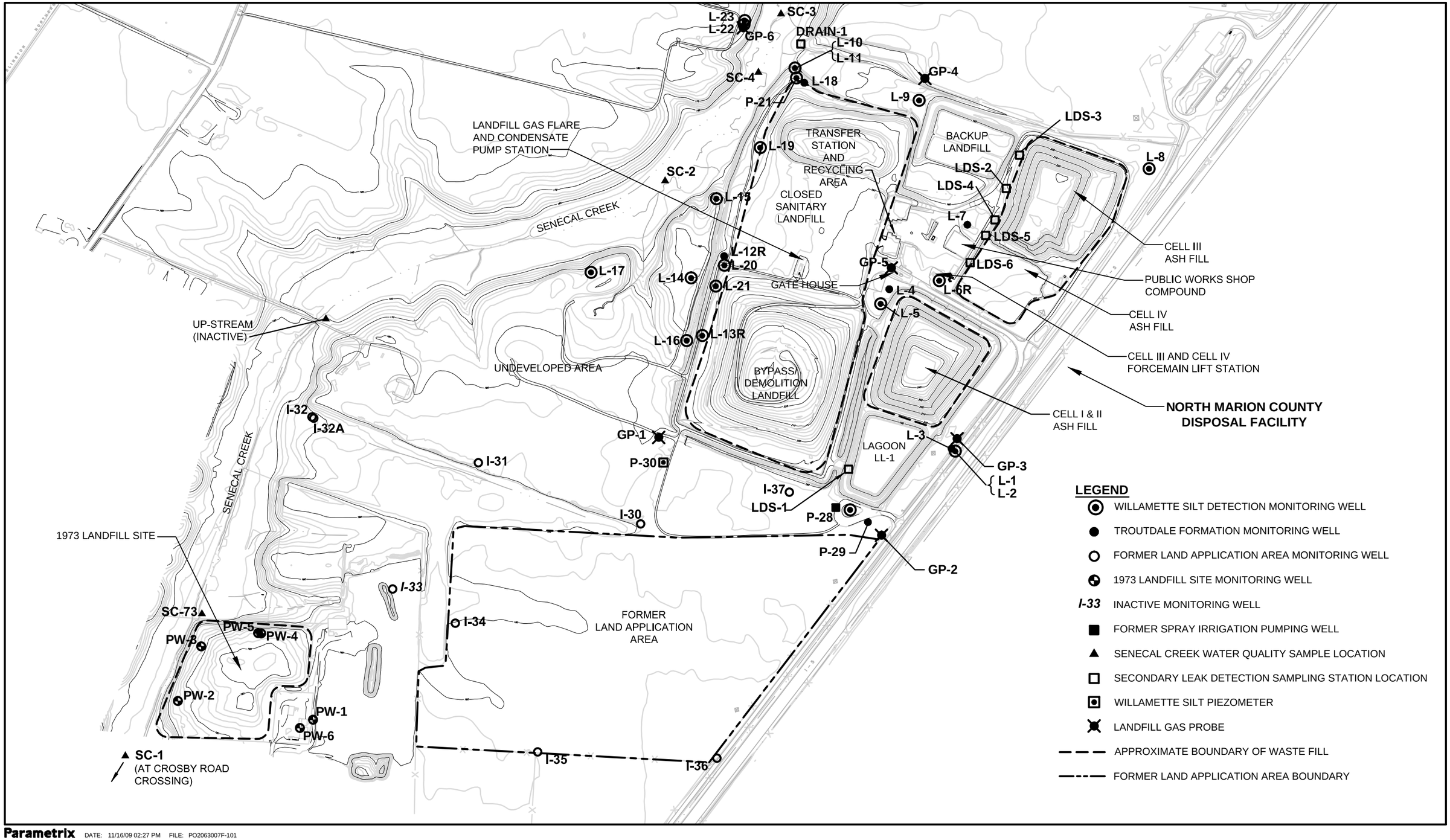
N

0 500 1,000 1,500

Feet

Figure 1
Site Location

Annual Environmental Monitoring Report
North Marion County Disposal Facility
Marion County, Oregon



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0 500'

SCALE IN FEET

Figure 2
Facility Site Map
Environmental Monitoring Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON

Water Quality Monitoring Plan
North Marion County Disposal Facility
Marion County, Oregon

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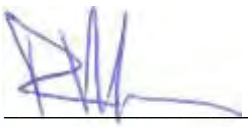
Portland, Oregon. June 2013.

CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a registered professional hydrogeologist licensed to practice as such, is affixed below.



Prepared by Rick Malin
Project Professional

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APPENDICES

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1. INTRODUCTION

This Water Quality Monitoring Plan (WQMP) is presented as Section 1 of the June 7, 2013 Environmental Monitoring Plan (EMP) for the North Marion County Disposal Facility (NMCDF). The June 2013 EMP incorporates site monitoring changes that have occurred since completion of the last EMP update on October 5, 2007 and reflects environmental monitoring requirements and reporting presented in the NMCDF Solid Waste Disposal Site Permit Number 240 issued on May 9, 2007.

The NMCDF EMP consists of five sections. Sections 2 and 3 contain the Leachate Control Management Plan (LCMP) and the Landfill Gas Monitoring Plan (LGMP), respectively.

Section 4 contains a Sampling and Analysis Plan (SAP) describing collection and analysis procedures and protocol for water quality sampling associated with the WQMP and LCMP.

Section 5 contains a copy of the NMCDF Solid Waste Disposal Site Permit (No. 240) for reference.

A brief description of the site location and operating background is provided below. A more detailed description of site location and background information, including the various on-site waste management areas and off-site management areas, is presented in the EMP introduction and plan organization text.

1.1 SITE LOCATION AND OPERATING BACKGROUND

The NMCDF is located in Marion County approximately three miles northwest of Woodburn, Oregon (Figure 1). The site is situated in the French Prairie region of the northern Willamette Valley and has been in operation since September 24, 1974. The facility currently provides the following waste disposal and recycling functions: waste transfer, material recycling, ash monofills, and backup landfill capability. Figure 2 shows the site's topography and its features and identifies various facility operations. Marion County is the owner, permittee, and operator of the NMCDF.

1.2 PLAN PURPOSE

This WQMP addresses water quality monitoring elements as required in Section 14.0 of the Department of Environmental Quality (DEQ) Solid Waste Disposal Facility Permit Number 240, issued on May 9, 2007. The WQMP describes the site's monitoring network and program used to monitor surface water quality (i.e., Senecal Creek and the wastewater lagoon) and groundwater quality conditions. The plan also describes past and current water quality conditions, the facility's water quality database, data evaluation procedures, and reporting format and requirements.

Section 4 of the EMP contains a SAP that describes the procedures for obtaining, preparing, documenting, preserving, and shipping water quality samples collected from the NMCDF site. The SAP establishes Quality Assurance/Quality Control (QA/QC) requirements for sample acquisition and handling.

Groundwater quality at the NMCDF is currently monitored through a network of 25 monitoring wells. Groundwater monitoring at the site extends back to 1975. The Record of Decision (DEQ 1999) provides an environmental monitoring history of the NMCDF, which is summarized in Section 3. The location of the three areas where water quality monitoring has been or is currently being completed is shown on Figure 1. The location of monitoring wells and piezometers in the three areas is shown on Figure 2. In addition to these monitoring

wells, 24 off-site domestic use water supply wells were previously part of the facility's water quality monitoring program. The location of these domestic use supply wells is shown on Figure 3.

Surface water quality is monitored at five locations along Senecal Creek, which flows along the western side of the facility.

Water quality samples were collected from the Land Application Area monitoring (I-series) wells as required by a Water Pollution Control Facilities Permit (WPCFP). As described in the EMP, the WPCFP was terminated in 2007. The County conducted voluntary water quality monitoring of the active I-series wells for five years following termination of the WPCFP at an annual frequency. Voluntary monitoring of the Land Application Area was discontinued following the fall 2011 event in response to continued improvement in groundwater quality conditions. Water level measurements are currently schedule to be collected from the active I-series wells during NMCDF semi-annual monitoring events to aid in the development of potentiometric contour maps.

Water quality samples were also voluntarily collected by the County from the 1973 Landfill Site to characterize conditions in this area. Monitoring of the 1973 Landfill Site was reduced to a Troutdale Formation monitoring well and a Senecal Creek sample point. Water level measurements are currently schedule to be collected from the PW-series wells located at the site during NMCDF semi-annual monitoring events to aid in the development of potentiometric contour maps.

Water quality samples are also collected from the wastewater lagoon, the Cell III groundwater gradient control discharge, and from secondary leachate collection and removal system (SLCRS) sampling stations. The collection and analysis of these samples are described in the LCMP.

A water quality sample schedule is provided in this WQMP that identifies locations, monitoring schedule, and frequency as presented in this plan.

1.3 SITE GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

A complete description of the geologic and hydrogeologic conditions at the site is presented in the Remedial Investigation Report (Dames & Moore 1996). A summary of these conditions are described below.

The NMCDF is situated in the French Prairie region of the northern Willamette Valley. This region is the largest of several broad plains in the main Willamette Valley area between the communities of Salem and Canby. It has an average mean sea level altitude of about 180 feet and slopes gently to the northwest (Price 1967). The flat French Prairie region is situated in a broad northeast-trending synclinal trough formed by the down warping of the Columbia River Basalt Group (CRBG) and older marine sediments.

Geologic units encountered at the NMCDF site during well installations, in stratigraphic order from youngest to oldest, consist of:

- Recent Holocene alluvium which includes the following soil groups in the site area: Woodburn silt loam, Amity silt loam, Willamette silt loam, Dayton silt loam, and Concord silt loam. The Dayton and Concord soil are present in the Senecal Creek floodplain and adjacent ephemeral drainages and have higher clay content.
- The Pleistocene Willamette Silt (WS) forms the uppermost geologic unit at the site. The unit consists of tan (oxidized condition) to blue gray (reduced condition) thinly

bedded silt, clay, and sandy clay. These silt deposits are associated with Pleistocene catastrophic flooded events down the Columbia River Gorge that temporarily ponded in the Willamette Valley. The uppermost groundwater system at the site is present in the WS.

- The Pliocene Troutdale Formation (TF), which underlies the Willamette Silt unit, consists of irregularly alternating and interbedded layers of clay, silt, sand, and gravel. The formation materials are largely derived from basaltic rocks and appear to have been deposited mainly by streams entering the French Prairie area from the south and east (Price 1967). Water-well log data in the site area suggests that the thickness of the unit is approximately 250 feet (Dames & Moore 1996).

Underlying the Troutdale Formation are the Sandy River Mudstone and the CRBG. The late Pliocene Sandy River Mudstone unit consists largely of bedded dark-gray clay and shale. The CRBG consists of a series of basalt lava flows. Neither of these units are penetrated by wells at the site or in the site area.

Movement of groundwater in the French Prairie area is radially outward from topographically high areas towards the Willamette and Pudding Rivers (Price 1967). Deeply incised streams that have intersected the water table (e.g., Senecal Creek) create local discharge areas for the uppermost groundwater system (i.e., the Willamette Silt hydrogeologic unit). Groundwater flow in the Willamette Silt unit in the site area appears to be primarily toward Senecal Creek or in a northwesterly to westerly direction.

The Troutdale Formation represents the primary water-bearing unit beneath the facility. The formation forms a series of permeable, semi-confined aquifers. The groundwater flow direction in the Troutdale Formation in the site area appears to be predominantly toward the northeast, with easterly and westerly flow components. This aquifer shows notable seasonal water level variation apparently due to water supply well pumping primarily for agricultural purposes.

Annual environmental monitoring reports for the NMCDF submitted over the past 10 years have documented observed groundwater flow direction and gradients in the WS and the TF at the site. Potentiometric contour maps of the WS and TF based on water level measurements collected during 2004, 2005, and 2006 and collected more recently during 2010, 2011, and 2012 are presented in Appendix A.

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2. WATER QUALITY MONITORING NETWORK

This section presents background information on the water quality monitoring network currently established at the site. This network consists of groundwater monitoring wells and surface monitoring points, and groundwater level measurement points. The monitoring of leachate and secondary leachate collection and removal system inspection points is presented in the LCMP contained in Section 3 of the EMP.

2.1 GROUNDWATER MONITORING WELL NETWORK

The site groundwater monitoring network consists of 40 monitoring wells and piezometers at the locations shown on Figure 2. Table 1 presents summary information for all monitoring wells at the NMCDF and the adjacent Land Application Area and 1973 Landfill Site. All monitoring wells at the site are secure, protected by bollards, and surveyed. Appendix B contains copies of the monitoring well logs.

Based on the current understanding of site hydrogeologic conditions, the functionality and integrity of the NMCDF monitoring well network is considered good for monitoring groundwater quality conditions at the site. An evaluation of the monitoring network was completed during the RI/FS. This evaluation led to decommissioning and installation of several wells. Regular maintenance is completed on monitoring wells to keep them assessable and in good working condition. Site developments have also led to the replacement of several wells. Replaced wells have been identified with a "R" designation (e.g., L-6R, L-12R, and L-13R).

The SAP, contained in Section 4 of the EMP, describes the procedure used to routinely evaluate and maintain the integrity of all monitoring points at the site. Section 3 describes historic and current groundwater quality conditions at the NMCDF. Section 4 describes how the groundwater monitoring network will be used to address site groundwater quality monitoring issues.

2.1.1 Network Development

As indicated in Table 1, monitoring wells generally have been installed at the site in phases over time. The groundwater monitoring wells were re-designated (re-numbered) during the summer of 1990 as described in the RI Report (Dames & Moore 1996). Wells designated with an "L" are monitoring wells associated with the NMCDF. Wells designated with a "P" were installed initially to serve as a piezometer with some of these wells now functioning as water quality monitoring locations for the NMCDF site. I-series wells are monitoring wells associated with the former Land Application Area. PW-series wells are monitoring wells associated with the 1973 Landfill Site. The oldest wells listed in Table 1 were installed in May 1982 with monitoring wells installed at the 1973 Landfill Site representing the most recently constructed wells.

2.1.2 Completion Depths

Monitoring wells at the NMCDF site have generally been completed in the following hydrogeologic zones:

- Shallow Zone of the WS: Wells L-1, L-5, L-8, L-9, L-11, L-15, L-16, L-17, L-19, L-21, L-22, P-21, P-28, and P-30. These wells are generally completed 20 to 25 feet below ground surface and are screened across the top of the water table.

- Intermediate Zone of the WS: Wells L-2, L-6R, L-10, L-13R, L-14, L-20, and L-23. These wells are generally completed 32 to 40 feet below ground surface and are screened in the intermediate to lower zone of the WS aquifer.
- Troutdale Formation: Wells L-3, L-4, L-7, L-12R, L-18, and P-29. These wells are completed 110 to 150 feet below ground surface and are screened in the upper portion of the TF.

Intermediate WS wells are either located adjacent to or near a shallow WS well.

Monitoring wells at the former Land Application Area are all shallow zone WS wells with the exception of inactive well I-32, which is screened in the upper portion of the TF.

Monitoring wells at the 1973 Landfill Site are also all shallow zone WS wells with the exception of PW-5, which is screened in the upper portion of the TF.

Figure 4 identifies monitoring wells at the NMCDF and the two adjacent sites with respect to which hydrogeologic zone each well is monitoring.

2.1.3 Well Survey

Survey of the monitoring well network was most recently completed by Marion County Public Works survey group during 2011. The survey included determining the location and vertical elevations of the water level measurement points (i.e., top of the well PVC) An element of the 2011 survey was the installation of seven benchmarks at the site. Benchmarks consist of ¾-inch rod driven down to 36 inches. All elevations are in NAVD88 units. All coordinates used Oregon Coordinate Reference System (OCRS) Salem Zone International Feet NAVD88. The northing and easting of each well and its water level measurement point elevation is identified in Table 1.

2.2 SURFACE WATER MONITORING NETWORK

Five surface water sampling points are currently used at the NMCDF to evaluate the water quality conditions of Senecal Creek. These Senecal Creek sampling points are as follows:

- SC-1: up-stream sample point on the down-stream side of the Crosby Road bridge
- SC-73: up-stream sample point located down-stream of the 1973 Landfill Site
- SC-2: up-stream sample point north of drainage reentrant present between wells L-14 and L-17
- SC-4: down-stream sample point located up-stream of the Cell III groundwater gradient control outfall (Drain-1)
- SC-3: down-stream sample point located down-stream of Drain-1.

Sample points SC-1, SC-2, and SC-3 were initially established with locations SC-73 and SC-4 added later

The location of these surface water sample points are shown of Figure 2. The location of the Crosby Road bridge sample point (SC-1) is outside of the area shown on Figure 2. The five Senecal Creek sample points, including SC-1, are shown on Figure 3.

2.3 OFF-SITE DOMESTIC WATER SUPPLY MONITORING NETWORK

Sampling of off-site drinking water supply wells was required by the March 1999 ROD. Further monitoring of the off-site drinking wells was discontinued in 2013 in response to sampling results that have not detected the presence of contaminants above primary water quality standards and levels. Past off-site supply well sampling results have not identified any indications of water quality issues associated with the NMCDF or identified drinking water quality issues other than the presence of iron and manganese above secondary standards. In a letter dated April 16, 2013 DEQ agreed with discontinuation of the off-site domestic water supply monitoring network. Information regarding the off-site domestic water supply monitoring network is retained in this EMP to serve as site associated reference material.

Annual sampling of all drinking water supply wells located west of I-5 and within a ¼-mile radius of the site was originally required in Section 9.1.1 of the ROD. There are four known active drinking water supply wells in this area. As stated in the 1999 ROD, the area of off-site drinking water well monitoring was to increase to a ½-mile radius west of I-5 during a year when a split sampling event with the DEQ Laboratory was scheduled to be completed at the site. Of the 31 drinking water wells identified in this area, the County received authorization to sample 24 of the wells. The County was relieved from sampling wells located on properties for which they could not gain reasonable access.

Figure 3 shows the location of the water supply wells located within a ½-mile radius of the NMCDF. Figure 3 is based on the groundwater-use survey presented in the Final RI/FS Report for the NMCDF (Dames & Moore 1996) and employs the same well identification scheme but modified to include additional well locations and location corrections. Wells identified with a “d” are drinking water supply wells. Wells identified with an “i” are irrigation wells. Figure 3 also shows monitoring well locations associated with NMCDF (L-series wells), Land Application Area (I-series wells), the 1973 Landfill Site (PW-series wells), and Senecal Creek surface water (SC-series) monitoring points.

Appendix C presents off-site drinking water supply well sampling information including well owner contact information; copy of the well log, if available; well location and sample point location maps; and past field sampling sheets.

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3. WATER QUALITY CONDITIONS

This section presents a review of historic and recent groundwater quality data for the site. The purpose of this review is to provide an understanding of past and current site water quality conditions. This understanding provides a basis and rationale for the approach to monitor the site's groundwater and surface water quality.

Groundwater and surface water quality samples have been collected at the site since 1975. A number of environmental studies were completed beginning in the mid 1980s and throughout the 1990s. The culmination of these studies was a RI/FS completed in 1998 with a ROD issued in 1999. The results of these studies found that groundwater quality impacts had occurred in the WS, the uppermost aquifer at the site, and that the impacts were most notable at wells located adjacent to the west side of the facility's closed trenchfill area. The studies found water quality impacts observed in the WS do not appear to extend down to the TF, the deeper aquifer beneath the facility. Groundwater flow in the WS is toward Senecal Creek, which runs along the west side of the facility and functions as a local groundwater discharge boundary for the WS. Monitoring of Senecal Creek water quality shows indications of agricultural-related impacts from up-stream sources and had been showing impacts from past wastewater disposal activities that were occurring at the former Land Application Area.

Remedial actions completed during and following the RI/FS have resulted in notable improvements in groundwater quality conditions at the site. It is anticipated these improving water quality conditions will continue with the maintenance of the cover systems and operation of the active landfill gas collection and discharge system.

3.1 FETROW INVESTIGATION FINDINGS

Russ Fetrow Engineering, Inc. completed a series of studies at the NMCDF during the late 1980s. These reports found increasing trends in select parameters of concern in groundwater quality samples collected from WS monitoring wells; particularly at wells L-14 and L-15 located adjacent to the west side of the trench sanitary fill area. A Preliminary Assessment was initiated and western WS wells L-16 and L-17 were installed in 1992. At this time there had been no confirmed violations of any state or federal primary drinking water quality standards (DEQ 1999). Results of a DEQ Laboratory sampling event completed during March 1993 revealed exceedances of several state or federal primary standards, including chromium at wells L-2, L-10, and L-11; arsenic at L-11; vinyl chloride and trichloroethylene at L-13; mercury at L-16; and benzene at P-21; all WS monitoring wells. Due to these conditions, it was determined that a remedial investigation/feasibility study was needed for the site.

3.2 REMEDIAL INVESTIGATION FINDINGS

The RI completed by Dames & Moore in 1996 noted that the most likely source of groundwater impacts observed at the NMCDF were from the unlined trenchfills in the northwestern portion of the facility and the unlined trenchfills overlain by the demolition landfill in the southwestern portion of the facility. Groundwater quality and flow direction data indicated that greater contamination appeared to be related to the southwestern part of the facility where the demolition landfill overlies the older trenchfills. It was assumed that the source of the contamination was buried materials placed in the trenchfill area that had come in contact with or was in close proximity to the shallow groundwater table (i.e., shallow WS). The RI concluded that groundwater contamination in the southwestern portion of the facility

included volatile organic compounds and nickel while the northwestern portion of the facility was primarily nickel.

An endangerment assessment of the site's groundwater determined that the primary constituents of concern was manganese, nickel, vanadium, benzene, 1,4-dichlorobenzene, 1,2-dichlorobenzene, 1,2-dichloroethane, 1,1-dichloroethene, tetrachloroethene, trichloroethene, and vinyl chloride. The endangerment assessment reduced this list of primary constituents of concern down to nickel, tetrachloroethene (PCE), trichloroethene (TCE), and vinyl chloride as the constituents of concern. Nickel was found to have been detected at a concentration above its primary drinking water standard in WS monitoring wells L-5, L-6, L-8, L-11, L-13, L-14, L-15, L-16, and L-17 and appeared to be the most widespread groundwater contaminant at the landfill. The RI report noted that elevated nickel concentrations were also observed in up-gradient wells above its primary drinking water standard. PCE and TCE were found to exceed their primary drinking water standard at WS wells L-13, L-16, and P-24 located adjacent to the west side of the trenchfill/demolition landfill. Low concentrations of VOCs were also noted to be present in WS wells L-14, L-15, and P-23, located west of the trenchfill area. Vinyl chloride was detected above its primary drinking water standard in WS wells P-24 and P-22 located adjacent to the west side of the trenchfill area.

The findings of the RI and the Endangerment Assessment were used to develop Remedial Action Objectives (RAOs). As described below, based on the RAOs, remedial actions were developed and screened in a Feasibility Study (Dames & Moore 1998). Based on these studies, the DEQ completed a Record of Decision for the NMCDF.

3.3 RECORD OF DECISION FINDINGS

DEQ's March 29, 1999 Record of Decision (ROD) noted that the results of groundwater monitoring had located at least one contaminant plume leaving the landfill compliance boundary along nearly the entire west side of the landfill in the WS. The source of the plume was thought to be from the trenchfill areas and the demolition landfill area. The ash monofill cells were not a suspected source of the observed groundwater impacts due to the type and nature of the contamination; primarily trace metals and VOCs. It was noted that trace metals are common in the ash, VOCs are not since they would have been burned off during the waste incineration process. Further, it was noted, there was a lack of salts in the contaminant plume, which is a clear indicator of the ash leachate. It was noted that there are a few detection wells between the ash cells and the trenchfill area, but that no correlation was present between what was observed in wells located down-gradient of the ash monofill cells and the contamination observed at the compliance boundary monitoring wells.

The ROD noted that no known impact to the Troutdale Formation or to any surface water (i.e., Senecal Creek) from landfill. Based on the findings of the Endangerment Assessment and an Ecological Assessment, RAOs were defined for groundwater (the WS and the TF) and surface water (Senecal Creek). Based on these RAOs, remedial actions were identified for the WS, the TF, and Senecal Creek. The FS developed and screened various remedial action alternatives to address the RAOs and based on this review and the Endangerment Assessment, recommended continued water quality monitoring of wells in the TF and WS and Senecal Creek with site actions including installation of an active landfill gas collection and discharge system, closing and installing a cover system of the demolition landfill, and regrading and maintaining positive drainage over the trenchfill areas.

The ROD, in general, adopted the recommendations of the FS and established specific actions. For the continued monitoring recommendation, actions identified in the ROD

included: the installation of several additional WS monitoring wells; establishment of trigger levels for several TF monitoring wells; actions to respond to confirmed changes at specified down-gradient WS wells; establishment of trigger levels for Senecal Creek; and implementation of an off-site drinking water well monitoring program. Institutional related actions included installation of an active landfill gas collection and discharge system; construction of a cover system over the closed demolition landfill; regrading and maintaining positive drainage over the trenchfill area; installation of fencing; purchasing of adjacent property that has or may become impacted by groundwater; and maintain public communication regarding environmental conditions at the site and site development activities.

Since they were issued in 1999, these ROD requirements have been carried forth by Marion County. The trigger levels for the TF were revised in 2004 due to errors associated with the levels originally established in the ROD. The renewed SWDSP for NMCDF identifies the current trigger levels for the TF in Attachment 2 where they are referred to as Remedial Action Concentration Limits (RACLs).

3.4 1973 LANDFILL SITE

Public meetings conducted to present the ROD found that there was concern by local residents that studies completed at NMCDF had not addressed the nearby closed 1973 Landfill Site located approximately a half-mile southwest of the NMCDF. A description of the 1973 Landfill Site is presented in the EMP. In response to these concerns, five monitoring wells (PW-1 thru PW-5) were installed at the 1973 Landfill site in 1999. Monitoring of the five wells and an adjacent water supply well (designated PW-6) at the inactive Crosby Street Public Works Shop, was initiated in 1999 and sampled along with the NMCDF wells on a semi-annual basis for the standard landfill groundwater quality parameter set. Samples results indicated that two wells (PW-2 and PW-4) showed elevated concentrations of cations and anions. Several trace metals and VOCs were also detected in the samples from wells PW-2 and PW-3. Five VOCs were detected in the sample from well PW-4 (ether, vinyl chloride, 1,4-dichlorobenzene, benzene, and tetrahydrofuran) and three (ether, vinyl chloride, and napthalene) in the sample from well PW-2. The concentration of VOCs detected did not exceed any drinking water quality or groundwater quality standards. The sample from WS background well PW-1 showed indications of agricultural impacts in the form of nitrate and sulfate, which were detected at higher concentrations than at the down-gradient wells.

The 1973 Landfill site PW-series wells were monitored on a semi-annual basis until 2003 when a reduced monitoring frequency was implemented in response to improving groundwater quality conditions. A Senecal Creek sample point (SC-73) was established in 2000 adjacent to the down-stream corner of the landfill site to evaluate site impact on creek water quality. Monitoring of the 1973 Landfill Site was further reduced in 2013 in response to concentration trends showing generally stable or declining trends and Senecal Creek SC-73 samples not indicating any notable change in water quality conditions compared with locations up- and down-stream of the landfill. In a letter dated April 16, 2013 DEQ approved a sample modification request focusing on confirming no impacts are occurring to the TF or Senecal Creek. Sampling of the 1973 Landfill Site WS wells PW-1 through PW-4 was discontinued. The results of monitoring completed at the 1973 Landfill Site have been presented in the NMCDF Annual Environmental Monitoring Reports.

3.5 LAND APPLICATION AREA

Prior to construction of the leachate treatment system (i.e., the VVDS; described in the EMP), leachate had been applied to the 55-acre Land Application Area utilizing a spray irrigation method. By this method, leachate contained in the storage lagoon was mixed with clean "chase water" pumped from a nearby deep water supply well. This diluted wastewater was then applied, by means of spray irrigation, to the 55-acre Land Application Area (previously referred to as the spray irrigation area). The former spray irrigation system became operational on August 22, 1989, and ceased operation on September 23, 1997. Operation of the spray irrigation system was permitted by Water Pollution Control Facilities Permit Number 101258.

The results of groundwater samples collected for the Land Application Area monitoring (I-series) wells indicated that upward concentration trends of salt-related contaminants associated with the leachate was occurring. These upward trends were observed primarily at wells I-30, I-33, I-34, I-35, and I-36. Exceedances for chloride and TDS occurred at wells I-30, I-34, I-35, and I-37 and for nitrate at wells I-30, I-31, and I-35. The elevated nitrate detected was determined not to be associated with the land application system, but caused by off-site agricultural-related activities. During a study to address groundwater conditions occurring in the Land Application Area, it was discovered that a drain tile system was present in the former spray irrigation application area, which drained off county property and into Senecal Creek. The drain tile system was subsequently plugged by sealing the main drain at every collector drain junction using a combination of mechanical plugs, bentonite, and soil.

A Groundwater Monitoring Plan (GMP) for the Land Application Area was completed to address groundwater monitoring requirements set forth in Water Pollution Control Facilities Permit Number 102364, dated November 5, 2001. This GMP described the groundwater quality monitoring program for Land Application Area in response to permit requirements. The Permit allowed leachate treated by the VVDS to be applied to the Land Application Area by means of drip irrigation. As described in the EMP operation of the VVDS ceased in June 2004. Leachate is now transport and disposed off-site. The DEQ terminated the site's Water Pollution Control Facilities Permit associated with the former land application area in 2007. The County continued voluntary sampling of the active I-series monitoring well network to assess groundwater quality changes over time in the former Land Application Area. In 2010, the County transferred ownership of well I-33 to the land owner and the well became inactive. Sample results collected from the former land application area monitoring wells following discontinuation of spray irrigation in 1997 indicated that: the locations where historically highest concentrations were detected have decreased to the point that in a number of cases they are now below other sample points; there continues to be a general overall declining trend for all parameters; and most of the historic application contaminants (salts) have been flushed out. In April 2013 discontinuation of voluntary sampling of the Land Application Area monitoring wells was proposed. In a letter dated April 16, 2013, the DEQ agreed that voluntary post-usage monitoring of groundwater quality conditions of the former Land Application Area is no longer a significant concern. Since 2006, results of monitoring completed at the former Land Application Area have been presented in the NMCDF Annual Environmental Monitoring Reports.

3.6 RECENT ANNUAL ENVIRONMENTAL MONITORING REPORT FINDINGS

Annual Environmental Monitoring Reports (AEMRs) for the NMCDF have presented comprehensive reviews of water quality data collected at the site each year. Recent

monitoring results have observed the following conditions with particular focus on the issues identified in this section.

3.6.1 NMCDF

WS wells located adjacent to the west side of the trenchfill area continue to show the greatest indications of water quality impact. Groundwater quality monitoring results for the past two years indicate that samples from WS wells L-11, L-10, P-21 and to a lesser extent WS wells L-13R and L-19 show the greatest overall indications of water quality impact. These WS wells are all located adjacent to the west side of trenchfill area; primarily near its northwest corner. In general, at the NMCDF, the highest concentration, in terms of total ion concentration, are observed in the northern most wells and decrease toward the south. Samples from wells L-11, L-10, and P-21 have the highest total ion concentrations followed by wells L-19, L-13R, L-20, and L-16, which are all located west of the trenchfill area. Overall, these wells have been showing water quality improvements overtime. Wells L-14, L-15, and L-17, which are also located west of the trenchfill area are showing lower overall total ion concentrations and generally stable concentration levels with no discernible long-term trends. Construction of the cover system over the demolition landfill, maintaining a positive drainage in the cover system over the trenchfill area, and installation and operation of the active landfill gas collection and discharge system are actions that are considered to be responsible for the observed improvement in groundwater quality conditions at these wells.

Many of the past detections of trace metals at concentrations that exceeded their water quality standard appear to have been in part due to excessive sample turbidity. Sampling methodologies have been utilized at the site to collect groundwater samples with an objective of limiting sample turbidity. The combination of sampling methodology and developed monitoring wells has produced samples with appropriate total suspended solid concentrations. An example of these changes is nickel. The highest nickel concentrations are still detected in WS wells located adjacent to the west side of the trenchfill. However, nickel concentrations detected in these wells have declined notably overtime. While the drinking water standard of 0.1 mg/l for nickel was remanded in 1995, this concentration limit was last exceeded in 1998 in samples from wells L-13 (since replaced by L-13R) and more recently installed wells L-21 and L-22. During the past several years, the only trace metal detected at a concentration that exceeds a water quality standard is arsenic. Arsenic is regularly detected above its water quality standard at adjacent WS wells L-11 and L-10. Arsenic concentrations at L-11 have varied and appear to shows a seasonal pattern. Sampling of adjacent deeper WS well L-10 for arsenic, initiated beginning with the Fall 2006 event, indicates that arsenic concentrations at well L-10 appear to be stable and below its water quality standard.

Following installation of the active landfill gas collection system, there has been a notable decline in the number and concentration of VOCs detected in groundwater samples from the NMCDF. VOCs continue to be generally detected at WS wells L-10, L-11, L-13R, L-19, and P-21. These wells are all located along the west side of the trenchfill area. VOCs are more recently no longer being detected in wells L-15, L-20, and L-21. The greatest number of VOCs are detected in samples from well P-21 where the concentration of benzene in samples from this well since 1993 has ranged from 6.30 µg/l and 4.10 µg/l. Benzene at well P-21 is the only VOC and location where a VOC had been detected above a drinking water quality standard but not since 2009.

Constituents that are regularly detected above their secondary drinking water standard or groundwater quality guidance level at the NMCDF are total dissolved solids, manganese, and iron. These exceedances generally occur in WS wells located along the west side of the trenchfill area as follows:

- Total dissolved solids: detected above OAR 340-40 Table 3 Groundwater Quality Guidance Level of 500 mg/l - wells L-10, L-11, L-13R, and P-21.
- Manganese: detected above OAR 340-40 Table 3 Groundwater Quality Guidance Level of 0.05 mg/l - wells L-2, L-10, L-11, L-13R, L-19, L-20, P-21, and all seven TF wells.
- Iron: detected above OAR 340-40 Table 3 Groundwater Quality Guidance Level of 0.3 mg/l - wells L-10, L-11, L-13R, L-19, L-20, P-21 and TF wells L-3, L-4, L-18, and PW-5.
- The field collected pH measurements at wells L-2, L-5, L-8, L-14, L-15, L-16, L-17, L-19, L-21, L-23, and P-21 are generally below its 6.5 su pH guidance level range.

Trigger levels established by the ROD for the TF have not been exceeded since the values were revised in 2004. An exception was arsenic in TF well L-12. Monitoring results from TF well L-12 indicated that changes in pH and oxidation/reduction potential (redox) was occurring in the well. A result of the apparent water chemistry change was the detection of elevated arsenic concentrations that exceeded the remedial action concentration limit established for L-12. Follow up verification sampling, however, consistently did not confirm initial sample results. It was suspected that a break or crack in the PVC casing of L-12 had occurred at around 11 to 15 feet below ground surface. This crack/break allowed shallow oxidized (positive redox) and slightly acidic WS water to enter the well and mix with TF water screened by the well that is reduced (negative redox) and slightly basic. The mixing of these two different water types appeared to have caused precipitates to occur as most notably expressed by several arsenic detections observed over the past couple of years. Well L-12 was abandoned and replacement well L-12R was installed during the week of November 12, 2012 Results from L-12R are similar to historic L-12 results.

Note that manganese is detected above its secondary standard in all TF monitoring wells and iron is detected above its secondary standard in half of the TF wells. Concentrations in the TF wells are fairly consistent over time and show no discernible trends.

The Senecal Creek trigger level for nitrate has been exceeded in the past. However, these exceedance events were not associated with the landfill due to the observation that elevated nitrate levels were observed in all Senecal Creek sample points at the time of the exceedance. Concentrations observed in Senecal Creek over time have been quite variable. Water quality conditions can differ year to year in part by the volume of water flowing in the creek during a given sampling event as well as potential impacts to the creek's water quality caused by activities occurring up-stream of the site. Senecal Creek originates south of Woodburn and runs adjacent to the western outskirts of Woodburn where a mixture of agricultural, residential, and commercial activities occur.

3.6.2 1973 Landfill Site

Groundwater samples collected from the 1973 Landfill Site indicate that WS well PW-4 followed by PW-2 show the greatest indications of water quality impacts. However, the concentrations of contaminants detected do not exceed a primary drinking water standard. Samples from WS well PW-3 have concentrations that generally lie between those detected at PW-2 and PW-4 and background concentrations detected at well PW-1. Samples from wells PW-2 and PW-4 are characterized by the presence of elevated concentrations of cations and anions (specifically calcium, chloride, magnesium, bicarbonate, and manganese) and leachate indicator parameters such as chemical oxygen demand and total organic carbon. Generally, the concentrations of these parameters are slightly higher at well PW-4. However, over time

the concentrations of several parameters have increased slightly at well PW-2 while decreasing at well PW-4. Consequently, total dissolved solids concentrations in samples collected from the two wells are becoming similar over time. The two wells do have some water quality differences. Well PW-2 is characterized by slightly higher chloride concentrations, while PW-4 has higher ammonia, iron, sodium, and sulfate concentrations. More recently, there are several parameters showing notable seasonal variations at both wells.

Several trace metals are detected in groundwater sample collected at the site. However, only barium is detected in all samples. There was no one location where the greatest number or highest concentrations of trace metals are generally detected. Sample turbidity can bias the detected and reported concentration of total (unfiltered) trace metal species collected at the site. VOCs are detected in samples collected from wells PW-2 and PW-4. Historically a couple of one time VOC detections occurred at WS wells PW-1 and PW-3. Naphthalene is consistently detected at PW-2 while benzene is consistently detected at PW-4. Ethyl ether (reported as a tentatively identified compound) is also detected at the two wells. The tentatively identified compound chlorodifloromethane is also regularly reported in samples collected from well PW-4. The concentrations of VOCs detected from water quality samples collected at the site have not exceeded a drinking water quality or groundwater quality standard.

Samples from WS background well PW-1 show indications of agricultural impacts primarily in the form of nitrate and to a lesser extent sulfate. Nitrate is detected at around 5 mg/l at well PW-1 but generally not detected in the other wells at the site. The sulfate concentrations detected at well PW-4 are substantially higher than any other sampling location but appears to be decreasing.

3.6.3 Land Application Area

Groundwater monitoring results from the I-series wells indicates that locations with the highest concentrations (wells I-30, I-34, and I-35) are showing both notable downward and upward trends. Chloride, conductivity and, to a lesser extent, TDS are declining in well I-30, while sodium and sulfate are both showing upward trends. Sulfate is increasing at well I-34 while other parameter concentrations are declining. Concentrations in well I-35 are increasing for sodium and potassium while trending downward for conductivity, nitrate, sulfate and TDS. With the exception of sodium and sulfate, concentrations in wells I-30, I-34, and I-35 are declining. Well I-33 is also showing a notable upward trend for sulfate. Chloride concentrations detected at wells I-30 and I-35 remain above its secondary water quality standard.

Seasonal variability has been evident in past monitoring of the Land Application Area monitoring wells. Generally an increase in concentrations was observed in the fall and a decrease in the spring. This correlation, while not nearly as pronounced as during previous years, is still somewhat evident. The observed seasonal pattern appears to be due in part to a decrease in the source of these salts in concurrence with seasonal precipitation. As noted in the Groundwater Monitoring Plan (Parametrix 1998), as distillate is applied on the land application area by means of drip irrigation along with normal precipitation events, groundwater quality conditions are anticipated to improve. It is also anticipated that an improvement in groundwater quality conditions (decreasing concentration trends) would not be immediately observed due to salts (chloride, sulfate, sodium, and potassium) from past leachate application activities residing in the vadose zone (or zone of aeration). It was anticipated that it would take several years for the existing salts residing in the vadose zone to be flushed out, eliminating it as a source of further groundwater quality degradation. The results of recent samples collected from the area suggest that some degree of vadose zone

flushing has occurred, which in turn is leading to decreasing concentration of salts being detected in groundwater samples.

4. SITE WATER QUALITY MONITORING APPROACH

This section describes how water quality conditions at the site described in Section 3 will be monitored using the existing monitoring network described in Section 2.

As detailed in Section 3, water quality monitoring of the site has been completed at the NMCDF site since 1975. These monitoring activities and associated environmental studies found that groundwater quality impacts had occurred in the WS; the uppermost aquifer beneath the site. Groundwater flow in the WS has been consistently documented as flowing toward Senecal Creek, which is understood to function as a local discharge boundary for the aquifer. A series of WS monitoring wells have been installed along the western boundary of the site's waste fill and between the fill area and Senecal Creek. WS monitoring wells associated with the NMCDF have also been installed along the north, south, and east sides of the facility boundary. Two WS wells are located in the middle of the facility. WS wells have been installed primarily in two zones; the shallow zone representing water table wells and the intermediate zone representing the more permeable area of the WS. The WS wells in combination with the Senecal Creek water quality monitoring points, consistent with the RI/FS, are used to provide continued monitoring of this area of the site.

The RI/FS found that there were no known water quality impacts to the TF or Senecal Creek. The ROD agreed with these findings and based on the findings from the Endangerment Assessment and the Ecological Assessment, established trigger levels for Senecal Creek and TF monitoring points. The trigger levels for the TF were revised in 2004 and are presented in Attachment 2 of the NMCDF May 9, 2007 Solid Waste Disposal Site Permit as Remedial Action Concentration Limits. Section 17.3 of the Permit identifies TF wells L-7, L-12, and L-18 as the compliance points for the site. In November 2012, well L-12 was replaced by well L-12R due to issues described in Section 3.6.1.

Based on the above framework, groundwater and surface water quality monitoring of the site will consist of the following elements:

1. Detection monitoring of the WS, Senecal Creek; and select TF wells.
2. Compliance monitoring of TF wells L-7, L-12R, and L-18.
3. Detection monitoring of the 1973 Landfill Site.
4. Post use monitoring of the Land Application Area.
5. Off-site water supply monitoring program.
6. Water level measurement program.

These water quality monitoring elements are described below.

Table 2 identifies the wells represented in the detection and compliance monitoring programs. Table 2 also identifies leachate monitoring points and secondary leachate collection and removal system inspection points described in the LCMP. The water quality parameter groups to be analyzed, their frequency, and schedule are identified in Table 2. Table 3 identifies the analytes represented in each of the parameter groups identified in Table 2. As shown on Table 3, there are two lists of parameters associated with the parameter groups. The NMCDF Indicator Parameters represent a select number of parameters associated with the NMCDF Permit Parameter list. The NMCDF Indicator Parameters represent an optimization of the facility's groundwater monitoring program. NMCDF Indicator Parameters were proposed in the NMCDF 2010 AEMR along with an application schedule.

These modifications were approved and implemented in 2011 consistent with DEQ's 2010 AEMR approval letter dated February 15, 2011.

4.1 DETECTION MONITORING

The purpose of the detection monitoring program is to collect water quality data from wells screened in the WS and from Senecal Creek such that changes in the water quality of the WS, particularly down-gradient of the facility, and the creek can be detected. As described in Section 3, water quality impacts have occurred in the WS along the west side of the facility waste boundary. However, with completion of corrective actions in the form of final cover system installation and enhancements and operation of an active landfill gas extraction system, water quality conditions in the WS have been improving. Impacts to Senecal Creek attributed to the landfill have not been observed. The objective of the detection monitoring program will be to continue to obtain water quality data to verify improving conditions or identify the occurrence of an adverse change to the water quality in the WS and/or in Senecal Creek.

4.1.1 Willamette Silt Wells

The following WS well groups will be used for the NMCDF detection monitoring program:

- Willamette Silt Tier I Detection Wells: L-10, L-11, L-13R, L-15, L-19, L-20, and L-21. These wells are located downgradient and closest to the landfill's western fill boundary.
- Willamette Silt Tier II Detection Wells: L-2, L-5, L-9, L-14, L-16, and P-21. These wells are located west of Tier I wells, in waste, or downgradient of an ash monofill cell.
- Willamette Silt Tier III Detection Wells: L-6R, L-8, L-17, L-22, L-23, and P-28. These wells are located at cross-gradient locations, in the central area of the facility, or west of Tier II wells.

The location of these wells is shown on Figure 5.

4.1.2 Senecal Creek Sample Points

The Senecal Creek sample points SC-1, SC-2, SC-3, SC-4, and SC-73 will be used for the NMCDF detection monitoring program. The following is a description of these surface water sample points:

- SC-1: This is an up-stream sample point located on the down-stream side of the Crosby Road bridge.
- SC-73: This sample point is located adjacent to the up-stream side of the 1973 Landfill Site fence and up-stream of the NMCDF. SC-73 primarily serves as a down-stream surface water sample point for the 1873 Landfill Site.
- SC-2: This sample point is located just down-stream of the convergence of a small drainage located west of the NMCDF facility. The SC-2 sample point functions as a mid-point location for the NMCDF site.
- SC-3: This sample point is slightly down-stream of the northwest corner of the NMCDF facility. It functions as the primary down-stream monitoring point.

- SC-4: This sample point is located slightly up-stream of the northwest corner of the NMCDF facility. It is located up-stream of the monofill Cell III groundwater gradient control discharge location. It also serves as a secondary down-gradient monitoring point.

The locations of the Senecal Creek sample points are shown on Figure 2 and 3. As indicated in Table 2, sample point SC-73 is only sampled during spring events. All or portions of Senecal Creek are typically dry during the fall monitoring events. During the spring event period, Senecal Creek can be found to flood its low lying drainage valley making access to or locating its drainage channel difficult. Samples from Senecal Creek will only be collected when water is continuously present in its drainage channel between up-stream sample point SC-1 and down-stream sample point SC-3.

4.1.3 Troutdale Formation wells.

As indicated in Table 2, all five NMCDF TF monitoring wells are sampled on the same schedule and frequency. The location of the TF monitoring wells is shown on Figure 2. TF wells L-3, L-4, and P-28 function as TF detection wells while wells L-7, L-12R, and L-18 function as compliance wells. 1973 Landfill Site TF monitoring well PW-5 is also sampled annually in the fall. Results from this well are included in the annual TF water quality review. TF well L-4 is an on-site nonpotable water supply well. Water from this well is used for irrigation of landscaped areas at the facility. Most of the landscape areas are irrigated by drip irrigation method.

4.2 COMPLIANCE MONITORING

Section 17.3 of the Permit identified TF monitoring wells L-7, L-12 (now L-12R), and L-18 as the designated compliance points. Remedial Action Concentration Limits (RACLs), as presented in Attachment 2 of the permit are applied to these three compliance wells. Based on water level measurements collected from the site, these three TF wells are down-gradient TF wells.

4.3 1973 LANDFILL SITE DETECTION MONITORING

As indicated in Table 2, TF monitoring well PW-5 is sampled annually in the fall. Senecal Creek sample point SC-73, which is also associated with the 1973 Landfill Site but part of the NMCDF surface water detection monitoring program, is sampled annually in the spring. As indicated in Section 3.4, sampling of the WS wells PW-1 through PW-4 has been discontinued. An adjacent non-potable water supply well (designated PW-6 and shown on Figure 3) was originally sampled during site monitoring events and then was sampled as part of the domestic well monitoring events that has also been discontinued as indicated in Section 2.3.

4.4 LAND APPLICATION AREA DETECTION MONITORING

As described in the EMP, monitoring of the former Land Application Area was originally completed to address groundwater monitoring requirements set forth in Schedule B2 of Water Pollution Control Facilities Permit (WPCF) Number 102364 issued on November 5, 2001. The WPCF provided for the construction, operation, and maintenance of a leachate collection, treatment, and land irrigation system. As described in the EMP, the treatment and land irrigation system is no longer in use and the WPCF has been terminated. As described in

Section 3.5, the post-use monitoring program of the former Land Application Area I-series monitoring wells has been discontinued.

4.5 OFF-SITE WATER SUPPLY MONITORING PROGRAM

The Groundwater Use Survey presented in the RI Report (Dames & Moore 1996) identified 27 domestic use water supply wells and 17 irrigation wells within a 1/2-mile radius of the NMCDF site. Implementation of an annual sampling program of drinking water supply wells located west of I-5 and within a ¼-mile of the site was required by the ROD. As indicated in the ROD, sampling of wells located within a ½-mile radius west of I-5 would be conducted during those years when a split sampling event was conducted at the site.

The off-site water supply monitoring program was initiated in 1999. Thirty one wells were found to be located within a ½-mile radius west of I-5. Sampling of wells located within a ½-mile radius west of I-5 was completed five times between 1999 and 2005. A more limited sampling of wells located within a ¼-mile was completed twice during this six year off-site well monitoring period.

In response to the development of a characterization data set for these wells, the sampling frequency of the off-site drinking water supply wells was reduced following the 2005 sampling event. Sampling of the 24 wells was completed in 2009. As described in Section 2.3, the off-site water supply monitoring program has been discontinued. Appendix C contains well location and past monitoring event summary tables and specific sample location information. This information regarding the off-site domestic water supply monitoring network is retained in Appendix C to serve as site associated reference material.

4.6 POTENTIOMETRIC MEASUREMENTS

Historically attempts have been made to collect depth to groundwater level in all monitoring wells at the site within a period of 8 hours and ideally within 4 hours to limit the possible effects of diurnal and barometric pressure changes. Water levels in WS wells have been observed to change fairly slowly and potentiometric contour maps have consistently indicated groundwater flow in the WS is toward Senecal Creek. Water level changes have been observed to occur more rapidly in TF wells, which are semi—confined and influenced by seasonal pumping. The potentiometric surface of TF in site area has a low gradient. Consequently, the collection of water level measurements from all TF wells during the first day of a semi-annual monitoring event should be completed. As indicated in Table 2, depth to water level measurements are also to be collected from the former land application area I-series wells and the 1973 Landfill Site PW-series wells. Sections 3.4 and 9.2 of the SAP describe the procedure to collect water level measurements.

Site maps depicting piezometric water level contours for the Willamette Silt and Troutdale Formations at the NMCDF for water level measurement events completed from 2004 to 2006 and more recently from 2010 to 2012 are presented in Appendix A.

5. REVIEW AND REPORTING OF WATER QUALITY RESULTS

This section describes how water quality data collected at the site will be managed, reviewed, and reported.

Analytical data of water quality samples collected from the NMCDF extends back to 1975. Since 1989, water quality samples have been collected at the NMCDF by representatives (or contractors) of Marion County and the DEQ Laboratory primarily on a semi-annual basis. A water quality database of samples collected at the landfill site since 1988 was developed in 1997 (Dames & Moore 1998) and has undergone several iterations of data quality and completeness reviews.

The NMCDF water quality database is currently on a Microsoft Access platform and was developed as an element of the NMCDF Remedial Investigation effort and initially used to complete an Endangerment Assessment for the site to evaluate the potential of human health risks associated with chemical releases at NMCDF. This database is regularly maintained and updated as analytical results of water quality samples collected from the site become available. Electronic data deliverables (reports) received from the laboratory are imported directly into the database reducing data entry error. Water quality reports for the site are generated using this database. Backup copies are annually produced and stored on compact disc.

Reports from the database are presented in Annual Environmental Monitoring Reports (AEMRs). As stated in Section 18.2 of the Permit, prior to February 1st of each year, two copies of an AEMR covering the past year from January 1st to December 31st will be submitted to the DEQ. The AEMR shall be prepared and stamped by either a geologist or a certified engineering geologist with current Oregon registration.

5.1 REVIEW OF GROUNDWATER RESULTS

The analysis and evaluation of water quality data collected from the NMCDF and its associated sites will be completed in the following manner. A review of field and laboratory data will be initially completed, upon receipt of the data from the laboratory, to identify and address data that: 1) did not meet QA/QC control objectives, 2) represents a significant change in water quality, or 3) exceeds a primary groundwater, drinking water quality standard, or a RACL.

5.1.1 Routine Event Data Review Action Criteria

Section 17.4 of the Permit indicates that;

if the approved concentration limits or any three action limits, remedial goals (if established), or indication of a significant change in water quality at a monitoring point,

then the County shall notify the DEQ in writing within 10 days of the receipt of the laboratory data and perform resampling immediately.

Examples of a significant change in water quality include:

- Detection of a volatile organic constituent (VOC) or other hazardous constituent not detected in the background and previously not reported.
- Exceedance of a Table 1 or 3 value listed in OAR 340-40 unless the background monitoring is above these numerical limits and the exceedance has previously been reported.

- Exceedance of an EPA Primary Drinking Water Standard that has previously not been reported.
- Exceedance of a remedial action concentration limit (RACL) as specified in Attachment 2 of the Permit.
- Detection of a compound an order of magnitude higher than background.

5.1.2 Resampling Event Data Review Action Criteria

If resampling show results that:

- confirm three or more action limits or remedial goals were exceeded, or
- there is a significant change in water quality results noted in the review of the routine sampling event.

then

- notify the DEQ within 10 days of receipt of laboratory data, or within 60 days of the sample date (whichever comes sooner).
- Work with the DEQ to implement an appropriate investigative strategy.
- Include the monitoring of Group 4 parameter, in addition to routine detection monitoring.

If the resampling results do not confirm the results noted in the routine (or initial) sampling event, then:

1. Continue with routine monitoring.
2. Discuss the initial data and resampling results in the next annual environmental monitoring report.

5.2 REPORTING

Reporting of water quality monitoring data includes the submittal of Annual Environmental Monitoring Reports (AEMRs) and the results of split-sampling events. These reporting requirements are addressed in this section. A statement of compliance must accompany the AEMR, which is described in section.

5.2.1 Data QA/QC

A QA/QC review will be completed for each sampling event and will be summarized in a QA/QC summary report that will accompany all data presentation reports. The QA/QC summary report will present the following information: project and sample information; a quality assurance summary; a review of analytical methods and holding times; and a review of laboratory and field quality control samples. Data exclusions from statistical consideration and/or analysis will be identified based on the QA/QC review. Data presentation reports (i.e., Annual Environmental Monitoring Reports) will also include a review of field activities or observations that may have had an influence on the representativeness of water quality data collected from the site.

5.2.2 Data Presentation and Analysis

Data presented in the AEMRs will be organized by permit-specified parameter groups and well groups. The following is the data reporting scheme used in the AEMRs.

Table numbers are used to represent the following sample groups:

- Table 1: Willamette Silt Tier 1 detection wells.
- Table 2: Willamette Silt Tier 2 detection wells.
- Table 3: Willamette Silt Tier 3 detection wells.
- Table 4: Troutdale Formation wells.
- Table 5: Senecal Creek monitoring locations.
- Table 6: Leachate collection and removal system monitoring locations.

Monitoring wells and locations included in each of the above groups is identified in Table 1. Exceptions are samples from TF well PW-5, located at the 1973 Landfill Site that will be included in Table 4 and samples from Senecal Creek location SC-73, also located at the 1973 Landfill Site, will be included in Table 5. Letters are used to designate the following permit specified water quality parameter groups:

- Table A: Field Indicators (Group 1a).
- Table B: Laboratory Indicators (Group 1b).
- Table C: Common Anions and Cations (Group 2a).
- Table D: Trace Metals - (Group 2b).
- Table E: Volatile Organic Constituents (Group 3).
- Table F: Assessment Monitoring (Group 4).
- Table G: Surface Water and Leachate (Group 5).

Using this table identification scheme, Table 2C, for example, will present the available common anion and cation data for the Willamette Silt Tier 2 detection wells. Data in the tables will be presented in chronologically descending order (i.e., most recent data at the bottom row).

Analytical results of decommissioned or inactive wells and inactive monitoring parameters (e.g., aluminum, boron, lanthanum, etc.) are not included in the database reports. Data from replacement wells L-6R, L-12R, and L-13R are included, along with data from replaced wells L-6, L-12, and L-13.

The following formats will be used to present data collected from the NMCDF site, including: potentiometric contour maps, time series plots, and box plots. Trilinear plots and Stiff diagrams are not required by the Permit but have been generated previously to assist in the evaluation and presentation of sample results.

As needed, summary statistics can also be completed including: sample size, average, median, standard deviation, interquartile range, standardized skewness, standardized kurtosis, and interquartile range of parameter detections. All nondetects will be replaced with a value that is 1/2 of the reported method detection limit (MDL). Summary statistics can be computed using Microsoft Excel, Analyse-It, Statgraphics, or a comparable statistical software package. Statistical methods and analysis should reference and be consistent with DEQ's Internal

Management Directive; Developing Concentration Limits at Permitted Solid Waste Facilities (DEQ 2011) which is based on EPA's March 2009 Unified Guidance; Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 2009).

Data evaluation will also include a comprehensive comparison of groundwater quality sample results to the following applicable water quality standards:

- State of Oregon Numerical Groundwater Quality Reference and Guidance Levels (OAR 340-40-020 Tables 1 through 3).
- EPA National Primary Drinking Water Regulations.

These water quality standards are presented on Table 3.

5.2.3 Water Quality Monitoring Report

As required in Section 18.4 of the NMCDF solid waste disposal site permit, the AEMR will at a minimum, must contain the following:

- Review of all significant events that occurred at the site during the last year;
- Review of the monitoring network performance and recommendations for changes;
- Summary of all data collected in the past year media including, but not limited to: groundwater, surface water, leachate (lagoon, LDS and/or SLCS), and LFG (include any air sample data), and soil samples;
- A summary monitoring report of the leachate management program;
- A summary of any data problems (examples could include, but not limited to QA/QC failures, flagged data, switched samples, etc.);
- Piezometric maps for each sampling event for each monitored water bearing zone of concern;
- Time history plots for field specific conductivity, dissolved oxygen, and all group 1b, 2a and 2b parameters;
- Box plots for field specific conductivity, dissolved oxygen, and all group 1b, 2a and 2b parameters;
- For each location and sample event an anion-cation balance for each location that has adequate data. An additional explanation must be included for any balance outside of plus or minus 10% in error;
- Copy of lab certification, if applicable (ORLAP or NELAP); and
- A copy of all field and lab data for the past year (Note: Lab data can be omitted from the annual report if the permittee agrees in writing to keep electronic and hard copies available until the permit is terminated and the permittee agrees to supply these copies to the Department within 72 hours of written request).

5.2.4 Leachate Treatment Report

As required in Section 18.5 of the NMCDF solid waste disposal site permit, a Leachate Treatment Report (LTR) will be included in the AEMR. The annual LTR will at a minimum, contain the following:

- Contents that satisfy the conditions of the Leachate Management Plan.

- Review of all significant events that occurred at the site during the last year regarding leachate issues.
- A review of the monitoring network performance and recommendations for improvements.
- The total monthly volume of leachate removed from ash monofill Cell III and Cell IV.
- The total monthly volume of leachate disposed through off-site or on-site disposal methods.

5.2.5 Split Sampling Submittal

In the event of a DEQ split sampling event, the following information will be submitted to the DEQ laboratory, located in Hillsboro, Oregon, within 90 days of the split sampling event:

- A copy of all information pertinent to the sample collection handling, transport and storage, including field notes;
- Copies of all laboratory analytical reports;
- Copies of all laboratory QA/QC reports;
- Copy of lab certification (ORLAP or NELAP);
- Site map showing flow directions and contours; and
- Any other data or reports requested by the DEQ.

Note: Split sampling events with the DEQ are currently not scheduled or identified in the Permit.

The address of the DEQ Laboratory is:

Oregon Department of Environmental Quality
Laboratory Division, Groundwater Monitoring Section
3150 NE 229th Avenue, Suite 150
Hillsboro, Oregon 97124
(503) 229-5983

Note that a split sample packet can also be emailed to the appropriate recipient at the DEQ Laboratory with the DEQ NMCDF project hydrogeologist or permit manager copied. The County can request from the DEQ Laboratory after submitting split sampling data information identified above copies of the following:

- DEQ's analysis of the sampling sample event.
- A copy of DEQ's QA/QC report.
- A copy of DEQ's laboratory analytical report.
- A copy of DEQ's field data sheets.

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6. REFERENCES

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Dames & Moore. 1998. Revised final Summary Groundwater Analytical Database for North Marion County Disposal Facility, March 1998; prepared for Marion County Department of Solid Waste Management.

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U.S. Environmental Protection Agency (EPA). 2003. National Primary and Secondary Drinking Water Standards; by the Office of Water (4606M) U.S. EPA, Washington, D.C. EPA 816-F-03-016.

U.S. EPA (EPA). 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance. March 2009. http://www.epa.gov/osw/hazard/correctiveaction/resources/guidance/sitechar/gwstats/

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FIGURES

Parametrix DATE: January 24, 2011 FILE: N_Marion_Locator.mxd

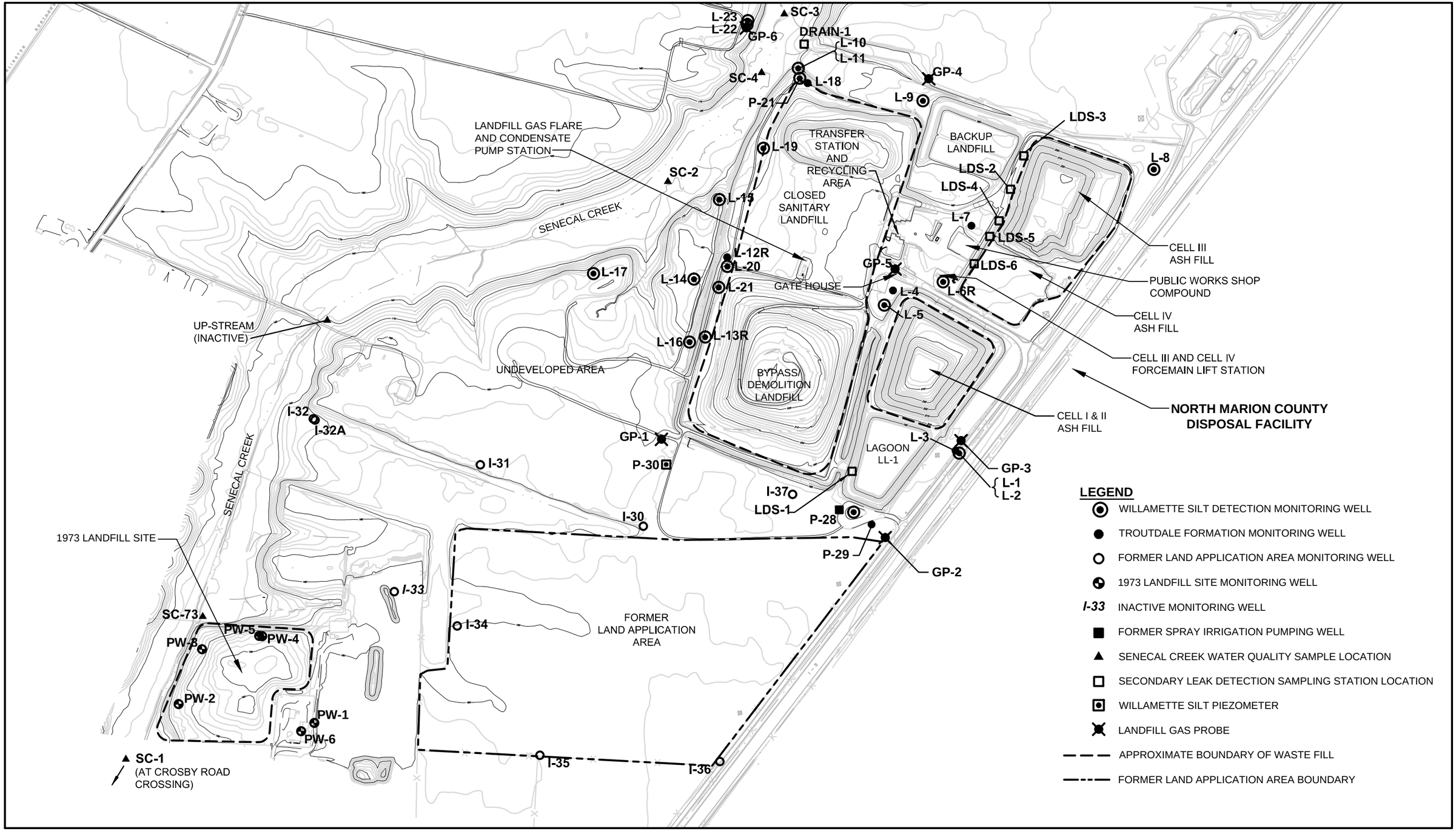
N

0 500 1,000 1,500

Feet

Figure 1
Site Location

Annual Environmental Monitoring Report
North Marion County Disposal Facility
Marion County, Oregon



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SCALE IN FEET

Figure 2
Facility Site Map
Environmental Monitoring Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON

North Marion Disposal Facility

Marion County Locator Map
Map Area

0 500 1,000 1,500
Feet

Legend

- Landfill Boundary
- 1973 Landfill
- Tax Lots
- Roads
- Rivers & Streams

Buffer

- 1/4 Mile Buffer
- 1/2 Mile Buffer

On-Site Wells

- Monitoring Well
- Monitored On-Site Water Supply Well
- Land Application Monitoring Well
- 73 Landfill Monitoring Well
- Senecal Creek Water Quality Sample Locations

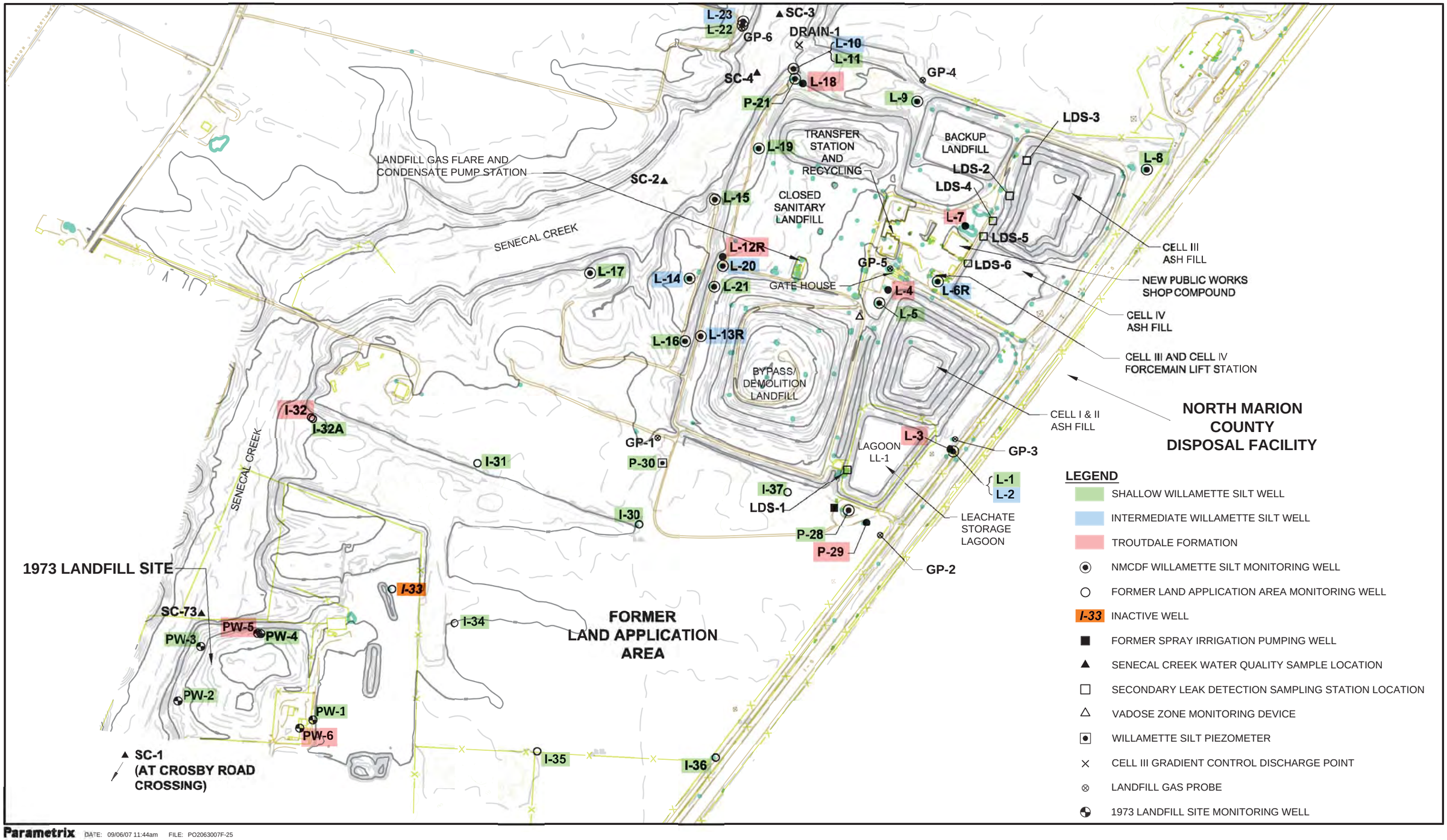
Off-Site Wells

- Monitored
- Not Monitored

Date: 01/07/05
Project: U:/gisprojects/solidwaste/disposal_fac/nm_fac.mxd
Prepared By: LL

Parametrix DATE: 09/06/07 10:26am FILE: PO2063007F-27

Figure 3
Site Area Well Location Map
Environmental Monitoring Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON



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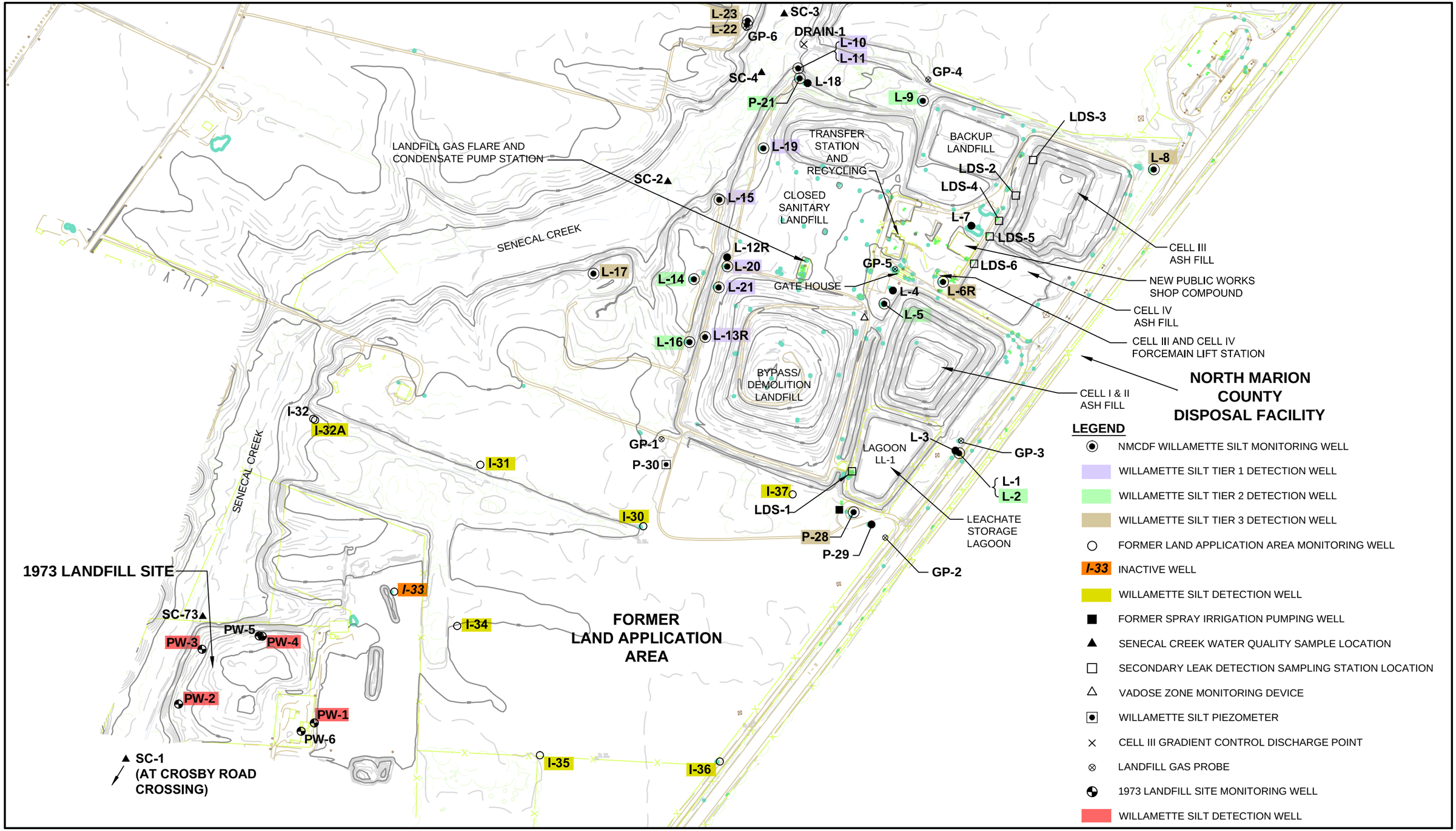
SCALE IN FEET

Figure 4
Hydrogeologic Zone Monitoring Locations
Environmental Monitoring Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON



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SCALE IN FEET

Figure 5
Willamette Silt Detection Well Locations
Environmental Monitoring Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON

TABLES

TABLE 1: MONITORING WELL AND PIEZOMETER SUMMARY
ENVIRONMENTAL MONITORING PLAN
NORTH MARION COUNTY DISPOSAL FACILITY

Site	Well Identification	Well Type	Installation Date	Well Status	Survey			Depth of Well (ft)	Purge/Sample Equipment; Comments
					North	East	MP Elevation		
NMCDF	L-1	Shallow WS	May-82	piezometer	307114.3510	222543.9380	187.455	14.45	n/a - piezometer
	L-2	Inter. WS	May-82	active	307114.3510	222543.9380	187.333	34.2	Dedicated Bladder Pump
	L-3	Troutdale	May-86	active	307129.5470	222524.8850	184.980	139	Dedidcated Bladder Pump w/ Packer
	L-4[1]	Troutdale	n/a	active	na	na	na	187.5	Supply well; Submersible Pump; tap sample
	L-5	Shallow WS	June-90	active	307915.1850	222110.3530	188.338	26.4	Dedicated Bladder Pump
	L-6R	Inter. WS	April-99	active	308043.8660	222427.6730	188.034	32.9	Dedicated Bladder Pump
	L-7	Troutdale	May-86	active	308354.6990	222572.2180	181.305	144	Flush; Dedidcated Bladder Pump w/ Packer
	L-8	Shallow WS	June-90	active	308690.7370	223554.0310	186.339	22.1	Dedicated Bailer
	L-9	Shallow WS	June-90	active	309024.2100	222286.7360	176.764	20.1	Dedicated Bladder Pump
	L-10	Inter. WS	May-82	active	309179.7240	221603.0770	161.922	33.4	Dedicated Bladder Bailer
	L-11	Shallow WS	May-82	active	309179.7240	221603.0770	161.549	13.6	Dedicated Bladder Pump
	L-12R	Troutdale	November-11	active	308140.7060	221250.3610	184.655	150	Dedicated Bladder Pump w/ Packer
	L-13R	Inter. WS	April-99	active	307702.2440	221142.8130	187.115	32.16	Flush mount; Dedicated Bladder Pump
	L-14	Inter. WS	June-90	active	308014.4280	221071.9370	183.104	31.5	Dedicated Bladder Pump
	L-15	Shallow WS	June-90	active	308453.5020	221196.3180	175.979	26.75	Dedicated Bladder Pump
	L-16	Shallow WS	October-92	active	307672.4790	221058.6980	179.904	22.3	Dedicated Bladder Pump
	L-17	Shallow WS	October-92	active	308027.8330	220523.9680	178.717	25	Dedicated Bladder Pump
	L-18	Troutdale	August-94	active	309101.6070	221655.1580	173.811	119.8	Dedicated Bladder Pump w/ Packer
	L-19[3]	Shallow WS	July-96	active	308738.8130	221427.4160	178.415	17.87	Dedicated Bailer
	L-20	Inter. WS	May-98	active	308090.4850	221251.8290	186.521	50.2	Dedicated Bladder Pump
	L-21	Shallow WS	May-98	active	307975.3280	221208.0910	184.596	22.07	Flush mount; Dedicated Bailer
	L-22	Shallow WS	May-98	active	309408.5950	221316.4270	178.627	21.75	Dedicated Bailer
	L-23	Inter. WS	May-98	active	309429.5850	221319.0550	180.012	40.36	Dedicated Bladder Pump
	P-21	Shallow WS	May-82	active	309125.2860	221613.0560	171.952	15.05	Dedicated Bladder Pump
	P-28	Shallow WS	May-96	active	306753.9080	221982.5740	185.641	30.8	Dedicated Bladder Pump
	P-29	Troutdale	May-96	active	306712.8720	222080.3060	184.839	110	Dedidcated Bladder Pump w/ Packer
	P-30	Shallow WS	May-96	piezometer	307003.2020	220952.8240	186.159	19.5	n/a - piezometer
	I-30	Shallow WS	May-82	piezometer	306662.2160	220839.0770	184.613	28.5	Dedicated Bailer
	I-31	Shallow WS	May-89	piezometer	306968.3640	219942.2140	184.656	29	Dedicated Bailer
	I-32	Troutdale	July-82	piezometer	307188.8640	219025.5380	182.370	99	n/a - piezometer
Land	I-32A	Shallow WS	May-82	piezometer	307183.7500	219035.3560	182.162	28.4	n/a - piezometer
Application	*I-33*	Shallow WS	May-82	inactive	558169.67	7591453.65	179.41	27.7	Well on private property; not a county well
Area	I-34	Shallow WS	May-89	piezometer	306089.4030	219843.0560	181.771	29.9	Dedicated Bailer
	I-35	Shallow WS	May-82	piezometer	305400.5880	220315.9400	183.101	27.4	Dedicated Bailer
	I-36	Shallow WS	May-82	piezometer	305398.6100	221295.8880	184.506	27.4	Dedicated Bailer
	I-37	Shallow WS	May-82	piezometer	306862.0300	221644.7800	183.783	28.8	Dedicated Bailer
	PW-1	Shallow WS	Jul-99	inactive	557456.08	7591019.23	183.73	27.16	Flush mount; Dedicated Bailer
	PW-2	Shallow WS	Jul-99	piezometer	305615.8300	218343.4900	179.017	39.01	Dedicated Bailer
1973 LF	PW-3	Shallow WS	Jul-99	piezometer	305918.0430	218460.9400	178.754	43.50	Dedicated Bailer
	PW-4	Shallow WS	Jul-99	piezometer	305998.5010	218785.3190	188.618	37.90	Dedicated Bailer
	PW-5	Troutdale	Jul-99	active	306000.4460	218768.3390	188.997	91.7	Dedidcated Bladder Pump w/ Packer

Notes:
Survey information based on survey completed by Marion County Public Works survey group during 2011; N/E based on OCRS Salem Zone International Feet NAVD88 as vertical datum.
Shaded yellow highligthed cell = pre-2011 survey event event data.
WS - Willamette Silt
MP - water level measuring point elevation (feet msl).
1 - Onsite water source water; sampled at spigot above grade
2 - Inactive Well. Used as a piezometer.
3 - Previous well designation P-31.

TABLE 2: WATER QUALITY SAMPLE LOCATIONS, FREQUENCY, AND SCHEDULE
WATER QUALITY MONITORING PLAN
NORTH MARION COUNTY DISPOSAL FACILITY

Locations	Analytes *	Frequency	Schedule
Willamette Silt Tier 1 Detection wells: L-10, L-11, L-13R, L-15, L-19, L-20, and L-21.	Group 1a Group 1b Group 2a Group 2b Group 3	Semi-annual	Spring and Fall
Willamette Silt Tier 2 Detection wells: L-2, L-5, L-9, L-14, L-16, and P-21.	Group 1a Group 1b Group 2a	Semi-annual	Spring and Fall
	Group 2b Group 3	Annual	Fall
Willamette Silt Tier 3 Detection wells: L-6R, L-8, L-17, L-22, L-23, and P-28.	Group 1a Group 1b Group 2a	Annual	Fall: L-6R, L-8, L-23, P-28. Spring: L-17 and L-22.
	Group 2b Group 3	Bi-Annual	Fall 2012, Fall 2014, Fall 2016, etc.
Troutdale Formation wells: L-3, L-4 (at the tap), L-7, L-12R, L-18, and P-29.	Group 1a Group 1b Group 2a	Semi-annual	Spring and Fall
	Group 2b Group 3	Annual	Fall
Piezometers: L-1 and P-30. Water levels to be collected from all monitoring wells at NMCDF, the former Land Application Area, and the 1973 Landfill Site.	Water levels	Semi-annual	Spring and Fall
Senecal Creek monitoring points: SC-1, SC-2, SC-3, SC-4, and SC-73.	Group 1a Group 1b Group 2a Group 2b Group 5	Semi-annual Annual: SC-73	Spring and Fall Spring: SC-73
	Group 3	Annual	Spring
Leachate, Secondary Leachate Collection and Removal Systems, and Groundwater Gradient Control Outfall inspection points: LDS-1, LDS-2, LDS-3, LDS-4, LDS-5, LDS-6, Cell 3/FM, LL-1, and Drain-1.	Group 1a Group 1b Group 2a Group 2b	Semi-annual	Spring and Fall
1973 Landfill Site wells: PW-5.	Group 1a Group 1b Group 2a Group 2b Group 3	Annual	Fall

NOTES:
1) ***** See Table 3, Water Quality Monitoring Parameters, for analytes/parameters included in each parameter group. Note the NMCDF Indicator Parameter list is used except during even year Fall events (i.e., Fall 2012, Fall 2014, etc.) when the Permit Parameter list is applied. See note #2 below for application detail.
2) NMCDF Indicator Parameter list applied to all sample point locations except those associated with 1973 Landfill Site and the former Land Application Area.
3) Water levels are collected from all wells and piezometers during first day of sampling event.
4) The semi-annual compliance monitoring periods are:

- Spring: April 1st through May 31st.
- Fall: October 1st through November 30th.

TABLE 3: WATER QUALITY MONITORING PARAMETERS - INDICATOR AND PERMIT PARAMETERS
WATER QUALITY MONITORING PLAN
NORTH MARION COUNTY DISPOSAL FACILITY

NMCDF INDICATOR PARAMETERS	NMCDF PERMIT PARAMETERS	METHOD	METHOD DESCRIPTION	METHOD REPORTING LEVEL (mg/L)	DEQ REF. LEVELS[d] (mg/L)	DEQ GUIDANCE LEVELS[e] (mg/L)	EPA DRINKING WATER STD[f]
GROUP 1a: FIELD INDICATOR PARAMETERS							
ELEVATION OF WATER LEVEL	ELEVATION OF WATER LEVEL	FIELD	Electric Probe				
pH	pH	FIELD	Reference Electrode Probe			6.5 to 8.5 su	
TEMPERATURE	TEMPERATURE	FIELD	Temperature Probe				
SPECIFIC CONDUCTANCE	SPECIFIC CONDUCTANCE	FIELD	Conductivity Probe				
DISSOLVED OXYGEN	DISSOLVED OXYGEN	FIELD	Metal Cathode Probe				
REDOX POTENTIAL (Eh)	REDOX POTENTIAL (Eh)	FIELD	Platinum Band Sensor Probe				
GROUP 1b: LEACHATE INDICATOR PARAMETERS							
	HARDNESS (as $CaCO_3$)	6020[a]	ICP-MS	2.00			
TOTAL ALKALINITY (as $CaCO_3$)	TOTAL ALKALINITY (as $CaCO_3$)	310.1[b]	Titrimetric	10.0			
TOTAL DISSOLVED SOLIDS (TDS)	TOTAL DISSOLVED SOLIDS (TDS)	160.1[b]	Gravimetric	10.0		500	
TOTAL SUSPENDED SOLIDS (TSS)	TOTAL SUSPENDED SOLIDS (TSS)	160.2[b]	Gravimetric	10.0			
	CHEMICAL OXYGEN DEMAND (COD)		Spectrophotometric	5.00			
	TOTAL ORGANIC CARBON (TOC)		UV, Persulfate Oxidation-IR	1.00			
	SPECIFIC CONDUCTANCE		Conductivity Probe	10.0			
	pH		Reference Electrode Probe	pH units			
GROUP 2a: COMMON ANIONS AND CATIONS[#]							
CALCIUM (Ca)	CALCIUM (Ca)	200.7[b]	ICP-MS	0.050			
	MAGNESIUM (Mg)	200.7[b]	ICP-MS	0.002			
SODIUM (Na)	SODIUM (Na)	200.7[b]	ICP-MS	1.00			
	POTASSIUM (K)	200.7[b]	ICP-MS	1.00			
	IRON (Fe)	200.7[b]	ICP-MS	0.0250		0.3	
	MANGANESE (Mn)	200.7[b]	ICP-MS	0.00200		0.05	
	AMMONIA-NITROGEN (NH_4-N)	350.3[b]	Electrode	0.100			
	CARBONATE ALKALINITY (CO_3)	310.1[b]	Titrimetric	10.0			
	BICARBONATE ALKALINITY (HCO_3)	310.1[b]	Titrimetric	10.0			
	SULFATE (SO_4)	300.0[b]	Ion Chromotography	1.00		250	
CHLORIDE (Cl)	CHLORIDE (Cl)	325.3[b]	Ion Chromotography	0.5		250	
	NITRATE (NO_3-N)	353.3[b]	Ion Chromotography	0.100	10.0		10
	SILICA (Si)	370.1[b]	Spectrophotometric Reduction	0.250			
	AMMONIUM (NH_4)	SM 8010F	Calculation	0.0500			
GROUP 2b: TRACE METALS							
	ANTIMONY (Sb)	6020[a]	ICP-MS	0.00100			0.006
ARSENIC (As)	ARSENIC (As)	6020[a]	ICP-MS	0.00100	0.05		0.010
BARIUM (Ba)	BARIUM (Ba)	6020[a]	ICP-MS	0.00100	1.0		2
	BERYLLIUM (Be)	6020[a]	ICP-MS	0.00200			0.004
CADMIUM (Cd)	CADMIUM (Cd)	6020[a]	ICP-MS	0.00100	0.01		0.005
	CHROMIUM (Cr)	6020[a]	ICP-MS	0.00200	0.05		0.1
	COBALT (Co)	6020[a]	ICP-MS	0.00100			
COPPER (Cu)	COPPER (Cu)	6020[a]	ICP-MS	0.00200		1.0	1.3***
LEAD (Pb)	LEAD (Pb)	6020[a]	ICP-MS	0.00100	0.05		0.015***
NICKEL (Ni)	NICKEL (Ni)	6020[a]	ICP-MS	0.00200			
	SELENIUM (Se)	6020[a]	ICP-MS	0.00100	0.01		0.05
	SILVER (Ag)	6020[a]	ICP-MS	0.00100	0.05		
	THALLIUM (Ti)	6020[a]	ICP-MS	0.00100			0.002
	VANADIUM (V)	6020[a]	ICP-MS	0.00200			
ZINC (Zn)	ZINC (Zn)	6020[a]	ICP-MS	0.0100		5.0	
GROUP 3: VOLATILE ORGANIC CONSTITUENTS							
VOLATILE ORGANIC CONSTITUENTS	VOLATILE ORGANIC CONSTITUENTS	8260B[a]	Gas Chromotography/Mass Spect.	0.50-1.0 ug/L			
GROUP 4: ASSESSMENT MONITORING PARAMETERS							
	SEMI-VOLATILE ORGANIC CONSTITUENTS	8270[a]	Gas Chromotography/Mass Spect.				
	MERCURY	7470[a]	Cold Vapor Atomic Adsorption	0.000200	0.002		
	CYANIDE	9010	Distillation, Spectrophotometric	0.010			0.2
	NITRITE	300.0[b]	Ion Chromotography	0.030			1
GROUP 5: SURFACE WATER MONITORING PARAMETERS							
TOTAL KJELDAHL NITROGEN (TKN)	TOTAL KJELDAHL NITROGEN (TKN)	351.3[b]	Digestion, Distillation, Titrimetric	5.00			
TOTAL PHOSPHORUS (P)	TOTAL PHOSPHORUS (P)	6010[a]	Inductively Coupled Plasma	0.200			
ORTHOPHOSPHATE (PO_4)	ORTHOPHOSPHATE (PO_4)	365.2[b]	Ion Chromatography	0.0100			
BIOLOGICAL OXYGEN DEMAND (BOD)	BIOLOGICAL OXYGEN DEMAND (BOD)	405.1[b]	Oxygen Electrode	4.00			
	TOTAL HALOGENATED ORGANICS (TOX)	9020[a]	Adsorption, Microcoulometric	0.0200			
TOTAL COLIFORM BACTERIA	TOTAL COLIFORM BACTERIA	SM 9221B[c]	Membrane Filter	1.00 MPN per 100ml			
FECAL COLIFORM BACTERIA	FECAL COLIFORM BACTERIA	SM 9221C[c]	Membrane Filter	2.00 MPN per 100ml			
E. COLI	E. COLI	SM 9223B	Membrane Filter	1.00 MPN per 100ml			

NMCDF Indicator Parameters applied to all NMCDF-related sample points (see Table 1). NMCDF permit parameters applied to even year Fall event NMCDF-related samples.

[#] DISSOLVED CONCENTRATIONS. SAMPLES MUST BE FIELD-FILTERED.

[a] TEST METHODS FOR EVALUATING SOLID WASTE - PHYSICAL/CHEMICAL METHODS. 3rd edition. EPA SW-846 (November 1990)

[b] METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES. EPA-600/4-79-020 (revised March 1983)

[d] DEQ NUMERICAL GROUNDWATER QUALITY REFERENCE LEVELS (HEALTH BASED). OAR 340-040-080 (January 1990).

[e] DEQ NUMERICAL GROUNDWATER QUALITY GUIDANCE LEVELS (NONHEALTH BASED). OAR 340-040-080 (January 1990).

[f] EPA NATIONAL PRIMARY DRINKING WATER STANDARDS. EPA 816-F-02-013 July 2002

*** EPA ACTION LEVELS.

Italized parameter - TOX has been removed from parameter per 1/25/11 DEQ approval.

ICP-MS: Inductively Coupled Plasma-Mass Spectrometry

TRACE METALS - TOTAL CONCENTRATIONS IF TSS <100 mg/L; BOTH TOTAL AND DISSOLVED CONCENTRATIONS IF TSS >100 mg/L.

Leachate Control Management Plan
North Marion County Disposal Facility
Marion County, Oregon

Prepared for

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June 2013.

CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a registered professional hydrogeologist licensed to practice as such, is affixed below.

Prepared by Rick Malin
Project Professional

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APPENDICES

Note: Appendices materials can be found on the CD at the back of this notebook.

ACRONYMS

AEMRs	Annual Environmental Monitoring Reports
ALTR	Annual Leachate Treatment Report
DEQ	Oregon Department of Environmental Quality
EMP	Environmental Monitoring Plan
GCL	geo-synthetic clay liner
LCMP	Leachate Control Management Plan
LGMP	Landfill Gas Monitoring Plan
NMCDF	North Marion County Disposal Facility
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SLCRSs	Secondary Leachate Collection and Removal Systems
VVDS	variable vacuum distillation system
VZMDs	vadose zone monitoring devices
WQMP	Water Quality Monitoring Plan

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1. INTRODUCTION

This Leachate Control Management Plan (LCMP) is presented as Section 2 of the June 7, 2013 Environmental Monitoring Plan for the North Marion County Disposal Facility (NMCDF). The June 2013 Environmental Monitoring Plan (EMP) incorporates site monitoring changes that have occurred since the completion of the last EMP update completed on October 5, 2007 and reflects environmental monitoring and reporting requirements contained in the NMCDF Solid Waste Disposal Site Permit Number 240, issued on May 9, 2007.

The NMCDF EMP consists of five sections. Sections 1 and 3 contain a Water Quality Monitoring Plan (WQMP) and a Landfill Gas Monitoring Plan (LGMP), respectively.

Section 4 contains a Sampling and Analysis Plan (SAP) describing collection and analysis procedures and protocols for water quality sampling associated with the LCMP and the WQMP.

Section 5 contains a copy of the May 9, 2007 NMCDF Solid Waste Disposal Site Permit for reference.

A brief description of the site location and operating background is provided below. A more detailed description of the site location and background information, including the various on-site waste management areas and off-site management areas, is presented in the EMP introduction and plan organization text.

1.1 SITE LOCATION AND OPERATIONS BACKGROUND

The NMCDF is located in Marion County approximately three miles northwest of Woodburn, Oregon (Figure 1). The site is situated in the French Prairie region of the northern Willamette Valley and has been in operation since September 24, 1974. The facility currently provides the following waste disposal and recycling functions: waste transfer, ash monofill, material recycling, and backup landfill capability. Figure 2 shows site topography and features and identifies various facility operations. Marion County is the owner, permittee, and operator of the NMCDF.

1.2 PLAN PURPOSE

The LCMP describes monitoring of primary leachate and secondary leachate collection and removal systems. Monitoring of the systems is an element of the facility's environmental monitoring program. Consequently, the LCMP addresses an EMP content element as required in Section 14.3 of the NMCDF solid waste disposal site permit.

The purpose of the LCMP is to provide a site-specific plan to monitor lined portions of the disposal facility equipped with Leachate Collection and Removal Systems (LCRSs). Monitoring is completed for both the Primary LCRSs (PLCRSs) and Secondary LCRSs (SLCRSs) that are associated with the lined portions of the site. Monitoring of the LCRSs is completed to provide data on the effectiveness of the control systems, system performance, and to characterize the composition of the fluids found in these systems overtime. The LCMP describes the procedures to check for the presence of fluids and to obtain water quality samples from the PLCRSs and the SLCRSs at the site. Water quality samples from the PLCRSs and SLCRSs are typically collected during the sample period when water quality samples are collected from monitoring wells and surface water sample points associated with the NMCDF environmental monitoring programs. Consequently, there is a certain amount of overlap between the LCMP and the WQMP (Section 1).

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2. LEACHATE COLLECTION AND REMOVAL SYSTEMS

Existing LCRSs at the NMCDF consist of primary and secondary leachate collection and removal systems for the wastewater storage facility (leachate lagoon), ash monofill Cells III and IV, and vadose zone monitoring devices (VZMDs) under the closed ash monofills Cells I and II. Figure 2 shows the location of the features. An overview of these systems and their operation is described in this section. Ash monofill Cell III includes a groundwater gradient control system that is also described.

2.1 WASTEWATER LAGOON

The geomembrane-lined wastewater lagoon receives leachate wastewater from the ash monofills. This section provides a description of the wastewater lagoon, historic and current disposal methods of the wastewater that has accumulated in the lagoon, and the lagoon's secondary leachate collection and removal system sample point.

2.1.1 Lagoon Design

As shown on the May 1988 Wastewater Storage Facility construction drawings (Fetrow 1988), the wastewater lagoon is constructed in the following manner. The membrane-lined lagoon consists of an 80 mil HDPE outer liner that overlies a geonet. The geonet overlies a 60 mil HDPE liner. A 12-inch thick bentonite layer is present under the 60 mil HDPE liner. The sandwiched geonet functions as the leak detection system for the outer liner as shown in Figure 3. Fluids present in the geonet layer are positively sloped to a sump located in the south central base of the lagoon (Figure 4). Figure 5 shows a cross-section of the lagoon leak detection sump area.

2.1.2 Wastewater Disposal

Disposal of wastewater in the lagoon was originally accomplished from 1990 through 1997 by dilution and land application utilizing spray irrigation over an area located south of the lagoon. The spray irrigation application of the diluted leachate was discontinued in September 1997. A floating cover over the lagoon was installed in October 1998 to minimize rainfall from mixing with the leachate in the lagoon. Construction of a leachate treatment system was completed in 2002 began regular operation in 2003. The treatment system consisted of a variable vacuum distillation system (VVDS) that was located adjacent to the west side of the leachate lagoon. Leachate stored in the lagoon was pumped directly to the VVDS. The VVDS operated intermittently until June 20, 2004 when it was permanently shut down due to on-going operation and maintenance issues and subsequently dismantled and removed.

Beginning in 2006, the County entered into a ten year agreement for off-site disposal of leachate with Waste Connections, Inc. Through its agreement with Waste Connections, the County transports and dispose wastewater (leachate) contained in the lagoon to Finley Buttes Landfill and Wasco Landfill in eastern Oregon. Under the agreement, Waste Connections loads, transports, treats and disposes approximately 3.5 million gallons of leachate per year. This is an estimated quantity and is dependent upon annual rainfall and the area of open landfill face. The historical annual production of leachate typically ranges from a minimum of 2.5 million gallons to 4.5 million gallons per year, depending on the amount of precipitation received and the surface area of the open active landfill face. Waste Connections is contractually required to transport and dispose of enough leachate by October 31st of each year to attain an elevation of 4.0 feet (3,008,000 gallons) or less in the leachate storage

lagoon. Leachate is pumped from the storage lagoon to the truck loading station using two 300 gallon per minute pumps located in the south lift station adjacent to the lagoon (Figure 6). The loading station is equipped with remote switches that allow the operator to control the pumps and fill sequence. The operator begins the fill sequence by connecting the fill hose, level controller and opening the appropriate valves. The pumps are turned on and the fill sequence is initiated. The transport truck is equipped with level sensors that automatically shut the pumps off when level of leachate in the tanker reaches 95 percent full. The operator completes the filling sequence using one pump to reduce the turbulence in the tank. Upon complete filling of the tanker, the operator, closes the appropriate valves and evacuates the fill hose of all leachate using compressed air to prevent any spills during disconnection of the hose. During 2012 approximately one to two truckloads per day or 8,000 to 16,000 gallons of leachate were loaded and transported each day.

Upon arrival at Finley Buttes Landfill, the leachate is pumped into drop boxes that are buried in the ground within the active landfill area. Cover soil is added to the leachate and blended using an excavator to absorb all the liquid, then subsequently removed and used for daily landfill cover. Finley Buttes also received approval from DEQ to use the leachate on landfill roads for dust control.

2.1.3 Lagoon SLCRS

The wastewater lagoon's SLCRS consists of a 3-inch diameter HDPE pipe that directs fluids that have collected in the sump to a sampling station located on the exterior southwest side of the lagoon berm. Prior to reaching the sampling station, the 3-inch diameter HDPE pipe reduces to a 1-inch diameter PVC pipe (Figure 5). The SLCRS sampling station consists of a valve that can be opened to check if fluids are present and to sample. The wastewater lagoon SLCRS sampling location is designated LDS-1. The location of LDS-1 is shown on Figure 2.

2.2 ASH MONOFILLS

Four lined ash monofills have been constructed at the NMCDF. Leachate from these ash monofill cells are directed to the waste water lagoon via a forcemain that discharges to a lifts station located adjacent to the west side of the lagoon. Currently, ash Cell IV is the only active cell; the remaining cells have been closed. The following is an operation summary of the ash monofill cells:

- Cell I was constructed in 1987, received ash fill up to October 1990 when it then received a final cover system.
- Cell II was constructed in 1990 south of and abutting Cell I. Cell II was closed to operation in early 1997 with a final cover system completed by the fall of 1997.
- Cell III was constructed in the northeast corner of the site and began receiving waste on March 20, 1997. During the summer of 2005, the northern portion of Cell III (approximately 5 acres) received a final cover system.
- Cell IV was constructed adjacent to the south side of Cell III during the summer and fall of 2002 and began receiving ash on February 10, 2004 and is currently active and receiving ash fill.

The location of the ash monofills are shown on Figure 2. Figure 6 shows the northeast corner of the site where Cells III and IV are located.

A complete fill-sequencing plan for Cell IV is contained in the NMCDF Operations Plan.

In 2011 Marion County initiated an ash screening and metal recovery operation within the Cell IV ash monofill. A screening and recovery demonstration was completed in 2010 to determine the economic and operational feasibility of removing ferrous and non-ferrous metal from the ash and utilizing the ash alternative daily cover at the Coffin Butte Landfill. The screening and recovery operation has changed the way ash is handled. Daily management of incoming ash still involves pushing the ash up slope along the active face. However, instead of grading the ash to a final elevation and slope for closure, the ash is managed as a resource in a stockpiling fashion. The ash is pushed up slope into piles where it is allowed to de-water for future processing through the metal recovery screen plant. The active working face and processing area of the Cell IV monofill is graded to contain the precipitation within the ash cell. No ash has been placed in a portion of the southwest corner of Cell IV, which is used as a drainage swale for stormwater from the processing area.

2.2.1 Active Cell IV Ash Monofill LCRS

Ash monofill Cell IV was constructed with a liner system consisting of two 60-millimeter textured HDPE geomembrane liners separated by a geo-synthetic clay liner (GCL) that is adhered to 40-millimeter HDPE liner.

Cell IV consists of three sub-cells. The Cell IV LCRSs consists of three identical sumps, one for each third of the cell's fill area. Similar to ash monofill Cell III, each LCRS is constructed with two collection levels: a Primary and a Secondary. As shown on Figure 7, the PLCRS is located on top of the upper 60-millimeter HDPE liner and collects leachate that drains down through a 12 inch thick gravel drainage layer. This drainage layer is separated from the ash waste fill by 12 inches of native soil, which functions as an operations layer. A geotextile layer separates the operation soil layer from the gravel drainage layer.

As shown on Figure 7, the Cell IV SLCRSs are located between the GCL and the top of the lower 60-mil HDPE liner. A geo-composite liner is present between the GCL and the SLCRS. The SLCRS is designed to collect liquid that penetrates the upper HDPE liner and the GCL. Similar to the LCRSs, Cell IV consists of three identical SLCRSs. Each sub-cell SLCRS sampling station is fitted with a dedicated electric pump that allows for the removal of fluid that could possibly accumulate. The electric pumps are used to check for the presence of fluid in the SLCRS and to obtain water quality samples, if fluid is present. The primary and secondary LCRSs for each sub-cell are equipped with flow totaling and fluid height meters. As shown on Figure 6, the Cell IV SLCRS sample points, from north to south, are designated LDS-4, LDS-5, and LDS-6.

2.2.2 Closed Cell III Ash Monofill LCRS

The Cell III ash monofill was constructed using a two membrane liner system. The Cell III SLCRS provides monitoring underneath the 28-inch thick clay layer that underlies the 60 mil HDPE cell bottom liner. The SLCRS consists of a 14-inch diameter HDPE pipe that extends and underlies the primary cell fluid collection sump. The primary SLCRS fluid collection sump is drained by two 14-inch diameter HDPE side slope riser drain lines that are connected to a header system. From the header system, fluids are then directed to the northern lift station and then to the wastewater lagoon. Figures 8 and 9 present a sump view and a sampling station detail, respectively, of the Cell III ash monofill SLCRS system. Figure 6 shows the location of Cell III SLCRS system and the location of its forcemain that directs leachate from the cell to the northern lift station.

Cell III consists of two sub-cells. Each sub-cell SLCRS sampling station is fitted with a dedicated electric pump that allows for the removal of fluid that could possibly accumulate.

The electric pumps are used to check for the presence of fluid in the SLCRS and to obtain water quality samples, if fluid is present. The southern and northern subcell SLCRS sampling stations are designated LDS-2 and LDS-3, respectively (Figure 6). Both the primary and secondary LCRSs for both subcells are equipped with flow totaling and fluid height meters.

2.2.3 Closed Ash Monofill Cell LCRS

Closed ash monofills Cells I and II, located north of the wastewater lagoon, are equipped with three vadose zone monitoring devices (VZMDs) or pan lysimeters. Water quality monitoring of the Cell I and II VZMDs has not been required by the previous NMCDF Solid Waste Disposal Site Permit and has not been conducted due to operational issues associated with the VZMDs. Previously completed inspections of the VZMDs have indicated that the devices either do not contain fluid or are not operational. A description of the closed ash monofill VZMDs is provided for purposes of site system description completeness.

The three pan lysimeters are designed to be sampled from ports located on west berm toe of Cell II (Figure 2). Figure 11 shows the construction design of the pan lysimeters. The lysimeters consist of a stainless steel collection pan that is connected by a 1/4-inch teflon lined tube to a pump body. The collection pans are located under that portion of the bentonite liner or FML which has an overlying 4-inch diameter perforated leachate collection line (Figure 11; monitor location detail). A stainless steel swing check valve is actuated by compressed air allowing for the presence of fluid to be checked and sampled.

2.3 LIFT STATIONS

Two lift stations (north and south) are used to pump leachate from the ash monofills into the leachate storage lagoon. The operation and monitoring of these stations is presented in this section.

2.3.1 North Lift Station

Leachate from Cells III and IV is pumped directly to the north lift station by the LCRS pumps located at the respective cells. The north lift station is located west of the southwest corner of Cell IV. Leachate in the north lift station is subsequently pumped to the storage lagoon using two 5-hp submersible pumps with an approximate flow rate of 40- and 65-gpm, respectively. A single flow meter is installed on the leachate force main that directs leachate to the wastewater lagoon. The northern lift station functions as the primary leachate sample point for Cells III and Cell IV. This fluid sample point is designated Cell 3/FM as shown on Figure 2.

2.3.2 South Lift Station

Leachate from Cells I and II is conveyed through leachate collection pipes under the cells which gravity flows into the South Lift Station. Leachate from the north lift station is also pumped to the south lift station. Leachate in the south lift station is subsequently drained and pumped into the lagoon. The south lift station is also used to pump leachate from the lagoon to a truck loading station as described in Section 2.1.2.

2.4 CELL III GRADIENT CONTROL

As a design feature of the ash monofill Cell III, a hydraulic gradient control was construct around Cell III to limit the height groundwater could achieve beneath the cell. The gradient

control system consists of perforated pipe (french drain type design) that encircles the cell. The perforated pipe is connected to a discharge line that routes captured groundwater along the north side of the site to a discharge point located near the northwest corner of the site. Figure 6 shows the approximate location of the hydraulic gradient control line around Cell III and the location of its discharge line. Groundwater captured by the Cell III hydraulic gradient control discharges into the Senecal Creek floodplain where it drains to Senecal Creek. The outfall of the gradient control is designated as sample point Drain-1. The location of this sample point is shown on Figure 10, which is a detailed map of the site's northwestern area. As shown on Figure 10, Senecal Creek sample point SC-4 has been established just up-stream of the hydraulic gradient control outfall while sample point SC-3 is located down-stream of the outfall.

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3. WATER QUALITY CONDITIONS

This section presents a review of recent water quality samples collected from leachate and secondary leachate collection and removal system inspection points. This information provides a basis and rationale of the approach for monitoring the site's leachate collection and removal systems.

The active secondary leachate collection and removal systems (SLCRSs) are checked for the presence of water, and if present, sampled on a semi-annual basis. Leachate samples are also collected from the northern lift station and the wastewater lagoon on a semi-annual basis. Sampling of the hydraulic gradient control discharge point is also completed as part of the LCRS monitoring program.

This section describes results of sampling completed at the active LCRS monitoring program sample points during the past couple of years. SLCRS sample point locations associated with Cells III and IV and their associated forcemain sample location are shown on Figure 6. The location of the SLCRS sample point for the wastewater lagoon is shown on Figure 2. The hydraulic control line discharge point is shown on Figure 10.

3.1 CELL III SLCRS

Water had been regularly detected in Cell III SLCRS sample points LDS-2 and LDS-3. Some of the water removed from these two Cell III secondary collection systems appears to be from dewatering of the clay layer that overlies the two SLCRSs. Since closure of the cell, the volume of water present in the SLCRSs has been declining. With the closure of the cell in 2005, it is likely that these sample points will become dry in the future. LDS-2 appears to have gone dry following the spring 2012 event.

Water samples collected from LDS-2 and LDS-3 have historically had slightly elevated concentrations of alkalinity, TDS, calcium, chloride, magnesium, potassium, sodium, and sulfate. Detected concentrations have varied overtime. Concentrations at LDS-2 peaked in early 2003 and steadily declined since. Concentrations at LDS-3 peaked in late 2005 and have also declined since but not as consistent as observed at LDS-2. The concentrations at southern sample point LDS-2 have declined to lower level than at northern LDS-3 even though filling of Cell III began on the northern side of the cell and progressed southward. The concentrations detected at LDS-2 and LDS-3 have historically been at least one order of magnitude less than those detected in samples collected at the northern forcemain lift station (sample point Cell3/FM). The pH of water collected at LDS-2 and LDS-3 is usually slightly acidic in the low six unit range. Trace metals historically detected at LDS-2 and LDS-3 include arsenic, barium, cobalt, copper, nickel, selenium, and zinc and, less frequently, chromium and cadmium at LDS-2.

Recent TDS concentrations at LDS-2 and LDS-3 have ranged from 640 mg/l to 1,400 mg/l and 2,600 mg/l to 3,980 mg/l, respectively. The 2003 AEMR noted a significant increase in the concentration for a number of parameters LDS-2. Since then, concentrations at LDS-2 decreased to pre-2003 levels. The cause for the increase in parameter concentrations is not known. The fall 2005 event sample from LDS-3 suggested a similar occurrence. Samples collected from LDS-3 during 2006 indicate that conditions have returned to pre-Fall 2005 conditions.

A comparison of Cell III SLCRS sample results to DEQ Numerical Groundwater Guidance and Reference Levels find that the detected concentrations of chloride, manganese, TDS, and sulfate are typically above their Guidance Levels. Arsenic, barium, cadmium, and selenium

have been detected on occasion at a concentration that exceeds their Reference Levels. Samples collected from the SLCRSs do not represent groundwater. However, a comparison to these levels provides a screening evaluation of the water quality conditions at the Cell III SLCRSs. Cell IV SLCRS

Pre-fill samples from the Cell IV SLCRS were collected during the winter 2004 monitoring event. Samples were collected from all three of Cell IV SLCRSs at that time and had TDS concentrations ranging from 121 mg/l to 249 mg/l. Fluid present in the SLCRS at this time is assumed to be fluids captured during cell construction.

Regular sampling of the Cell IV SLCR LDS-4 was initiated during the spring 2004 following placement of ash into this section of the cell. Sampling of LDS-5 was initiated during the spring 2007 event when placement of ash began in this sub-section of the cell. Sampling of LDS-6 will begin when ash placement occurs in the southern sub-section of Cell IV. Beginning in 2006, inspection of LDS-4 found that water was not present in the SLCRS. Presence of water in LDS-4 returned in 2009.

Water samples from the three Cell IV SLCRS have shown variable concentrations over time. At northern LDS-4, concentrations have more recently been showing variable concentrations with more recent indications of downward trends. At middle sub-cell sample point LDS-5, a notable concentration increase was observed in 2012 while concentrations at southern sample point LDS-6 have been declining from a peak event that occurred during spring 2011. Observations made during 2012 and in 2011 indicate that high water table conditions occurring during late winter and early spring appear to be pushing up on the cell's bottom liner. During 2010 and continuing into the early part of 2011, the open area of LDS-6 sub-cell was expanded as part of the metals recovery operations area.

For reference purposes, similar to Cell III observations, a comparison of Cell IV SCLCRs samples to DEQ Numerical Groundwater Guidance and Reference Levels detected chloride, manganese, TDS, and sulfate typically above their Guidance Levels. Arsenic, barium, cadmium, and selenium have been detected on occasion at a concentration that exceeds their Reference Levels. Samples collected from the SLCRSs do not represent groundwater. However, a comparison to these levels provides a screening evaluation of the water quality conditions at the Cell IV SLCRSs.

3.2 CELL III/IV LEACHATE

Leachate generated at ash monofill Cells III and IV is pumped via forcemains to the northern lift station located near the southwest corner of Cell IV (Figure 6). Samples are collected from this lift station and designated Cell3/FM.

The volume of leachate generated from Cell III has generally been declining due to cessation of filling in 2004 and final closure cover placement over most of the cell in 2005. The volume of leachate generation at Cell IV appears to be increasing with continued receipt of ash waste and implementation of the more recent operation of metal recovery system. The full operations area of the cell is now exposed to precipitation. Ash waste disposal is currently occurring near the south side of Cell III.

Leachate generated by the ash monofill cells is characterized by high concentrations of salts (calcium, chloride, potassium, sodium, and sulfate) along with lower concentrations of trace metals (arsenic, barium, cadmium, copper, lead, nickel, selenium, and zinc). After showing an upward concentration trend from 2001 to 2003 followed by a stable trend during 2004 and continuing into 2005; a decreasing trend began during the latter half of 2005. More recently the concentration of the leachate at Cell3/FM has returned to pre-2005 levels. The average

TDS concentrations are typically around 60,000 mg/l Samples collected from the northern forcemain lift station (Cell3/FM) can vary depending upon the amount of mixing and rate of discharge from the forcemain into the lift station that is occurring at the time of sample collection.

Leachate samples collected at location Cell3/FM are acidic with elevated concentrations of TDS, COD, calcium, chloride, potassium, sodium, and sulfate. The concentrations of these parameters remain variable over time. Total trace metals consistently detected include barium, cadmium, copper, lead, nickel, and zinc. Prior to 2005, antimony, cobalt, chromium, and selenium were also included in the consistently detected list of trace metals.

For reference purposes, Cell 3/FM samples collected during 2012 were compared to DEQ Numerical Groundwater Guidance and Reference Levels. Samples collected from the Cell III and IV (northern) lift station do not represent groundwater. However, a comparison to these levels provides a screening evaluation of the water quality conditions at the lift station. Parameters generally detected above a Groundwater Numerical Guidance Level in Cell3/FM samples include the following:

- Chloride: Average concentration was 23,500 mg/l; down from 31,000 mg/l range concentrations observed in 2010 and 2011.
- Manganese: Average concentration was 21 mg/l, slightly lower than typically observed range of 23 to 26 mg/L.
- TDS: Average concentration was 52,500 mg/l. TDS concentrations have increased beginning in 2010 for typical concentrations of around 32,000 mg/l.
- Sulfate: No exceedances due to high reporting limit. Sulfate concentrations can be variable and more recently ranged from 56 to 481 mg/L.

Parameters that have been detected above a Groundwater Numerical Reference Level include barium, cadmium, and lead.

3.3 WASTEWATER LAGOON

Leachate from the ash monofill cells (Cells I through IV) is directed to the wastewater lagoon, as is gas condensate from the landfill gas flare system. A floating cover over the lagoon was installed in October 1998 to minimize rainfall mixing with the leachate in the lagoon. Water quality samples collected from the wastewater lagoon are designated LL-1.

Wastewater lagoon samples show some concentration variability over time, which appears to be dependent upon the volume of water present and the amount of mixing that had occurred. TDS concentrations generally range from 35,000 mg/l to 50,000 mg/l. TDS concentrations of samples collected from the wastewater lagoon have generally been less variable and increasing since the installation of the floating cover system.

TDS concentration of the wastewater lagoon samples are typically lower than TDS concentrations of samples collected from the northern lift station (Cell3/FM). This condition has generally been observed since 2001 with exception of a period during 2009 and 2010. Generally, lower concentrations of “salts” (i.e., calcium, chloride, potassium, sodium, and sulfate) are detected in wastewater lagoon (LL-1) samples. This difference has been attributed to geochemical stratification that appears to occur in the water stored in the lagoon. Attempts are made to consistently collect lagoon samples approximately four feet below its water surface. It is assumed that higher concentrations of salts and metals increase with depth in the

lagoon water (i.e., lower concentrations at the surface). Leachate in the northern and southern lift stations is regularly mixed reducing the opportunity for geochemical stratification.

For reference purposes, samples collected from the lagoon during 2012 were compared with DEQ Numerical Groundwater Guidance and Reference Levels. Samples collected from the wastewater lagoon do not represent groundwater. However, a comparison to these levels provides a screening evaluation of the lagoon water quality. Parameters detected above a Groundwater Numerical Guidance Level during 2006 include:

- Chloride: Average concentration was 22,000 mg/L. Chloride concentrations typically range between 22,000 and 26,000 mg/L.
- Iron: Fall event concentration of 0.61 mg/L. Iron concentrations more recently have ranged from 0.12 to 0.31 mg/L.
- Manganese: Fall event concentration was 20 mg/L. Manganese concentrations more recently have ranged from 15.1 to 17.4 mg/L.
- TDS: Average concentration was 47,000 mg/L. TDS concentration typically range between 38,000 to 55,000 mg/L.
- Sulfate: Concentrations typically range from 55 to 349 mg/L.

Parameters detected above a Groundwater Numerical Reference Level are typically limited to barium, cadmium, and lead.

3.4 WASTEWATER LAGOON SLCRS

The wastewater lagoon SLCRS sample point is designated LDS-1. The location of this sample point is shown on Figure 2. Inspection of this sample point has consistently found the presence of fluid.

TDS concentration at LDS-1 typically range from 46,000 to 54,000 mg/L and are higher than the leachate samples collected from the lagoon (LL-1). TDS concentrations at LDS-1 show signs of stabilizing after showing upward trends since 2002. Prior to 2002, parameters detected in LL-1, in general, had lower concentrations than in LDS-1. From 2003 to 2005, overall concentrations of most parameters in LL-1 samples were similar to or higher than LDS-1 samples. During 2006, conditions changed with TDS of samples from LDS-1 being greater than the concentrations of samples from LL-1. During 2010 TDS concentrations again became similar between LL-1 and LDS-1, but more recently (2011 and 2012) appear to have again become higher at LDS-1. Both LDS-1 and water in the lagoon remain acidic.

For reference purposes, the following is a comparison of 2006 LDS-1 samples with DEQ Numerical Groundwater Guidance and Reference Levels. Samples collected from the wastewater lagoon SLCRS do not represent groundwater. However, a comparison to groundwater levels provides a screening evaluation of the lagoon's SLCRS water quality. Parameters detected above Groundwater Numerical Guidance Level in samples collected during 2006 include:

- Chloride: Average concentration was 25,500 mg/L Chloride concentrations typically range from 28,800 to 24,000 mg/L.
- Iron: Fall 2012 concentration was 42 mg/L. Recent iron concentrations typically range from 17 to 50 mg/L.

- Manganese: Fall 2012 concentration was 12 mg/L. Recent manganese concentrations have ranged from 11.5 to 14.7 mg/L.
- TDS: Average concentration was 52,000 mg/L. Recent TDS concentrations have ranged from 46,200 to 66,500 mg/L.
- Sulfate: Recent concentrations have ranged from 69.7 to 492 mg/L.

Barium was the only parameter detected above a Groundwater Numerical Reference Level during 2012. Barium is typically the only parameter detected above their Reference Level.

3.5 HYDRAULIC CONTROL DISCHARGE

The hydraulic gradient control discharge was first sampled during the fall 1996 monitoring event after Cell III had been constructed but prior to receiving ash fill. Water discharging from the hydraulic control was observed to be slightly turbid at that time with a total suspended solids concentration of 95 mg/l. The next monitoring activity associated with the hydraulic discharge water was the collection of field parameter measurements completed during the spring 1999 sampling event. Beginning with the spring 2003 sampling event, regular collection of field parameter reading of the gradient control discharge water was completed. A second sample of the discharge water occurred during the fall 2004 site sampling event. Inclusion of the gradient control discharge point into the site's sampling program began with the fall 2005 sampling event.

The results of sampling completed on the hydraulic control discharge point (designated Drain-1) indicate that concentrations have either declined overtime since fall 2005 or have remained stable. Total suspended solids concentrations are consistently less than 10 mg/L. Stabilization over time of the water-bearing materials disturbed by construction of the Cell III hydraulic control system appears to be the cause of the water quality conditions being observed at Drain-1 sample point. Arsenic, barium, and vanadium are the three trace metals consistently detected in Drain-1 samples. Other trace metals are typically not detected. The concentrations of the three detected trace metals have remained stable over time. Older data indicated that water quality conditions were slightly different between spring and fall events with spring events generally having higher measured specific conductivity values. More recent data shows less of this seasonal condition. Continued monitoring of the hydraulic control discharge sample point Drain-1 provides data to evaluate trends and changes in the water quality discharging from the Cell III hydraulic gradient control.

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4. LEACHATE SYSTEM MONITORING PROGRAM

This section describes how the leachate collection and removal systems associated with the lined portions of the site, as described in Section 2, will be inspected for the presence of fluid and sampled, if fluid is present. Information associated with submittal of an Annual Leachate Treatment Report is also described.

4.1 PROGRAM APPROACH

As detailed in Section 3, regular monitoring of the ash monofill SLCRSs and their associated leachate monitoring points has been conducted regularly for the past seventeen years. As the facility has developed over time, additional monitoring points have been established. These monitoring activities have documented changes in leachate quality and quantity as operational activities have changed over time.

As noted in the March 29, 1999 Record of Decision (ROD), the ash monofill cells were not a suspected source of groundwater impacts observed at the facility due to the type and nature of the contamination; consisting primarily of trace metals and VOCs. The ROD noted that trace metals are common in the ash, but that VOCs are not since they would have been burned off during the waste incineration process. Further, it was noted, there was a lack of salts in the contaminant plume, which is a clear indicator of the ash leachate. It was noted that there are a few detection wells between the ash cells and the trenchfill area, but that no correlation was present between what was observed in wells located down-gradient of the ash monofill cells and the contamination observed at the compliance boundary monitoring wells.

Based on these observations, inspection and monitoring of the LCRSs provides data on the presence and character of the fluids found in the facility's collection and removal systems. Data from the leachate collection sampling points serve to characterize leachate generated from the closed Cell III ash monofill and the active Cell IV ash monofill overtime. Inspection and sampling of the hydraulic gradient control provides data on potential changes in groundwater quality in the area of the two cells. Monitoring wells located down-gradient of the ash monofills also provides data on groundwater quality.

Table 1 is the comprehensive water quality sampling schedule for the NMCDF. As indicated on Table 1, PLCRS (sample points Cell3/FM and LL-1), SLCRS (LDS-1 through LDS-6), and Drain-1 (hydraulic control outfall) are sampled on a semi-annual basis concurrent with the collection of other water quality monitoring being completed at the site. Table 2 identifies the analytes represented in each of the parameter groups shown on Table 1.

The Sampling and Analysis Plan, presented in Section 4 of the EMP, describes the collection and analysis procedures and protocol for water quality sampling associated with the LCMP.

4.2 SYSTEM INSPECTION METHODOLOGY

For ash monofill Cell III and Cell IV SLCRSs, the volume of fluid removed from each SLCRS is measured by a dedicated flow totaling meter. During each semi-annual inspection event, flow totalizing meter readings and fluid level height, as indicated at readouts located of their respected instrument panel stations, will be recorded along with the date, time, and the individual completing the measurement in the site field sampling notebook. The wastewater lagoon SCLCRs is not equipped with instrumentation providing fluid levels. Bonded to the floating cover is a staff gauge to assist in determining the leachate depth. To estimate the stored volume, the water height is read off of the berm staff gauge and compared with a table to convert the height reading to the corresponding volume equivalence.

4.2.1 Wastewater Lagoon SLCRS

The presence of fluid volume at the wastewater lagoon SLCRS (sample point LDS-1) will be determined by opening the sampling station valve and measuring the rate at which fluid, if present, flows into a 10 liter graduated cylinder.

4.2.2 Cell III and IV SLCRS

Fluid volumes at the Cell III and IV SLCRS are determined by flow totaling meters installed at each sampling stations (Figure 6). The SLCRS stations are each equipped with an electronic system control and status panel that includes total flow and fluid level readouts. Flow totalizers have also been installed on the discharge lines of the Cell III and IV SLCRS. These in-line meters are to be used to determine volumes pumped from each SLCRS. As described in Section 4.3, the AEMR will present the total gallons of leachate collected monthly and the total gallons received from each source (the wastewater lagoon SLCRS, closed ash monofills Cells I and II primary LCS, and ash monofills Cell III and IV LCS and SLCRS).

4.2.3 Northern Lift Station

Water quality samples have been collected from the northern lift station. Leachate from Cells III and IV discharges into the northern lift station where it is then pumped to the southern lift station where it is then pumped into the wastewater lagoon. The northern lift station (sample point Cell3/FM) is sampled semi-annually. The location of the northern lift station (sample point Cell3/FM) and its associated forcemains is shown on Figure 6.

4.2.4 Wastewater Lagoon

The wastewater lagoon has level markings on its eastern side that identifies the volume of leachate contained in the lagoon. The level of leachate in the lagoon will be recorded during each inspection event.

4.2.5 Hydraulic Control Discharge Point

The rate of water discharging from the hydraulic control discharge line will be measured using a five gallon bucket. The time it takes to fill up a five gallon bucket will be recorded during each inspection event.

4.2.6 Cells I and II SLCRS

The VZMDs installed at NMCDF use a gas-actuated device with a check valve (the only moving part of the device). The Cell I and II VZMDs are inactive and not inspected. Previous inspections of the VZMDs suggested that there is no fluid in the devices or that they are not functioning.

4.3 ANNUAL LEACHATE TREATMENT REPORT

Regular inspection and monitoring of the primary and secondary leachate collection and removal systems is an important element of the facility's environmental monitoring program. The County completes inspection of the primary and secondary leachate collection and removal systems at minimum on a monthly frequency. As required in Section 18.5, an Annual Leachate Treatment Report (ALTR) shall be included as part of the Annual Environmental Monitoring Report (AEMR). The ALTR at a minimum shall include:

- Contents that satisfy conditions of the Leachate Management Plan
- A review of all significant events that occurred at the site during the last year regarding leachate issues.
- A review of the monitoring network performance and recommendations for improvements.
- The total monthly volume of leachate removed from Cells III and IV.
- The total monthly volume of leachate disposed through off-site or on-site disposal methods.

ALTRs have been presented in past AEMRs.

4.4 SAMPLING PROGRAM AND PROCEDURES

Table 1 presents the frequency, schedule, and water quality parameters to be completed at the active leachate, SLCRS stations, the wastewater lagoon, and the hydraulic control discharge point. The presence of fluids in the active SLCRSs are to be checked during each sampling event as described in Section 4.1. If fluid is present, fluid from the SLCRS sampling station will be collected and submitted for the analysis listed in Table 1.

The analytes for each of the parameter groups identified in Table 1 is presented in Table 2. As shown on Table 2, there are two lists of parameters associated with the parameter groups. The NMCDF Indicator Parameters represent a select number of parameters associated with the NMCDF Permit Parameter list. The NMCDF Indicator Parameters represent an optimization of the facility's groundwater monitoring program. NMCDF Indicator Parameters were proposed in the NMCDF 2010 AEMR along with an application schedule. These modifications were approved and implemented in 2011 consistent with DEQ's 2010 AEMR approval letter dated February 15, 2011.

The following presents the procedures to collect water quality samples from the SLCRS. The Sampling and Analysis Plan, presented as Section 4 of the EMP, also describes these procedures along with water quality collection, documentation, and analysis procedures.

4.4.1 Wastewater Lagoon

Water quality samples from the wastewater lagoon will be collected by opening the metal cover access hatch located near southern side of the floating cover. The hatch can be accessed from the south side of the lagoon via a padded access walking path. Fluid from the lagoon is collected by using a bailer. The wastewater lagoon sample point is designated LL-1.

4.4.2 Wastewater Lagoon SLCRS

Water quality samples from the wastewater lagoon SLCRS (sample point LDS-1) will be collected by opening the sampling station valve and collecting the fluid discharging from the sampling port. Fluid from the sampling port will be collected in appropriate laboratory provided sample containers. The sampling port valve will need to be adjusted in such a manner as to provide a slow but steady stream of fluid into the container.

4.4.3 Cell III and Cell IV SLCRS

The Cell III and IV SLCRS sampling stations LDS-2 through LDS-6 are fitted with dedicated electric pumps used to check for the presence of fluid and to obtain a water quality sample, if

fluid is present. The electronic control panels located at the two sampling stations provide pump control and system status information. Special keys are needed to access the Cell III SLCRS discharge lines and monitoring/operations panel. The same special key is also needed to access the Cell IV monitoring/operations panel. Prior to sample collection, the SLCRS is pumped using the manual (hand) mode setting for at least one minute to purge standing fluid from the pump and its discharge line. Samples are then collected directly from the SLCRS pump discharge line. SLCRS discharge lines are then returned back to their appropriate locations and the pump operation setting is returned to its automatic setting.

4.4.4 Northern Lift Station

Samples from the northern lift station (designated Cell 3/FM) are collected at the top of the lift station. A special key is required to open the lift station access doors. Care should be taken when these doors are open due to potential fall hazard. Water quality samples from the northern lift station are collected using a disposable bailer.

4.4.5 Existing VZMD SLCRS

The procedures to collect water quality samples from the VZMDs are detailed in Appendix A. The VZMDs are inactive. Previous inspections of the VZMDs suggested that there is no fluid in the devices or that they are not functioning. The information presented in Appendix A is provided as a reference source.

5. REVIEW AND REPORTING OF WATER QUALITY RESULTS

This section describes how water quality data collected from the primary and secondary LCRSs and the hydraulic gradient control discharge point will be managed, reviewed, and reported. Section 5 of the WQMP (Section 1 of the EMP) provides additional detail regarding water quality data management, review, and reporting.

A water quality database of samples collected at the landfill site since 1988 was developed in 1997 (Dames & Moore 1998) and has undergone several iterations of data quality and completeness reviews. Data collected from sample points described in this plan are included in this database.

The NMCDF water quality database is currently on a Microsoft Access platform and was developed as an element of the NMCDF Remedial Investigation effort and initially used to complete an Endangerment Assessment for the site to evaluate the potential of human health risks associated with chemical releases at NMCDF. This database is regularly maintained and updated as analytical results of water quality samples collected from the site become available. Electronic data deliverables (reports) received from the laboratory are imported directly into the database reducing data entry error. Water quality reports for the site are generated using this database. Backup copies are annually produced and stored on a compact disc.

Reports from the database are presented in Annual Environmental Monitoring Reports (AEMRs). In addition to the presentation of water quality data collected from the site, as stated in Section 4.3, an Annual Leachate Treatment Report is to be included as part of the AEMR. Prior to February 1st of each year, two copies of an AEMR covering the past year from January 1st to December 31st will be submitted to the DEQ. The AEMR is to be prepared and stamped by either a geologist or a certified engineering geologist with current Oregon registration.

5.1 REVIEW OF WATER QUALITY RESULTS

The analysis and evaluation of water quality data collected from the NMCDF PLCRSs, SLCRSs, the wastewater lagoon, and the hydraulic gradient control discharge point will be completed in the following manner. A review of field and laboratory data will be initially completed, upon receipt of the data from the laboratory, to identify and address data that: 1) did not meet QA/QC control objectives, 2) represents a significant change in water quality, or 3) exceeds a primary groundwater or drinking water quality standard. Water from the PLCRS and the SLCRS monitoring points are not considered groundwater or drinking water. However these standards have been used to screen LCRS results to identify those analytes and parameters that were detected above these standards which are then compared to prior results to facilitate evaluation of changes in water quality.

5.2 REPORTING

Reporting of water quality monitoring data from the PLCRS, SLCRS, and the hydraulic gradient control monitoring points will be included in the AEMR. Elements associated with the Annual Leachate Treatment Report described in Section 4.3 shall also be part of the AEMR.

5.2.1 Data QA/QC

A QA/QC review will be completed for each water quality sampling event and will be summarized in a QA/QC summary report that will accompany all data presentation reports. The QA/QC summary report will present the following information: project and sample information; a quality assurance summary; a review of analytical methods and holding times; and a review of laboratory and field quality control samples. Data presentation reports (i.e., Annual Environmental Monitoring Reports) will also include a review of field activities or observations that may have had an influence on the representativeness of water quality data collected from the site.

5.2.2 Data Presentation and Analysis

Data presented in the AEMRs will be organized by permit-specified parameter groups and well groups. These groups and the analytes and parameters represented in each ground are identified on Table 2. Data associated with the PLCRSs, SLCRSs, and the hydraulic gradient control discharge point will be presented as Table 6, which these sample point locations. Letters will be used to designate the following permit specified water quality parameter groups associated with leachate and SLCRSs sample analysis:

- Table A: Field Indicators (Group 1a).
- Table B: Laboratory Indicators (Group 1b).
- Table C: Common Anions and Cations (Group 2a).
- Table D: Trace Metals - (Group 2b).

Using this table identification scheme, Table 6C, for example, will present the available common anion and cation data for the PLCRS, SLCRS, and the hydraulic gradient control discharge point sample points. Data in the tables will be presented in chronologically descending order (i.e., most recent data at the bottom row).

The following formats will be used to present data collected from the leachate and SLCRSs sample locations, including: time series plots and box plots.

6. REFERENCES

Oregon Administrative Rules (OAR). 1990. Department of Environmental Quality Chapter 340 Division 90 Groundwater Quality Protection.

Parametrix. 2007. Environmental Monitoring Plan, North Marion County Disposal Facility, Marion County, Oregon; prepared for Marion County Department of Solid Waste Management.

Parametrix. 2007. Water Quality Monitoring Plan, North Marion County Disposal Facility, Marion County; prepared for Marion County Department of Solid Waste Management.

Russ Fetrow Engineering (Fetrow). May 1988. Woodburn Disposal Facility, Wastewater Storage Facility.

Russ Fetrow Engineering (Fetrow). July 1987. Woodburn Landfill, Ash Storage Facility - 1987 Expansion.

U.S. Environmental Protection Agency (EPA). 2003. National Primary and Secondary Drinking Water Standards; by the Office of Water (4606M) U.S. EPA, Washington, D.C. EPA 816-F-03-016.

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FIGURES

Parametrix DATE: January 24, 2011 FILE: N_Marion_Locator.mxd

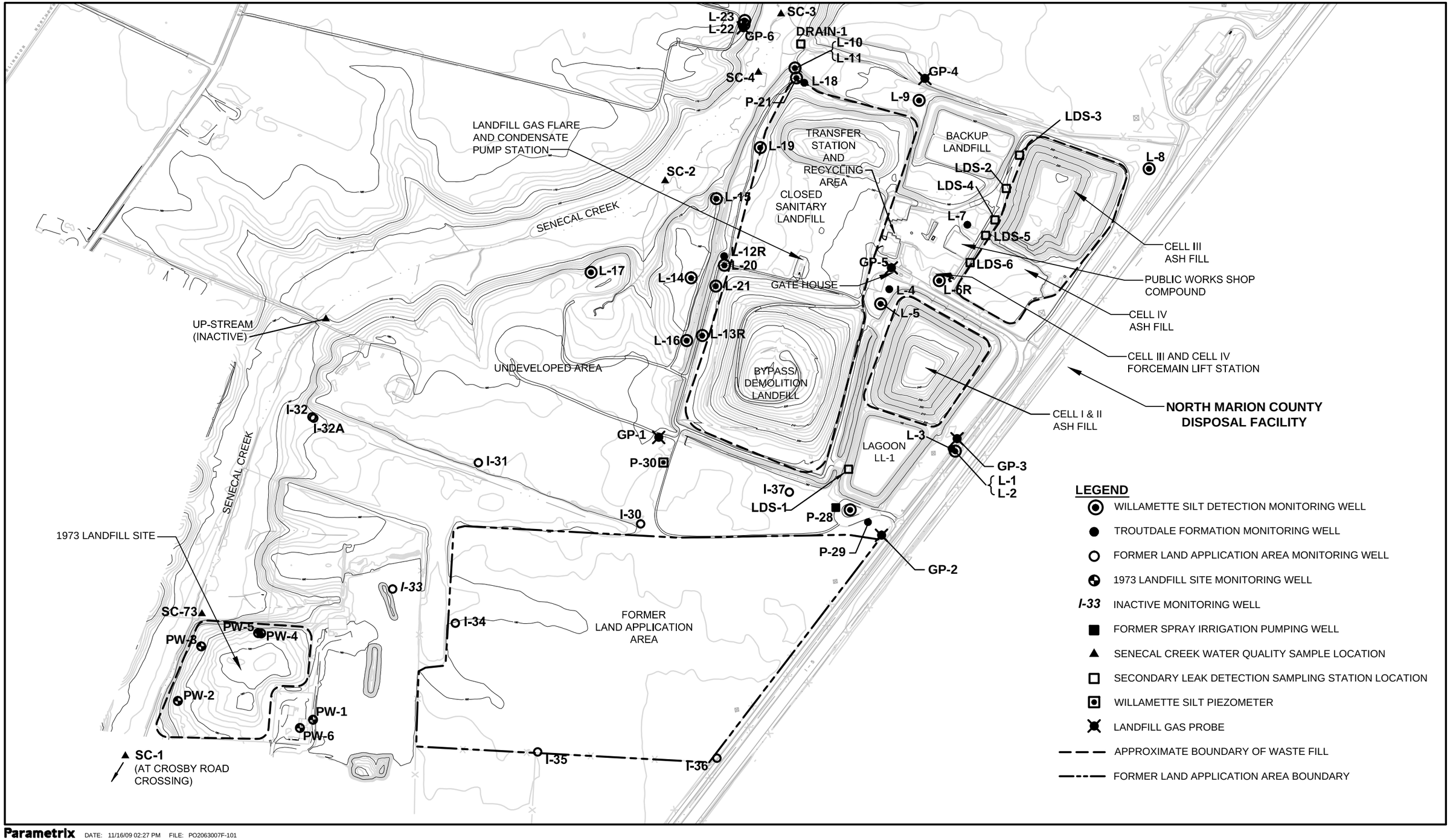
N

0 500 1,000 1,500

Feet

Figure 1
Site Location

Annual Environmental Monitoring Report
North Marion County Disposal Facility
Marion County, Oregon



Parametrix DATE: 11/16/09 02:27 PM FILE: PO2063007F-101

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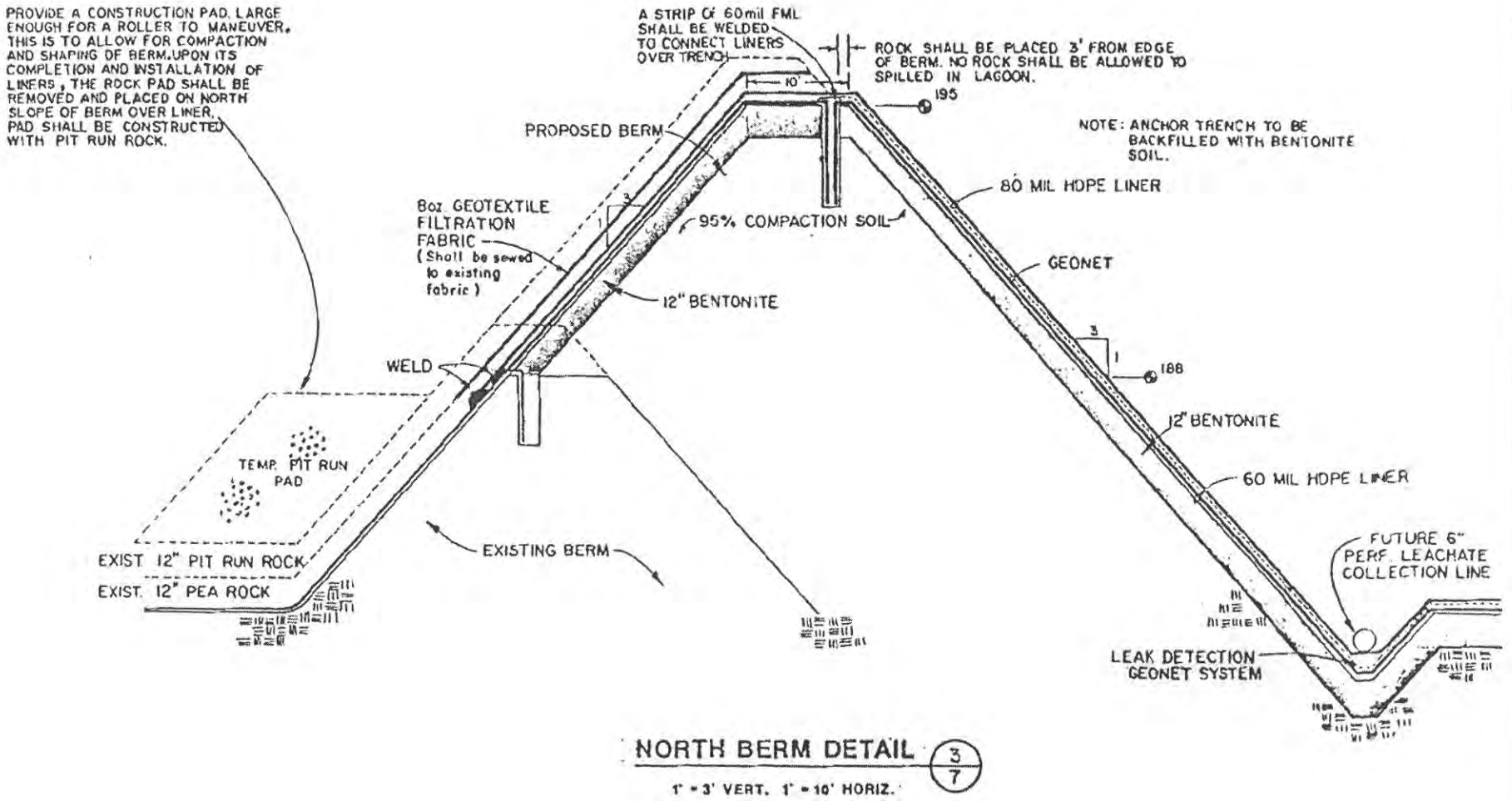
SCALE IN FEET

Figure 2
Facility Site Map
Environmental Monitoring Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON

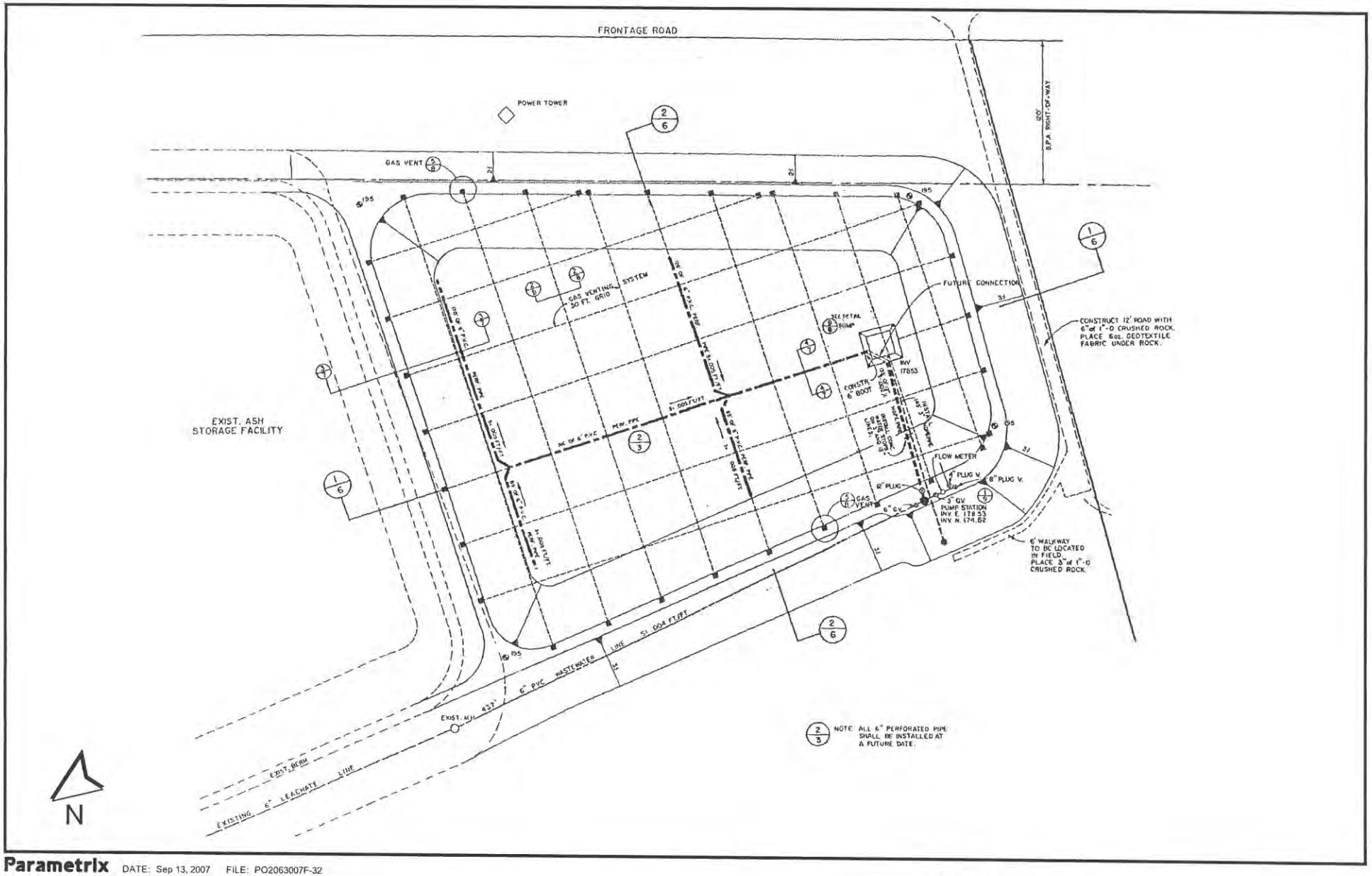


Base Map Modified From Woodburn Disposal Facility, Wastewater Storage Facility, Details North Berm Detail (Sheet 7/9), By Russ Fetrow Engineering, Inc., MAY 1988.

Parametrix DATE: Sep 13, 2007 FILE: PO2063007F-31

Figure 3
Wastewater Storage Facility North Berm Detail
Environmental Monitoring Plan

NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON

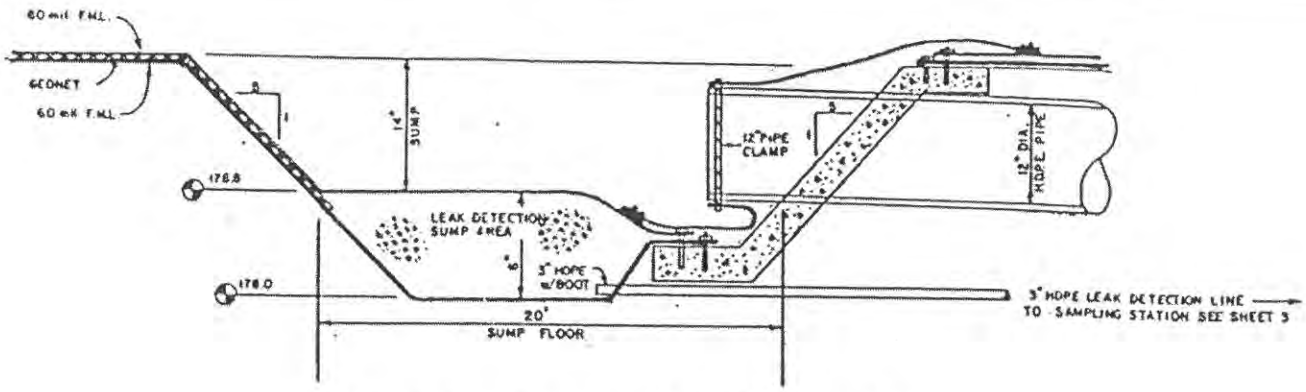


Parametrix DATE: Sep 13, 2007 FILE: PO2063007F-32

Base Map Modified From Woodburn Disposal Facility, Wastewater Storage Facility,Gas Venting & Leak Detection System (Sheet 3/9), By Russ Fetrow Engineering, Inc., MAY 1988.

Figure 4
Wastewater Storage Facility Plan View
Environmental Monitoring Plan

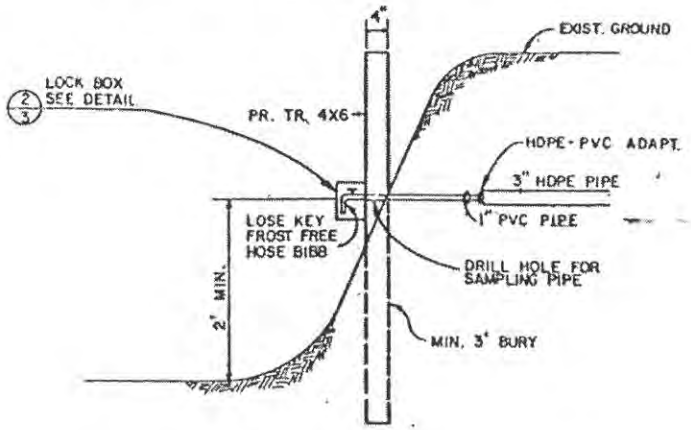
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON



SUMP / 12" PIPE BOOT DETAIL 9/8

N.T.S.

Detail From Woodburn Disposal Facility, Wastewater Storage Facility, Details - Sump / 12" Pipe Boot Detail (Sheet 8/9), By Russ Fetrow Engineering, Inc., MAY 1988.

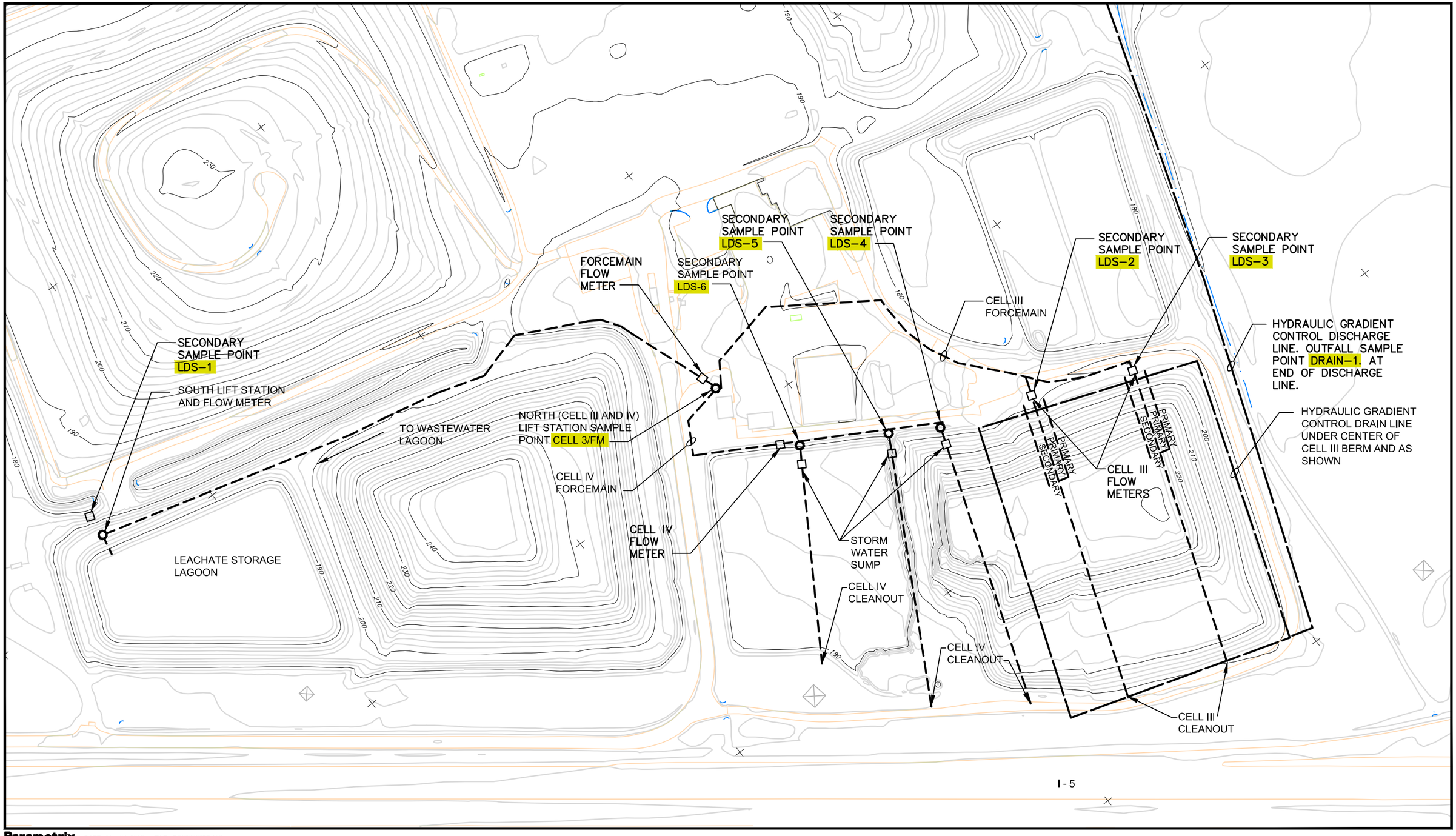


LEAK DETECTION SAMPLING STATION 1/3

Detail From Woodburn Disposal Facility, Wastewater Storage Facility,Gas Venting & Leak Detection System (Sheet 3/9), By Russ Fetrow Engineering, Inc., MAY 1988.

Parametrix DATE: Sep 13, 2007 FILE: PO2063007F-33

Figure 5
Wastewater Storage Facility Sump Pipe Boot Detail
Secondary Leachate Collection & Removal System
Sampling Station - Environmental Monitoring Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON



Parametrix DATE: May 24, 2013 FILE: PO2063007F-102

N

0 175'

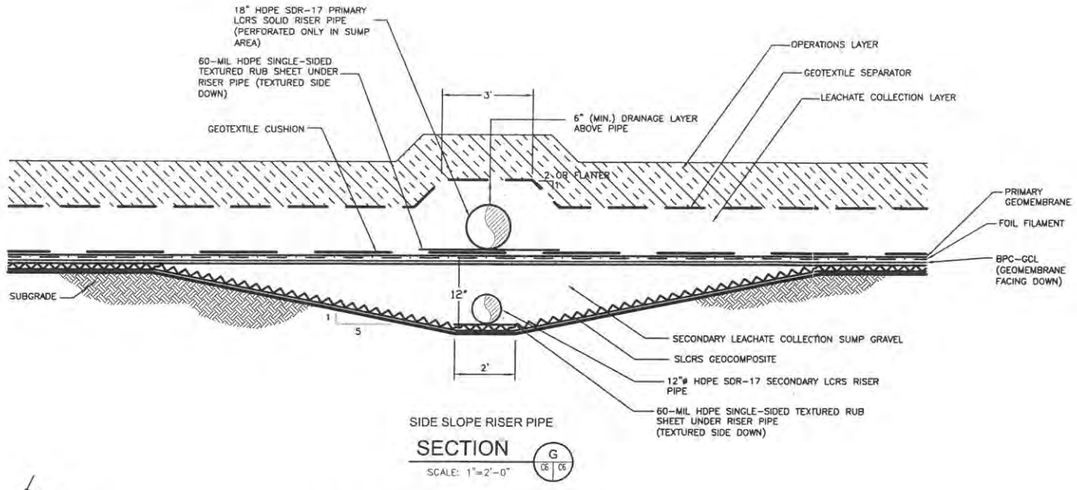
SCALE IN FEET

LEGEND

LEACHATE COLLECTION AND REMOVAL SYSTEM SAMPLE POINTS

Figure 6
Leachate Collection & Conveyance Enviromental Monitoring Plan

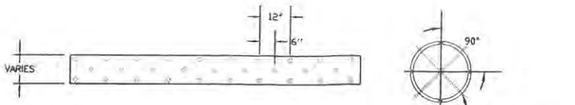
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON



SIDE SLOPE RISER PIPE

SECTION (G | C6 | C6)

SCALE: 1"=2'-0"

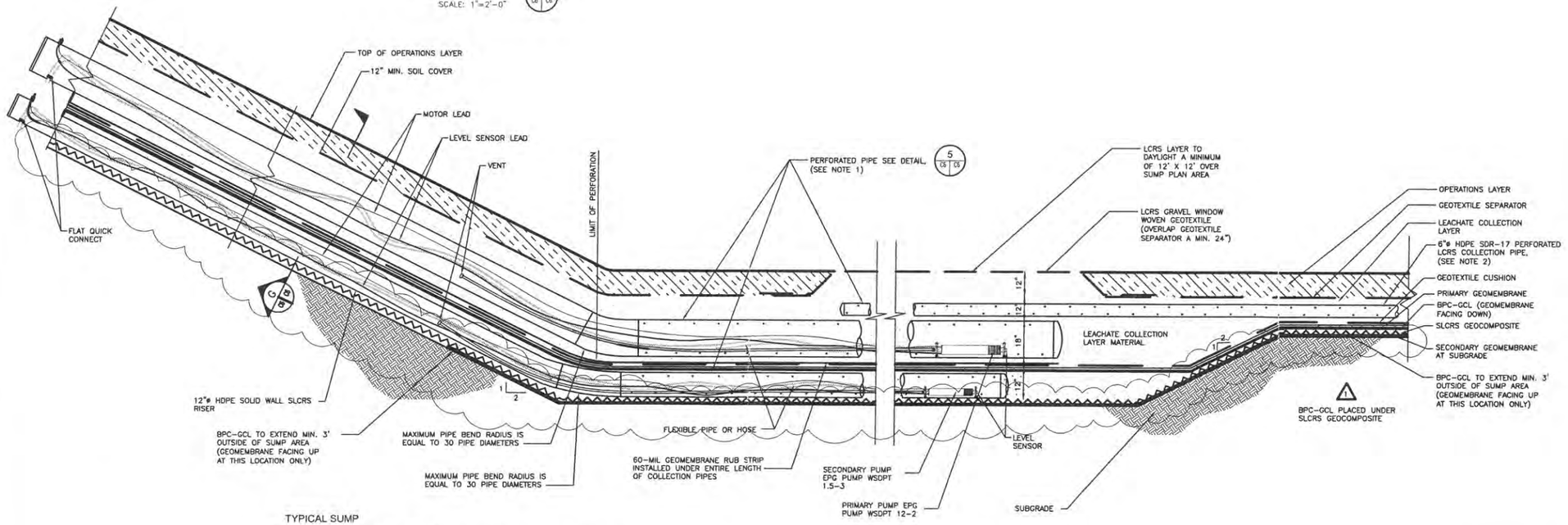


HDPE PIPE PERFORATION

DETAIL (5 | C6 | C6)

SCALE: 1"= 2'-0"

CHECK SCALE FOR REDUCTION
SCALE = 1"



TYPICAL SUMP

SECTION (H | C5 | C6)

SCALE: 1"=2'-0"

NOTES:
1. LENGTH OF PRIMARY AND SECONDARY PERFORATED COLLECTION PIPES TO BE EXTENDED MIN. 20 FEET INTO SUMP.
2. LENGTH OF 6" DIAMETER PERFORATED HDPE LCRS COLLECTION PIPE TO EXTEND A MINIMUM OF 15 FEET INTO SUMP.

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
1	5/21/02	ISSUED FOR CONSTRUCTION	SKW	ECK	DMG	WG
0	4/5/02	ISSUED FOR CONSTRUCTION	SKW	ECK	DMG	WG

DATE OF ISSUE 4/5/2002 — DWN BY SUSAN WENTZ — DES BY ERIK KORSMO — CHK BY DOUGLAS GATRELL — APP BY WES GAVETT

EMCON/OWT Solid Waste Services

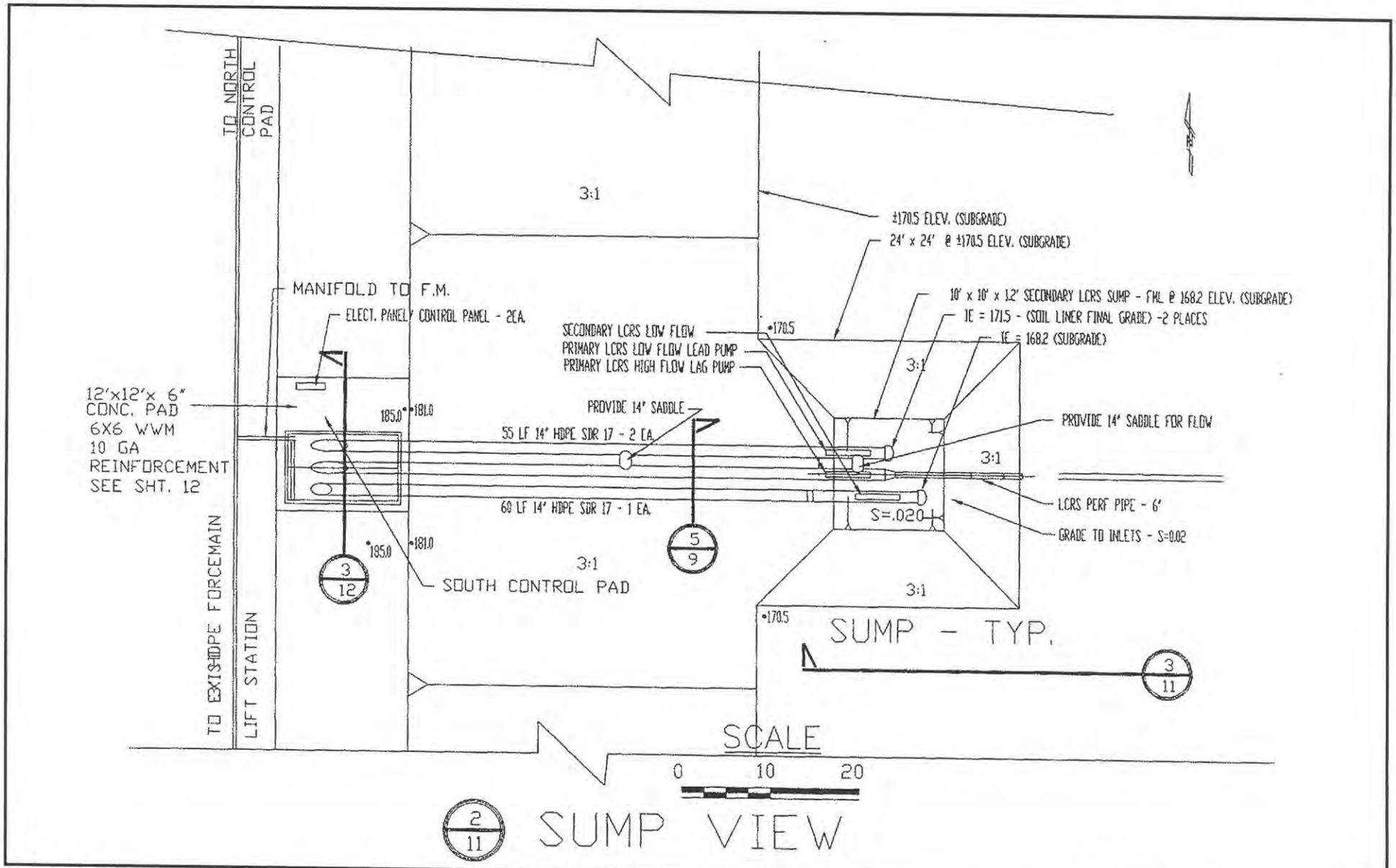
MARION COUNTY, OREGON
NORTH MARION COUNTY
DISPOSAL FACILITY

CELL IV ASH MONOFILL
SECTIONS AND DETAILS

DRAWING NO. C6

PROJECT NO. 829844

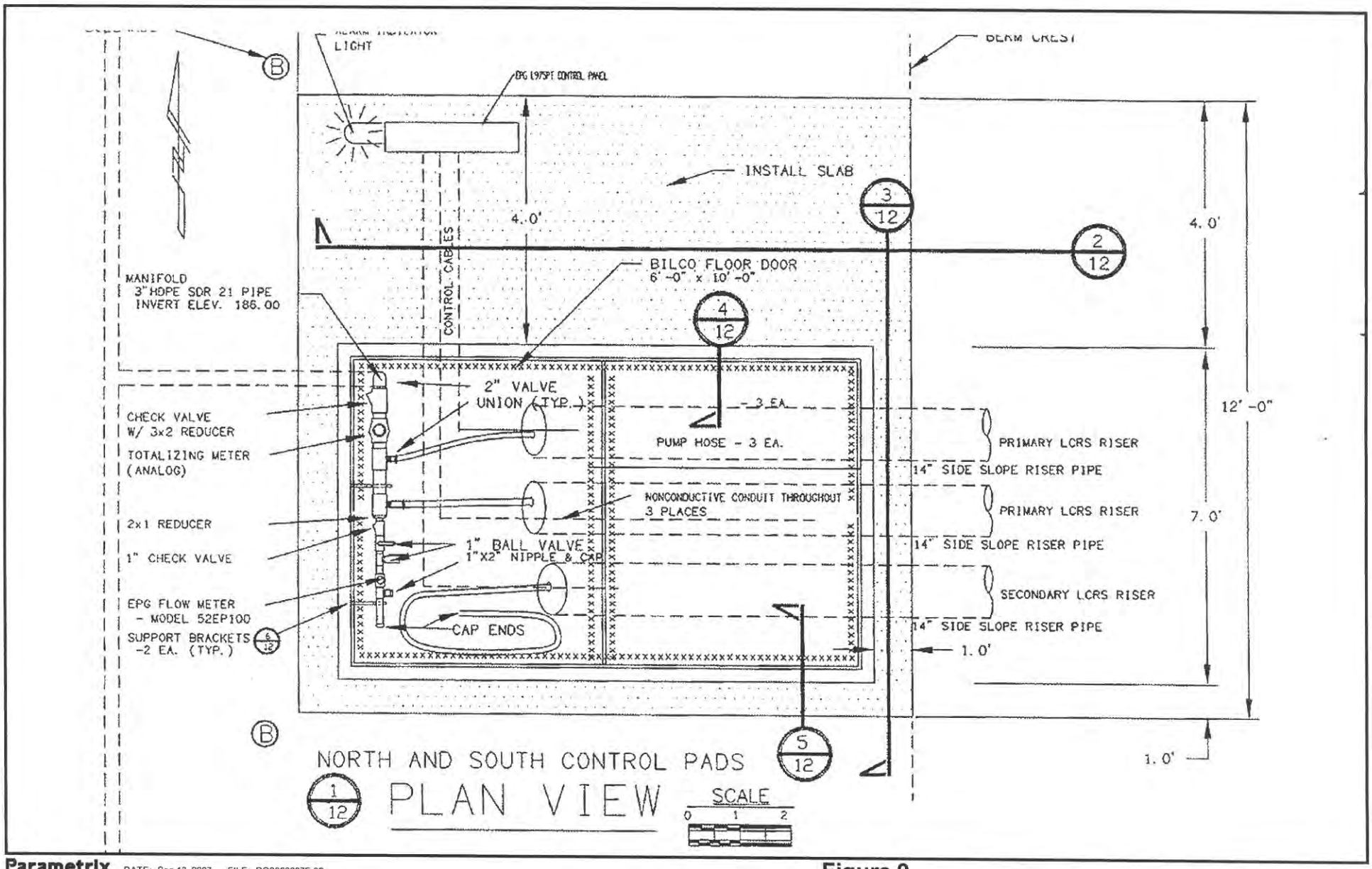
Figure 7
Cell IV Ash Monofill Primary And Secondary Leachate Collection And Removal System Details
Environmental Monitoring Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON



Parametrix DATE: Sep 13, 2007 FILE: PO2063007F-35

Figure 8
Cell III Ash Monofill Sump View
Environmental Monitoring Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON

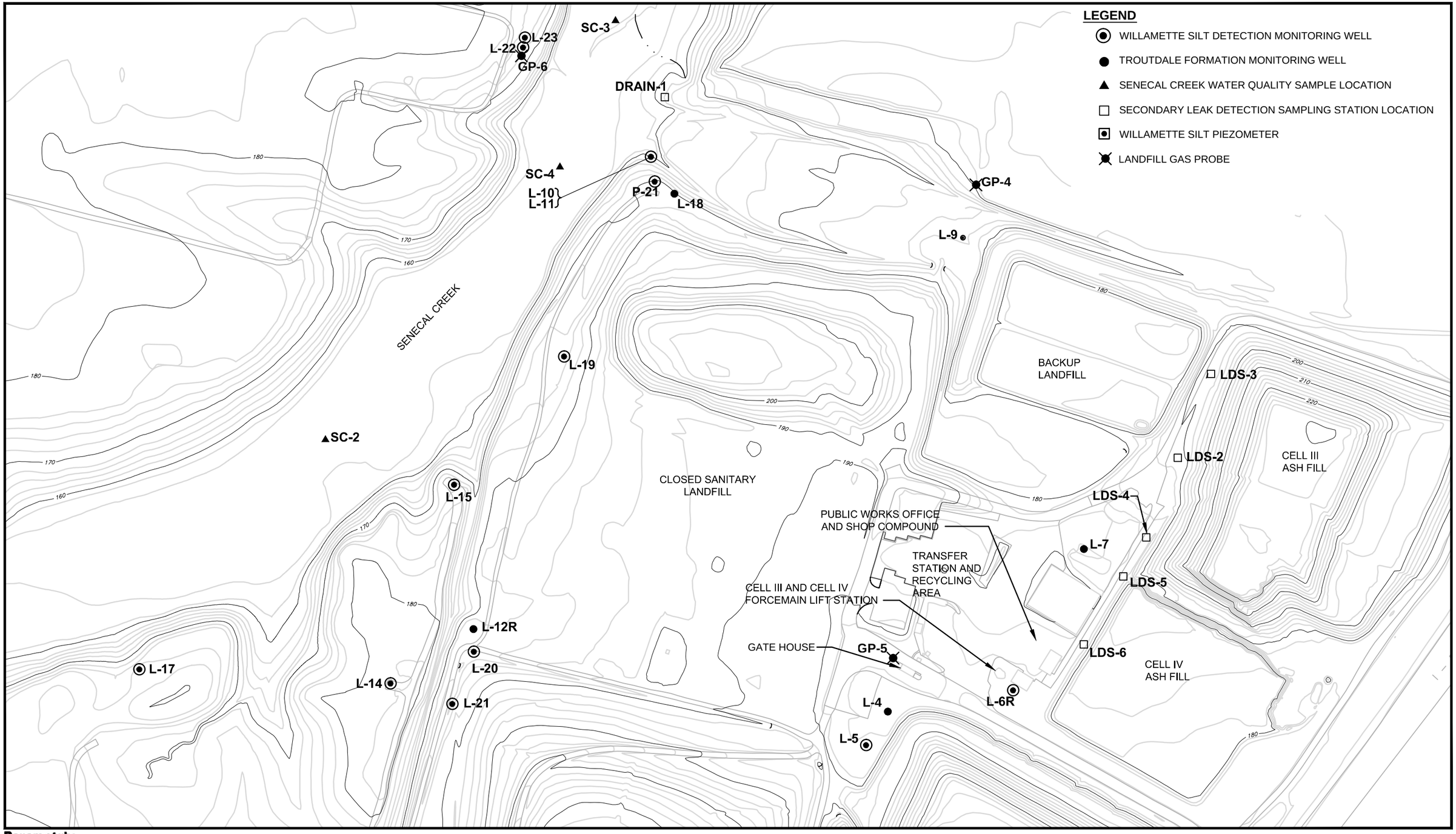
Detail From Marion County Department of Solid Waste Management, Cell III Ash Monofill Construction Specification Drawings, North Marion County Disposal Facility, April 1996.



Parametrix DATE: Sep 13, 2007 FILE: PO2063007F-36

Figure 9
Cell III Ash Monofill Secondary Leachate Collection And Removal System Sampling Station
Environmental Monitoring Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON

Detail From Marion County Department of Solid Waste Management, Cell III Ash Monofill Construction Specification Drawings, North Marion County Disposal Facility, April 1996.



Parametrix DATE: May 24, 2013 FILE: PO2063007F-104

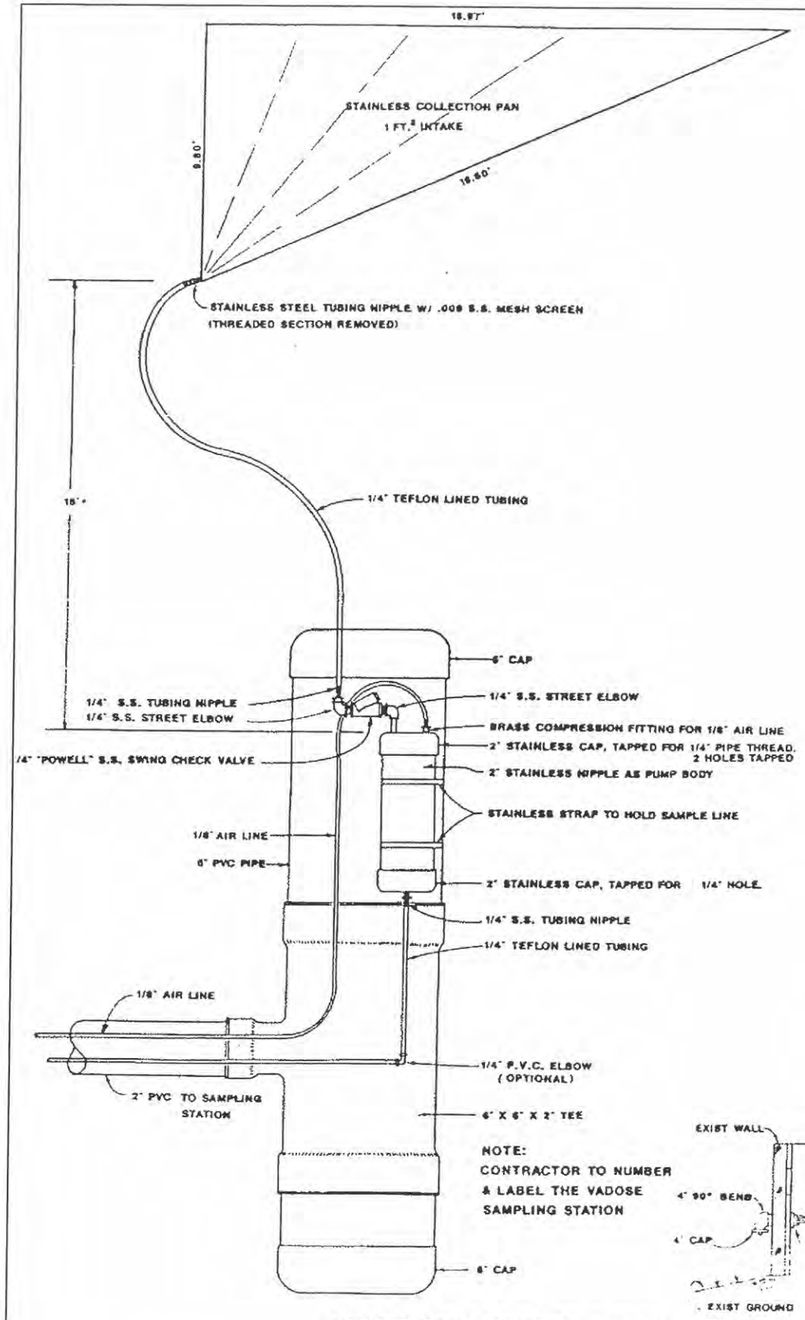
N

0 200'

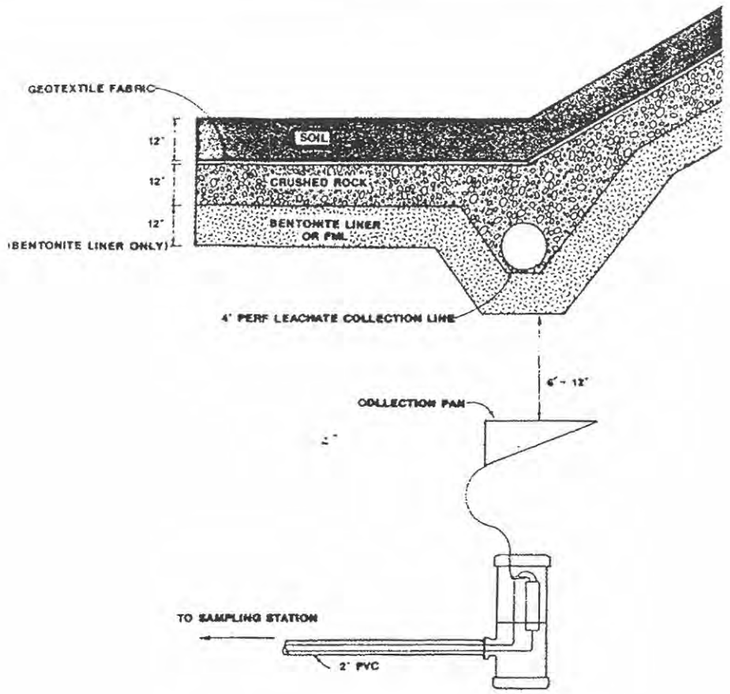
SCALE IN FEET

Figure 10
NorthWest Site Area Detail Map
Enviromental Monitoring Plan

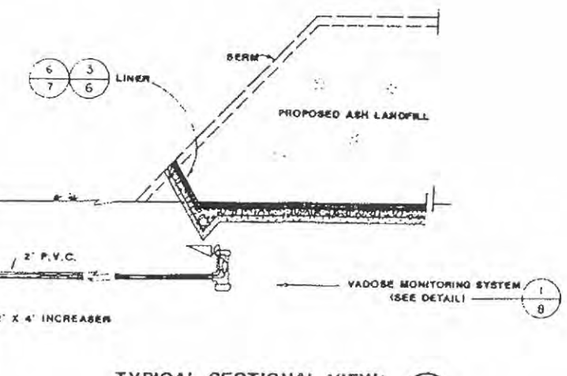
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON



VADOSE ZONE MONITOR SYSTEM (1/8)
N.T.S.



MONITOR LOCATION DETAIL (3/8)



TYPICAL SECTIONAL VIEW (2/8)
N.T.S.

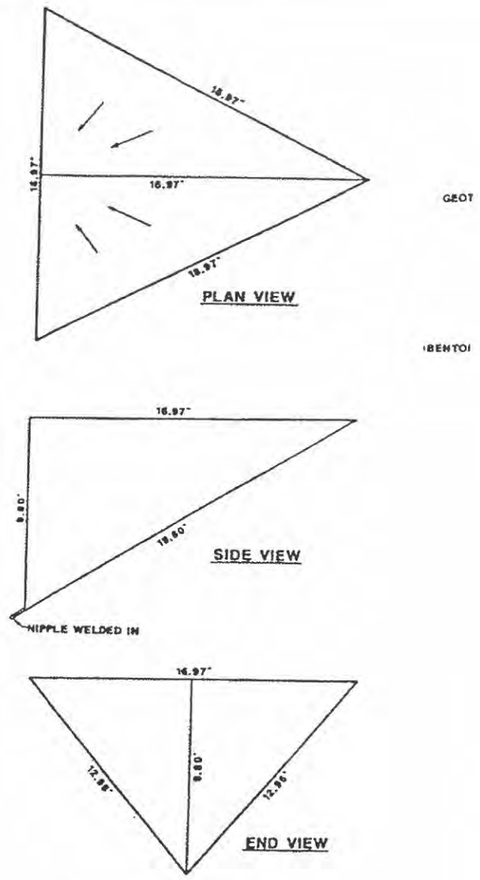


Figure Modified From Woodburn Landfill Ash Storage Facility,1987 Expansion, (Sheet 8/8), By Russ Fetrow Engineering, Inc., Salem, Oregon

Parametrix DATE: 09/13/07 11:37am FILE: PO2063007F-34

Figure 11
Closed Ash Monofill Cells I & II Pan Lysimeters
Environmental Montoring Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON

TABLES

TABLE 1: WATER QUALITY SAMPLE LOCATIONS, FREQUENCY, AND SCHEDULE
LEACHATE CONTROL MANAGEMENT PLAN
NORTH MARION COUNTY DISPOSAL FACILITY

Locations	Analytes *	Frequency	Schedule
Willamette Silt Tier 1 Detection wells: L-10, L-11, L-13R, L-15, L-19, L-20, and L-21.	Group 1a Group 1b Group 2a Group 2b Group 3	Semi-annual	Spring and Fall
Willamette Silt Tier 2 Detection wells: L-2, L-5, L-9, L-14, L-16, and P-21.	Group 1a Group 1b Group 2a	Semi-annual	Spring and Fall
	Group 2b Group 3	Annual	Fall
Willamette Silt Tier 3 Detection wells: L-6R, L-8, L-17, L-22, L-23, and P-28.	Group 1a Group 1b Group 2a	Annual	Fall: L-6R, L-8, L-23, P-28. Spring: L-17 and L-22.
	Group 2b Group 3	Bi-Annual	Fall 2012, Fall 2014, Fall 2016, etc.
Troutdale Formation wells: L-3, L-4 (at the tap), L-7, L-12R, L-18, and P-29.	Group 1a Group 1b Group 2a	Semi-annual	Spring and Fall
	Group 2b Group 3	Annual	Fall
Piezometers: L-1 and P-30. Water levels to be collected from all monitoring wells at NMCDF, the former Land Application Area, and the 1973 Landfill Site.	Water levels	Semi-annual	Spring and Fall
Senecal Creek monitoring points: SC-1, SC-2, SC-3, SC-4, and SC-73.	Group 1a Group 1b Group 2a Group 2b Group 5	Semi-annual Annual: SC-73	Spring and Fall Spring: SC-73
	Group 3	Annual	Spring
Leachate, Secondary Leachate Collection and Removal Systems, and Groundwater Gradient Control Outfall inspection points: LDS-1, LDS-2, LDS-3, LDS-4, LDS-5, LDS-6, Cell 3/FM, LL-1, and Drain-1.	Group 1a Group 1b Group 2a Group 2b	Semi-annual	Spring and Fall
1973 Landfill Site wells: PW-5.	Group 1a Group 1b Group 2a Group 2b Group 3	Annual	Fall

NOTES:
1) ***** See Table 3, Water Quality Monitoring Parameters, for analytes/parameters included in each parameter group. Note the NMCDF Indicator Parameter list is used except during even year Fall events (i.e., Fall 2012, Fall 2014, etc.) when the Permit Parameter list is applied. See note #2 below for application detail.
2) NMCDF Indicator Parameter list applied to all sample point locations except those associated with 1973 Landfill Site and the former Land Application Area.
3) Water levels are collected from all wells and piezometers during first day of sampling event.
4) The semi-annual compliance monitoring periods are:

- Spring: April 1st through May 31st.
- Fall: October 1st through November 30th.

TABLE 2: WATER QUALITY MONITORING PARAMETERS - INDICATOR AND PERMIT PARAMETERS
LEACHATE CONTROL MANAGEMENT PLAN
NORTH MARION COUNTY DISPOSAL FACILITY

NMCDF INDICATOR PARAMETERS	NMCDF PERMIT PARAMETERS	METHOD	METHOD DESCRIPTION	METHOD REPORTING LEVEL (mg/L)	DEQ REF. LEVELS[d] (mg/L)	DEQ GUIDANCE LEVELS[e] (mg/L)	EPA DRINKING WATER STD[f]
GROUP 1a: FIELD INDICATOR PARAMETERS							
ELEVATION OF WATER LEVEL	ELEVATION OF WATER LEVEL	FIELD	Electric Probe				
pH	pH	FIELD	Reference Electrode Probe			6.5 to 8.5 su	
TEMPERATURE	TEMPERATURE	FIELD	Temperature Probe				
SPECIFIC CONDUCTANCE	SPECIFIC CONDUCTANCE	FIELD	Conductivity Probe				
DISSOLVED OXYGEN	DISSOLVED OXYGEN	FIELD	Metal Cathode Probe				
REDOX POTENTIAL (Eh)	REDOX POTENTIAL (Eh)	FIELD	Platinum Band Sensor Probe				
GROUP 1b: LEACHATE INDICATOR PARAMETERS							
	HARDNESS (as $CaCO_3$)	6020[a]	ICP-MS	2.00			
TOTAL ALKALINITY (as $CaCO_3$)	TOTAL ALKALINITY (as $CaCO_3$)	310.1[b]	Titrimetric	10.0			
TOTAL DISSOLVED SOLIDS (TDS)	TOTAL DISSOLVED SOLIDS (TDS)	160.1[b]	Gravimetric	10.0		500	
TOTAL SUSPENDED SOLIDS (TSS)	TOTAL SUSPENDED SOLIDS (TSS)	160.2[b]	Gravimetric	10.0			
	CHEMICAL OXYGEN DEMAND (COD)		Spectrophotometric	5.00			
	TOTAL ORGANIC CARBON (TOC)		UV, Persulfate Oxidation-IR	1.00			
	SPECIFIC CONDUCTANCE		Conductivity Probe	10.0			
	pH		Reference Electrode Probe	pH units			
GROUP 2a: COMMON ANIONS AND CATIONS[#]							
CALCIUM (Ca)	CALCIUM (Ca)	200.7[b]	ICP-MS	0.050			
	MAGNESIUM (Mg)	200.7[b]	ICP-MS	0.002			
SODIUM (Na)	SODIUM (Na)	200.7[b]	ICP-MS	1.00			
	POTASSIUM (K)	200.7[b]	ICP-MS	1.00			
	IRON (Fe)	200.7[b]	ICP-MS	0.0250		0.3	
	MANGANESE (Mn)	200.7[b]	ICP-MS	0.00200		0.05	
	AMMONIA-NITROGEN (NH_4-N)	350.3[b]	Electrode	0.100			
	CARBONATE ALKALINITY (CO_3)	310.1[b]	Titrimetric	10.0			
	BICARBONATE ALKALINITY (HCO_3)	310.1[b]	Titrimetric	10.0			
	SULFATE (SO_4)	300.0[b]	Ion Chromotography	1.00		250	
CHLORIDE (Cl)	CHLORIDE (Cl)	325.3[b]	Ion Chromotography	0.5		250	
	NITRATE (NO_3-N)	353.3[b]	Ion Chromotography	0.100	10.0		10
	SILICA (Si)	370.1[b]	Spectrophotometric Reduction	0.250			
	AMMONIUM (NH_4)	SM 8010F	Calculation	0.0500			
GROUP 2b: TRACE METALS							
	ANTIMONY (Sb)	6020[a]	ICP-MS	0.00100			0.006
ARSENIC (As)	ARSENIC (As)	6020[a]	ICP-MS	0.00100	0.05		0.010
BARIUM (Ba)	BARIUM (Ba)	6020[a]	ICP-MS	0.00100	1.0		2
	BERYLLIUM (Be)	6020[a]	ICP-MS	0.00200			0.004
CADMIUM (Cd)	CADMIUM (Cd)	6020[a]	ICP-MS	0.00100	0.01		0.005
	CHROMIUM (Cr)	6020[a]	ICP-MS	0.00200	0.05		0.1
	COBALT (Co)	6020[a]	ICP-MS	0.00100			
COPPER (Cu)	COPPER (Cu)	6020[a]	ICP-MS	0.00200		1.0	1.3***
LEAD (Pb)	LEAD (Pb)	6020[a]	ICP-MS	0.00100	0.05		0.015***
NICKEL (Ni)	NICKEL (Ni)	6020[a]	ICP-MS	0.00200			
	SELENIUM (Se)	6020[a]	ICP-MS	0.00100	0.01		0.05
	SILVER (Ag)	6020[a]	ICP-MS	0.00100	0.05		
	THALLIUM (Ti)	6020[a]	ICP-MS	0.00100			0.002
	VANADIUM (V)	6020[a]	ICP-MS	0.00200			
ZINC (Zn)	ZINC (Zn)	6020[a]	ICP-MS	0.0100		5.0	
GROUP 3: VOLATILE ORGANIC CONSTITUENTS							
VOLATILE ORGANIC CONSTITUENTS	VOLATILE ORGANIC CONSTITUENTS	8260B[a]	Gas Chromotography/Mass Spect.	0.50-1.0 ug/L			
GROUP 4: ASSESSMENT MONITORING PARAMETERS							
	SEMI-VOLATILE ORGANIC CONSTITUENTS	8270[a]	Gas Chromotography/Mass Spect.				
	MERCURY	7470[a]	Cold Vapor Atomic Adsorption	0.000200	0.002		
	CYANIDE	9010	Distillation, Spectrophotometric	0.010			0.2
	NITRITE	300.0[b]	Ion Chromotography	0.030			1
GROUP 5: SURFACE WATER MONITORING PARAMETERS							
TOTAL KJELDAHL NITROGEN (TKN)	TOTAL KJELDAHL NITROGEN (TKN)	351.3[b]	Digestion, Distillation, Titrimetric	5.00			
TOTAL PHOSPHORUS (P)	TOTAL PHOSPHORUS (P)	6010[a]	Inductively Coupled Plasma	0.200			
ORTHOPHOSPHATE (PO_4)	ORTHOPHOSPHATE (PO_4)	365.2[b]	Ion Chromatography	0.0100			
BIOLOGICAL OXYGEN DEMAND (BOD)	BIOLOGICAL OXYGEN DEMAND (BOD)	405.1[b]	Oxygen Electrode	4.00			
	TOTAL HALOGENATED ORGANICS (TOX)	9020[a]	Adsorption, Microcoulometric	0.0200			
TOTAL COLIFORM BACTERIA	TOTAL COLIFORM BACTERIA	SM 9221B[c]	Membrane Filter	1.00 MPN per 100ml			
FECAL COLIFORM BACTERIA	FECAL COLIFORM BACTERIA	SM 9221C[c]	Membrane Filter	2.00 MPN per 100ml			
E. COLI	E. COLI	SM 9223B	Membrane Filter	1.00 MPN per 100ml			

NMCDF Indicator Parameters applied to all NMCDF-related sample points (see Table 1). NMCDF permit parameters applied to even year Fall event NMCDF-related samples.

[#] DISSOLVED CONCENTRATIONS. SAMPLES MUST BE FIELD-FILTERED.

[a] TEST METHODS FOR EVALUATING SOLID WASTE - PHYSICAL/CHEMICAL METHODS. 3rd edition. EPA SW-846 (November 1990)

[b] METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES. EPA-600/4-79-020 (revised March 1983)

[d] DEQ NUMERICAL GROUNDWATER QUALITY REFERENCE LEVELS (HEALTH BASED). OAR 340-040-080 (January 1990).

[e] DEQ NUMERICAL GROUNDWATER QUALITY GUIDANCE LEVELS (NONHEALTH BASED). OAR 340-040-080 (January 1990).

[f] EPA NATIONAL PRIMARY DRINKING WATER STANDARDS. EPA 816-F-02-013 July 2002

*** EPA ACTION LEVELS.

Italized parameter - TOX has been removed from parameter per 1/25/11 DEQ approval.

ICP-MS: Inductively Coupled Plasma-Mass Spectrometry

TRACE METALS - TOTAL CONCENTRATIONS IF TSS <100 mg/L; BOTH TOTAL AND DISSOLVED CONCENTRATIONS IF TSS >100 mg/L.

Landfill Gas Monitoring Plan
North Marion County Disposal Facility
Marion County, Oregon

Prepared for

Marion County Department of Public Works - Environmental Services
5155 Silverton Road NE
Salem, Oregon 97305

Prepared by

Parametrix
700 NE Multnomah, Suite 1000
Portland, OR 97232-4110
T. 503.233.2400 T. 360.694.5020 F. 503.233.4825
www.parametrix.com

Version Date: June 7, 2013

CITATION

Parametrix.2013. Landfill Gas Monitoring Plan
North Marion County Disposal Facility
Marion County, Oregon. Prepared by Parametrix, Portland, Oregon.

TABLE OF CONTENTS

LIST OF FIGURES

APPENDICES

Note: Appendices materials can be found on the CD at the back of this notebook.

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1. INTRODUCTION

The NMCDF, formerly known as the Woodburn Landfill, is located in Marion County approximately three miles northwest of Woodburn, Oregon (Figure 1). The site is situated in the French Prairie region of the northern Willamette Valley and has been in operation since 1974. The facility currently provides the following waste disposal and recycling functions: waste transfer, ash monofilling, material recycling, and backup landfill capability. Figure 2 presents site topography and features and identifies various facility operations.

This Landfill Gas Monitoring Plan (LGMP) addresses methane monitoring requirements set forth in the Department of Environmental Quality (DEQ) Solid Waste Disposal Site Permit Number 240, issued on May 9, 2007 (Permit). This LGMP is presented as Section 3 of the NMCDF Environmental Monitoring Plan (EMP). The EMP presents site monitoring plans for groundwater, surface water, landfill gas, and the facility's leachate collection and removal systems. This LGMP specifically describes the procedures to monitor for the presence of landfill gas at the NMCDF. These procedures are described in the LGMP for the NMCDF developed by SCS Engineers (1997) which is located in Appendix A.

An active landfill gas extraction system has been constructed at the NMCDF. This system is monitored and maintained. Appendix B to this LGMP presents the Operation and Maintenance Manual for the NMCDF landfill gas control system. The Operations and Maintenance Manual is divided into two volumes. Volume 1 describes the collection system including conveyance piping system, condensate disposal system, extraction network, subsurface monitoring network, and building monitoring network. Volume 2 describes the flare station. Part 1 of Volume 2 describes the flare station's mechanical and electrical systems while Part 2 provides vender data for the flare station. The Operations and Maintenance Manual is contained on a compact disc.

1.1 BACKGROUND

Quarterly monitoring for subsurface gas migration at the NMCDF is completed at six permanent gas probes, GP-1 through GP-6. The gas probes, installed at the site in 1998, are shown in Figure 2. Five of the gas probes are used for soil gas boundary compliance monitoring. Gas probe GP-5, located just west of the facility gatehouse, is used to supplement gatehouse structure monitoring. The LGMP presented in Appendix A provides monitoring location rationale and probe design.

The active landfill gas extraction system consists of eight gas extraction wells located in the closed demolition/by-pass landfill mound and thirteen gas extraction trenches located in the eastern portion of the closed northwest trench fill area. The collected gas is destroyed at the on-site landfill gas flare facility shown on Figure 3. The LFG extraction system runs approximately 6 hours per day every day of the year. Residual nitrogen levels have generally remained stable at the individual LFG extraction wells. The flow rate of the flare is approximately 90 scfm with methane concentrations around 30 percent. Methane percentages measured at the extraction wells continue to decrease and oxygen levels are consistently less than 1 percent. These factors indicate that complete decomposition is occurring and stable conditions are present within the landfill trenches and closed demolition landfill.

1.2 SAMPLING OVERVIEW

Subsurface landfill gas migration monitoring is conducted quarterly at the six permanent probes. The flare and condensate pump station for the active landfill gas (LFG) extraction system was completed in February 1999 and became fully operational in March 1999.

In addition to the gas probes, LFG monitoring is also completed at the gatehouse office and at the adjacent pump shed on a continuous basis. The continuous monitoring devices do not record data but sound an alarm if gas concentrations exceed one percent of the lower explosive limit. As part of the routine safety inspections completed at the site, continuous gas monitoring alarms are tested to insure they were functioning properly.

Since their installation in 1998, quarterly monitoring of the perimeter boundary probes has not detected the presence of methane. Methane gas has been detected at the supplemental LFG monitoring probe GP-5 Detections at GP-5, which have occurred during spring events, can be attributed to the presence of high groundwater levels and the infiltration of soil saturation above and around the trench-fill gas extraction wells that combine to seal off gas flow from the trench-fill extraction area wells. These detections at GP-5 indicate the influence that the active landfill gas extraction system has on controlling gas migration from the closed trench fill area. Figure 4 shows the proximity of supplemental gas probe GP-5 to the active landfill gas extraction system.

1.3 REPORTING

The results of quarterly monitoring completed on the six gas probe locations during the course of each year is presented in the NMCDF Annual Environmental Monitoring Report (AEMR). As described in Appendix A, parameters measured at the probe locations include methane, carbon dioxide, oxygen, and static pressure. The occurrence of a structure gas monitoring alarm going off is also described in the AEMR.

FIGURES

Parametrix DATE: January 24, 2011 FILE: N_Marion_Locator.mxd

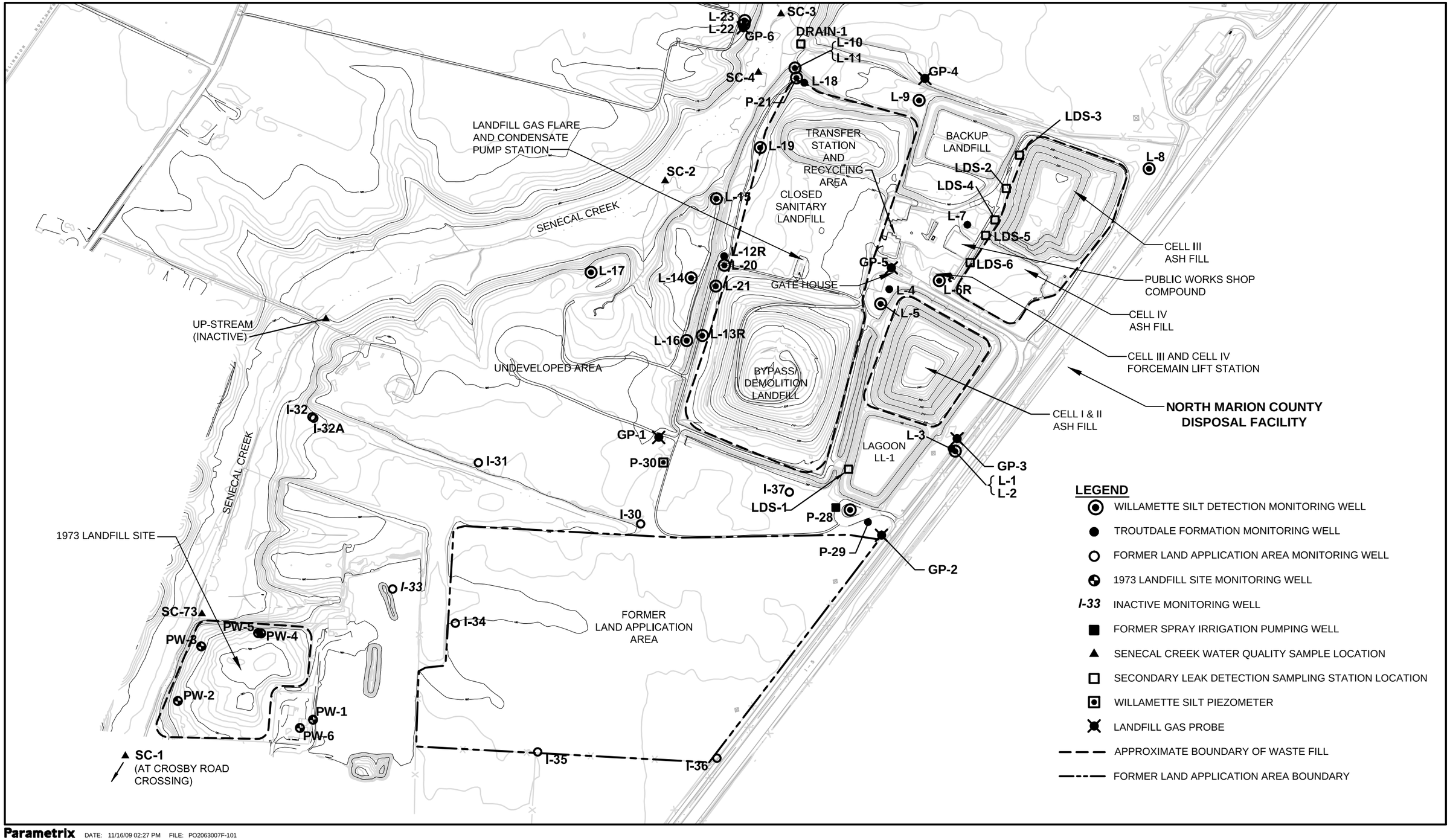
N

0 500 1,000 1,500

Feet

Figure 1
Site Location

Annual Environmental Monitoring Report
North Marion County Disposal Facility
Marion County, Oregon



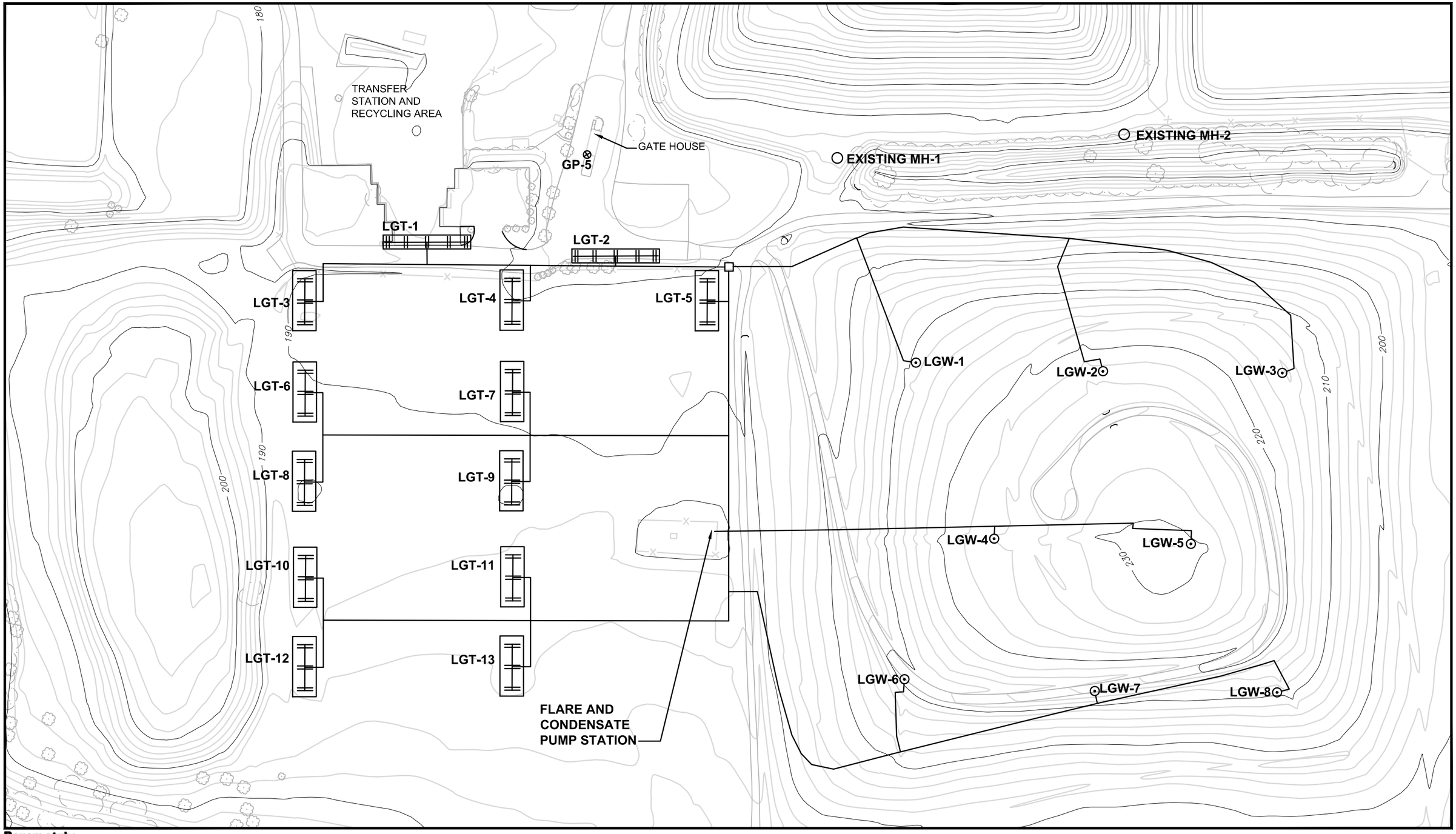
Parametrix DATE: 11/16/09 02:27 PM FILE: PO2063007F-101

N

0 500'

SCALE IN FEET

Figure 2
Facility Site Map
Environmental Monitoring Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON



Parametrix DATE: May 24, 2013 FILE: PO2063007F-103

N

0 120'

SCALE IN FEET

MAP SOURCE:
DAMES & MOORE 1998
GAS EXTRACTION NETWORK AND PIPING PLAN

LEGEND

- LANDFILL GAS EXTRACTION TRENCH
- ⊗ LANDFILL GAS MONITORING WELL
- ⊙ LANDFILL GAS EXTRACTION WELL

Figure 3
Gas Extraction Network
Environmental Monitoring Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON

Sampling and Analysis Plan
North Marion County Disposal Facility
Marion County, Oregon

Prepared for

Marion County Department of Public Works - Environmental Services
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Salem, Oregon 97305

Prepared by

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Version Date: June 7, 2013

CITATION

Parametrix. 2013. Sampling and Analysis Plan
North Marion County Disposal Facility
Marion County, Oregon. Prepared by Parametrix, Portland, Oregon.
June 2013.

CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a registered professional geologist licensed to practice as such, is affixed below.

Prepared by Rick Malin
Project Professional

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APPENDICES

Note: Appendices materials can be found on the CD at the back of this notebook.

ACRONYMS

AEMRs	Annual Environmental Monitoring Reports
ALTR	Annual Leachate Treatment Report
DEQ	Oregon Department of Environmental Quality
EMP	Environmental Monitoring Plan
GCL	geo-synthetic clay liner
LCMP	Leachate Control Management Plan
LGMP	Landfill Gas Monitoring Plan
NMCDF	North Marion County Disposal Facility
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SLCRSs	Secondary Leachate Collection and Removal Systems
VZMDs	vadose zone monitoring devices
WQMP	Water Quality Monitoring Plan

1. INTRODUCTION

The NMCDF, formerly known as the Woodburn Landfill, is located in Marion County approximately three miles northwest of Woodburn, Oregon (Figure 1). The site is situated in the French Prairie region of the northern Willamette Valley and has been in operation since 1974. The facility currently provides the following waste disposal and recycling functions: waste transfer, ash monofilling, material recycling, and backup landfill capability. Figure 2 presents site topography and features and identifies various facility operations.

This Sampling and Analysis Plan (SAP) addresses water quality monitoring requirements set forth in the Department of Environmental Quality (DEQ) Solid Waste Disposal Site Permit Number 240, issued on May 9, 2007 (Permit). This SAP is presented as Section 4 of the NMCDF Environmental Monitoring Plan (EMP). The EMP presents site monitoring plans for groundwater, surface water, landfill gas, and the facility's leachate collection and removal systems. This SAP specifically describes the procedures recommended for obtaining, preparing, documenting, preserving, and shipping water quality samples collected at the NMCDF associated with the Water Quality Monitoring Plan (WQMP: EMP Section1) and the Leachate Control Monitoring Plan (LCMP: EMP Section 2). The SAP also establishes Quality Assurance/Quality Control (QA/QC) requirements for sample acquisition and handling.

Water quality samples collected from the site will be submitted to an ORELAP accredited and/or a NELAP recognized laboratory. A copy of the ORELAP accreditation certificate and Quality Assurance/Quality Control Manual (QAM) for the analytical laboratory currently completing analysis under this SAP is presented as Appendix B to this SAP.

1.1 BACKGROUND

This SAP is the latest version of the May 1996 SAP that has been revised several times. The November 1996 version of the SAP specifically addressed the decommissioning of piezometers P-22, P-23, P-24, P-25, P-26, and P-27 in July 1996 and the installation of piezometers P-28, P-29, P-30, and P-31. The November 1996 SAP also addressed conditions of approval items as presented in the October 8, 1996 DEQ letter approving the May 10, 1996 Water Quality Monitoring Plan (WQMP). The June 1998 revision of the SAP specifically addressed the installation of wells L-20, L-21, L-22, and L-23 and the redesignation of well L-19 (formerly P-31) from a piezometer to an active groundwater quality monitoring location. This October 2007 SAP reflected updates to the facility's Environmental Monitoring Plan (EMP) and requirements stated in the May 9, 2007 permit. This SAP has been revised to reflect modifications to the site's monitoring program that have occurred since October 2007. Elements of these modifications are described in the June 2013 EMP.

1.2 SAMPLING OVERVIEW

Water quality monitoring of the site consists of three water sources: groundwater, surface water, and leachate or leachate-related. Water quality monitoring of the NMCDF has also included two adjacent sites: the former Land Application Area and the 1973 Landfill Site. These two adjacent site locations are shown on Figure 2. Background description of these two sites is presented in the EMP. A brief overview of the water quality monitoring as addressed by this SAP is described below.

1.2.1 Groundwater Monitoring

The monitoring of landfill impact on groundwater quality at the NMCDF is currently completed through a network of 25 (L- and P- series) monitoring wells. Table 1 provides summary information on the NMCDF site wells and Figure 2 shows their locations. In addition to the NMCDF monitoring wells there are 9 monitoring (I-series) wells associated with the Land Application Area and 5 monitoring (PW-series) wells associated with the 1973 Landfill Site. Summary information for these wells are also presented on Table 1 with their locations shown on Figure 2. With the exception of 1973 Landfill Site well PW-5 these monitoring wells are only used for water level measurements. Sampling of monitoring wells at the NMCDF is completed on a semi-annual frequency.

1.2.2 Surface Water Monitoring

Surface water quality samples are collected from 5 sample points along Senecal Creek. Senecal Creek runs along the western boundary of the site. The location of these SC-series surface water quality sample points is shown on Figure 2. The up-stream sample point is located on the down-stream side of the Crosby Road bridge, which is not shown on Figure 2. Sampling of these surface water monitoring points is completed during semi-annual monitoring events.

1.2.3 Leachate Collection and Removal Systems

There are 9 monitoring points associated with the leachate collection and removal systems (LCRSs) at the NMCDF. Sample points LDS-1 through LDS-6 are secondary LCRSs. With the exception of LDS-1, the LDS-series samples points are associated with ash monofill Cell III and Cell IV. These two cells are located near the northeast area of the NMCDF. Sample points Cell3/FM and LL-1 are primary LCRS sample points. Sample point Drain-1 is the discharge point of the groundwater gradient control for Cell III. The location of these LCRS related sample points are shown in Figure 2.

2. SITE GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

An overview of site geologic and hydrogeologic conditions is presented to provide a general understanding of groundwater conditions at the site and their relationship to the site monitoring well network.

The NMCDF is situated in the French Prairie region of the northern Willamette Valley. This region is the largest of several broad plains in the main Willamette Valley area between the communities of Salem and Canby. It has an average mean sea level altitude of about 180 feet and slopes gently to the northwest (Price 1967). The flat French Prairie region is situated in a broad northeast-trending synclinal trough formed by the down warping of the Columbia River Basalt Group (CRBG) and older marine sediments.

Geologic units encountered at the NMCDF site during well installations, in stratigraphic order from youngest to oldest, consist of:

- Recent Holocene alluvium includes the following soil groups: Woodburn silt loam, Amity silt loam, Willamette silt loam, Dayton silt loam, and Concord silt loam. The Dayton and Concord soil units occupy creek and ephemeral drainages and tend to be more clayey. Generally these soils are not saturated except during extended rain event periods. Some of the shallow wells may have the upper portion of their screen extending up into the alluvium.
- The Pleistocene Willamette Silt (WS) forms the uppermost geologic unit at the site. The unit consists of tan (oxidized condition) to blue gray (reduced condition) thinly bedded silt, clay, and sandy clay. The uppermost groundwater system is present in the WS. Most of the monitoring wells at the site are screened in the WS.
- The Pliocene Troutdale Formation (TF), which underlies the Willamette Silt unit, consists of irregularly alternating and interbedded layers of clay, silt, sand, and gravel. The formation materials are largely derived from basaltic rocks and appear to have been deposited mainly by streams entering the French Prairie area from the south and east (Price 1967). Water-well log data in the site area suggests that the thickness of the unit is approximately 250 feet (Dames & Moore 1996). There are eight TF monitoring wells at the site. TF well I-32 is only used for water level measurements.

Underlying the Troutdale Formation are the Sandy River Mudstone and the CRBG. The late Pliocene Sandy River Mudstone unit consists largely of bedded dark-gray clay and shale. The CRBG consists of a series of basalt lava flows. Neither of these units is penetrated by wells at the site or in the site area.

Movement of groundwater in the French Prairie area is radially outward from topographically high areas towards the Willamette and Pudding Rivers (Price 1967). Deeply incised streams that have intersected the water table (e.g., Senecal Creek) create local discharge areas for the uppermost groundwater system (i.e., the Willamette Silt hydrogeologic unit). Groundwater flow in the Willamette Silt unit in the site area appears to be primarily toward Senecal Creek or in a northwesterly to westerly direction. Sampling of Senecal Creek at the site is conducted to monitor if groundwater quality at the site is adversely impacting the creek's water quality.

The TF represents the primary water-bearing unit beneath the facility and is the primary beneficial use aquifer in the French Prairie region. The formation forms a series of permeable, semi-confined aquifers. The groundwater flow direction in the Troutdale Formation in the site area appears to be predominantly toward the north, with easterly and

westerly flow components. This aquifer shows notable seasonal water level variation due to water supply well pumping primarily for agricultural purposes.

3. WATER QUALITY MONITORING LOCATIONS

Water quality monitoring at the NMCDF includes the collection and analysis of water samples from monitoring wells, Senecal Creek, and LCRSs. These water quality sampling locations are identified on Figure 2. The WQMP and LCMP describe these monitoring points and the sampling program. This section summarizes the sampling programs presented in the WQMP and LCMP.

3.1 Groundwater Monitoring Locations

Groundwater monitoring associated with the NMCDF consists of two well types; Willamette Silt detection wells and Troutdale Formation wells. These well types are described below. Table 1 identifies wells associated with the three sites (NMCDF, former Land Application Area, and 1973 Landfill Site) and, for each well, provides its measuring point elevation, well depth, identifies type of dedicated sampling equipment, approximate purge volumes, and general comments.

3.1.1 Willamette Silt Wells

The NMCDF monitoring network for the WS consists of the following well groups:

- Tier 1 Detection Wells: L-10, L-11, L-13R, L-15, L-19, L-20, and L 21. These wells are located down-gradient and closest to the landfill's western fill boundary.
- Tier 2 Detection Wells: L-2, L-5, L-9, L-14, L-16, and P-21. These wells are located west of Tier 1 wells, in waste, or down-gradient of an ash monofill cell.
- Tier 3 Detection Wells: L-6R, L-8, L-17, L-22, L-23, and P-28. These wells are located at cross-gradient locations, in the central area of the facility, or west of Tier 2 wells.

Wells L-1 and P-30 function only as piezometers.

The adjacent Land Application Area monitoring network for the WS consists of the following wells:

- Land Application Detection Wells: I-30, I-31, I-32A, I-33, I-34, I-35, and I-37. These wells are associated with the former Land Application Area.

These wells function only as piezometers.

Note well I-33 is located on private property, is no longer owned by the County, and is therefore no longer part of the facility monitoring well network.

The adjacent 1973 Landfill Site monitoring network for the WS consists of the following wells:

- 1973 Landfill Site Detection Wells: PW-1, PW-2, PW-3, and PW-4. With the exception of PW-1, these wells are located adjacent to the boundary of the 1973 Landfill Site. Well PW-1 is located slightly east of the 1973 Landfill Site at an up-gradient location.

These wells function only as piezometers.

Figure 3 shows the location of these WS wells. Figure 4 identifies the zone (shallow or intermediate) screened by each WS well.

3.1.2 Troutdale Formation Wells

The NMCDF monitoring network for the TF consists of the following wells: L-3, L-4, L-7, L-12R, L-18, and P 29. Note that L-4 is an on-site sealed water supply well.

The adjacent former Land Application Area monitoring network for the TF consists of well I-32. This well functions only as a piezometer.

The adjacent 1973 Landfill Site monitoring network for the TF consists of well PW-5.

Figure 4 shows the location of the TF monitoring wells.

3.2 Surface Water Monitoring Locations

Surface water quality samples are collected at five locations from Senecal Creek which flows in a northerly direction west of the site. Senecal Creek sample points SC-1, SC-2, SC-3, SC-4, and SC-73 are part of the NMCDF detection monitoring program. The following is a description of these surface water sample points:

- SC-1: This is an up-stream sample point located on the down-stream side of the Crosby Road bridge. The location of this sample point is easy to access.
- SC-73: This sample point is located adjacent to the up-stream side of the 1973 Landfill Site's north fence where it crosses the creek. Sample point SC-73 primarily serves as a down-stream surface water sample point for the 1973 Landfill Site. This sample point can be accessed by a path located near the northwest corner of the 1973 Landfill.
- SC-2: This sample point is located just down-stream of the convergence of a small drainage located west of the NMCDF facility. The SC-2 sample point functions as a mid-point location for the NMCDF site. This sample point can be accessed from a path located northeast of well L-17.
- SC-3: This sample point is slightly down-stream of the northwest corner of the NMCDF facility. It functions as the primary down-stream monitoring point. This sample point can be accessed from a path located north of the Drain-1 sample point.
- SC-4: This sample point is located slightly up-stream of the northwest corner of the NMCDF facility. It is located up-stream of the monofill Cell III groundwater gradient control discharge location. It also serves as a secondary down-gradient monitoring point. This sample point can be accessed from a path located approximately 95 feet south of well P-21.

The locations of the Senecal Creek sample points are shown on Figures 2 and 5. These sample point locations and paths to the sample points have been flagged with survey tape. Water quality samples at each sample point should be collected ideally from the creek's drainage channel and from its central portion if possible. The creek's drainage channel is typically 4 feet wide and up to two feet deep. A series of beaver dams have been constructed in the area of sample points SC-3 and SC-4 which have resulted in this area of the creek to be a series of dam pools of various sizes. Under high flow conditions, the creek will also rise above its drainage channel and flood the lowlands adjacent to the creek in the area up-stream of locations SC-3 and SC-4 making access to locations SC-2 and SC-73 difficult. Hip waders are usually needed to collect samples from all but up-stream sample point SC-1.

Portions of Senecal Creek above the SC-3 sample point where beaver dams are not present are typically dry during fall monitoring events. To obtain samples representative of Senecal

Creek, water quality samples from the creek will only be collected when water is continuously present in the creek's drainage channel, and ideally flowing, between up-stream sample point SC-1 and the down-stream sample point SC-3. During a sampling event, if Senecal Creek is found to consist of disconnected pools of water or if water is not present at up-stream sample point SC-1, water quality samples from the creek will not be collected.

During each sampling event, the volume of water in the creek and its flow conditions are to be documented. Conditions to be noted include:

1. Is the creek dry, a series of disconnected pools, or is it flowing.
2. Is water present at up-stream sample point SC-1.
3. If the creek is flowing; is water within its drainage channel or has it spilled beyond its channel.
4. If creek is flowing; what is the visual quality of the water (e.g., clear with duck weed, turbid brown water, sheen present, etc.).
5. Are there any other sources of water present near the sample points or changes that have occurred in the creek's drainage (e.g., new beaver dam, fallen tree redirecting water, presence of another source of water draining into the creek, etc.).

3.3 Leachate Collection and Removal Systems

Design and construction of the LCRSs at the site are presented in the LCMP. The LCMP also presents fluid volume measurement and water quality sampling procedures of the site LCRSs. The LCMP is presented as Section 3 of the EMP Update. The LCRSs sample points consist of primary LCRSs (PLCRSs) and secondary LCRSs (SLCRSs). Details of how the various LCRSs are inspected and sampled are included in this section.

The following are the PLCRS sample points: Cell3/FM and LL-1. The Cell3/FS sample point is the northern lift station. The LL-1 is the wastewater lagoon.

The following are the SLCRS sample points: LDS-1, LDS-2, LDS-3, LDS-4, LDS-5, and LDS-6. LDS-1 is associated with the leachate lagoon. LDS-2 and LDS-3 are associated with Cell III while LDS-4, LDS-5, and LDS-6 are associated with Cell IV.

Sample point Drain-1 is the discharge point of the hydraulic gradient control around Cell III that limits the height groundwater can achieve beneath the cell. The Drain-1 sample point is located near the northwest corner of the site. The location of this sample point is shown on Figure 2. It can be accessed from an old road grade that runs west of well L-9.

Figure 6 shows the locations of the Cell III and Cell IV SLCRS sample points LDS-2 through LDS-6 and the location of the Cell3/FM sample point. The location of the wastewater SCLRS sample point LDS-1 is shown on Figure 2. These sample points are easily assessable.

The following identifies the procedures to collect and document water quality samples from the LCRSs. These procedures are consistent with the collection of samples from monitoring well and surface water quality monitoring points at the site.

3.3.1 Wastewater Lagoon

The wastewater lagoon is equipped with a floating cover with a hinged horizontal access door located near its southern side. This lagoon access door can be reached via an access path located on the south side of the lagoon consisting of float pads sewed into the floating cover. This access door is used as the sample point to collect lagoon leachate samples which are

designated LL-1. A disposable polyethylene bailer is used to collect a water sample approximately four feet below the lagoon's water surface. The approximate location of the wastewater lagoon LCRS sampling station LL-1 is shown on Figure 2.

3.3.2 Cell IV Ash Monofill

The Cell IV SLCRS sampling stations are fitted with dedicated electric pumps used to check for the presence of fluid and to obtain a water quality sample, if fluid is present. The electronic control panels located at the three sampling stations provide pump control and system status information. A special key is needed to access the Cell IV SLCRS monitoring/operations panel. Prior to sample collection, readings on the SLCRS flow totalizer located on the SLCRS discharge line and the water level digital readout are to be recorded.

The SLCRS is then purged of standing fluid by turning the pump operation switch to its manual (hand) mode for at least one minute. Samples are then collected directly from the SLCRS pump discharge line which can be disconnected from the PLCRS riser by a simple cam lock. SLCRS discharge lines are then returned back to their appropriate locations and the pump operation setting is returned to its automatic setting.

3.3.3 Cell III Ash Monofill

The Cell III SLCRS sampling stations are fitted with dedicated electric pumps used to check for the presence of fluid and to obtain a water quality sample, if fluid is present. The electronic control panels located at the two sampling stations provide pump control and system status information. A special key is needed to access the Cell III SLCRS monitoring/operations panel. Prior to sample collection, readings on the SLCRS flow totalizer, located on the SLCRS discharge line, and the water level digital readout are to be recorded.

A different key is needed to access the Cell III discharge lines which are located in the LCRS riser vault. Prior to sample collection, the SLCRS is pumped using the manual (hand) mode setting for at least one minute to purge standing fluid from the pump and its discharge line. Samples are then collected directly from the SLCRS pump discharge line which can be pulled from the PLCRS riser. SLCRS discharge lines are then returned back to their appropriate locations and the pump operation setting is returned to its automatic setting.

3.3.4 North Lift Station

As shown in Figure 6, leachate from Cell III and Cell IV ash monofills is discharged via forcemains to the north lift station. The north lift station is located approximately 150 feet west of the southwest corner of Cell IV as shown on Figure 6. A special key similar to the one needed to access the Cell III SLCRS is required to open the north lift station access doors. Care should be taken when these doors are open due to potential fall hazard. Water quality samples are collected from the north lift station using a disposable bailer. Samples collected from the northern lift station are designated Cell 3/FM.

3.4 Water Level Measurement Locations

Depth to water level measurements are collected from all WS and TF monitoring wells identified in Section 3.1 and listed in Table 1. Table 1 also provides the elevation of the water level measurement point which are all off the top of the well's PVC casing. The locations of these wells are shown on Figure 4.

Depth to groundwater level measurements should be collected during the first day of the sampling event to minimize diurnal effects and changes in barometric pressure. Water levels in WS wells have been observed to change fairly slowly and potentiometric contour maps have consistently indicated groundwater flow in the WS is toward Senecal Creek. Water level changes have been observed to occur more rapidly in TF wells, which are semi-confined and influenced by seasonal pumping. The potentiometric surface of TF in site area has a low gradient. Consequently, the collection of water level measurements from all TF wells during the first day of a semi-annual monitoring event should be completed.

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4. SAMPLING SCHEDULE

Table 2 presents the water quality sampling schedule for the NMCDF and its adjacent sites. Table 2 identifies the various locations described in Section 3, the analysis to be completed, the frequency of the analysis, and its schedule. As indicated on Tables 2, water quality sampling at the site are completed on a semi-annual basis.

4.1 Sampling Events

As indicated on Table 2, water quality samples will be collected and submitted for analytical laboratory testing during the spring and fall compliance monitoring periods. These periods, as indicated on Table 3, are:

- Spring Event: April 1st through May 31st;
- Fall Event: October 1st through November 30th.

Table 2 identifies which wells will be sampled and the analysis to be completed. The analytes or parameters included in the analyte groups listed on Table 2 are identified on Table 3. As shown on Table 3, there are two lists of parameters associated with the parameter groups. The NMCDF Indicator Parameters represent a select number of parameters associated with the NMCDF Permit Parameter list. The NMCDF Indicator Parameters represent an optimization of the facility's groundwater monitoring program. NMCDF Indicator Parameters were proposed in the NMCDF 2010 AEMR along with an application schedule. These modifications were approved and implemented in 2011 consistent with DEQ's 2010 AEMR approval letter dated February 15, 2011.The NMCDF Permit Parameter are identified in Attachment 1 of the Permit. A copy of the Permit is presented in Section 5 of the EMP. As indicated in Table 3, analysis of Group 4 Assessment Monitoring parameters is not part of the current site monitoring program. Table 3 also identifies for each parameter the appropriate method of analysis and the laboratory method reporting level (MRL).

Table 4 presents a list of the volatile organic constituents (VOCs) that are identified under EPA Test Method 8260B, the MRL of each analyte and the existing DEQ Numerical Groundwater Reference Levels of VOCs (based on OAR 340-40-080).

The proposed MRL of a given constituent should be no greater than ten-percent of the constituents Maximum Contaminant Limit (MCL), if such a standard exists. Tables 3 and 4 present applicable DEQ Numerical groundwater Quality Reference and Guidance Levels (based on OAR 340-40-080) and EPA Drinking Water and Health Advisory Standards for each constituent with a MCL standard.

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5. SAMPLING PREPARATION

This section describes activities that need to be completed prior to sampling. These activities include communication with the laboratory, notifying the DEQ, setting a sampling schedule, and site access preparation.

5.1 Laboratory Notification

The current designated laboratory for water quality analysis of samples collected at the site is:

TestAmerica
9405 SW Nimbus Avenue
Beaverton, Oregon 97008-7132
(503) 643-9200; Fax (503) 644-2202

The designated laboratory should be contacted at least two weeks prior to an upcoming sampling event. The laboratory will provide, upon request, sample coolers, appropriate sample bottles with preservatives, sample labels, chain of custody forms, and custody seals.

Table 2 identifies the locations to be sampled, the parameter groups to be analyzed, and the sampling schedule. Table 3 identifies the parameters and chemicals present in each parameter group identified on Table 2. Table 4 lists the analytes and the MCLs for VOCs reported by EPA Method 8260B.

Table 5 identifies appropriate sample containers, preservatives, holding times, and applicable comments.

The laboratory will need to know:

- The specific parameters/analytes to be completed, as identified on Table 3. Table 2 presents the parameter groups to be analyzed, sampling frequency and schedule.
- The number of samples to be collected. This includes the number of wells to be sampled plus additional field duplicate sample sets as described in Section 6.1. Table 2 provides this information. A field duplicate sample set is to be collected for each day of sampling or for each batch of 10 samples.
- Common anions and cations are to be field filtered for dissolved species analysis. Dissolved trace metal species may also be necessary if the total suspended solids concentration of the sample is greater than 100 mg/L.
- Need for a laboratory prepared VOC transport (trip) blank to accompany each set of VOC samples to and from the laboratory. VOC travel blank specifics are discussed in Section 6.1.
- If VOC (by EPA Method 8260B) analysis is to be completed, the laboratory needs to also complete tentatively identified compound (TIC) analysis for the samples submitted. The TIC analysis represents a library search of detections not on the Method 8260B standard analyte list.

5.2 DEQ Sampling Notification

The Salem office of the DEQ Solid Waste Program shall be notified, in writing, at least 10 working days prior to a water quality monitoring sampling event at the site. The address of the DEQ Western Region Solid Waste Program is:

Western Region Solid Waste Program
Oregon Department of Environmental Quality
750 Front Street NE, Suite 120
Salem, Oregon 97301-1039
(503) 378-8240

An email to the DEQ project hydrogeologist assigned to the NMCDF site also serves as an acceptable form of written event notification.

As stated in Section 15.5 of the Permit, the DEQ must approve any changes to the sample program in writing prior to implementation. Written requests must be submitted to change:

- Sample frequencies
- Sample locations
- Parameters to be sampled for, and
- To conduct unscheduled samplings or split samplings.

The DEQ has reserved the right to add to or delete from the list of scheduled sampling events, sample locations, parameters to be sampled for, or locations to be sampled.

Once the request has been approved by the DEQ, this change will become part of the EMP requirements by reference.

5.3 DEQ Split Sampling Events

Section 15.3 of the Solid Waste Disposal Site Permit requires split sampling to be conducted with the DEQ laboratory when requested. As indicated in the Permit, the DEQ laboratory shall receive split sampling notification and scheduling information 45 days prior to the sampling event. Split sampling events are not identified in the Permit.

In the event of changes to a split sampling event, the DEQ will make an effort to notify the county of any changes at least 30 days prior to the event.

5.4 Site Access/Sample Scheduling

Keys to the monitoring wells and special keys to access SLCRS sample locations can be obtained from the Marion County Department of Public Works – Environmental Services in Salem, Oregon. Monitoring well keys are also available at the site gate house. The site access gate remains unlocked during facility operation hours which are 8:00 am to 4:30 pm Monday through Saturday. The access gate will allow exit from the site after 4:30 pm. Don Alexander with the Marion County Department of Public Works – Environmental Services is the site contact and can be reached at (503) 588-5169, extension 5919.

Weather conditions prior to and during a sampling event should be taken in consideration and planned for accordingly. Four wheel drive capable vehicles should be used during wet period sampling events at the site to limit the possibility of becoming stuck. Most wells at the NMCDF can be accessed by all-weather roads. Wells located off-site of the NMCDF, in the western portion of the site present, at the 1973 Landfill Site, or the Land Application Area represent the greatest potential for access issues.

Due to access conditions and the location of monitoring wells and surface water sampling points at the site, water quality monitoring is best completed by sampling the following well groups to increase collection efficiency and limit the potential of cross-contamination. Based

primarily on well location and consideration of water quality conditions and existing access routes, four well water quality sampling groups have been developed for the site:

- Group A: Eastern area wells: L-2, L-3, L-4, L-5, L-7, L-8, L-9, P-28, and P-29. SLCRS detection points LDS-1, LDS-2, LDS-3, LDS-4, LDS-5, LDS-6 and Cell3/FM can be collected during well sampling in this area or rolled into other well groups for sampling.
- Group B: Western area wells: L-6R, L-12R, L-13R, L-14, L-15, L-16, L-17, L-20, and L-21. Senecal Creek sample points (all five locations) can be collected during well sampling in this area.
- Group C: Northwest area of landfill area: L-10, L-11, P-21, P-29, P-28, L-18, L-19, L-22, and L-23. Samples can also be collected from sample point LL-1 (leachate lagoon) and Drain-1.
- Group D: Land Application Area wells I-30, I-31, I-32, I-32a, I-34, I-35, I-36, and I-37. 1973 Landfill Site wells PW-1 through PW-5. Note with the exception of well PW-5 these well are only used as piezometers. Due access issues and location, a water level from PW-1 can be deferred.

Currently, there are 40 active water quality sampling points at the site. See Table 3.

5.5 Sampling Methodology

Wells at the site are equipped with dedicated bladder pumps (i.e., Well Wizards) or dedicated PVC bailers suspended in the wells from slip caps. Table 1 identifies the type of dedicated sampling equipment installed at each well location. Dedicated bladder pumps with packers are installed in all active deep (Troutdale Formation) monitoring wells. The inflatable packers, set just above the well screen, reduce the purge volume requirement to five gallons. An exception is well L-4 which is an on-site water supply well completed with an electrical submersible pump.

Table 1 identifies well sampling equipment currently used to sample each of the monitoring wells listed. Water quality samples from wells with dedicated bailers will be collected with the dedicated or a disposable bailer. Wells with dedicated bladder pumps will use the installed pump to collect water quality samples from the well. Well purging and sampling methodology are presented discussed in Section 8. Accessing and sampling Senecal Creek and leachate collection and removal sample points is presented in Sections 3.2 and 3.3, respectively.

Table 6 presents a list of equipment necessary to collect water quality samples at the site. Purging of the wells will be completed with the dedicated bladder pump, if installed.

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6. QUALITY CONTROL PROCEDURES

Quality control procedures are designed to ensure that all samples collected at the site are (1) consistent with project objectives; (2) identified, handled, and transported sin a manner that ensures the data are representative of actual site conditions; and (3) processed so that information is not lost in sample transferal. This section details QA procedures to be used at the site.

6.1 FIELD QA/QC

To ensure QA/QC of water quality sample data collected at the site, the following documentation procedures and field duplicate and blank methodology will be employed:

- Documentation - All sample collection and equipment handling procedures will be documented, including the calibration of field parameter equipment. Field measurement equipment shall be calibrated at the beginning of each field day. A calibration check should be completed during the middle of each field day or within 4 hours of calibration and at the end of the field day to determine if instrument drift has occurred. If drift has occurred, the instrument will be recalibrated. Calibration of field parameter equipment will be documented in the site field report form, calibration form, or sampling notebook. Documentation of water quality sample collection and associated sampling equipment will be recorded on the site field sampling sheets (see Appendix A). Sampling field data sheets will be used to document sample collected at each water quality monitoring location.
- Transport (trip) Blank - Water quality sampling events that include analysis of VOCs will employ a VOC transport blank to accommodate sample shipment. The VOC transport blank will be prepared by the laboratory and accompany the laboratory prepared sampling kit (laboratory-provided bottles and coolers) to and from the site. The transport blank will be preserved in the same manner as the other VOC samples. All VOC samples collected during a specific sampling period are to be stored in cooler(s) that contains a VOC blank(s).
- Equipment Blank - An equipment blank will be collected on a daily basis only when non-dedicated pumps, bailers, or sampling devices are used for the collection of a water quality sample. All wells and leachate collection points at the site are equipped with dedicated PVC bailers, bladder pumps, or submersible pumps.
- Field Duplicate - A field duplicate "blind" sample will be collected. The purpose of the field duplicate is to evaluate the precision associated with sample collection, preservation, and storage, as well as with laboratory procedures. Field duplicate samples will be collected at a minimum frequency of one every sampling day or one for each subsequent 10 samples, whichever is greater. The "blind" field duplicate sample will be collected at the same time or immediately following collection of the original sample (e.g., VOC sample collection followed by field duplicate VOC sample collection, etc.). The field duplicate will be submitted for the same analysis as the original sample it is duplicating. The identity of the field duplicate (commonly designated FD) and the sampling date (e.g., FD-4/22 is a blind field duplicate collected on April 22nd) will be recorded on the site sampling field data form for the location from which it was collected. On the field duplicate sample containers and the chain-of-custody form, the blind field duplicate will be labeled in the manner described.

6.2 LABORATORY QA/QC

Water quality samples collected from the site will be submitted for analysis to the designated contracted analytical laboratory. A copy of the current designated analytical laboratories Quality Assurance/Quality Control Manual or Program/Plan (QAM/P) is presented in Appendix B. Included in the QAM/P are laboratory procedures regarding: routine equipment calibration to standards of known concentrations; the analysis and reporting of results of laboratory method blanks, duplicates, and matrix spikes for all analytes on schedules appropriate for the analytical methods used; the reporting of the accuracy and the precision data for the analysis period; and the reporting of the percent recovery of surrogate spikes in each sample analyzed for organic analytes. The contracted designated analytical laboratory report shall include a Quality Control Data Report which presents method blank and surrogate standard results.

The contracted analytical laboratory should implement data validation policy that requires all data generated by the laboratory to be subjected to at least three levels of review before being released. This data generation, validation, and review process should be included in the QAM/P. During preparation of the draft report, the laboratory's information management system should be programed to automatically check for and lists any sample results involving out-of-control QC samples, modified analyte lists, or any special flags which may have been assigned by the primary or secondary reviewers. Generation of the final report is accomplished when the laboratory Project Manager generates and saves the electronic version of the draft report to a centralized electronic archive and then prints the file on laboratory letterhead. In order to ensure consistency between the different formats of analytical data, electronic data deliverables (EDDs) are produced from the laboratory information management system at the same time the hard-copy (or PDF format) final report is generated.

The existing NMCDF water quality database is in Microsoft Access format and includes water quality data, dating back to 1988. As new site water quality data is obtained, EDDs from the laboratory are directly transferred (uploaded) into the database. This database update methodology increases data transfer efficiency and reduces data entry errors. The existing database provides various types of data reports and formats.

7. SITE SAMPLING FIELD DATA DOCUMENTATION

Site sampling documentation will be completed using a field report form and a sampling field data form (sampling form). Copies of these sampling forms should be reproduced on water-proof paper. A copy of the sampling form is presented in Appendix A.

Field Report Form - The field report form is used to record general sampling event information including: site arrival and departure times; field instrumentation calibration activities and results (if separate calibration form is not used); samples collected (sample identification, collection time, and number of containers; site conditions (e.g., weather);, ambient air condition comments; sample-associated personnel on-site (contractors and visitors); communications; field logistic issues; problem encountered and their remedies; and other relevant information that records sampling event activities throughout the day. Examples of ambient air condition comment include observations of odors, smoke, visible ash fall out from a source other than a sampling point.

Sampling Form - The sampling form, to be completed at each water quality location during each sampling event, provides a format to document sample acquisition information. A copy of the sampling form will be submitted with each water quality monitoring event report.

The following information will be recorded during each water quality sampling event:

- General sampling information (i.e., semi-annual sampling event, field sampling personnel and other relevant specifics). This information should be recorded on both the field report and sampling forms.
- Weather conditions at the time of the sampling event (temperature, precipitation, and wind). This information should be recorded on the field report form and/or in the site sampling field notebook.
- Field instrument calibration documentation noting the time and measured value of a known standard. Field equipment to be calibrated includes: pH, specific conductivity, dissolved oxygen, and reduction/oxidation potential (ORP) meters. Calibration information will be recorded on the field report form.
- Well purging actions will be recorded on the sampling form for each monitoring well sampling location, and should include: depth to groundwater prior to purging; estimated purge volume; purge volume measurement method; time and date of well purging; and the actual volume purged from the well. The monitoring well purge volume calculation method to be employed at the site is presented in Section 8.3.
- Field parameter measurements noted during water quality sampling at a given location. Field parameter measurement information will include the time of measurement, the amount of water removed at the time of the measurement (at monitoring well locations), temperature, pH, specific conductivity, dissolved oxygen readings, and ORP. Included with field measurement data will be notations of the appearance of the sample (e.g., color, turbidity, and other observations). This information will be recorded on the sampling form. Field parameter monitoring is discussed in Section 8.4.
- Type of purging and sampling equipment used at each well location will be recorded on the sampling form.
- Sampling deviations, problems, or other pertinent information at a water quality monitoring location will be documented in the remarks section of the sampling form.

- The name and location of the laboratory, the use of chain-of-custody documentation, shipment method, and documentation of any split samples collected will also be noted on the sampling form.

Errors made on the sampling form or on the field report form will be crossed out with a single line and initialed by the field representative. Necessary corrections will be entered next to the error.

8. WATER QUALITY SAMPLING FIELD PROCEDURES

The goal of water quality sampling is to collect samples that are representative of a water-bearing formation, a surface water location, or a leachate associated sample point. Specific sampling procedures are organized as follows:

- Description of the sample location
- Water level measurement
- Well purging
- Field parameter measurements and instrumentation calibration
- Sample collection

The sampling forms, presented in Appendix A, provide a format on which to record and document completion of sample event and the collection of water quality samples at the site. Information to be recorded on these forms is presented in Section 7.

The purpose of an established sampling procedure is to collect a sample representative of groundwater present in the geologic formation, water quality at surface water sample locations, or water quality from leachate removal and collection associated sample points. Use of consistent sample collection procedures and methodologies reduces the possibility of a resulting sample concentration change being a result of or caused by a sampling procedure or method change. Procedures for sampling water quality are described in the following sub-sections.

8.1 Description of Sample Locations

The condition of each well will be documented. Details of well condition should include conditions of the protective casing and its cap, the condition of the well casing, the well's security (i.e., is it locked), and presence and condition of the monument concrete pad, if present. Visual damage or impeded access to the well will be detailed in the remarks section of the site sampling field form. The presence of gaseous odor in or around the well will be noted and described.

Water quality sample location conditions will also be noted in a similar manner. The flow conditions at each Senecal Creek sample point will be noted (i.e., is water present and if so how much is present and does it appear to be flowing). For the wastewater lagoon, the approximate water level in the lagoon should be noted as indicated by the level markings on its west side. Additional relevant surface water sample location observations during the collection of a water quality sample should be noted.

The presence of water at the leachate collection and removal sample points will to be noted. Any access or system operation or sample collection issues will also be noted.

8.2 Water Level Measurement

Ideally at the beginning of each sampling event, a water level survey will be conducted by measuring static water levels in all monitoring wells at the site within a period of 8 hours to limit the possible effects of diurnal and barometric pressure. The water level survey will form a data set used to construct potentiometric maps. Table 1 identifies the water level measuring point for each well and its elevation. A water level measurement form is presented in Appendix A.

As noted in Section 3.4, water levels in WS wells have been observed to change fairly slowly and potentiometric contour maps have consistently indicated groundwater flow in the WS is toward Senecal Creek. Water level changes have been observed to occur more rapidly in TF wells, which are semi-confined and influenced by seasonal pumping. The potentiometric surface of TF in site area has a low gradient. Consequently, the collection of water level measurements from all TF wells during the first day of a semi-annual monitoring event should be completed.

The depth of water in each well will be measured with an electric water level indicator from the reference point identified in Table 1 which is usually the top of the dedicated sample pump access hole or the top of the PVC casing (marked with a small notch) to the nearest 0.01 foot. The water level indicator will be rinsed with deionized water before use in each well. The water level meter instrument should be washed with a non-phosphate detergent and then fully rinsed prior to and at the end of each field day. Section 9 discusses decontamination procedures to be used at the site. All water level measurements will be recorded on the appropriate field sampling forms.

8.3 Monitoring Well Purging

The purpose of well purging is to flush the well of standing water until it contains fresh water representative of the formation. Purging of monitoring wells at the site utilize the three well casing volume-method. Exceptions are the active TF wells which are equipped with inflatable packers situated above the well screen. The following provides additional information regarding monitoring well purging at the NMCDF.

Most of the monitoring wells at the site generally have fair to good yield characteristics. As noted on Table 1, there are four shallow WS wells (L-8, L-19, L-21, and L-22) that have poor yields due to shallow completion depths. These wells are equipped with dedicated bailers. They typically produce cloudy to turbid water during purging and may bail dry. Following purging these wells are typically allowed to recover and stabilize for 24 hours prior to sampling. Low-flow sampling method could potentially be utilized at most monitoring wells at the site. However, there may be several wells where drawdown during purging would exceed the standard less than 1-foot drawdown criteria. The 1-foot maximum drawdown criteria may be more difficult to meet during fall events compared with spring events.

All Troutdale Formation wells, except L-4, are equipped with dedicated bladder pump systems using an inflatable packer that greatly reduces the required purge volume of these wells. The packers are located just above the 10-foot long well screens in these wells. The packers are inflated to a pressure of 90 psi after the collection of a water level measurement and prior to well purging. The purge volume of the Troutdale Formation wells when the packer is inflated is 5 gallons. As indicated on Table 1, the adopted practice is to purge 10 gallons from these TF wells prior to sample collection.

Before sampling takes place, the volume of water in the well casing will be calculated and recorded on the sampling form. Monitoring well casing volumes will be calculated by the following equation:

Casing volume = H (TD - DTW)

Where:

H = A constant that converts the length (per feet) of the standing water column in the well to casing volume (in gallons). For the 2-inch diameter wells at the site H = 0.17 gallons per foot of depth.

TD = Total depth of the monitoring well (in feet) from the top of the PVC well casing to the bottom of the PVC well casing. The depth of each well is provided on Table 1.

DTW = Depth to water (in feet) measured from the top of the well casing.

This calculation does not include the volume of water present in the well's filter pack. Table 1 identifies the approximate volume for 3 casing volumes. During purging, water removed from the well will be discharged to a calibrated five-gallon bucket to track the actual volume of water removed from the well.

Field parameter readings will be collected at a minimum rate of once per each well casing volume purged to establish that water entering the well is representative of formation water conditions. If field parameters have not stabilized after three well casing volumes have been removed, purging should continue until successive samples yield consistent results (i.e., plus or minus 10 percent). Water extracted from the monitoring wells during purging will be disposed on the ground away from the well.

Low yield monitoring wells will be purged and sampled using the dedicated PVC bailer suspended in each of the wells. Low yield wells will be purged a minimum of three well casing volumes or until less than an approximate two-foot column of water is present in the well. Following the completion of purging, the low yield monitoring wells will be allowed to recover for several hours prior to sampling.

Well L-4, the on-site nonpotable water supply well, is located just east of well L-5 (Figure 2). The water quality sampling point for well L-4 is a frost-free tap located on the northwest corner of the transfer station gate house (fee station). This tap is the closest known wellhead sampling point. The well will be purged for a minimum of 10 minutes from the tap with water directed away to an appropriate location by use of a garden hose. A stormwater grate is located just west of the gate house. This time period will remove at least one well casing volumes based on observed discharge rate at the tap (10 gallons per minute) and the estimated water column in the well (100 gallons).

For each monitoring well, Table 1 presents the approximate three well casing purge volume. These volume estimates are based on observed average depth to water from measurements. The volume of water extracted from a well during purging will be measured in a calibrated five gallon bucket with the exception of well L-4.

8.4 Monitoring of Field Parameters

During purging, field parameters (temperature, pH, ORP, specific conductivity, and dissolved oxygen) will be monitored and recorded on the site sampling data form. Field parameters will be recorded at minimum rate of once per each purge volume. A final round of field parameter measurements will be collected either during or following sample collection.

Calibration or checking of field parameter monitoring equipment will be completed at the beginning of each field day. A calibration check should be completed during the middle of each field day or within 4 hours of calibration and at the end of the field day to determine if field instrument drift has occurred. If drift has occurred, the instrument will be recalibrated. Calibration of field parameter equipment will be documented in the daily field meter calibration log. All field parameter measurement equipment will be portable such that measurements are collected at the sampling location.

8.5 Sampling Procedure

Water quality samples will be collected from monitoring wells, surface water monitoring points, and LCRS monitoring points by the following procedures.

8.5.1 Groundwater Quality Sampling

Groundwater samples will be collected after a minimum of three well casing volumes have been extracted from the well or the well becomes effectively dry (i.e., a water column in well is reduced to two feet or less and recovery is slow). The well will be sampled within 24 hours following the completion of purging and should be allowed at least four hours to recover prior to sample collection if it is a low yield well. This purging and sampling approach attempts to limit the concentration of total suspended solids in the water quality samples collected from the well.

Wells equipped with dedicated bailers will be sampled by gently lowering the bailer into the wells using a monofilament line that is wound on a reel or a disposable cord/twine string that is used only at a specific location. Wells equipped with bladder pumps will be collected directly from the discharge tube into the appropriate container(s) provided by the analytical laboratory. Table 1 identifies the dedicated sampling equipment at each well.

Groundwater quality samples will be collected using the following guidelines:

- For well equipped with dedicated bailers, the bailer will be gently lowered into the well to limit formation disturbance and limit sample turbidity issues.
- Water will be transferred from the bailer or bladder pump discharge tube directly into the bottle that has been specifically prepared for the constituent or set of constituents. Water will be poured slowly down the inside of the container to reduce aeration.
- Field-filtered samples include common anion and cation and trace metal groups as listed in Table 4. Field-filtered samples will be collected using a Gelman Sciences or similar design in-line disposable 0.45-micron copolymer high capacity filter. A new filter will be used at each sampling location. Wells without bladder pumps will require pressure through the filter to be supplied by a portable peristaltic pump.
- 40-mL vials used for volatile organic analysis (VOA) should be filled using a bottom-filling technique. For wells with dedicated bailers, this technique consists of placing a disposable bailer control flow tube near the bottom of the VOA vial and slowly dispensing the water from the bailer until the vial is full. For wells with bladder pumps, the pressure setting will be reduced to allow for a low flow rate into the vial. The teflon-lined screw lid will be placed on the VOA vial so that no air bubbles are trapped in the vial. When the lid is secure, the vial will be inverted and tapped to evaluate the presence of bubbles. If bubbles are present, the lid will be removed and additional sample volume added. The lid will be secured and checked for air bubbles, as before.
- Plastic bottles without preservatives should be filled completely to minimize air contact. Glass bottles, other than total organic carbon containers, should be filled only seven-eighths full to allow room for liquid expansion.
- Appropriate sample containers and preservatives for each constituent or group of constituents are listed in Table 5. Sample containers will be supplied by the laboratory with the appropriate preservative. The laboratory will certify that the provided containers were prepared according to appropriate EPA protocol. Upon

sample collection, the containers will be placed into coolers containing ice or laboratory provided synthetic frozen ice packs.

- To limit potential contamination from outside sources, a new pair of latex, vinyl, or nitrile surgical-type gloves should be donned at each sampling location.
- Each sample container will be labeled in a water proof manner indicating sample location, date, and time. The sample container should be pre-labeled to the extent possible to provide distinct clear sample information.

8.5.2 Surface Water Quality Sampling

Surface water sampling points at the site consist of the Senecal Creek sample points which are described in Section 3.2. Senecal Creek surface water samples will be collected by immersing the appropriate sample containers into the water stream at the sample point until water slowly flows into the container. Care needs to be taken to keep water from flowing back out of the container, especially if a laboratory preservative is present in the container. Dissolved metal samples will be collected in a temporary decontaminated vessel. The sample will then be field-filtered, using the filtering procedure presented in Section 8.5.1, into the appropriate laboratory provided sample container.

The water quality samples from the lagoon will be collected by using a dedicated disposable polyethylene bailer and lowering the bailer vertically into the water column down to a depth of approximately 4 feet. Water will then be transferred into the appropriate sample container in the same manner discussed above.

8.5.3 LCRS Water Quality Sampling

Fluid collected from the LCRS sample points will be collected using the same protocol used for the collection of groundwater samples as presented in this SAP. The Leachate Control Management Plan (LCMP; presented as Section 2 of the EMP) describes the design of the primary and secondary LCRSs. Section 3.3 also provides details regarding LRCR sample points. Sampling of the LCRS consists of inspecting for the presence of fluid and if fluid is present collecting a sample. The following presents the procedures to operate and collected water quality samples the LCRS sample points.

8.5.3.1 Wastewater Lagoon SLCRS

The presence of fluid volume at the wastewater lagoon secondary LCRS (SLCRS) will be determined by opening the sampling station valve and measuring the rate at which fluid, if present, flows into a 10 liter graduated cylinder.

Water quality samples from the wastewater lagoon SLCRS (sample point LDS-1) will be collected by opening the sampling station valve and collecting the fluid discharging from the sampling port. Fluid from the sampling port will be collected in appropriate laboratory provided sample containers. The sampling port valve will need to be adjusted in such a manner as to provide a slow but steady stream of fluid into the container.

8.5.3.2 Cell III and Cell IV SLCRS

Fluid volumes at the Cell III and IV SLCRS are determined by flow totaling meters installed at each sampling station (Figure 6). The SLCRS stations are each equipped with an electronic system control and status panel that includes total flow and fluid level readouts. The flow totalizer meters located on the discharge lines shall be used.

The Cell III SLCRS sampling stations (sample points LDS-2 and LDS-3) are fitted with dedicated electric pumps used to check for the presence of fluid and to obtain a water quality sample, if fluid is present. The electronic control panels located at the two sampling stations provide pump control and system status information. Special keys are needed to access the Cell III SLCRS discharge lines and monitoring/operations panel.

The Cell IV SLCRS sampling stations (sample points LDS-4, LDS-5, and LDS-6) are also fitted with dedicated electric pumps used to check for the presence of fluid and to obtain a water quality sample, if fluid is present. A special key is also needed to access the Cell IV monitoring/operations panel. Prior to sample collection, the SLCRS is pumped using the manual (hand) mode setting for at least one minute to purge standing fluid from the pump and its discharge line. Samples are then collected directly from the SLCRS pump discharge line. SLCRS discharge lines are then returned back to their appropriate locations and the pump operation setting is returned to its automatic setting.

8.5.3.3 North Lift Station

Samples from the north lift station (designated Cell 3/FM) are collected at the top of the lift station. A special key is required to open the lift station access doors. Care should be taken when these doors are open due to potential fall hazard. Water quality samples from the north lift station are collected using a disposable bailer.

8.5.3.4 Hydraulic Control Discharge Point

The rate of water discharging from the hydraulic control discharge line will be measured using a five gallon bucket if standing water is below the bottom of the discharge line. The time it takes to fill up a five gallon bucket will be recorded during each inspection event. Samples are collected directly from at the discharge outfall pipe.

8.5.3.5 Existing VZMD SLCRS

Procedures to collect water quality samples from the VZMDs are detailed provided below as a reference source. The VZMDs are inactive. Previous inspections of the VZMDs indicate that there is no fluid in the devices or that they are not functioning.

The closed ash monofill Cell II is equipped with vadose zone monitoring devices (VZMDs). Sampling of the VZMDs is not required by the NMCDF Solid Waste Disposal Site Permit. This information is provided in the event sampling of the VZMDs is to be completed.

The VZMDs installed at NMCDF are constructed with a gas-actuated check valve (the only moving part of the device). The VZMD is checked and sampled for presence of fluids using inert pressurized gas (e.g., nitrogen) cylinder line to operate the flapper-style valve. The existing VZMD or pan lysimeters are checked for presence of fluids and sampled in the following manner:

- Attach an inert pressurized gas (e.g., nitrogen) cylinder line to the "in" line of the VZMD.
- The "out" line of the VZMD is placed into a clean graduated cylinder of at least 250 mL capacity.
- Open the valve on the gas cylinder is until pressure reaches 3 to 6 pounds per square inch.
- Collect fluid discharging from the "out" line of VZMD into the graduated cylinder for determination of fluid volume present. If samples are to be collected, transfer

fluid into the laboratory provided containers. Record the total fluid volume discharged from each VZMD.

- The collection of field parameters and field filter species are to be completed by the procedures presented in Section 8.5.2.

Under some specific circumstances the check valve may not seat properly or may stick close. The following procedures describe methods to check and remedy these conditions.

Condition 1: Valve Stuck Open

The VZMD flapper-style valves are not subject to high pressure or high volume movement through the valve, therefore the valves are never in the fully open position. If the valve is stuck in the open position, it will not fully open and some sample return, if present, is possible. If the system is full of liquid, the back pressure of attempting to remove a sample will often close the sticking valve. A sudden pressure surge will assist in closing the valve.

To verify if the system is empty or partially full, the system can be checked to verify whether the valve is stuck open or if there is no sample in the system in the following manner:

1. If gas returns through the sample discharge line, there is no sample.
2. If gas dose not return from the sample discharge line and low pressure builds but can't be maintained in the system, then either the gas pressure line is leaking, the valve is stuck partially open (sufficiently wide to allow pressurizing gas to escape), or the sample discharge line is faulty (ruptured).
3. If gas or sample does not return from the sample discharge line, pressure builds in the pressure line and is maintained, then either one or both of the lines have collapsed or have been pinched off but the valve is closing.

If the gas pressure or sample discharge lines are collapsed, disconnected, ruptured, or otherwise faulty, then there is no remedy other than replacing them. Given the protection of the lines it is unlikely that damage will occur as long as maximum gas pressure is kept below 15 psi.

If the check valve is stuck open, then surging gas pressure can close the valve. As noted, if the system is flooded (completely full of liquid)_, then pressure (and resulting backflow) will almost certainly close the valve. If the system is stuck open causing little or no sample return, then the following procedure should be followed:

1. Under low pressure (3 to 6 psi maximum) introduce clean water (distilled and deionized) back down the sample discharge line until water is coming out of the gas pressure line. Do not exceed 6 psi.
2. When the system is flooded, pressurize the gas pressure line with the appropriate gas to less than 15 psi. This will seat the valve, if it can be seated. Several attempts maybe necessary to close the valve.

Condition 2: Valve Stuck Close

In some instances, the valve can become stuck closed. In this circumstance, fluid from the catch basin does not flow into the unit and no sample is returned. If operated normally, this would consistently appear to be an empty VZMD, when fluid may actually be collected in the catch basin but not in the sampling unit. The procedure to check for this condition is as follows:

1. Plug off the sample discharge line and draw a vacuum on the gas pressure line. If a vacuum continuously increases on this line, then the valve is stuck closed. Continue increasing the vacuum until the valve is freed. When the valve opens, the vacuum will decrease suddenly.

If the valve is not stuck, the vacuum will remain low and will not be maintained without continuously evacuating the system. If the valve does not break free, flushing the system with clean water (distilled and de-ionized) can sometimes loosen deposits and allow the valve to be freed with the application of the vacuum.

8.5.3.6 Backup Cell Detection Devices

The backup landfill cell is equipped with two remote piezometers and two VZMDs (pan lysimeters). The access point for the two pressure controlled VZMDs and the two remote piezometers are located on the north side of the backup landfill. These systems are inactive.

9. DECONTAMINATION

Decontamination procedures are required to remove contaminants from equipment that comes into contact with the sample matrix (sample contacting equipment) and from ancillary equipment that has not contacted the portion of sample to be analyzed (non-sample contacting equipment). The decontamination procedure methods to be employed at the NMCDF site are based on standard practices as presented in ASTM Standard D-5088-90, Decontamination of Field Equipment Used at Nonradioactive Waste Sites.

Sample collection at the NMCDF site will use dedicated or disposable sampling equipment including: dedicated bladder pumps, dedicated submersible pumps, or dedicated or disposable bailer. Dedicated pumps and bailers are stored and remain in their respective wells. Decontamination procedures to be completed at the site are primarily directed toward non-sample contacting equipment such as bailer lines and field parameter probes.

Sample contacting equipment are those items that comes in direct contact with the sample or a portion of the sample that will undergo chemical analysis or physical testing. Non-sample contacting equipment are those items associated with the sampling effort that do not directly contact the sample.

Decontamination of sample contacting equipment, if used, well receive a non-phosphate detergent wash followed by rinse with deionized water and then allowed to air dry.

Decontamination of non-sample contacting equipment will receive a non-phosphate detergent wash and rinsed with deionized water.

Control rinse water will be obtained from a water system of known chemical composition. The non-phosphate detergent will be Alquinox, Lquinox, or a similar solution. Deionized water shall be organic-free reagent grade.

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10. SAMPLE PACKAGING AND SHIPMENT

Chain-of-custody procedures will be followed. The following procedures for sample packing and shipment will be followed:

- Double-check that the sample label sticker on the sample bottle has been completed and that the label identification matches the chain-of-custody form.
- Roll up or contain glass containers with bubble-pack and tape, taking care that there is no glass-to-glass contact. Plastic bottles do not have to be wrapped with bubble pack.
- Pack the sample bottles in coolers, preferably keeping all the samples from one well together. Use additional bubble-pack or styrofoam packing material to provide cushioning and support between and below sample bottles, especially the large glass bottles.
- Use ice sealed inside plastic bags to cool the samples. Do not use ice for packing between bottles.
- Complete the chain-of-custody form in triplicate, listing each sample bottle in the cooler. Indicate on the chain-of-custody forms which analyses are to be performed. Seal the top chain-of-custody sheet in a Ziploc bag and tape it to the inside lid of the cooler.
- Close the cooler and tape it shut by making one complete wrap of banding tape on each end of the cooler and seal the opening with a custody seal.
- Transport the coolers to the laboratory or use the laboratory courier service. Chain of custody forms are to be signed upon sample relinquishment.

Coordination regarding getting samples to the laboratory needs to consider making sure sample holding times will be met and keeping samples within sample storage requirements (less than or equal to 6 degrees C and above freezing) until after they are received by the analytical laboratory.

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11. REFERENCES

Dames & Moore, 1996. Final Remedial Investigation Report, Focused Remedial Investigation/Feasibility Study, North Marion County Disposal Facility, Woodburn, Oregon; prepared for Marion County Department of Solid Waste Management.

Oregon Administrative Rules (OAR). 1990. Department of Environmental Quality Chapter 340 Division 40 Groundwater Quality Protection. http://arcweb.sos.state.or.us/pages/rules/oars_300/oar_340/340_040.html

Parametrix, 2013. Water Quality Monitoring Plan, North Marion County Disposal Facility, Marion County; prepared for Marion County Department of Solid Waste Management.

Parametrix, 2013. Leachate Control Management Plan, North Marion County Disposal Facility, Marion County; prepared for Marion County Department of Solid Waste Management.

Parametrix, 2013. Environmental Monitoring Plan, North Marion County Disposal Facility, Marion County; prepared for Marion County Department of Solid Waste Management.

Price, 1967. Geology and Water Resources in the French Prairie Area, Northern Willamette Valley, Oregon; U.S. Geological Survey Water-Supply Paper 1833.

U.S. Environmental Protection Agency (EPA). 2009. National Primary and Secondary Drinking Water Standards; by the Office of Water (4606M) U.S. EPA, Washington, D.C. EPA 816-F-09-0004. http://water.epa.gov/drink/contaminants/index.cfm#List.

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FIGURES

Parametrix DATE: January 24, 2011 FILE: N_Marion_Locator.mxd

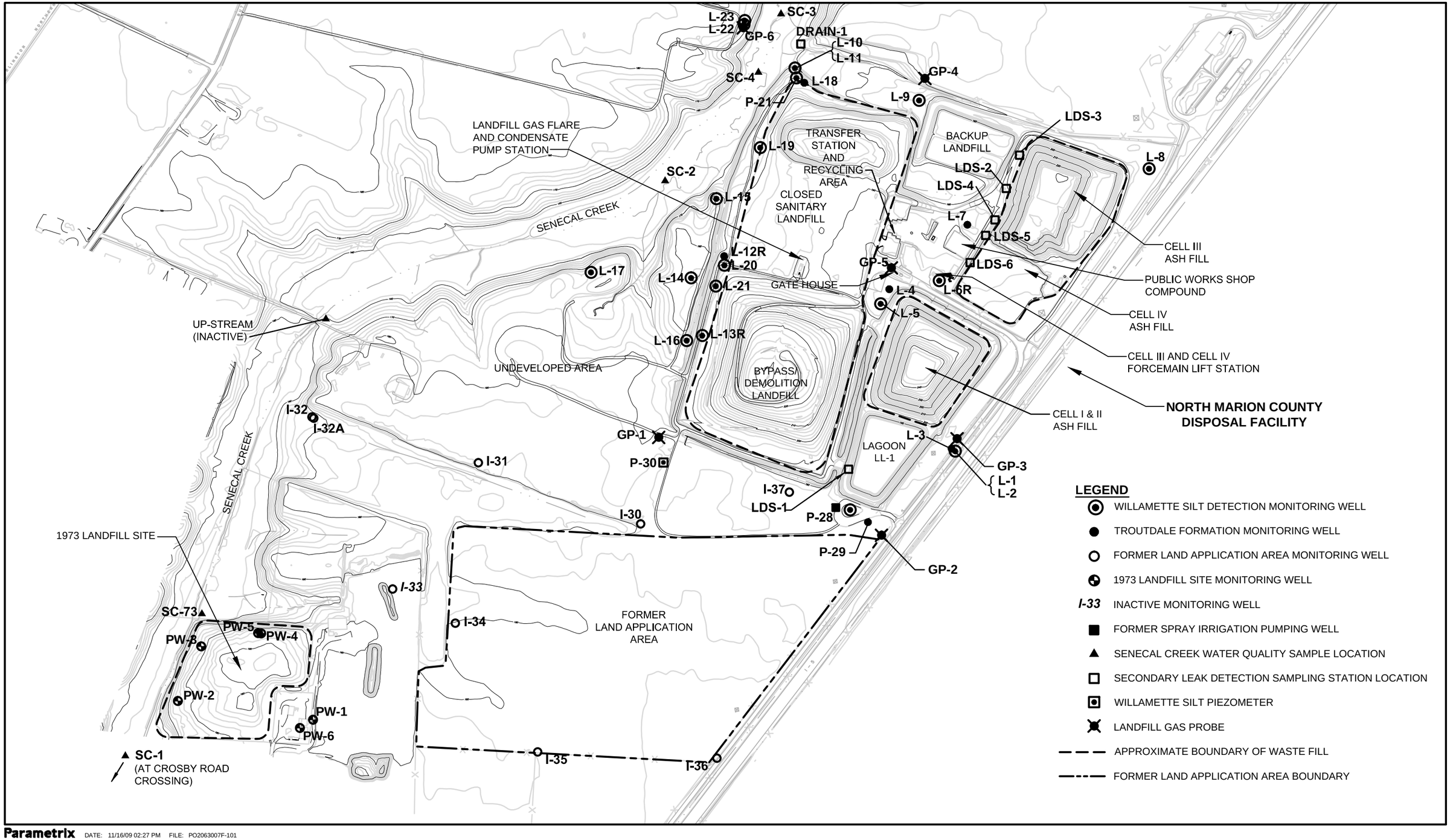
N

0 500 1,000 1,500

Feet

Figure 1
Site Location

Annual Environmental Monitoring Report
North Marion County Disposal Facility
Marion County, Oregon



Parametrix DATE: 11/16/09 02:27 PM FILE: PO2063007F-101

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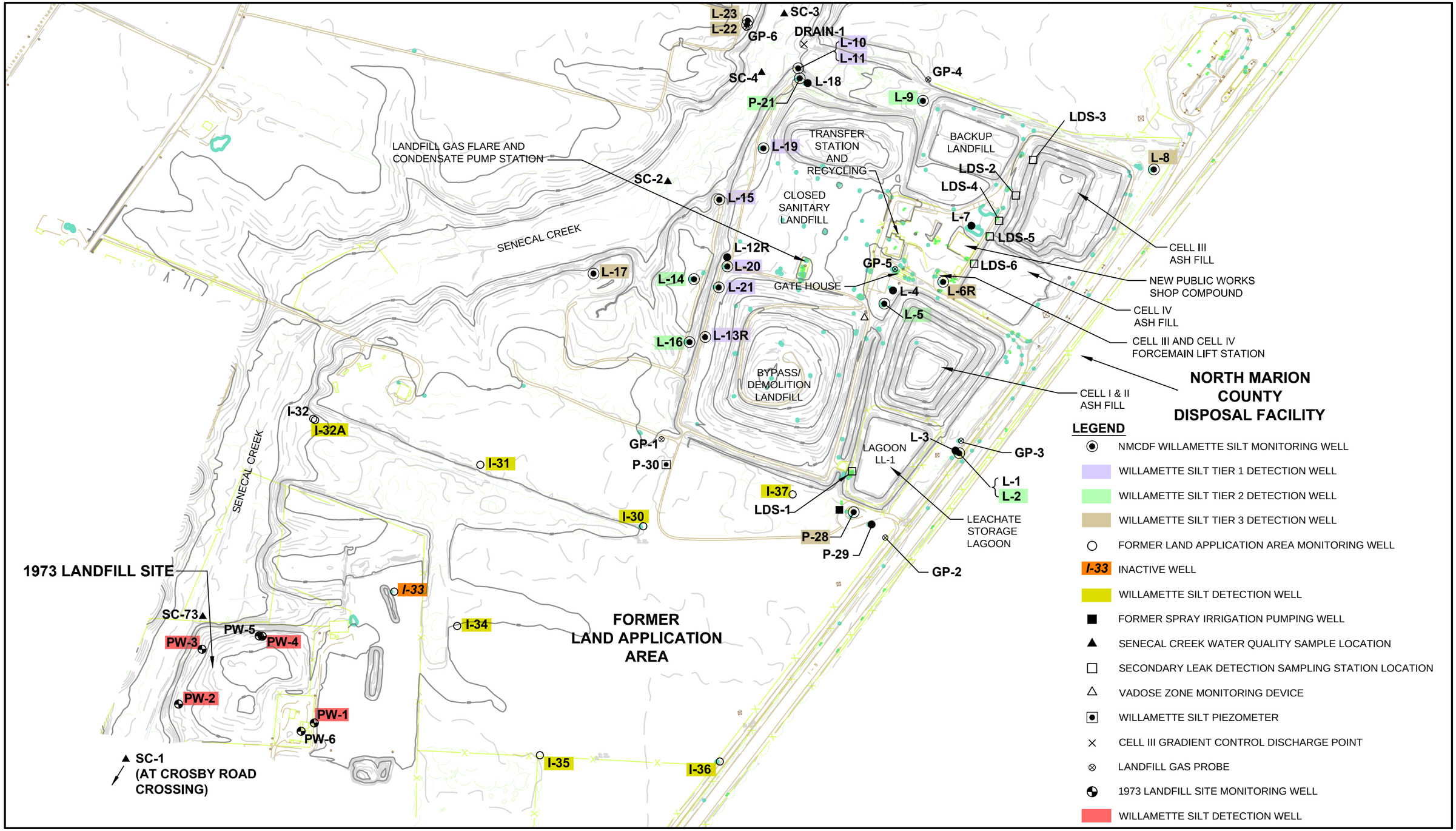
0 500'

SCALE IN FEET

Figure 2
Facility Site Map
Environmental Monitoring Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON



Parametrix DATE: 09/26/07 09:31am FILE: PO2063007F-26

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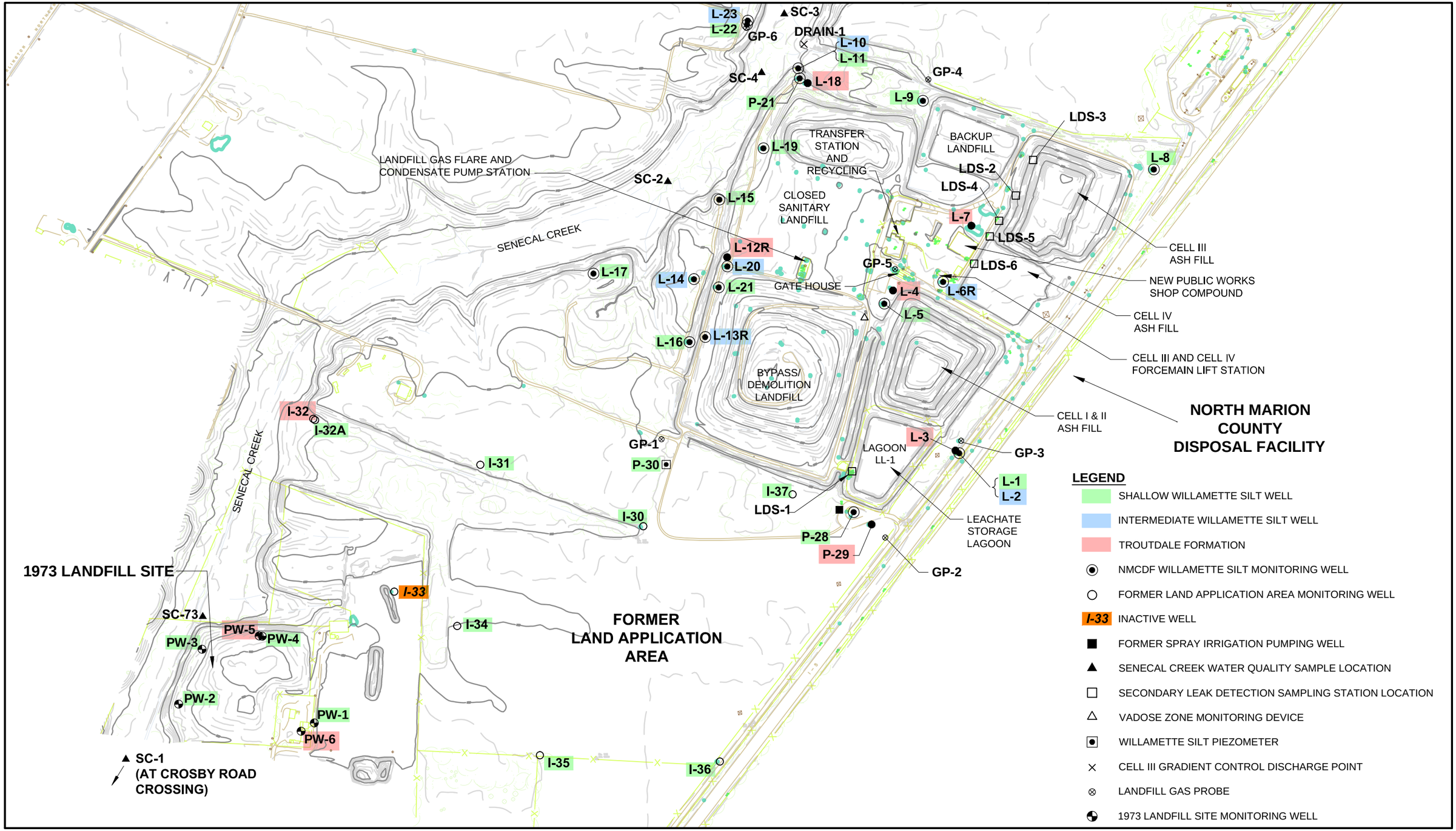
0 500'

SCALE IN FEET

Figure 3
Willamette Silt Detection Well Locations
Sampling and Analysis Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON



Parametrix DATE: 09/06/07 11:44am FILE: PO2063007F-25

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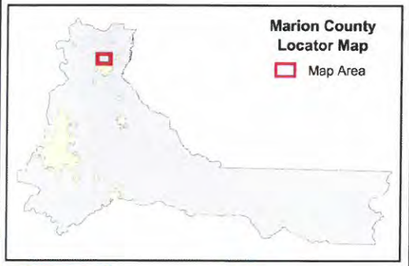
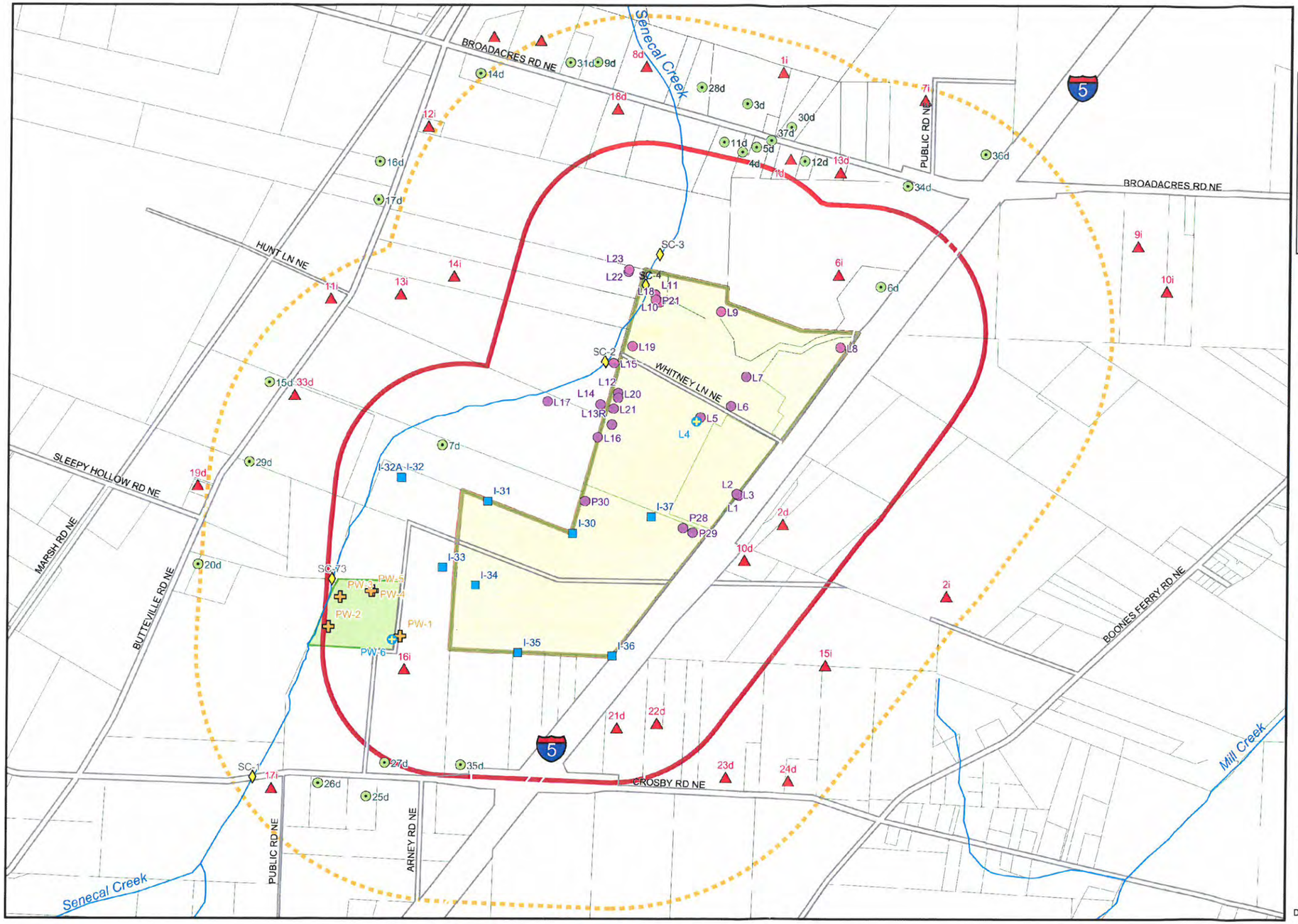
0 500'

SCALE IN FEET

Figure 4
Hydrogeologic Zone Monitoring Locations
Sampling and Analysis Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON

North Marion Disposal Facility





0 500 1,000 1,500 Feet

Legend

Landfill Boundary
1973 Landfill
Tax Lots
Roads
Rivers & Streams

Buffer
- 1/4 Mile Buffer
- 1/2 Mile Buffer

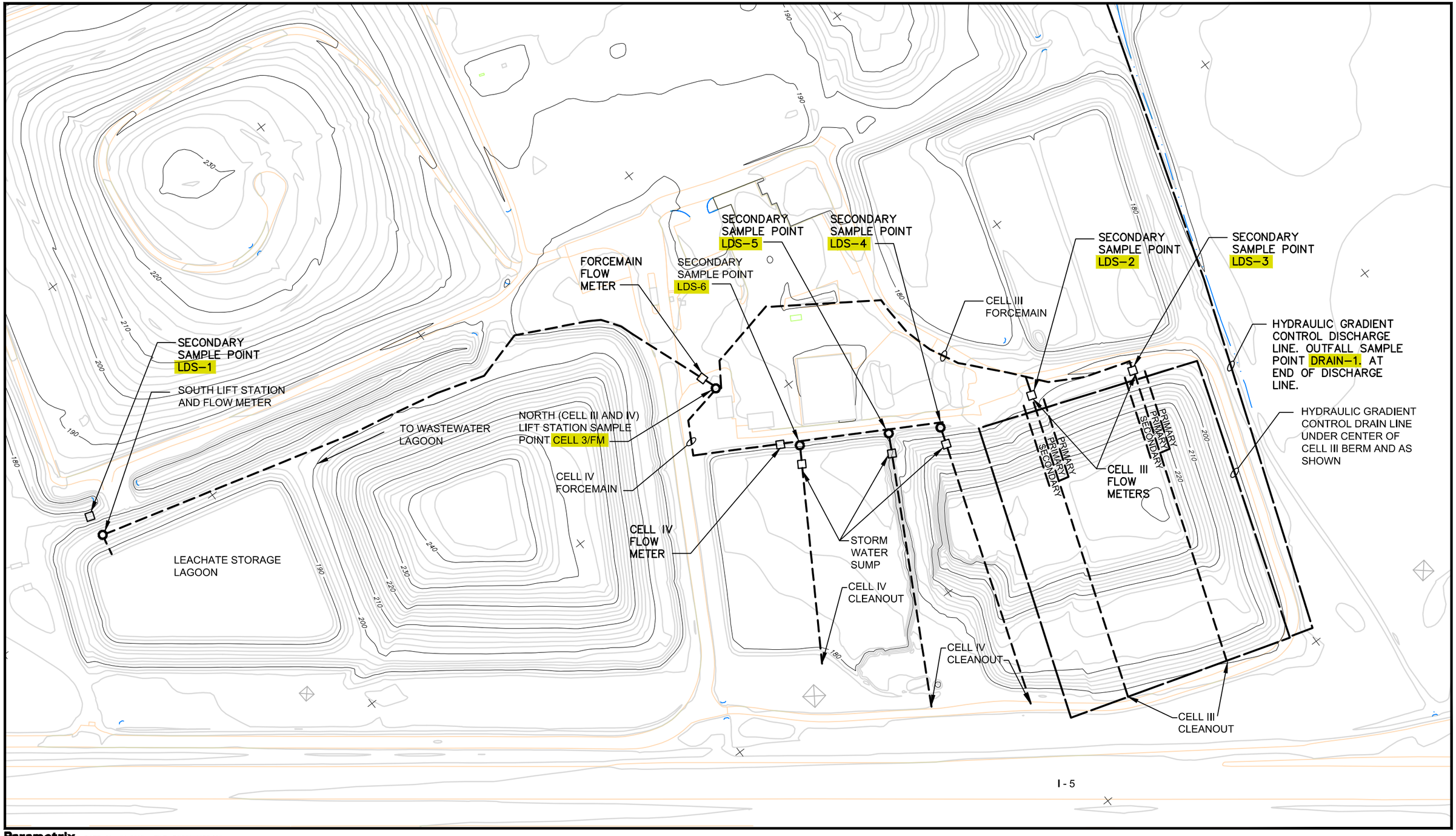
On-Site Wells
- Monitoring Well
- Monitored On-Site Water Supply Well
- Land Application Monitoring Well
- 73 Landfill Monitoring Well
- Senecal Creek Water Quality Sample Locations

Off-Site Wells
- Monitored
- Not Monitored

Date: 01/07/05 | Project: U:/gisprojects/solidwaste/disposal_fac/nm_fac.mxd | Prepared By: LL

Parametrix DATE: 09/06/07 10:26am FILE: PO2063007F-27

Figure 5
Site Area Well Location Map
Environmental Monitoring Plan
NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON



Parametrix DATE: May 24, 2013 FILE: PO2063007F-102

N

0 175'

SCALE IN FEET

LEGEND

LEACHATE COLLECTION AND REMOVAL SYSTEM SAMPLE POINTS

Figure 6
Leachate Collection & Conveyance Enviromental Monitoring Plan

NORTH MARION COUNTY DISPOSAL FACILITY
MARION COUNTY, OREGON

TABLES

Table 1: MONITORING WELL AND PIEZOMETER SUMMARY
ENVIRONMENTAL MONITORING PLAN
NORTH MARION COUNTY DISPOSAL FACILITY

Site	Well Type	Well Identification	Depth to Water Measurement Point Elevation (feet msl)	Depth to Water Measurement Point	Depth of Well from Top of PVC (feet)	Purge/Sample Equipment	Approximate Purge Volume (gallons)	Initial Dedicated Pump Settings	Comments
NMCDF	**Willamette Silt**	L-1	187.46	top of PVC	14.45	Dedicated Bailer	3.5	n/a	Non-Active well. Located adjacent to L-2. Bails dry. Turbid water.
		L-2	187.33	top of pump plate	34.2	Dedicated Bladder Pump	13	P=35; D=B+; R=B+	Tends to produce cloudy water w/ brown particulate matter.
		L-5	188.34	top of pump plate	23.30	Dedicated Bladder Pump	5.5	P=35; D=B+; R=A1/2	Produces clear water with fine black particulate matter. Wasps like this well.
		L-6R	188.03	top of pump plate	32.84	Dedicated Bladder Pump	8	P=45; D=A1/2; R=B-	Can produces slightly cloudy water.
		L-8	186.34	top of PVC	22.10	Dedicated Bailer	3	n/a	Produces slightly cloudy water. Can be almost bailed dry.
		L-9	177.76	top of pump plate	20.13	Dedicated Bladder Pump	7	P=30; D=A1/2; R=A1/2	Produces clear water. Can run dry. Usually has ants.
		L-10	161.92	top of pump plate	32.70	Dedicated Bladder Pump	15	P=30; D=A1/2; R=A1/2	Produces slightly cloudy water. Located adjacent to L-11.
		L-11	161.55	top of pump plate	13.60	Dedicated Bladder Pump	5	P=15; D=B-; R=B	Notable leachate odor. Can produce cloudy water.
		L-13R	187.72	top of pump plate	32.16	Dedicated Bladder Pump	9	P=28; D=B-; R=B+	Flush mount well middle of access road.
		L-14	183.10	top of pump plate	31.55	Dedicated Bladder Pump	9	P=25; D=B1/2; R=B+	Produces clear water. Remote location.
		L-15	175.98	top of pump plate	26.75	Dedicated Bladder Pump	6	P=25; D=B1/2; R=B1/2	Produces clear water. Remote location.
		L-16	179.90	top of pump plate	22.30	Dedicated Bladder Pump	7.5	P=34; D=B-; R=B+	Produces clear water.
		L-17	178.72	top of pump plate	25.00	Dedicated Bladder Pump	3	P=20; D=A-; R=B	Generally produces clear water. Little or no water present during fall events. Remote location.
		L-19	178.42	top of PVC	17.90	Dedicated Bailer	5	n/a	Produces cloudy water.
		L-20	186.52	top of pump plate	50.20	Dedicated Bladder Pump	17	P=32; D=B; R=B	Produces clear water.
		L-21	184.60	top of PVC	18.40	Dedicated Bailer	3.5	n/a	Flush mount well middle of access road. Well produces turbid water. Usually dry during fall events.
		L-22	178.63	top of PVC	21.75	Dedicated Bailer	2	n/a	Usually dry during fall events. Usually produces cloudy to turbid water. Remote location.
		L-23	180.01	top of pump plate	40.36	Dedicated Bladder Pump	9.5	P=30; D=B; R=B	Produces clear water. Remote location
		P-21	171.95	top of pump plate	15.05	Dedicated Bladder Pump	7.5	P=22; D=B-; R=C+	Well located in or adjacent to waste. Ususally high water level in well. Notable leachate odor. Effervescent water.
		P-28	185.64	top of pump plate	30.8	Dedicated Bladder Pump	8.5	P=27; D=B1/2; R=B-	Produces clear water.
		P-30	186.16	top of PVC	19.5	none	n/a	n/a	Well used only as a piezometer.
	Troutdale Formation	L-3	184.98	top of PVC bell	139.0	Dedicated Bladder Pump w/ Packer	10	P=97; D=C-; R=C+	Equipped w/ inflatable packer. Produces clear water.
		L-4	n/a	sealed well	187.5	Submersible Pump	10 minute purge	n/a	Purged and sampled from spigot located on northwest side of gate house.
		L-7	181.31	top of PVC bell	144.0	Dedicated Bladder Pump w/ Packer	10	P=85; D=C-; R=B1/2	Equipped w/ inflatable packer. Can produce slightly cloudy water.
		L-12R	184.66	top of PVC bell	153.6	Dedicated Bladder Pump w/ Packer	10	P=90; D=C+; R=B1/2	Equipped w/ inflatable packer. Generally produces clear water.
		L-18	173.81	top of pump plate	119.8	Dedicated Bladder Pump w/ Packer	10	P=87; D=B1/2; R=B1/2	Equipped w/ inflatable packer. Produces clear water.
		P-29	184.84	top of pump plate	110.0	Dedicated Bladder Pump w/ Packer	10	P=70; D=C1/2; R=B	Produces clear water.
Land Application Area	**Willamette Silt**	I-30	184.61	top of PVC	28.45	Dedicated Bailer	5	n/a	Non-active well. Usually bails dry.
		I-31	184.66	top of PVC	29.00	Dedicated Bailer	8.5	n/a	Non-active well. Produces clear water.
		I-32A	182.16	top of PVC	28.4	none	n/a	n/a	Non-active well, Only used as a piezometer.
		I-33	179.41	top of PVC	27.7	Dedicated Bailer	10.5	n/a	Well on private property. No longer a County well.
		I-34	181.77	top of PVC	29.9	Dedicated Bailer	11	n/a	Non-active well. Produces clear water.
		I-35	183.10	top of PVC	27.4	Dedicated Bailer	11	n/a	Non-active well. Usually bails dry.
		I-36	184.51	top of PVC	27.4	Dedicated Bailer	10.5	n/a	Non-active well. Produces slightly cloudy water.
		I-37	183.78	top of PVC	28.8	Dedicated Bailer	10.5	n/a	non-active well. Usually bails dry.
	Troutdale Formation	I-32	182.37	top of PVC	99	none	n/a	n/a	Non-active well. Well only used as a piezometer.
1973 Landfill Site	**Willamette Silt**	PW-1	183.73	top of PVC	28.80	Dedicated Bailer	8	n/a	Non-active well. Produces cloudy water. Drawsdown during bailing.
		PW-2	179.02	top of PVC	41.70	Dedicated Bailer	12	n/a	Produces cloudy to turbid water. Odiferous. Drawsdown during purging.
		PW-3	178.75	top of PVC	43.52	Dedicated Bailer	13	n/a	Non-active well. Produces cloudy to turbid water. Odiferous. Drawsdown during purging.
		PW-4	188.62	top of PVC	43.50	Dedicated Bailer	9	n/a	Non-active well. Produces cloudy to turbid water. Odiferous and effervscent water. Drawsdown during purging.
	Troutdale Formation	PW-5	189.00	top of pump plate	92.88	Dedicated Bladder Pump w/ Packer	10	P=75; D=B1/2; R=B-	Equipped w/ inflatable packer. Produces clear water.

Notes:
Highlight depth to water measurement point elevation indicates that well was not surveyed during 2011 well survey completed by Marion County Public Works survey group.
Initial dedicated pump settings: P = pressure; D and R are old non-electronic valve type Well Wizard controller discharge and recharge settings.

TABLE 2: WATER QUALITY SAMPLE LOCATIONS, FREQUENCY, AND SCHEDULE
SAMPLING AND ANALYSIS PLAN
NORTH MARION COUNTY DISPOSAL FACILITY

Locations	Analytes *	Frequency	Schedule
Willamette Silt Tier 1 Detection wells: L-10, L-11, L-13R, L-15, L-19, L-20, and L-21.	Group 1a Group 1b Group 2a Group 2b Group 3	Semi-annual	Spring and Fall
Willamette Silt Tier 2 Detection wells: L-2, L-5, L-9, L-14, L-16, and P-21.	Group 1a Group 1b Group 2a	Semi-annual	Spring and Fall
	Group 2b Group 3	Annual	Fall
Willamette Silt Tier 3 Detection wells: L-6R, L-8, L-17, L-22, L-23, and P-28.	Group 1a Group 1b Group 2a	Annual	Fall: L-6R, L-8, L-23, P-28. Spring: L-17 and L-22.
	Group 2b Group 3	Bi-Annual	Fall 2012, Fall 2014, Fall 2016, etc.
Troutdale Formation wells: L-3, L-4 (at the tap), L-7, L-12R, L-18, and P-29.	Group 1a Group 1b Group 2a	Semi-annual	Spring and Fall
	Group 2b Group 3	Annual	Fall
Piezometers: L-1 and P-30. Water levels to be collected from all monitoring wells at NMCDF, the former Land Application Area, and the 1973 Landfill Site.	Water levels	Semi-annual	Spring and Fall
Senecal Creek monitoring points: SC-1, SC-2, SC-3, SC-4, and SC-73.	Group 1a Group 1b Group 2a Group 2b Group 5	Semi-annual Annual: SC-73	Spring and Fall Spring: SC-73
	Group 3	Annual	Spring
Leachate, Secondary Leachate Collection and Removal Systems, and Groundwater Gradient Control Outfall inspection points: LDS-1, LDS-2, LDS-3, LDS-4, LDS-5, LDS-6, Cell 3/FM, LL-1, and Drain-1.	Group 1a Group 1b Group 2a Group 2b	Semi-annual	Spring and Fall
1973 Landfill Site wells: PW-5.	Group 1a Group 1b Group 2a Group 2b Group 3	Annual	Fall

NOTES:
1) ***** See Table 3, Water Quality Monitoring Parameters, for analytes/parameters included in each parameter group. Note the NMCDF Indicator Parameter list is used except during even year Fall events (i.e., Fall 2012, Fall 2014, etc.) when the Permit Parameter list is applied. See note #2 below for application detail.
2) NMCDF Indicator Parameter list applied to all sample point locations except those associated with 1973 Landfill Site and the former Land Application Area.
3) Water levels are collected from all wells and piezometers during first day of sampling event.
4) The semi-annual compliance monitoring periods are:

- Spring: April 1st through May 31st.
- Fall: October 1st through November 30th.

TABLE 3: WATER QUALITY MONITORING PARAMETERS - INDICATOR AND PERMIT PARAMETERS
SAMPLING AND ANALYSIS PLAN
NORTH MARION COUNTY DISPOSAL FACILITY

NMCDF INDICATOR PARAMETERS	NMCDF PERMIT PARAMETERS	METHOD	METHOD DESCRIPTION	METHOD REPORTING LEVEL (mg/L)	DEQ REF. LEVELS[d] (mg/L)	DEQ GUIDANCE LEVELS[e] (mg/L)	EPA DRINKING WATER STD[f]
GROUP 1a: FIELD INDICATOR PARAMETERS							
ELEVATION OF WATER LEVEL	ELEVATION OF WATER LEVEL	FIELD	Electric Probe				
pH	pH	FIELD	Reference Electrode Probe			6.5 to 8.5 su	
TEMPERATURE	TEMPERATURE	FIELD	Temperature Probe				
SPECIFIC CONDUCTANCE	SPECIFIC CONDUCTANCE	FIELD	Conductivity Probe				
DISSOLVED OXYGEN	DISSOLVED OXYGEN	FIELD	Metal Cathode Probe				
REDOX POTENTIAL (Eh)	REDOX POTENTIAL (Eh)	FIELD	Platinum Band Sensor Probe				
GROUP 1b: LEACHATE INDICATOR PARAMETERS							
	HARDNESS (as $CaCO_3$)	6020[a]	ICP-MS	2.00			
TOTAL ALKALINITY (as $CaCO_3$)	TOTAL ALKALINITY (as $CaCO_3$)	310.1[b]	Titrimetric	10.0			
TOTAL DISSOLVED SOLIDS (TDS)	TOTAL DISSOLVED SOLIDS (TDS)	160.1[b]	Gravimetric	10.0		500	
TOTAL SUSPENDED SOLIDS (TSS)	TOTAL SUSPENDED SOLIDS (TSS)	160.2[b]	Gravimetric	10.0			
	CHEMICAL OXYGEN DEMAND (COD)		Spectrophotometric	5.00			
	TOTAL ORGANIC CARBON (TOC)		UV, Persulfate Oxidation-IR	1.00			
	SPECIFIC CONDUCTANCE		Conductivity Probe	10.0			
	pH		Reference Electrode Probe	pH units			
GROUP 2a: COMMON ANIONS AND CATIONS[#]							
CALCIUM (Ca)	CALCIUM (Ca)	200.7[b]	ICP-MS	0.050			
	MAGNESIUM (Mg)	200.7[b]	ICP-MS	0.002			
SODIUM (Na)	SODIUM (Na)	200.7[b]	ICP-MS	1.00			
	POTASSIUM (K)	200.7[b]	ICP-MS	1.00			
	IRON (Fe)	200.7[b]	ICP-MS	0.0250		0.3	
	MANGANESE (Mn)	200.7[b]	ICP-MS	0.00200		0.05	
	AMMONIA-NITROGEN (NH_4-N)	350.3[b]	Electrode	0.100			
	CARBONATE ALKALINITY (CO_3)	310.1[b]	Titrimetric	10.0			
	BICARBONATE ALKALINITY (HCO_3)	310.1[b]	Titrimetric	10.0			
	SULFATE (SO_4)	300.0[b]	Ion Chromotography	1.00		250	
CHLORIDE (Cl)	CHLORIDE (Cl)	325.3[b]	Ion Chromotography	0.5		250	
	NITRATE (NO_3-N)	353.3[b]	Ion Chromotography	0.100	10.0		10
	SILICA (Si)	370.1[b]	Spectrophotometric Reduction	0.250			
	AMMONIUM (NH_4)	SM 8010F	Calculation	0.0500			
GROUP 2b: TRACE METALS							
	ANTIMONY (Sb)	6020[a]	ICP-MS	0.00100			0.006
ARSENIC (As)	ARSENIC (As)	6020[a]	ICP-MS	0.00100	0.05		0.010
BARIUM (Ba)	BARIUM (Ba)	6020[a]	ICP-MS	0.00100	1.0		2
	BERYLLIUM (Be)	6020[a]	ICP-MS	0.00200			0.004
CADMIUM (Cd)	CADMIUM (Cd)	6020[a]	ICP-MS	0.00100	0.01		0.005
	CHROMIUM (Cr)	6020[a]	ICP-MS	0.00200	0.05		0.1
	COBALT (Co)	6020[a]	ICP-MS	0.00100			
COPPER (Cu)	COPPER (Cu)	6020[a]	ICP-MS	0.00200		1.0	1.3***
LEAD (Pb)	LEAD (Pb)	6020[a]	ICP-MS	0.00100	0.05		0.015***
NICKEL (Ni)	NICKEL (Ni)	6020[a]	ICP-MS	0.00200			
	SELENIUM (Se)	6020[a]	ICP-MS	0.00100	0.01		0.05
	SILVER (Ag)	6020[a]	ICP-MS	0.00100	0.05		
	THALLIUM (Ti)	6020[a]	ICP-MS	0.00100			0.002
	VANADIUM (V)	6020[a]	ICP-MS	0.00200			
ZINC (Zn)	ZINC (Zn)	6020[a]	ICP-MS	0.0100		5.0	
GROUP 3: VOLATILE ORGANIC CONSTITUENTS							
VOLATILE ORGANIC CONSTITUENTS	VOLATILE ORGANIC CONSTITUENTS	8260B[a]	Gas Chromotography/Mass Spect.	0.50-1.0 ug/L			
GROUP 4: ASSESSMENT MONITORING PARAMETERS							
	SEMI-VOLATILE ORGANIC CONSTITUENTS	8270[a]	Gas Chromotography/Mass Spect.				
	MERCURY	7470[a]	Cold Vapor Atomic Adsorption	0.000200	0.002		
	CYANIDE	9010	Distillation, Spectrophotometric	0.010			0.2
	NITRITE	300.0[b]	Ion Chromotography	0.030			1
GROUP 5: SURFACE WATER MONITORING PARAMETERS							
TOTAL KJELDAHL NITROGEN (TKN)	TOTAL KJELDAHL NITROGEN (TKN)	351.3[b]	Digestion, Distillation, Titrimetric	5.00			
TOTAL PHOSPHORUS (P)	TOTAL PHOSPHORUS (P)	6010[a]	Inductively Coupled Plasma	0.200			
ORTHOPHOSPHATE (PO_4)	ORTHOPHOSPHATE (PO_4)	365.2[b]	Ion Chromatography	0.0100			
BIOLOGICAL OXYGEN DEMAND (BOD)	BIOLOGICAL OXYGEN DEMAND (BOD)	405.1[b]	Oxygen Electrode	4.00			
	TOTAL HALOGENATED ORGANICS (TOX)	9020[a]	Adsorption, Microcoulometric	0.0200			
TOTAL COLIFORM BACTERIA	TOTAL COLIFORM BACTERIA	SM 9221B[c]	Membrane Filter	1.00 MPN per 100ml			
FECAL COLIFORM BACTERIA	FECAL COLIFORM BACTERIA	SM 9221C[c]	Membrane Filter	2.00 MPN per 100ml			
E. COLI	E. COLI	SM 9223B	Membrane Filter	1.00 MPN per 100ml			

NMCDF Indicator Parameters applied to all NMCDF-related sample points (see Table 1). NMCDF permit parameters applied to even year Fall event NMCDF-related samples.

[#] DISSOLVED CONCENTRATIONS. SAMPLES MUST BE FIELD-FILTERED.

[a] TEST METHODS FOR EVALUATING SOLID WASTE - PHYSICAL/CHEMICAL METHODS. 3rd edition. EPA SW-846 (November 1990)

[b] METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES. EPA-600/4-79-020 (revised March 1983)

[d] DEQ NUMERICAL GROUNDWATER QUALITY REFERENCE LEVELS (HEALTH BASED). OAR 340-040-080 (January 1990).

[e] DEQ NUMERICAL GROUNDWATER QUALITY GUIDANCE LEVELS (NONHEALTH BASED). OAR 340-040-080 (January 1990).

[f] EPA NATIONAL PRIMARY DRINKING WATER STANDARDS. EPA 816-F-02-013 July 2002

*** EPA ACTION LEVELS.

Italized parameter - TOX has been removed from parameter per 1/25/11 DEQ approval.

ICP-MS: Inductively Coupled Plasma-Mass Spectrometry

TRACE METALS - TOTAL CONCENTRATIONS IF TSS <100 mg/L; BOTH TOTAL AND DISSOLVED CONCENTRATIONS IF TSS >100 mg/L.

TABLE 4: VOLATILE ORGANIC CONSTITUENTS - EPA METHOD 8260
SAMPLING AND ANALYSIS PLAN
NORTH MARION COUNTY DISPOSAL FACILITY

ANALYTE	EPA DW STD. & HEALTH ADVISORY (ug/L)	DEQ-GW QUALITY LEVELS (ug/L)	METHOD REPORT LEVEL (ug/L)
Acetone		NEL	10.0
Benzene	5	5	0.500
Bromobenzene		NEL	0.500
Bromochloromethane		NEL	0.500
Bromodichloromethane (THM)	100	NEL	0.500
Bromoform (THM)	100	NEL	1.00
Bromomethane		NEL	5.00
2-Butanone		NEL	10.0
n-Butylbenzene		NEL	5.00
sec-Butylbenzene		NEL	0.500
tert-Butylbenzene		NEL	1.00
Carbon Tetrachloride	5	5	1.00
Chlorobenzene	100	NEL	0.500
Chloroethane		NEL	1.00
Chloroform (TMH)	100	NEL	0.500
Chloromethane		NEL	5.00
2-Chlorotoluene		NEL	0.500
4-Chlorotoluene		NEL	0.500
1,2-Dibromo-3-chloropropane	0.2	NEL	5.00
Dibromochloromethane		NEL	0.500
1,2-Dibromoethane		NEL	0.500
Dibromomethane		NEL	0.500
1,2-Dichlorobenzene	600	NEL	0.500
1,3-Dichlorobenzene	600	NEL	0.500
1,4-Dichlorobenzene	75	75	0.500
Dichlorodifluoromethane		NEL	5.00
1,1-Dichloroethane		NEL	0.500
1,2-Dichloroethane (EDC)	5	5	0.500
1,1-Dichloroethene	7	7	0.500
cis-1,2-Dichloroethene	70	NEL	0.500
trans-1,2-Dichloroethene	100	NEL	0.500
1,2-Dichloropropane (1,2-DCP)	5	NEL	0.500
1,3-Dichloropropane		NEL	0.500
2,2-Dichloropropane		NEL	0.500
1,1-Dichloropropene		NEL	1.00
Ethylbenzene	700	NEL	0.500
Hexachlorobutadiene		NEL	2.000
2-Hexanone		NEL	10.0
Isopropylbenzene		NEL	2.00
p-Isopropyl toluene		NEL	2.00
4-Methyl-2-pentanone		NEL	5.00
Methylene Chloride		NEL	5.00
Napthalene		NEL	2.00
n-Propylbenzene		NEL	0.500
Styrene	100	NEL	0.500
1,1,1,2-Tetrachloroethane		NEL	0.500
1,1,2,2-Tetrachloroethane		NEL	0.500
Tetrachloroethene (PCE)	5	NEL	0.500
Toluene	1000	NEL	0.500
1,2,3-Trichlorobenzene		NEL	1.00
1,2,4-Trichlorobenzene	70	NEL	1.00
1,1,1-Trichloroethane (1,1,1-TCA)	200	200	1.00
1,1,2-Trichloroethane	5	NEL	0.500
Trichloroethene (TCE)	5	5	0.500
Trichlorofluoromethane		NEL	0.500
1,2,3-Trichloropropane		NEL	0.500
1,2,4-Trimethylbenzene		NEL	1.00
1,3,5-Trimethylbenzene		NEL	0.500
Vinyl chloride	2	2	0.500
o-xylenes		NEL	0.500
m,p-xylenes	10,000	NEL	1.00

NOTES:
NEL = NO ESTABLISHED MCL.
* TOTALS FOR ALL THM'S COMBIND CANNOT EXCEED 0.008 mg/L.

TABLE 5: Water Quality Sample Containers, Preservatives, and Holding Times
North Marion County Disposal Facility
Sampling and Analysis Plan

Parameter	Analytical Method	Volume Required (mL)	Container Type	Preservative	Holding Time
Indicator Parameters (Group 1b)					
Total Alkalinity	SM2320B	500	Plastic	Cool, 4°C	14 days
Hardness	SM2340B	500	Plastic	HNO_3 to pH <2	6 months
Total Dissolved Solids (TDS)	SM2540C	500	Plastic	Cool, 4°C	7 days
Total Suspended Solids (TSS)	SM2540D	500	Plastic	Cool, 4°C	7 days
Specific Conductance (lab)	120.1/9050	10 uS/cm	Plastic	Cool, 4°C	28 days
pH (lab)	150.1/9040A	pH units	Plastic	Cool, 4°C	24 hours
Chemical Oxygen Demand (COD)	SM5220D	500	Plastic	H_2SO_4 to pH <2; Cool, 4°C	28 days
Total Organic Carbon (TOC)	SM5310B	250	Glass	H_2SO_4 to pH <2; Cool, 4°C	28 days
Common Anions and Cations (Group 2a)					
Calcium	200.7/6010	250	Plastic	HNO_3 to pH <2	6 months
Magnesium	200.7/6010	250	Plastic	HNO_3 to pH <2	6 months
Iron	200.7/6010	250	Plastic	HNO_3 to pH <2	6 months
Manganese	200.7/6010	250	Plastic	HNO_3 to pH <2	6 months
Sodium	200.7/6010	250	Plastic	HNO_3 to pH <2	6 months
Potassium	200.7/6010	250	Plastic	HNO_3 to pH <2	6 months
Ammonia-Nitrogen	350.1/SM4500	500	Plastic	H_2SO_4 to pH <2; Cool, 4°C	28 days
Ammonium-Nitrogen	SM8010F	calculated	na	na	na
Nitrate-Nitrogen	300.0	500	Plastic	Cool, 4°C	48 hours
Bicarbonate (HCO_3) - Alkalinity	SM2320B	500	Plastic	Cool, 4°C	14 days
Carbonate (CO_3) - Alkalinity	SM2320B	500	Plastic	Cool, 4°C	14 days
Sulfate	300.0	250	Plastic	Cool, 4°C	28 days
Chloride	300.0	250	Plastic	Cool, 4°C	28 days
Dissolved and Total Trace Metals (Group 2b)					
Arsenic	200.8/6020	250	Plastic	HNO_3 to pH <2	6 months
Antimony	200.8/6020	250	Plastic	HNO_3 to pH <2	6 months
Barium	200.8/6020	250	Plastic	HNO_3 to pH <2	6 months
Beryllium	200.8/6020	250	Plastic	HNO_3 to pH <2	6 months
Cadmium	200.8/6020	250	Plastic	HNO_3 to pH <2	6 months
Chromium	200.8/6020	250	Plastic	HNO_3 to pH <2	6 months
Cobalt	200.8/6020	250	Plastic	HNO_3 to pH <2	6 months
Copper	200.8/6020	250	Plastic	HNO_3 to pH <2	6 months
Lead	200.8/6020	250	Plastic	HNO_3 to pH <2	6 months
Nickel	200.8/6020	250	Plastic	HNO_3 to pH <2	6 months
Slenium	200.8/6020	250	Plastic	HNO_3 to pH <2	6 months
Thallium	200.8/6020	250	Plastic	HNO_3 to pH <2	6 months
Vanadium	200.8/6020	250	Plastic	HNO_3 to pH <2	6 months
Zinc	200.8/6020	250	Plastic	HNO_3 to pH <2	6 months
Volatile Organic Compounds (VOCs) (Group 3)	8260/524.2	3/40-mL vials	Glass with Teflon-lined septum caps	HCL to pH <2; Cool, 4°C	14 days
Total Kjeldahl Nitrogen	351.2	500	Plastic	Cool, 4°C	28 days
Total Phosphorus	365.1	500	Plastic	H_2SO_4 to pH <2; Cool, 4°C	28 days
Orthosphosphate	365.2	500	Plastic	Cool, 4°C	2 days
Biological Oxygen Demand	SM5210B	1000	Plastic	Cool, 4°C	2 days
Total Coliform Bacteria	SM9221E	120	Plastic, sterile	Cool, 4°C	24 hours
Fecal Coliform Bacteria	SM9221E	120	Plastic, sterile	Cool, 4°C	24 hours
E. Coli	SM9223B	120	Plastic, sterile	Cool, 4°C	24 hours

NOTE: Information from U.S. EPA "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods" (SW-846).

TABLE 6
NORTH MARION COUNTY DISPOSAL FACILITY - MARION COUNTY
EQUIPMENT CHECKLIST

Sample Point Related
- ☐Keys (unlock wells)
- ☐5-gallon bucket (track purge volume)
- ☐Keys to access LCRS locations
- ☐Cell phone and contact numbers
- ☐Site map with sample locations

Field Parameter Measurements
- ☐Water level indicator (reads to 0.01 ft)
- ☐pH meter with buffers
- ☐Conductivity meter with standards
- ☐Dissolved oxygen meter
- ☐Thermometer
- ☐Oxidation/Reduction meter
- ☐Spare meter batteries
- ☐Distilled decon rinse water

Documentation
- ☐Adhesive labels for sample containers (from lab)
- ☐Ball point pen, pencil, and indelible ink pen
- ☐Clipboard
- ☐Sampling field notebook (water-proof paper)
- ☐Sampling data sheets (on water-proof paper)
- ☐Custody sheets (from lab)
- ☐Custody seals (from lab)
- ☐Sampling and analysis plan
- ☐Meter operation manuals

Decontamination
- ☐Alconox or trisodium phosphate detergent
- ☐Distilled water
- ☐Plastic tarp
- ☐Medium-side wash brushes
- ☐Surgical gloves
- ☐Rubber boots

Shipping
- ☐Sample containers (from lab)
- ☐Covers (from lab)
- ☐Ice or blue ice
- ☐Zip-loc and/or bubble bags
- ☐Strapping tape

Miscellaneous
- ☐Paper towels
- ☐Small sledge hammer
- ☐Watch with stopwatch
- ☐Knife
- ☐Safety glasses
- ☐Duct tape
- ☐Rain gear
- ☐Heavy rubber outer gloves
- ☐Hip waters for creek sampling

Monitoring Well Sampling
- ☐Power source (generator or battery)
- ☐Air compressor or tank w/ regulator
- ☐Bladder pump controller
- ☐0.25-inch polyethylene tubing
- ☐Size 15 silicon tubing
- ☐Flow through cell for meters
- ☐Graduated cylinder
- ☐Peristaltic pump with power source
- ☐Disposable 0.45 micron filters

State of Oregon
Department of
Environmental
Quality

SOLID WASTE DISPOSAL SITE PERMIT:
Municipal Landfill/Ash Disposal Facility

Oregon Department of Environmental Quality
750 Front Street NE, Suite 120
Salem, OR 97301
Telephone: (503) 378-5047

Issued in accordance with the provisions of ORS Chapter 459 and subject to the land use compatibility statement referenced below.

ISSUED TO:

Marion County Public Works
5155 Silverton Road NE
Salem, OR 97305
503.588.5169

FACILITY NAME AND LOCATION:

North Marion County Disposal Facility
17827 Whitney Ln
Wooburn, OR 97071

Section 14, T4S, R1W, Marion County

OWNER:

Marion County Public Works
5155 Silverton Road NE
Salem, OR 97305

OPERATOR:

Marion County Public Works
5155 Silverton Road NE
Salem, OR 97305

ISSUED IN RESPONSE TO:

- a solid waste permit renewal application received January 5, 2005
- a Land Use Compatibility Statement from Marion County Planning Department dated July 24, 1986.

The determination to issue this permit is based on findings and technical information included in the permit record.

ISSUED BY THE OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY

Brian Fuller, Manager, Hazardous and Solid Waste
Permitting and Compliance
Western Region

5-9-07
Date

Permitted Activities

Until such time as this permit expires or is modified or revoked, the permittee is authorized to operate and maintain a solid waste land disposal site in conformance with the requirements, limitations, and conditions set forth in this document including all attachments.

TABLE OF CONTENTS

Introduction

This document is a solid waste permit issued by the Oregon Department of Environmental Quality in accordance with Oregon Revised Statutes (ORS) 459 and Oregon Administrative Rules (OAR), Chapter 340.

In this document

This document contains the following sections:

PERMIT ADMINISTRATION

1.0 ISSUANCE

1.1 In this section

This section describes the parameters surrounding permit issuance, including the following information:

- Permittee
- Permit number
- Permit term
- Facility type
- Facility owner/operator
- Basis for issuance
- Definitions

1.2 Permittee

This permit is issued to Marion County Public Works.

1.3 Permit number

This permit will be referred to as Solid Waste Permit Number 240.

1.4 Permit term

The issue date of this permit is the date this document is signed.

The expiration date of this permit is November 30, 2015.

1.5 Facility type

The facility is permitted as a municipal landfill and ash disposal facility.

1.6 Facility owner/ operator

The owner of this facility is:

Marion County Public Works
5155 Silverton Road NE
Salem, OR 97305

The operator of this facility is:

Marion County Public Works
5155 Silverton Road NE
Salem, OR 97305

1.7 Basis for issuance

This permit is issued based upon the following documents submitted by the permittee:

- solid waste permit application received January 5, 2005 ;
- the required plans approved by the Department, and
- Land Use Compatibility Statements from Marion County Planning Department dated July 24, 1986

1.8 Definitions

Unless otherwise specified, all terms are as defined in OAR 340-93-0030.

1.9 Submittal address

All submittals to the Department, unless otherwise noted, must be sent to:

Oregon Department of Environmental Quality
Manager, Solid Waste Program
750 Front Street NE, Suite 120
Salem, OR 97301

Telephone: 503.378.5047

2.0 DISCLAIMERS

2.1	**In this section**	This section describes disclaimer information for the Department, including: • Property rights • Department liability
2.2	**Property rights**	The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights.
2.3	**Department liability**	The Department, its officers, agents, or employees do not sustain any liability on account of the issuance of this permit or on account of the construction, maintenance, or operation of facilities pursuant to this permit.

3.0 AUTHORITY

3.1	**In this section**	This section describes the authority of the Oregon Department of Environmental Quality to issue this permit, including the following information: • 10 year permit • Documents superseded • Binding nature • Other compliance • Penalties
3.2	**Ten year permit**	This permit is issued for a maximum of 10 years as authorized by Oregon Revised Statutes 459.245 (2).
3.3	**Documents superseded**	This document is the primary solid waste permit for the facility, superseding all other solid waste permit issued for North Marion County Disposal Facility by the Department.
3.4	**Binding nature**	Conditions of this permit are binding upon the permittee. The permittee is liable for all acts and omissions of the permittee's contractors and agents.
3.5	**Other compliance**	Issuance of this permit does not relieve the permittee from the responsibility to comply with all other applicable federal, state, or local laws or regulations. This includes the following solid waste requirements, as well as all updates or additions to these requirements: • solid waste permit application received January 5, 2005; • Oregon Revised Statutes, Chapters 459 and 459A; • Oregon Administrative Rules Chapter 340, and • any documents submitted by the permittee and approved by the Department.
3.6	**Penalties**	Violation of permit conditions will subject the permittee to civil penalties of up to $10,000 for each day of each violation.

4.0 PERMIT MODIFICATION

4.1	**In this section**	This section describes information about modification of this permit, including: • 5 year review • Modification • Modification by Department • Modification by permittee • Public participation • Changes in ownership
4.2	**Five year review**	Between the 4th and 6th year of the life of the permit, the Department will review the permit and determine whether or not the permit should be amended. While not an exclusive list, the following factors will be used in making that determination: • compliance history of the facility; • changes in volume, waste composition, or operations at the facility; • changes in state or federal rules which should be incorporated into the permit; • a significant release of leachate or landfill gas to the environment from the facility; • significant changes to a Department-approved site development plan, and/or conceptual design.
4.3	**Modification**	At any time in the life of the permit, the Department or the permittee may propose changes to the permit.
4.4	**Modification and revocation by Department**	The Director may, at any time before the expiration date, modify, suspend, or revoke this permit in whole or in part, in accordance with Oregon Revised Statutes 459.255, for reasons including but not limited to the following: • violation of any terms or conditions of this permit or any applicable statute, rule, standard, or order of the Commission; • obtaining this permit by misrepresentation or failure to disclose fully all relevant facts, or • a significant change in the quantity or character of solid waste received or in the operation of the disposal site.
4.5	**Modification by permittee**	The permittee must apply for a modification to this permit if there is a significant change in facility operations or a deviation from activities described in this document.
4.6	**Public participation**	Significant changes in the permit will be made public by the issuance of a public notice as required by Department rules.
4.7	**Changes in ownership**	The permittee must report to the Department any changes in either ownership of the disposal site property or of the name and address of the permittee or operator within ten (10) days of the change.

ALLOWABLE ACTIVITIES

5.0 AUTHORIZATIONS

5.1 In this section

This section describes the activities the permittee is authorized to conduct, including:

- Wastes authorized for receipt
- Authorization of other wastes
- Authorization of activities
- Tires for recycling, and
- Salvaging and recycling

5.2 Wastes authorized for receipt

This permit authorizes the facility to accept:

- Non-hazardous municipal solid wastes, incinerator combustion residues (ash), and
- Municipal solid waste in the backup disposal area, in the event the incinerator cannot accept the waste.

5.3 Authorization of other wastes

Wastes excluded from the above authorization may be authorized for acceptance if:

- The permittee develops a special waste management plan and submits it to the Department for approval;
- The Department approves the special waste management plan, and
- The permittee can demonstrate that the materials do not constitute hazardous waste, as defined by state and federal regulations.

5.4 Authorization of activities

All facility activities are to be conducted in accordance with the provisions of this permit. All plans required by this permit become part of the permit by reference once approved by the Department. Any conditions of the approval are also incorporated into this permit unless contested by the permittee within 30 days of the receipt of a conditional approval.

5.5 Tires for recycling

This permit authorizes the facility to accept up to 100 whole tires for storage and removal.

This permit authorizes the facility to accept up to 2,000 whole tires for storage and removal if the permittee maintains a continuous contract with a waste tire carrier to remove the tires from the site.

5.6 Salvaging and recycling

Salvaging and recycling are authorized if conducted in a controlled and orderly manner.

Exception: salvaging of food products is prohibited.

6.0 PROHIBITIONS

6.1	**In this section**	This section describes specific activities the permittee is prohibited from conducting, including: • Hazardous waste disposal • Liquid waste disposal • Vehicle disposal • Used oil disposal • Battery disposal • Tire disposal • Recyclable material disposal • Open burning
6.2	**Hazardous waste disposal**	The permittee must not accept any hazardous wastes, including hazardous wastes from conditionally-exempt small quantity generators. Reference: Hazardous wastes are defined in ORS 466.005 and OAR 340 Division 101 In the event discovered wastes are hazardous or suspected to be hazardous, the permittee must, within 48 hours, notify the Department and initiate procedures to identify and remove the waste. Hazardous wastes must be removed within 90 days, unless otherwise approved by the Department. Temporary storage and transportation must be carried out in accordance with the rules of the Department.
6.3	**Liquid waste disposal**	The permittee must not accept liquid waste for disposal, except as defined in Section 5.2, for disposal. Definition: Liquid wastes are wastes that do not pass the paint filter test performed in accordance with EPA Method 9095
6.4	**Vehicle disposal**	The permittee must not accept discarded or abandoned vehicles for disposal.
6.5	**Used oil disposal**	The permittee must not accept used oil for disposal.
6.6	**Battery disposal**	The permittee must not accept lead-acid batteries for disposal.
6.7	**Tire disposal**	The permittee must not accept waste tires for disposal.
6.8	**Recyclable material disposal**	The permittee must not landfill or dispose of any source separated recyclable material brought to the disposal site. Exception: If the source separated material is determined to be in a condition which makes the material unusable or not recyclable then it may be landfilled. This determination must be made after consultation with the Department.
6.9	**Open burning**	The permittee must not conduct any open burning at the site.

OPERATIONS AND DESIGN

7.0 OPERATIONS PLAN

7.1 In this section

This section describes the requirements associated with a facility Operations Plan, including:

- Operations plan
- Plan content
- Operations and maintenance manual
- Plan and manual maintenance, and
- Plan and manual compliance

7.2 Operations Plan

Within 180 days of the permit issue date, the permittee must review and submit any necessary updates to the site Operations Plan to the Department for approval. Upon approval, this plan is incorporated into this permit by reference.

7.3 Plan content

The Operations Plan must describe the operation of the disposal site in accordance with all regulatory and permit requirements, including the following:

Content area	Describe plans for:
General operations	• handling and removal of unauthorized wastes discovered at the facility • management of landfill gas • management of landfill leachate • surface water and erosion control structure design • non-compliance response
Disposal operations	• placement of daily and intermediate cover • detecting and preventing the disposal of regulated hazardous wastes, polychlorinated biphenyl wastes, and any other unacceptable wastes as determined by the Department • disposal of putrescible wastes • disposal of cleanup materials contaminated with hazardous substances • fill progression and phasing
Special waste management plan	• identifying and characterizing wastes which require special management or waste streams not otherwise authorized by the permit • identifying the source of all special wastes • determining appropriate handling procedures • documenting plan implementation, including waste characterization References: OAR 340-093-0190, OAR 340-094-0040[11][b][J]
Ancillary operations	• handling and removal of waste tires • management of transfer containers
Inspection and maintenance	• washing equipment • maintaining leachate and gas collection systems • maintaining surface water control structures
Operating record	• operating record location
Contingency	• providing fire protection equipment • notification of emergencies and fires to Department

Reference: OAR 340-94-0040 describes requirements for preparation of an Operations Plan.

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Reference: OAR 340-94-0040 describes requirements for preparation of an Operations Plan.

7.4	**Operations and Maintenance Manual**	Within 60 days of approval of the Operations Plan, the permittee must prepare an updated Operations and Maintenance Manual, which describes specific procedures for conducting routine and emergency operations at the site. A copy of the Operations and Maintenance Manual must be maintained in the Operating Record location and be available for Department review.
7.5	**Plan and Manual maintenance**	The permittee must revise both the Operations Plan and the Operations and Maintenance Manual as necessary to keep them current and reflective of current facility conditions and procedures. The permittee must submit Operations Plan revisions to the Department for approval.
7.6	**Plan and Manual compliance**	The permittee must conduct all operations at the facility in accordance with the approved Operations Plan, including any amendments, and the Operations and Maintenance Manual.

8.0 RECORDKEEPING AND REPORTING - OPERATIONS

8.1	**In this section**	This section describes recordkeeping and reporting operational information for the facility, including: • Non-compliance reporting • Permit display • Access to records • Procedure • Submittal address
8.2	**Non-compliance reporting**	In the event that any condition of this permit or of the Department's rules is violated, the permittee must immediately take action to correct the unauthorized condition and immediately notify the Department at: 503.378.5047 Response: In response to such a notification, the Department may conduct an investigation to evaluate the nature and extent of the problem, and to evaluate plans for additional corrective actions, as necessary.
8.3	**Permit display**	The permittee must display this permit, or a photocopy thereof, where it can be readily referred to by operating personnel.
8.4	**Access to records**	Upon request, the permittee must make all records and reports related to the permitted facility available to the Department.

8.5 **Procedure**

The permittee must keep records and submit reports according to the following:

Step	Action
1	Establish a location for the Operating Record at the facility or another location mutually agreed with the Department.
2	Place information required by 40 CFR 258.29 in the Operating Record.

3	Collect information during facility operations on the amount of each type of solid waste received, recording "0" if the waste is not received. At a minimum, the following types of waste must be separately identified, and be categorized as being either in- or out-of-state wastes: • municipal solid waste ash
4	Collect information about the amount of each material recovered for recycling or other beneficial purpose each quarter
5	Submit the information collected in Step 3 above on the Solid Waste Disposal Report/Fee Calculation form provided by the Department. Pay solid waste fees as required by OAR 340-097. Date due: the last day of each calendar quarter
6	Submit the information collected in Step 4 above, on a form provided or approved by the Department, to the wasteshed representative. Date due: January 25th of each year
7	Retain copies of all records and reports for five years from the date created.
8	Update all records such that they reflect current conditions at the facility.

8.6 Submittal address

All submittals to the Department under this section must be sent to:

Oregon Department of Environmental Quality
Land Quality Division
Solid Waste Program
811 S.W. Sixth Ave.
Portland, OR 97204

503.229.5913

9.0 SPECIFIC OPERATING CONDITIONS

9.1 In this section

This section describes specific conditions to which site operations must conform, including:

- Discovery of prohibited waste
- Daily cover
- Intermediate cover
- Surface water structure
- Leachate management system
- Leachate surface impoundment
- Surface contour management
- Ash placement
- Litter control
- Vector control, and
- On-site roads

9.2 Discovery of prohibited waste

In the event that the permittee discovers prohibited wastes, the permittee must, within 48 hours, notify the Department and initiate procedures to isolate or remove the waste. Non-putrescible, non-hazardous prohibited waste must be transported to a disposal or recycling facility authorized to accept such waste within 90 days, unless otherwise approved or restricted by the Department. Storage of putrescible, non-hazardous, prohibited wastes must be approved by the Department in writing.

9.3	**Daily cover**	At a minimum, all solid wastes must be covered with a layer of six inches of compacted soil or an approved alternative daily cover of equivalent performance at the end of each working day. For the cell of the ash mono-fill, the permittee shall conduct operations as specified in the approved operations plan.
9.4	**Intermediate cover**	Interim cover must be constructed and maintained as specified in Department-approved design and operations plans. Interim cover must be constructed over fill areas which will not receive additional waste for an extended period of time (i.e., greater than 120 days), and interim cover that is to remain exposed for more than two years must be actively revegetated as approved by the Department.
9.5	**Surface water structures**	All stormwater drainage structures must be maintained in good functional condition. Any significant damage must be reported to the Department and repairs made as soon as possible.
9.6	**Leachate management systems**	The Permittee must operate the disposal site in a manner that deters leachate production to the maximum extent practicable. The Permittee must construct, operate and maintain in good functional condition all leachate containment, collection, detection, removal, storage and treatment systems approved by the Department. Leachate must be continuously removed from all landfill leachate collection systems, such that hydraulic head on the bottom liner is minimized and does not exceed one (1) foot.
9.7	**Leachate surface impoundments**	Leachate must be prevented from escaping to local drainage ways and to other unlined areas of the site. Leachate surface impoundments must be maintained as non-overflow facilities with minimum of two (2) feet of dike freeboard above the leachate surface, unless otherwise approved by the Department. Fencing must control public access to the impoundments and all gates must be locked when an attendant is not on duty. Clearly legible and visible signs must be posted, stating the contents of the surface impoundments and "no trespassing."
9.8	**Surface contour management**	The permittee shall maintain surface contour of all landfill operation so that ponding of water is minimized all time.
9.9	**Ash placement**	The permittee shall spread all ash into thin layers and thoroughly compact daily or as soon as it is sufficiently dry to spread and compact. Ash dust shall not visibly escape the ash mono-fill area.
9.10	**Litter control**	The Permittee must implement procedures which minimize the scattering of windblown litter and provide for effective and timely collection of litter to ensure the appearance of a well-maintained facility and prevent nuisance conditions.
9.11	**Vector control**	The Permittee must implement procedures that minimize insects, rodents, and birds at the active disposal area.
9.12	**On-site roads**	Roads from the landfill property line to the active disposal area and environmental monitoring locations must be constructed and maintained to minimize traffic hazards, dust and mud, and to provide reasonable all-weather vehicle access to active disposal units.

10.0 SITE DEVELOPMENT AND DESIGN

10.1 In this section

This section describes site development and design requirements for continued use of the landfill, or any landfill expansion or new facility construction, including:

- Site development plan
- Baseline design criteria
- Design plans
- Construction requirements
- Construction documents
- Construction report submittal
- Construction report content, and
- Approval to use

10.2 Site Development Plan

Within 180 days of the permit issue date, the permittee must update and submit the long-term Site Development Plan to the Department for approval. Upon approval, this plan is incorporated into this permit by reference.

Reference: The *Solid Waste Landfill Guidance, September 1996,* provides information on applicable elements of a Site Development Plan. Following the organizational format provided in the Guidance will expedite Department review of the plan.

10.3 Baseline design criteria

Conceptual and detailed plans submitted for a new MSW landfill disposal unit pursuant to this permit must, at a minimum, provide for:

- A composite liner system which includes an approved geo-membrane liner (not less than 60 mils in thickness when using high density polyethylene, and not less than 30 mils of thickness for other types of approved geo-membranes) and at least two feet of compacted soil having an in-place permeability no greater than 1×10^{-7} cm/sec, or an alternative liner approved by the Department pursuant to 40 CFR Part 258.40(a)(1).
- A primary leachate collection and removal system (LCRS) which fully covers the liner system. As required by 40 CFR 258.40(a)(2), the primary LCRS must function to maintain less than a one (1) foot depth of leachate over the liner. All leachate collection pipes must be serviceable by clean out.
- A secondary leachate collection and removal system(s) designed to effectively monitor the performance of the overlying composite liner system. The secondary leachate collection and removal system(s) must, at a minimum, be: (1) capable of detecting and collecting leachate at locations of maximum leak probability; and (2) hydraulically separated from groundwater to prevent erroneous monitoring results caused by infiltrating groundwater.
- A leachate collection sump(s) having two composite bottom liners and a leak detection and removal system. Each composite liner must meet the minimum composite liner criteria described above in this subsection, or equivalent.
- Construction of an appropriate operations layer above the primary LCRS, to protect the LCRS and liner system from damage.
- If applicable, appurtenant leachate surface impoundments having two liners and a leak detection and removal system. One liner must meet the minimum composite liner criteria described above in this subsection.

10.4	**Design plans**	The permittee must submit engineering design plans for new disposal units, closure of existing units, or other ancillary facilities for Department review and approval at least six months prior to the anticipated construction date. The design plans must be prepared and stamped by a qualified professional engineer with current Oregon registration. The engineering design plans must: • specify applicable performance criteria, construction material properties and characteristics, dimensions, and slopes, and • provide all relevant engineering analyses and calculations as a basis for the design
10.5	**New cell Construction requirements**	The permittee must perform all construction for new cells in accordance with approved plans and specifications, including all conditions of approval, and any amendments to those plans and specifications approved in writing by the Department.
10.6	**Construction documents**	Prior to construction of the final landfill cover, a new landfill disposal unit, or other waste containment unit at the site, the permittee must submit and receive written Department approval of complete construction documents for the project to be constructed. The construction documents submitted must: • define the construction project team; • include construction contract documents specifying material and workmanship requirements to guide how the Constructor is to furnish products and execute work; • include a Construction Quality Assurance (CQA) plan, describing the measures taken to monitor that the quality of materials and the work performed by the Constructor complies with project specifications and contract requirements. Reference: Following the current *Solid Waste Guidance* will expedite Department review of the construction documents.
10.7	**Construction inspection**	During construction of a new landfill disposal unit or final cover system, the Permittee must provide the Department with a summary and schedule of planned construction activities in order to facilitate Department inspection during day periods of construction.
10.8	**Construction report submittal**	Within 90 days of completing construction of a landfill disposal unit, a final cover system over an existing or new unit, or a major appurtenant facility, the permittee must submit to the Department a Construction Certification Report, prepared by a qualified independent party, to document and certify that all required components and structures have been constructed in compliance with the permit requirements and approved design specifications.

10.9 Construction report content

The construction report must include:

- an executive summary of the construction project and any major problems encountered;
- a list of the governing construction documents;
- a summary of all construction and CQA activities;
- manufacturers certifications for conformance of all geo-synthetic materials with project specifications;
- test data documenting soil materials conformance with project specifications;
- a summary of all CQA observations, including daily inspection records and test data sheets documenting materials deployment and installation in conformance with project specifications;
- problem identification and corrective measures implemented;
- designer acceptance reports for errors and inconsistencies;
- a list of deviations from design and material specifications, including documentation justifying the deviations, copies of change orders and recorded field adjustments, and copies of written Department approvals for deviations and change orders;
- signed certificates for sub-grade acceptance prior to placement of soil liner and for acceptance of soil liner prior to deployment of geo-membrane liner, and
- photographs and as-constructed drawings, including record surveys of sub-grade, soil liner, granular drainage layer and protective soil layer, and a certification statement(s) and signatures legally representing the CQA consultant, designer and facility owner, one of which is that of a professional engineer with current Oregon registration.

10.10 Approval to use

The permittee must not dispose of solid waste in newly constructed disposal units until the Department has accepted the Construction Certification. If the Department does not respond to the Construction Certification Report within 30 days of its receipt, the permittee may place waste in the unit.

SITE CLOSURE

11.0 CLOSURE CONSTRUCTION AND MAINTENANCE

11.1 In this section

This section describes requirements for closure construction and maintenance at the facility, including:

- Worst-case plan development
- Notification
- Closure permit
- Closure plan approval
- Closure schedule
- Final cover
- Surface contour maintenance, and
- Deed record

11.2 Worst-case plan development

The permittee must maintain an up-to-date conceptual "worst-case" closure plan and a conceptual post-closure plan. The plans must be placed in the facility file.

Reference: The plans must comply with 40 CFR, Part 258, Subpart F, and OAR 340-094-0110.

11.3 Notification

The permittee must notify the Department when the conceptual "worst-case" closure and conceptual post-closure care plans are updated and placed in the file.

11.4	**Closure permit**	At least five (5) years prior to the anticipated final closure of the landfill, the permittee must apply for a closure permit. As part of the application for a closure permit, the permittee must submit a Final Engineered Site Closure Plan to the Department for review and approval. The Site Closure Plan must specify the procedures necessary completely to close the landfill at the end of its intended operating life. Reference: OAR 340-094-0110 (3).
11.5	**Closure plan approval**	At least 6 months prior to final closure of any portion of the landfill, the permittee must submit for approval detailed engineering plans, specifications, and a schedule for closure. Reference: The *Solid Waste Landfill Guidance, September 1996,* provides information on applicable elements of a Closure Plan. Following the organizational format provided in the Guidance will expedite Department review of the plan
11.6	**Closure schedule**	The permittee must close each area of the landfill on the schedule approved by the Department.
11.7	**Site closure**	The permittee shall close the disposal site in phases as filling progresses. As soon as filling is completed in each phase of the ash mono-fill, and the area reaches final grade, the permittee shall use final cover, and shall grade and seed the cover in accordance with the final cover system design plan approved by the Department, and any amendment to the plan.
11.8	**Post-closure plan**	A final engineered post-closure plan must be prepared and submitted to the Department with the final engineered site closure plan or according to an alternative schedule approved in writing by the Department. The final engineered post-closure plan must: • Identify and describe the post-closure activities which must be carried out to properly monitor and maintain the closed landfill site, as specified in the requirements of OAR 340-094-0115 (3), and • Follow the organizational format and include the applicable information requested by current Department guidelines related to post-closure care.
11.9	**Final cover**	Unless otherwise approved by the Department, the final landfill cover must be: • at least three feet thick [OAR 340-094-0120(2)(a)] • minimize infiltration of precipitation as required by 40 CFR Part 258.60, and • graded to compensate for estimated differential settlement such that final (post-settlement) slopes will maintain positive drainage between two (2) percent and thirty (30) percent.
11.10	**Vegetation**	The permittee must establish and maintain a dense, healthy growth of native vegetation over the closed areas of the landfill consistent with the proposed final use.
11.11	**Surface contour maintenance**	The permittee must maintain the final surface contours of the landfill cover so that erosion and ponding of water is prevented to the maximum extent practicable. Erosion damage (cuts) must be repaired and seeded so that all waste remains covered. The permittee must refill with soil, grade, and seed all areas that have settled or where water ponds, and all areas where the cover soil has been damaged by cracking or erosion. Areas where vegetation has not been fully established must be fertilized, re-seeded, and maintained.
11.12	**Deed record**	Within 30 days after final closure of the disposal site, the permittee must record the presence of the waste in the property deed record on file with the county.

12.0 FINANCIAL ASSURANCE

12.1	**In this section**	This section describes requirements for financial assurance at the facility, including: • Financial assurance plan • Submittal • Use of financial assurance, and • Continuous nature
12.2	**Financial assurance plan**	The permittee must prepare or update a financial assurance plan and provide financial assurance for the costs of site closure, post-closure care, and corrective action, if any, prior to April 30 each year. The plan must be placed in the facility file. Reference: The plan must be prepared in accordance with OAR 340-094-0140. Acceptable mechanisms are described in OAR 340-094-0145.
12.3	**Submittal**	The permittee must submit to the Department evidence of the financial assurance consisting of: • a copy of the first financial assurance mechanism, and • a written certification that the financial assurance meets all state requirements. Note: The permittee must annually review and update financial assurance in accordance with OAR 340-094-0140(6)(e).
12.4	**Use of financial assurance**	The permittee must not use the financial assurance for any purpose other than to finance the approved closure, post-closure, and corrective action activities or to guarantee that those activities will be completed.
12.5	**Continuous nature**	Continuous financial assurance must be maintained for the facility until the permittee or other person owning or controlling the site is no longer required to demonstrate financial responsibility for closure, post-closure care, or corrective action (if required).

ENVIRONMENTAL MONITORING

13.0 SITE CHARACTERIZATION

13.1 In this section

This section describes requirements for further site characterization of the facility:

- Approved footprint
- Workplan, and
- Site Characterization Report (SCR)

13.2 Workplan

At 180 days prior to any new landfill cell construction or expansion beyond the currently characterized and approved footprint, the permittee must submit for approval at least two copies of a detail workplan summarizing all site characterization completed to date and a plan for further site characterization to be accomplished. The workplan must include, at a minimum:

- Description of the expansion;
- A proposal for monitoring the expansion area for each relevant media;
- Update to the Environmental Monitoring Plan (EMP) once changes are approved;
- Type of investigation to be conducted; and,
- Schedule of events and submissions.

13.3 Site characterization report (SCR)

At 180 days prior to any landfill expansion construction, the permittee must submit at least two copies of the SCR to the department for approval. This report must follow the workplan approved by the Department, including any conditions of the approval. The report must be prepared and stamped by either a Geologist or a Certified Engineering Geologist, with current Oregon registration. The SCR must be submitted and approved before any construction or waste disposal into the new area can begin. Once approved, this report and any conditions of approval become part of the permit.

Reference: The *Solid Waste Landfill Guidance, September 1996,* provides information on applicable elements of a Site Characterization Report. Following the organizational format provided in the guidance will expedite Department review of the plan.

14.0 ENVIRONMENTAL MONITORING PLAN (EMP)

14.1 In this section

This section describes requirements for an Environmental Monitoring Plan (EMP) for the facility, including:

- EMP submittal
- EMP contents
- EMP maintenance
- Long term environmental monitoring, and
- Additional environmental monitoring points

14.2 EMP submittal

Within 90 days of the permit issue date, the permittee must submit, for approval, two copies of an updated Environmental Monitoring Plan (EMP) to the Department. The plan must be prepared and stamped by either a Geologist or a Certified Engineering Geologist, with current Oregon registration. Upon approval, this plan is incorporated into this permit by reference.

14.3 EMP contents

The updated EMP must include plans that implement an environmental monitoring program that will characterize potential facility impacts. The updated plan may consist of the previous approved EMP with any changes or additions since that time (i.e., approved permit-specific concentration limits, revised parameter lists, revised schedules, new wells...). At a minimum, the updated EMP should address the issues and topics found in Section 10 of DEQ's Solid Waste Guidance, September 1, 1996.

14.4 EMP maintenance

The permittee must revise the EMP as necessary to keep it reflective of current facility conditions, procedures, and sampling requirements or changes. The permittee must submit all EMP revisions to the Department for approval.

14.5 Plan compliance

The permittee shall perform all environmental monitoring at the facility in accordance with the site-specific, Department-approved EMP, including any conditions of approval.

14.6 Long-term monitoring plan

Reduction to the on-site monitoring program may be proposed in the EMP. Appropriate compliance levels have been established for the site as part of the RI/FS/ROD effort.

Note: See also the requirements for establishing concentration limits in this permit, procedure for establishing CLVs can be found in OAR 340-040-030(4).

14.7 Additional monitoring points

Any new or replacement monitoring point or device established during the time frame of this permit must be incorporated into the Environmental Monitoring Plan (EMP). The updated plan must be resubmitted to the Department for approval.

15.0 ENVIRONMENTAL SAMPLING REQUIREMENTS

15.1 In this section

This section also describes general sampling requirements, including:

- Notification
- Split sampling
- Monitoring schedule, and
- Changes in sampling or split sampling

15.2 Notification

The Department must receive written notification of all upcoming sampling events at least ten (10) working days prior to the scheduled date of the sampling event.

15.3 Split sampling

The permittee must split samples with the Department when requested, and must schedule all requested split-sampling events with the Department laboratory at least forty-five (45) days prior to the sampling event.

15.4 Monitoring schedule

The permittee must perform environmental monitoring according to the approved EMP. Quarters are defined as the following:

If sampling in the...	Schedule the sampling event	
	On, or after....	But on, or before...
Winter	January 1	February 28
Spring	April 1	May 31
Summer	July 1	August 31
Fall	October 1	November 30

15.5	**Changes in sampling or split sampling**	The Department must approve any changes to the sample program in writing prior to implementation. The permittee may make written requests to change: sample frequencies; parameters to be sampled for; or locations to be sampled. Once approved, this will become part of the EMP requirements by reference. The Department reserves the right to add to or delete from the list of scheduled sampling events, sample locations, parameters to be sampled for, and to conduct unscheduled samplings or split sampling. In the event of changes to the split-sampling schedule, the Department will make an effort to notify the permittee of any changes at least 30 days prior to the event.

16.0 ESTABLISHING CONCENTRATION LIMITS

16.1	**In this section**	This section describes establishing concentration limits, action limits or remedial goals for groundwater monitoring, only to the extent that such concentration limits, action limits or remedial goals have not been addressed in the Record of Decision (ROD), including: • Gathering data • Statistical analysis • Proposing limits or goals • Changing limits
16.2	**Gathering data**	Monitoring of the background wells in accordance with the approved Environmental Monitoring Plan must be conducted until all necessary data sets have been collected, and concentration limits are proposed for each individual parameter of concern. If an intrawell approach is to be proposed to set concentration limits then the permittee must demonstrate to the Department's satisfaction that the data is valid and that no impacts from the facility have influenced the data set to be used.
16.3	**Future units**	For future units, the permittee must collect a sufficient number of samples to determine background groundwater quality prior to the placement of waste in the new cells.
16.4	**Statistical analysis**	The permittee must perform statistical evaluations of monitoring results for each sampling event in accordance with 40 CFR 258.53 or other methods approved of in advance by the Department in order to establish compliance concentration limits. References: *Statistical Analysis of Groundwater Monitoring Data at RCRA facilities, Addendum to Interim Final Guidance,* USEPA, June 1992; and, *Statistical Guidance for all RCRA Sites,* DEQ: SWPC, August 3, 1992.
16.5	**Proposing limits or goals**	Concentration limits, action limits or remedial goals must be generated for a Department approved set of parameters that are to be included in the long-term monitoring of the site. Limits or goals shall be established once there are at least nine acceptable data points from the appropriate background well(s) as established under this permit.
16.6	**Changing limits**	If the Permittee can demonstrate to the Department's satisfaction that the background groundwater quality has significantly changed since a concentration limit or action limit was established, and this change is not due to any influence from the permitted facility, then the Permittee can propose for Department approval a revised level of the specific limit that is affected.

16.7 Setting/changing CLVs Regulations on how to set and change Concentration Limit Variances (CLVs) are found in the Oregon Groundwater Quality Protection Rules [OAR 340-040-0030(4)].

17.0 ENVIRONMENTAL MONITORING STANDARDS

17.1 In this section This section describes requirements for evaluating compliance with environmental monitoring standards, including:

- Rule
- Compliance points
- Review of monitoring results
- Resampling results
- Methane limits, and
- Certified environmental laboratory data

17.2 Rule The permittee must not allow the release of any substance from the landfill into groundwater, surface water, or any other media, which will result in a violation of any applicable federal or state air or water limit, drinking water rules, or regulations beyond the solid waste boundary of the disposal site or an alternative boundary specified by the Department.

17.3 Compliance points The following monitoring locations are designated as compliance points: Troutdale Formation Monitoring Wells, L-7, L-12, and L-18. Also, a detection monitoring plan including wells screened within the Willamette Silt and surface water monitoring points will be established and presented within the EMP.

17.4 Review of results The permittee must review the analytical results after each monitoring event according to the following table.

If data show results are...	Then...
above approved concentration limits or any three action limits, remedial goals (if established), or indicating a significant change in water quality at a monitoring point Note: Examples of significant changes • Detection of a VOC or other hazardous constituent not detected in background; • Exceedance of a Table 1 or 3 value listed in OAR 340-40 unless the background water quality is above these numerical limits; • Exceedance of a Safe Drinking Water Standard; • Exceedance of a remedial action concentration limit as specified in the Record of Decision; • Detection of a compound in an order of magnitude higher than background.	1. Notify the Department in writing within 10 days of receipt of laboratory results; and, 2. Perform resampling immediately and evaluate results as described below. Note: If this is a known release, previously confirmed to the Department in writing, resampling is not required
None of the above	Continue groundwater monitoring with next scheduled sampling event

Note: Remedial Action Concentration Limits (RACL) established to date are listed in Attachment 2.

17.5 Resampling results

Upon receipt of data from resampling, the permittee must review the results according to the following table.

If resampling data show results...	then: ...
That confirm that three or more action limits or remedial goals were exceeded, or there is a significant change in water quality results noted in the review of the routine sampling event Refer to Section 17.4 above for examples of significant change in water quality *See Attachment 1: Parameter Groups	1. notify the Department within 10 days of receipt of laboratory data, or within 60 days of the sample date (whichever comes sooner) 2. work with the Department to implement an appropriate investigative strategy 3. include the monitoring of Group 4 parameters, in addition to routine detection monitoring.
That do not confirm the results noted in the routine sampling event,	1. continue with routine monitoring; and, 2. discuss the data from the routine sampling event and the resampling results in the next annual environmental monitoring report.

17.6 Methane limits

The concentration of methane must not exceed:

- 25 percent of the Lower Explosive Limit for methane in onsite structures (excluding gas control structures or gas recovery system components); or,
- The Lower Explosive Limit for methane at the facility boundary.

Note: The Lower Explosive Limit for methane is 5 percent.

17.7 Methane exceedance

If methane levels exceed the specified limits, then the permittee must:

1. Immediately take all necessary steps to ensure protection of human health;
2. Within 7 days of detection (unless the Department approves an alternative schedule), enter the methane levels in the operating record and describe measures taken to protect human health and safety; and,

Within 60 days of detection, implement a remediation plan for the methane releases, incorporate the plan into the monitoring records, and notify the Department that the plan has been implemented.

17.8 Certified environmental laboratory data

The Department suggests the use of only environmental sampling data analyzed by an Oregon Laboratory Accredited Program (ORLAP) lab or a National Volunteer Laboratory Accreditation Program (NVLAP) lab. A copy of the certification should accompany the submitted data. Use of an ORLAP or NVLAP approved lab will aid you and the Department in Environmental Monitoring Plan and Annual Environmental Monitoring Report preparation and review.

18.0 RECORDKEEPING AND REPORTING – ENVIRONMENTAL MONITORING

18.1 In this section

This section describes recordkeeping and reporting requirements associated with environmental monitoring, including:

- Annual environmental monitoring report (AEMR)
- Statement of compliance
- Annual environmental monitoring report contents
- Annual leachate treatment report contents
- Split sampling submittal
- Lab address, and
- Department response to split samples

18.2 Annual environmental monitoring report (AEMR)

Prior to February 1 of each year for the duration of this permit, the permittee must submit to the Department two copies of an annual monitoring report covering the past year from January 1st to December 31st. The report must be prepared and stamped by either a Geologist or a Certified Engineering Geologist, with current Oregon registration. The report must follow the format approved in the Environmental Monitoring Plan.

Note: Whenever possible, the permittee must submit two-sided copies of all reports

18.3 Statement of compliance

A short (approximately one-page) cover letter must accompany the AEMR that:

- Compares the analytical results with the relevant monitoring standards (concentration limits, action limits, or remedial goals);
- States whether or not federal or state standards were exceeded for the relevant media; and,
- States whether or not a significant change in water quality has occurred.

18.4 Annual environmental monitoring report (AEMR) contents

Each AEMR must reflect actual and true conditions at the facility. Data presented in the reports must be as error-free as possible compared to the original field and lab data. The AEMR, at a minimum, must contain:

- Review of all significant events that occurred at the site during the last year;
- Review of the monitoring network performance and recommendations for changes;
- Summary of all the data collected in the past year media including, but not limited to: groundwater, surface water, leachate (lagoon, LDS and/or SLCS), and LFG (include any air sample data), and soil samples;
- A summary monitoring report of the leachate management program
- A summary of any data problems (examples could include, but not limited to QA/QC failures, flagged data, switched samples, etc.);
- Piezometric maps for each sampling event for each monitored water bearing zone of concern;
- Time history plots for field specific conductivity, dissolved oxygen, and all group 1b and group 2a and 2b parameters;
- Box plots for field specific conductivity, dissolved oxygen, and all group 1b and group 2a and 2b parameters;
- For each location and sample event an anion-cation balance for each location that has adequate data. An additional explanation must be included for any balance outside of ±10% in error;
- Copy of the lab certification, if applicable (ORLAP or NVLAP)
- A copy of all field and lab data for the past year (Note: lab data can be omitted from the annual report if the permittee agrees in writing to keep electronic and hard copies available until the permit is terminated and the permittee agrees to supply these copies to the Department within 72 hours of a written request).

The Department may reduce the above reporting requirements for data produced by a laboratory with current ORLAP or NVLAP certification

Note: Whenever possible, the permittee must submit two-sided copies of all reports

18.5 Annual leachate treatment report contents

This annual report must include at a minimum:

- Contents that satisfy the conditions of the Leachate Management Plan;
- A review of all significant events that occurred at the site during the last year regarding leachate issues;
- A review of the monitoring network performance and recommendations for improvements;
- The total monthly volume of leachate removed from ash monofill Cell III and Cell IV;
- The total monthly volume of leachate disposed through off-site or on-site disposal methods;
- The Annual Leachate Treatment Report shall be included as part of the Annual Environmental Monitoring Report (AEMR).

18.6 Split sampling submittal

Within 90 days of any split sampling event, the permittee must submit the following information from the split sampling event to the Department's laboratory:

- A copy of all information pertinent to the sample collection handling, transport and storage, including field notes;
- Copies of all laboratory analytical reports;
- Copies of all laboratory QA/QC reports;
- Copy of the lab certification (ORLAP or NVLAP, see Certified Environmental Lab Data condition above);
- Site map showing flow directions and contours; and
- Any other data or reports requested by the Department.

18.7	**Lab address**	All split sampling reporting must be sent to: Oregon Department of Environmental Quality Lab, Groundwater Monitoring Section 1712 SW 11th Avenue Portland, OR 97201 (503) 229-5983
18.8	**Department response to split samples**	If requested by the permittee and after the permittee has submitted all split sampling data information, the Department lab may send the permittee a copy of: • The Department's analysis of the split sample; • A copy of the QA/QC report; • A copy of the analytical report; and/or, • A copy of field data sheets.

19.0 ENVIRONMENTAL MONITORING NETWORK

19.1	**In this section**	This section describes requirements for the environmental monitoring network, including: • Well installation • Monitoring devices • Access to monitoring devices • Damage reporting • Device construction • Construction reporting • Recommendation to abandon • Gas system maintenance, and • Gas system repair
19.2	**Well installation**	For future units, the permittee must ensure that department-approved background and detection and/or compliance wells are in place for any future units, at least 12 months before refuse is accepted for disposal in the new cells. This requirement may be waived or modified in writing by the Department if adequate justification is made.
19.3	**Monitoring devices**	The permittee must protect, operate, and maintain gas, groundwater, leachate, and surface water monitoring devices so that samples representative of actual conditions can be collected.
19.4	**Access to monitoring devices**	The permittee must maintain reasonable all-weather access to all monitoring devices and/or locations in order to facilitate sample collection and/or inspection.
19.5	**Damage reporting**	Any damage to a monitoring device must be reported to the Department in writing within fourteen (14) days of the discovery, along with a description of proposed repair or replacement measures and a time schedule for completion of this work. Examples: damage impairing well function or changing the physical location to any degree.
19.6	**Device construction**	All monitoring well abandonment (decommissions), replacements, repairs, and installations must be conducted to comply with the Water Resources Department Rules OAR 690-240 and with the Department's *Guidelines for Groundwater Monitoring Well drilling, Construction, and Decommissioning* dated August 1992.

19.7	**Construction reporting**	All monitoring well repairs, abandonments, replacements, and installations, including driller's logs, well location information, and construction information must be documented in a report prepared and stamped by either a Geologist or a Certified Engineering Geologist, with current Oregon registration. The report must be submitted to the Department within thirty (30) days of the action and included in the next AEMR.
19.8	**Recommendation to abandon**	The permittee must submit a recommendation to the Department to decommission or replace any well in the monitoring network that: • Has been installed in a borehole that hydraulically intersects two saturated stratas; • Does not have the corresponding and necessary supporting documentation of appropriate installation or construction; or, • Is damaged beyond repair or destroyed during the time frame of this permit.
19.9	**Gas system maintenance**	The permittee must operate and maintain in good working order the landfill gas containment, collection, removal, treatment, and monitoring system such that nuisance odors are deterred to the maximum extent practical and methane concentrations do not exceed compliance limits.
19.10	**Gas system damage repair**	Within 60 days of discovery of the damage, the permittee must replace or repair the damage to any equipment in the gas system and submit a written inspection report to the Department.

COMPLIANCE SCHEDULE

20.0 SUMMARY OF DUE DATES

20.1 Summary The following is a summary of event-driven reporting required by this permit. This section does not include routine reporting and submittals required by this permit.

Due Date	Activity	See section...
Within 180 days of permit issuance	Submit updated Operations Plan	7.2 Operations Plan
Within 180 days of permit issuance	Submit site development plan	10.2 Site development plan
6 months before any construction	Submit design plans	10.4 Design plans
90 days after completion of any major construction	Submit construction certification report	10.8 Construction report
5 years prior to closure	Submit closure permit application	11.4 Closure permit
April 30 each year	Submit copy of financial assurance mechanism and certification	12.2 Financial Assurance plan
Within 180 days prior to landfill expansion construction	Submit a Workplan	13.2 Workplan
Within 180 days prior to landfill expansion construction	Submit a Site Characterization Report (SCR)	13.3 Site Characterization Report
Within 90 days of permit issuance	Submit updated Environmental Monitoring Plan (EMP)	14.2 Environmental Monitoring Plan
February 1 each year	Submit annual environmental monitoring report	18.2 Environmental monitoring report
30 days of any well construction	Submit well construction report	19.7 Construction reporting

ATTACHMENTS

21.0 ATTACHMENTS TO PERMIT

21.1 Attachment listing

The following attachments to this document are:

Number	Description
1	Parameter Groups
2	Concentration Limits, Action Limits, Remedial Goals

ATTACHMENT 1: PARAMETER GROUPS

In this attachment

This attachment describes the parameter groups and any associated requirements for environmental monitoring.

Note: Method means EPA SW 846 Method [suggested methods are in square brackets].

Group 1a: Field indicators

The following parameters comprise the field indicators parameter group:

- Elevation of water level
- pH
- Temperature
- Specific Conductance
- Dissolved Oxygen
- Eh

These parameters must be measured in the field at the time samples are collected, either down-hole in situ, in a flow-through well, or immediately following sample recovery, with instruments calibrated to relevant standards

Group 1b: Leachate indicators

The following parameters comprise the laboratory indicators parameter group:

- Hardness (as $CaCO_3$)
- Total Alkalinity (as $CaCO_3$)
- Total Organic Carbon (TOC)
- pH (lab)
- Specific Conductance (lab) [Method 9050]
- Total Dissolved Solids (TDS)
- Total Suspended Solids (TSS)
- Chemical Oxygen Demand (COD)

Sample handling, preservation, and analysis are determined by requirements for each individual analyte: EPA or AWWA Standard Methods techniques must be followed.

Group 2a: Common anions and cations

The following parameters comprise the common anions and cations parameter group:

- Calcium (Ca)
- Sulfate (SO_4)
- Ammonia (NH_3)
- Sodium (Na)
- Nitrate (NO_3)
- Silica (SiO_2)
- Iron (Fe)
- Manganese (Mn)
- Magnesium (Mg)
- Chloride (Cl)
- Carbonate (CO_3)
- Potassium (K)
- Bicarbonate (HCO_3)
- Ammonium (NH4)

Dissolved concentrations must be measured. Samples must be field-filtered and field-preserved according to standard DEQ and/or EPA guidelines and analyzed by appropriate EPA or AWWA Standard Methods techniques. Results must be reported in mg/L and meq/L.

Group 2b: Trace metals

The following parameters comprise the trace metals parameter group:

Antimony (Sb)	Chromium (Cr)	Selenium (Se)
Arsenic (As)	Cobalt (Co)	Silver (Ag)
Barium (Ba)	Copper (Cu)	Thallium (Tl)
Beryllium (Be)	Lead (Pb)	Vanadium (V)
Cadmium (Cd)	Nickel (Ni)	Zinc (Zn)

If the Total Suspended Solids concentration is...	then analyze for...
less than or equal to 100.0 mg/L in the sample	total concentrations (unfiltered)
Greater than 100.0 mg/L in the sample	both total (unfiltered) and dissolved (field-filtered)

Samples must be field-preserved according to standard DEQ and/or EPA guidelines and analyzed by EPA Method 6010 or Department-approved equivalent.

Group 3: Volatile organic constituents

Analysis for all compounds detectable by EPA Method 8260B or EPA Method 524.2, including a library search to identify any unknown compounds present. EPA Method 8260 comprises the volatile organic constituents parameter group. Facilities that want to use EPA Methods 8021, or 8240B, as an alternative must obtain approval by the Department prior to use.

Group 4: Assessment monitoring

The following analyses comprise the assessment monitoring parameter group:

Semi-volatile Organic Constituents, including Phenols, EPA Method 8270
Mercury, EPA Method 7470
Cyanide, EPA Method 9010
Nitrite

All Method 8270 analyses must include a library search to identify any unknown compounds present.

Group 5: surface water and leachate

The following parameters comprise the surface water parameter group:

Total Kjeldahl Nitrogen (TKN)	Total Coliform Bacteria [EPA Method 9131]
Total Phosphorus (P)	Fecal Coliform Bacteria [EPA Method 9131]
Orthophosphate (PO_4)	E. Coli
Biological Oxygen Demand (BOD)	
Total Halogenated Organics (TOX) [EPA Method 9020B]	

ATTACHMENT 2: REMEDIAL ACTION CONCENTRATION LIMITS

In accordance with OAR 340-040-0050(2) and as defined in the site Record of Decision (dated March 29, 1999), and the ROD Amendment (dated 2004), Remedial Action Concentration Limits are established for the Troutdale Formation monitoring wells specified in Section 17.3 of this permit as follows:

Compound	RACL	Basis
Volatile Organic Compounds (µg/L)		
Acrylonitrile	5.0	MRL
Benzene	0.5	MRL
Chloromethane	5.0	MRL
Cis-1,2-Dichloroethene	61	PRG
Dibromochloromethane	1.0	MRL
Bromodichloromethane	1.0	MRL
1,1-Dichloroethene (DCE)	7.0	MCL
1,2-Dichloroethane (DCA)	0.5	MRL
1,4-Dichlorobenzene	0.5	MRL
Tetrachloroethane (PCE)	0.66	PRG
1,1,1,2-Tetrachloroethane	0.5	MRL
1,1,2,2-Tetrachloroethane	0.5	MRL
Trichloroethene (TCE)	0.5	MRL
1,1,2-Trichlorothane	0.5	MRL
Methylene Chloride	5.0	MRL
Vinyl chloride	0.5	MRL
Trace Metals (mg/L)		
Antimony	0.006	MCL
Arsenic	0.009	Background
Barium	2.0	MCL
Beryllium	0.004	MCL
Cadmium	0.005	MCL
Chromium	0.1	MCL
Cyanide	0.2	MCL
Lead	0.015	MCL
Mercury	0.002	MCL
Nickel	0.73	PRG
Selenium	0.05	MCL
Silver	0.18	PRG
Thallium	0.002	MCL
Vanadium	0.26	PRG
Dissolved Metals and Inorganic Compounds (mg/L)		
Fluoride	2.2	PRG
Manganese	1.29	Background
Nitrate (as N)	10	MCL
Nitrite (as N)	1.0	PRG
Nitrate + Nitrite (both as N)	1	MCL for Nitrite

RACL: Remedial Action Concentration Limit

Basis: The lower of either the Federal primary Maximum Contaminant Level (MCL), State Reference Level (OAR 340-040-020, Tables 1 through 3), EPA Region 9 Preliminary Remedial Goal (PRG), or The laboratory Method Reporting Limit (MRL). Background refers to the statistically-generated background for the compound using historical data. The details are presented in the ROD and ROD Amendment.