

**SKYLINE LANDFILL
CITY OF FERRIS
DALLAS AND ELLIS COUNTIES, TEXAS
TCEQ PERMIT APPLICATION NO. MSW 42D**

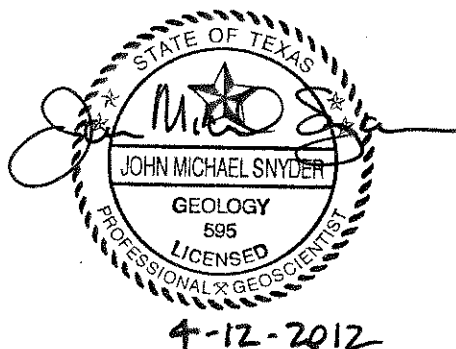
PERMIT AMENDMENT APPLICATION

**PART III – FACILITY INVESTIGATION AND DESIGN
ATTACHMENT F
GROUNDWATER MONITORING PLAN**

Prepared for

Waste Management of Texas, Inc.

April 2012



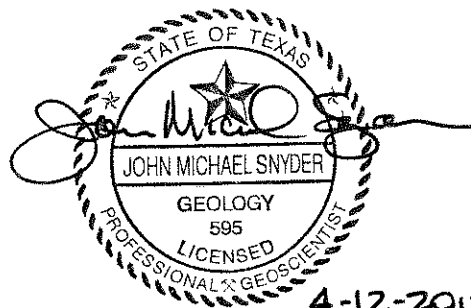
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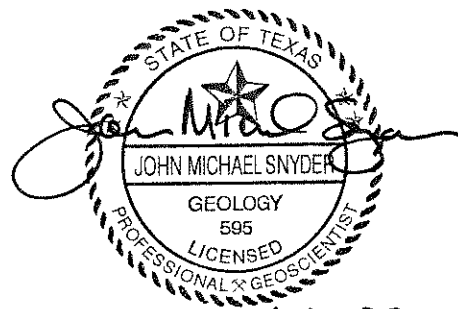
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4-12-2012

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GROUNDWATER MONITORING SYSTEM DESIGN CERTIFICATION

General Site Information

Site: Skyline Landfill

Site Location: City of Ferris, Dallas and Ellis Counties, Texas

MSW Permit Application No.: 42D

Qualified Groundwater Scientist Statement

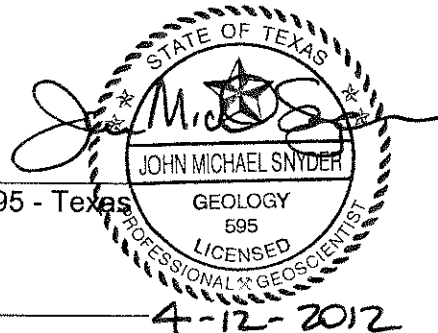
I, Michael Snyder, am a licensed professional geoscientist in the State of Texas and a qualified groundwater scientist as defined in §330.3. I have reviewed the groundwater monitoring system and supporting data contained herein. In my professional opinion, the groundwater monitoring system is in compliance with the groundwater monitoring requirements specified in 30 TAC §330.401 through §330.421. This system has been designed for specific application to the Skyline Landfill (Permit Application No. MSW 42D). The only warranty made by me in connection with this document is that I have used that degree of care and skill ordinarily exercised under similar conditions by reputable members of my profession, practicing in the same or similar locality. No other warranty, expressed or implied, is intended.

Firm/Address: Biggs and Mathews Environmental, Inc.
1700 Robert Road, Suite 100
Mansfield, Texas 76063

Signature: _____

Michael Snyder, P.G. No. 595 - Texas

Date: _____



1 SITE HYDROGEOLOGY

Two subsurface stratigraphic units have been identified at the site. They include Stratum I, weathered Taylor Marl, and Stratum II, unweathered Taylor Marl. The Taylor Marl is a very dense, low permeability formation consisting of calcareous clays (marl). Several hundred feet of Taylor exists beneath the site. The uppermost regional aquifer is the Woodbine formation, which is more than 1100 feet beneath the site and separated from the site by the very low permeability materials of the Taylor, Austin, and Eagle Ford formations. These formations consist of clay, marl, shale, and fine grained limestone (Austin).

Groundwater occurs from the infiltration of precipitation and moves laterally within the weathered Taylor Marl and in the upper parts of the unweathered Taylor. Some of the material that is traditionally called unweathered marl because it is gray actually may contain weathered textures a few feet into the gray marl or clay. Groundwater flows laterally in a flow direction influenced by the depth of weathering. A conceptual hydrogeologic cross section is included in Attachment E, Appendix E6 as Figure E6-9. The excavation at the site is extended down into the unweathered Taylor where placement of composite liners has cut off normal groundwater flow in the permeable parts of the Taylor. Groundwater is diverted around the excavation. Placement of waste, daily cover soil, intermediate cover soil, a leachate collection system, and eventually final cover will prevent infiltration of precipitation in the area covered by the waste footprint. These factors have altered normal groundwater flow. Groundwater now flows from the south toward the north and is diverted around the site. Infiltration recharge still occurs on the downgradient parts of the site. In those areas groundwater flows more normally in a pattern related to the topography and the shape of the unweathered surface. In many places on the downgradient side of the site groundwater flows parallel to the point of compliance. A conceptual hydrogeologic cross section and hydrogeologic model are included as Figures E6-9 and E6-10 in Attachment E, Appendix E6.

1.1 Groundwater Flow Direction and Rate

Groundwater occurs at the site in the weathered Taylor Marl and upper part of the unweathered Taylor Marl. Groundwater flow is structurally controlled and mimics the topography. Permeability in the Taylor Marl is related to the depth of weathering of the Taylor and is thus related to the surface topographic expression. The top of the unweathered map (included in Attachment E as Figure E3-6) shows a strong resemblance to the topography. Groundwater in the Taylor Marl at the site flows from the south end of the site to the north, generally toward Ten Mile Creek. Groundwater flow direction is influenced by the depth of weathering and the unweathered surface (Figure E3-6), which is influenced by the topography (Figure E6-8). Minor fluctuations in the unweathered surface and thus the potentiometric surface show minor variations in the groundwater flow directions to the northwest and northeast perimeters.

Groundwater flow from the south is diverted around the composite lined excavation. Normal groundwater flow directions prevail north of the site as precipitation infiltration reaches the water table. A conceptual hydrogeologic cross section and a conceptual hydrogeologic flow model are included as Figures E6-9 and E6-10. The excavation is extended well into the low permeability unweathered Taylor. As such, a leachate leak is unlikely to migrate into the weathered Taylor groundwater.

The original site characterization included in the 1991 permit application showed multiple piezometers installed to identify groundwater in the weathered Taylor. A table of water levels from piezometers is included in Attachment E as Table E-11. A pre-excavation potentiometric surface map from 1991 is included in Attachment E as Figure E6-7. Most of the piezometers demonstrated groundwater occurrence during the characterization. Thirty-five piezometers were installed in clustered locations, and piezometers at all locations encountered groundwater during the characterization period of 1987-1993. Water levels from existing monitoring wells are included in Attachment E as Table E-10. As shown in the table, the areas near MW-4, MW-5, MW-7, and MW-13 are now consistently dry.

Initial development occurred with excavation of Cell 1 in the center of the site. This cell opened in 1995 so excavation was completed prior to that. Cell development then moved southward. By 1999 excavation and cell development had proceeded through the center of the site to southern extent of the site. All development then moved clockwise from south to north along the west side.

Cell development consists first of excavation of the Taylor Marl. The process of excavation and the accompanying dewatering creates an inward gradient. Once the liner and underdrain are installed, the inward gradient persists. Also, when the liner is installed, recharge by infiltration of precipitation is prevented by the liner.

There are currently three areas along the site perimeters where monitoring wells are dry. First, on the west side, MW-3R, MW-4, and MW-5 are dry. MW-3R was dry upon installation in 2007 but has produced water since June 2009. MW-4 and MW-5 have been dry since at least 2001, except for two instances.

The second area, near MW-7 on the north side, initially had water and then was intermittently dry through 2010, except for two instances. Since 2010 MW-7 has remained typically dry and only had water during two monitoring events. MW-6, located on the northwest side between MW-5 and MW-7 (both of which are dry), currently has water but has been periodically dry. Monitoring well MW-21 (located between MW-6 and MW-7) has been dry since June 2011.

Finally, there is the area near MW-13 on the northern end of the east side of the site. MW-13 has been dry since December 2001. Monitoring well MW-26 has been dry since installation (September 2009).

Figure F1-1 shows comparisons of water levels from existing monitoring wells and water levels from original piezometers near those monitoring wells.

Because the entire upgradient (south) end of the site was excavated, lined, and filled early in the site history, precipitation infiltration that would otherwise have flowed northward to the downgradient end of the site has been prevented. As the excavation and fill sequence has progressed along the west side, monitoring wells on the west (MW-4 and MW-5) are now dry. In addition, MW-7 and occasionally MW-6 and new monitoring well MW-21 along the northeast part of the site are dry. As cell development continues, additional wells will become dry or at least intermittently dry.

Multiple potentiometric surface maps were created over both temporal and seasonal variations and are included in Attachment E, Figures E6-1 through E6-5. These maps reflect the altered groundwater flow pattern created by the placement of the lined excavations that extend well into the unweathered Taylor. Groundwater contours reflect "no flow" boundaries adjacent to the excavation and the dry areas near MW-4 and MW-5 on the west and MW-13 on the east. On the downgradient side of the site (north boundaries) groundwater flow follows the topography and the unweathered surface and in places flows parallel to the site boundaries. Groundwater flow velocity is estimated to be approximately 2.01×10^{-4} ft/yr in Stratum I (Attachment E, Appendix E6, Figure E6-6).

2 OPERATIONAL CONSIDERATIONS FOR GROUNDWATER SYSTEM DESIGN

2.1 Relationship of Excavation Bottom to Uppermost Aquifer

The excavation of the Skyline Landfill is designed to remain in the clayey Taylor Marl formation. The excavation extends well into the less permeable unweathered clay. Weathering and thus permeability decrease with depth. Groundwater flows horizontally near the interface of the weathered and unweathered marl. The unweathered marl correlation is based on the color change from tan-gray to gray shale. Some weathering occurs below the top of the color change and thus the upper part of the gray (unweathered) marl may slowly transmit groundwater and is in communication with the weathered marl. The excavation is bottomed well into the unweathered Taylor at least 40 feet over much of the site. Recharge to the Taylor by infiltration of precipitation may be diminished by placement of waste and containment layers in the waste footprint area. Groundwater flow patterns are altered as groundwater is diverted around the excavation cells where they are lined with a composite liner.

2.2 Leachate Sump Design

The Skyline Landfill containment system and excavation are designed to accommodate a Subtitle D leachate collection system (LCS). The excavation bottom over the site is now lined with a composite liner and is sloped to direct leachate flow to the lowest areas where sumps are designed to collect the leachate. Leachate is then pumped out of the sumps. While leachate will not remain for lengthy periods of time nor at significant depths, the sump locations are the lowest areas of the excavation. While a leak from the Subtitle D cell is unlikely, if one were to occur, it would be more likely to be at the lowest leachate collection points in the sumps. Since the sumps are located in the unweathered Taylor Marl and migration of a contaminant is not possible in the unweathered Taylor Marl, no monitoring wells are necessary or useful in the unweathered Taylor Marl. Sump locations at the Skyline Landfill are shown on Figures F1-2 and F1-3. There are a total of eight sumps in the leachate sump design at the Skyline Landfill. Monitoring wells are located downgradient from each sump.

2.3 Critical Receptors

Critical receptors to groundwater flow downgradient of a landfill could include public drinking water supply wells, individual drinking water or livestock wells, and surface water bodies used for drinking water supply. There are a total of three individual domestic wells to the east and south of the site. These wells are screened in the

Woodbine, several hundred feet deeper than the Taylor Marl formation and are separated by several hundred feet of low permeability Cretaceous shales and limestone. The wells are located upgradient from the site. One public water supply well (602) is located directly east of the site. This well is also screened in the Woodbine, which is several hundred feet deeper than the Taylor Marl Formation and is separated by several hundred feet of low permeability Cretaceous shales and limestones. The nearest surface water body is Ten Mile Creek, which is located several hundred feet north of the site.

3 SUBTITLE D GROUNDWATER MONITORING SYSTEM

This site has an existing Subtitle D groundwater monitoring system that was certified by a qualified groundwater scientist (defined in 30 TAC §330.3) as being in compliance with 30 TAC §330.401 through §330.409.

The existing groundwater monitoring system (Figure F1-2) consists of a total of twenty-six (26) wells that monitor groundwater in the Stratum I marl (uppermost aquifer). The groundwater monitoring system design certification was most recently accepted by the TCEQ on April 10, 2009. Based on recent groundwater contours, four of the wells are upgradient (MW-1, MW-17, MW-18, and MW-20R) and the remaining twenty-two are downgradient (MW-2R, MW-3R, MW-4, MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16, MW-19, MW-21, MW-22, MW-23, MW-24, MW-25, and MW-26). The point of compliance is shown on Figure F1-2.

See Section 3.5 – Monitoring Well Design and Construction and Figure F1-4 – Typical Monitoring Well Detail for monitoring well construction information.

3.1 Monitoring Well Locations

For groundwater monitoring purposes, the groundwater zone beneath the Skyline Landfill has been identified as the weathered Taylor Marl. Although not an aquifer by TCEQ definition or standard hydrogeological terminology, groundwater occurs in the weathered Taylor and upper parts of the unweathered Taylor. The Taylor Marl is present and is correlatable across the site. Groundwater enters the Taylor Marl south of the site (upgradient). Monitoring wells are designed to be screened across the interface of the weathered/unweathered Taylor Marl contact.

Four monitoring wells will need to be replaced because of the change in the footprint. These monitoring wells are now located either within the proposed waste footprint or outside of the 500-foot maximum distance from waste. Monitoring wells MW-8, MW-11, MW-21, and MW-22 will be plugged and replaced with MW-8R, MW-11R, MW-21R, and MW-22R, as shown on Figure F1-3. One monitoring well (MW-27) is being added to the network.

The proposed monitoring system will consist of 27 wells, of which 4 are upgradient and 23 are downgradient (Figure F1-3).

3.2 Design Criteria

The existing groundwater monitoring system for the Skyline Landfill (Figure F1-2) was designed and is operated in accordance with those rules and was certified by a qualified

groundwater scientist. The waste fill excavation is founded in the Taylor Marl formation. The weathered Taylor and upper part of the unweathered Taylor, although not an aquifer, is the uppermost groundwater zone for monitoring purposes. The proposed modifications to the Skyline Landfill groundwater monitoring system are also designed in accordance with the required elements of the stated regulations and have also been designed so that the monitoring well spacing does not exceed 600 feet or is demonstrated to be adequate. In some cases where the groundwater flow direction is parallel or near parallel to the site boundary monitoring wells are actually monitoring the same flow paths and are thus redundant. In order to achieve a groundwater monitoring system design to comply with §330.403, the following criteria listed in Table F-1 were followed. The table lists the location of the appropriate section where the required information is located in this application.

Those areas where the distance between monitoring wells exceeds 600 feet were approved by TCEQ based on a site-specific demonstration as required by 30 TAC §330.401(b). The TCEQ approval letter dated April 14, 2009, is included as Figure F1-5 in Appendix F1.

Because normal recharge caused by infiltration of precipitation has been cut off over a larger area (the landfill footprint), water levels may be lower than normal in some areas. Because of this, several monitoring wells are periodically dry. Wells MW-2R, MW-3R, MW-4, and MW-5 on the west side of the site are frequently dry. MW-7 on the north side of the site is dry. MW-12 and MW-13 on the northeast side of the site are also often dry, indicating that normal recharge and thus groundwater flow in those areas has been cut off.

**Table F-1
Skyline Landfill
Groundwater Monitoring System
Design Criteria**

Criterion	Location of Information in this Report
Identify and Characterize the Uppermost Aquifer	Section 1 – Site Hydrogeology
Establish Groundwater Flow Direction and Rate	Section 1.1 – Groundwater Flow Direction and Rate
Evaluate Potential Impacts of Operational Attributes of the Facility on Groundwater Flow	Section 2.1 – Relationship of Excavation Bottom to Uppermost Aquifer Section 2.2 – Leachate Sump Design
Determine Impacts to Critical Receptors	Section 2.3 – Critical Receptors
Determine the Appropriate Locations and Screened Intervals of Groundwater Monitoring Wells	Section 3.1 – Monitoring Well Locations Section 3.2 – Design Criteria Figure F1-4 – Typical Monitoring Well Detail

3.3 Contaminant Pathway Analysis

In the unlikely event of a leachate release (i.e., failure of multiple, redundant engineered containment systems such as composite liners and a leachate collection system), contaminants would move downward through the unsaturated portion of the weathered Taylor Marl, where present.

If the leachate were to reach the groundwater, the miscible contaminants would be diluted by the groundwater and would move laterally, downgradient (northward). Due to the relative difference in hydraulic conductivity between the weathered portions of the Taylor Marl and the deeper unweathered Taylor Marl, leachate migration in the lower clay confining layer is unlikely.

3.4 Sampling and Analysis Procedures

Appendix F2 – Groundwater Sampling and Analysis Plan contains the general requirements, sampling procedures and methods, and statistical analysis information required in 30 TAC §330.405(a)-(f).

3.5 Monitoring Well Design and Construction

In accordance with §330.421 – Monitor Well Construction Specifications, a licensed Texas driller will install monitoring wells in accordance with the regulations. Wells will be drilled by a method that will not introduce contaminants into the borehole or casing. A licensed professional geoscientist or engineer who is familiar with the geology of the area will supervise monitoring well installation and development and will provide a log of the boring. Equivalent alternatives to TCEQ requirements may be used if prior written approval is obtained from the executive director. Monitoring well construction details including screen intervals, well locations and elevations, filter pack and bentonite seal elevations, and surface completion are shown on Figure F1-4. Monitoring well construction will be completed in accordance with §§330.63, 330.403, and 330.421.

If any fluid is required in the drilling of monitoring wells, clean, treated city water shall be used and a chemical analysis provided to the executive director. No glue or solvents will be used in monitoring well construction.

After installation, monitoring wells will be developed to remove drilling artifacts and open the water-bearing zone for maximum flow until all water used or affected during drilling activities is removed and field measurements of pH, specific conductance, and temperature are stabilized.

A registered professional land surveyor will survey the well location and elevation.

Within 60 days of completion of a monitoring well or any other part of a monitoring system, an installation report will be submitted. The report will include construction and installation details for each well on forms available from the commission, a site map drawn to scale

showing the location of all monitoring wells and the relevant point(s) of compliance, well elevations to the nearest 0.01 foot above msl (with year of datum shown), latitude and longitude or landfill grid location of each well, copies of detailed geologic logs including soil sample data, and copies of driller's reports required by other agencies.

Damaged monitoring wells that are no longer usable will be reported to the executive director for a determination whether to replace or repair the well. In accordance with 30 TAC §305.70, if a compromised well requires replacement a permit modification request will be submitted within 45 days of the discovery.

Plugging and abandonment of monitoring wells will be performed in accordance with 16 TAC §76.702 and §76.1004. No abandonment will be performed without prior written authorization.

All parts of the groundwater monitoring system will be operated and maintained so that they perform at least to design specifications throughout the life of the groundwater monitoring program.

The facility must notify the executive director if changes in site construction or operation or changes in adjacent property affect or are likely to affect the direction and rate of groundwater flow and the potential for detecting groundwater contamination from the facility.

4 GROUNDWATER QUALITY

4.1 Plume of Contamination

In accordance with 30 TAC §330.63(f)(2), it is concluded that no plume of contamination has been identified as of the September 2011 groundwater sampling event.

4.2 Background and Detection Monitoring

In accordance with 30 TAC §330.63(f)(5), the following is a discussion on the current and proposed background and detection groundwater monitoring program that meets the requirements of §330.407.

An approved Subtitle D groundwater monitoring system has been installed at the facility, with monitoring commencing in December 1994. Background groundwater quality has been established and reported to TCEQ for the following existing site monitoring wells: MW-1, MW-2R, MW-3R, MW-8, MW-9, MW-10, MW-11, MW-12, MW-14, MW-15, MW-16, MW-17, MW-18, MW-19, and MW-20R. Background values are still being established for monitoring wells MW-4, MW-5, MW-6, MW-7, MW-13 that are frequently dry and for MW-21, MW-22, MW-23, MW-24, MW-25, and MW-26 that were installed in 2009. A tabulation of historical analytical results for all wells is provided in Part III, Attachment E – Geology Report, Appendix E7 – Historical Groundwater Data in accordance with 30 TAC §330.63(e)(5)(E).

For any new or replaced monitoring well that may be added to the system, background groundwater quality will be established as described in Appendix F2 – Groundwater Sampling and Analysis Plan. After the background analyses have been completed, the data will be analyzed statistically and background concentrations will be established for each parameter. The background values will be reported to TCEQ in accordance with the requirements described in Appendix F2.

A review of historical data shows that hazardous constituents listed in 40 CFR 258, Appendix I, and 30 TAC §330.419 have been detected during groundwater monitoring at the landfill. However, all detections at the facility have been either unverified one-time detections, occurred in upgradient wells not located on the facility's point of compliance, or have been shown to have been caused by a source other than the facility's landfill units.

Inorganics Summary:

Nine of the fifteen metals listed in 40 CFR Part 258 – arsenic, barium, chromium, cobalt, copper, lead, nickel, selenium, and zinc – have been detected in samples from facility monitoring events. Only three of these detections were confirmed by verification

resampling; the 12/2003 ASD for selenium in MW-16 was prepared without verification resampling. Each initial detection is listed in the historical tabulation of analytical data provided in Appendix E7. In each instance, the detection was reported in accordance with the requirements of the facility GWSAP in effect at the time of the detection. In addition, appropriate statistical evaluations have been performed in accordance with the facility GWSAP. Many of the detections occurred during background sampling and since detections during background could cause control limits to be unusually high and minimize the potential to detect an increase in the well, the data is evaluated to detect increasing trends as well as comparison with the control chart limits. To date, there has been no need to place the facility in assessment monitoring as a result of any detection. ASDs were prepared as a result of four statistical exceedances and submitted to TCEQ in accordance with the facility's GWSAP as follows:

**Table F-2
Skyline Landfill
Alternate Source Demonstrations Submitted**

Event	Well	Constituent	ASD dated	ASD approved
12/2001	MW-15	Nickel	4/5/2002	4/18/2002
12/2003	MW-16	Selenium	4/6/2004	5/26/2004
12/2004	MW-15	Selenium	5/20/2005	6/21/2005
5/2006	MW-06	Nickel	9/15/2006	10/20/2006

Detections above the established maximum contaminant level (MCL) for Appendix I parameters have only occurred in upgradient wells, as summarized in Table F-3. The Appendix I metal detections at upgradient MW-20R, which is a low-yield well, are attributed to high turbidity in the well (238 NTU).

**Table F-3
Skyline Landfill
Historical Detections Above the MCL of Appendix I Constituents**

Well	Constituent	MCL (µg/L)	Result (µg/L)	Date	Notes
MW-20	Lead, total	15	20	12/21/94	Upgradient well.
MW-20R	Arsenic, total	10	16	12/07/06	Upgradient well.
MW-20R	Lead, total	15	15	12/16/05	Upgradient well.
MW-20R	Lead, total	15	22	12/07/06	Upgradient well.

Organics Summary:

Based on the analytical data tabulation, the only volatile organic compounds (VOCs) detected have been acetone at MW-2R (in March 2010 at 47 µg/L and in March 2011 at 30 µg/L) and 1,1-dichloroethane at upgradient MW-17 (December 2010, June 2010 and

December 2011 at concentrations of 1.1 µg/L, 2.6 µg/L, and 2.0 µg/L, respectively), all well below the groundwater protection standard of 2,400 µg/L. Neither acetone nor 1,1-dichloroethane has an established MCL.

Acetone is a common laboratory contaminant and has not been detected at consecutive events at MW-2R.

Monitoring well MW-17, located adjacent to but hydraulically upgradient of a capped pre-Subtitle D disposal area, was approved by TCEQ as a background well with the 2009 Subchapter J permit modification. As stated in the U.S. EPA Solid Waste Technical Manual (EPA 530-R-93-017) in Section 5.6.3, "the objective of a groundwater monitoring system is to intercept groundwater that has been contaminated by leachate from the MSWLF unit." The detection of 1,1-dichloroethane at a concentration near the PQL (1 mg/L) in an approved background non-point-of-compliance well without confirmation from leachate indicator parameters does not indicate leakage from a landfill unit; therefore, no action is required.

Table F-4 below summarizes the historical statistical exceedances, verification resampling and alternate source demonstrations for the facility point of compliance wells through the December 2011 monitoring event; no statistical exceedances have been identified since the June 2009 event. The inorganic groundwater quality indicator parameters detected (ammonia, potassium, iron, chloride, and alkalinity) are not listed in 40 CFR Part 258, Appendix I. Conducting analysis for these constituents is now optional and statistical analysis is no longer required to be performed on the results.

**Table F-4
Skyline Landfill
Summary of Historical Statistical Exceedances through December 2011**

Event	Well	Constituent	Result (mg/L)	Upper Prediction Limit (mg/L)	Practical Quantitation Limit (mg/L)	Primary MCL (if applicable) (mg/L)	Follow Up
Dec-00	MW-14	Iron, dissolved	0.551	0.321	0.1		Unverified
Dec-00	MW-16	Ammonia	1.2	1.64	0.1		Verified
Dec-00	MW-16	Potassium	24	26.09	0.5		Verified
Dec-00	MW-19	Potassium	17	19.4	0.5		Verified
Jun-01	MW-12	Iron	2.73	2.5	0.1		Unverified
Jun-01	MW-15	Selenium	0.0095	0.005	0.005	0.05	Unverified
Jun-01	MW-16	Iron	1.7	0.15	0.1		Unverified
Jun-01	MW-16	Nickel	0.0562	n/a	0.04		Unverified
Dec-01	MW-14	Iron	0.33	0.3234	0.1		Unverified
Dec-01	MW-15	Nickel	0.0536	0.0519	0.04		ASD submitted on 4/5/2002 and approved on 4/18/2002
Jun-02	MW-12	Iron	0.845	0.185	0.1		Verified
Jun-02	MW-14	Calcium	404	545.71	0.2		Unverified
Jun-02	MW-16	Arsenic	0.0196	0.013	0.01	0.05	Unverified
Dec-02	MW-12	Iron	1.4	0.185	0.1		Verified
Dec-02	MW-12	Alkalinity	890	1002.96	5		Unverified
Dec-02	MW-14	Calcium	460	545.71	0.2		Unverified
Dec-02	MW-14	Iron	1.9	0.3234	0.1		Unverified
Dec-02	MW-14	Sulfate	2700	3134.2	300		Unverified
Jun-03	MW-12	Iron	1.2	0.185	0.1		Verified
Jun-03	MW-14	Calcium	450	545.71	0.2		Verified
Jun-03	MW-12	Alkalinity	830	1002.96	5		Unverified
Jun-03	MW-14	Magnesium	190	252.35	0.5		Unverified
Jun-03	MW-15	Selenium	0.0071	0.005	0.005	0.05	Unverified
Dec-03	MW-16	Selenium	0.0054	0.005	0.005	0.05	ASD submitted on 4/6/04 and approved on 5/26/04

**Table F-4
Skyline Landfill
Summary of Historical Statistical Exceedances through December 2011 (Continued)**

Event	Well	Constituent	Result (mg/L)	Upper Prediction Limit (mg/L)	Practical Quantitation Limit (mg/L)	Primary MCL (if applicable) (mg/L)	Follow Up
Jun-04	MW-12	Iron	3.4	0.185	0.1		Verified
Jun-04	MW-14	Calcium	480	545.7	0.2		Unverified
Jun-04	MW-14	Magnesium	190	252.4	0.5		Unverified
Jun-04	MW-14	Sulfate	2500	3134	71		Unverified
Jun-04	MW-16	Iron	0.62	0.13	0.1		Unverified
Dec-04	MW-9	Calcium	550	674.61	0.2		Unverified
Dec-04	MW-9	Magnesium	170	213.49	0.5		Unverified
Dec-04	MW-12	TDS	7900	10673.88	10		Unverified
Dec-04	MW-12	Iron	3.2	0.185	0.1		Verified
Dec-04	MW-14	Calcium	490	545.71	0.2		Unverified
Dec-04	MW-14	Magnesium	190	252.35	0.5		Unverified
Dec-04	MW-14	Potassium	12	15.89	0.5		Unverified
Dec-04	MW-14	Sulfate	2500	3134.2	71		Unverified
Dec-04	MW-15	Selenium	0.016	0.005	.005	0.05	ASD submitted on 5/20/05 and approved on 6/21/05
Dec-04	MW-16	Iron	0.55	0.13	0.1		Unverified
Dec-04	MW-16	Selenium	0.018	0.005	.005	0.05	Unverified
Dec-04	MW-19	Selenium	0.0088	0.005	.005	0.05	Unverified.
<i>July 28, 2005 – Background update through 2005 is approved</i>							
Dec-05	MW-08	Iron	0.94	0.579	0.1		Unverified
Jun-06	MW-06	Nickel	0.11	0.0537	0.04		Initial Detection. ASD submitted on 9/15/06 and approved on 10/20/06.
Jun-06	MW-08	Iron	1	0.579	0.1		Unverified
Jun-06	MW-08	Ammonia	1.9	2.82	0.1		Unverified
Dec-06	MW-09	Sulfate	7500	3872	620		Unverified
Dec-06	MW-10	Sulfate	7600	4275	620		Unverified
Dec-06	MW-11	Sulfate	7600	4190	620		Unverified

**Table F-4
Skyline Landfill
Summary of Historical Statistical Exceedances through December 2011 (Continued)**

Event	Well	Constituent	Result (mg/L)	Upper Prediction Limit (mg/L)	Practical Quantitation Limit (mg/L)	Primary MCL (if applicable) (mg/L)	Follow Up
Dec-06	MW-14	Sulfate	6000	3427	620		Unverified
Dec-06	MW-16	Sulfate	1100	8189	620		Unverified
Dec-06	MW-19	Sulfate	9500	5146	620		Unverified
Jun-07	MW-08	Iron	3.9	0.579	0.1		Unverified
Jun-07	MW-15	Ammonia	1.2	1.29	0.1		Unverified
Jun-07	MW-16	Chloride	1300	1286	5		Unverified
Dec-07	MW-08	Alkalinity	570	568.7	5		Unverified
Dec-07	MW-08	Iron	12	0.579	0.1		Verified
Dec-07	MW-16	Alkalinity	560	575.8	5		Unverified
Dec-07	MW-16	Chloride	1600	1286	5		Unverified
Jun-08	MW-08	Alkalinity	530	568.7	5		Unverified
Jun-08	MW-08	Iron	1.9	0.579	0.1		Verified
Jun-08	MW-16	Alkalinity	580	575.8	5		Unverified
Jun-08	MW-16	Chloride	1700	1286	5		Verified
Jun-08	MW-16	Potassium	26	32.7	0.5		Unverified
Dec-08	MW-08	Alkalinity	520	568.7	5		Verified
Dec-08	MW-08	Iron	2.5	0.579	0.1		Verified
Dec-08	MW-16	Alkalinity	570	575.8	5		Verified
Dec-08	MW-16	Chloride	2000	1286	5		Verified
Dec-08	MW-16	Potassium	28	32.7	0.5		Unverified
<i>Subchapter J Permit Modification approved on 4/10/09. Modification included approval to no longer report statistical analysis on inorganic parameters.</i>							
Jun-09	MW-19	Barium	0.012	0.01	0.01	2	Unverified

4.3 Assessment Monitoring

In accordance with §330.63(f)(6), the required information is provided. All detections at the facility of hazardous constituents in 40 CFR Part 258, Appendix I, and 30 TAC §330.419 have been either unverified one-time detections, occurred in upgradient wells not located on the facility's point of compliance, or have been shown to have been caused by a source other than the facility's landfill units. Should such hazardous constituents be detected in the future, and should such detections support the implementation of assessment monitoring, information to establish an assessment monitoring program under §330.409 will be submitted including a description of special wastes previously handled at the landfill and a characterization of the contaminated groundwater, including any detected concentration(s) of assessment constituents defined in §330.409.

Detailed plans and an engineering report describing the proposed groundwater monitoring program under §330.405 are included in this plan as well as the proposed sampling, analysis, and statistical comparison procedures.

Should statistically significant increases or increasing trends of hazardous constituents be detected in point of compliance wells in the future groundwater monitoring events and absent an alternate source demonstration, the Skyline Landfill will establish an assessment monitoring program under §330.409 in accordance with the procedures described in Appendix F2 – Groundwater Sampling and Analysis Plan that will include sampling for Appendix II constituents.

4.4 Corrective Action Program

In accordance with §330.63(f)(7), the required information is provided. Detections of hazardous constituents at the facility above established MCLs have only occurred in upgradient wells. Should such hazardous constituents be detected in point of compliance wells in the future groundwater monitoring events above the concentration limits established in 30 TAC §330.409, and absent an alternate source demonstration, information, data and analysis to establish a corrective action program meeting the requirements of §330.411 and §330.413 will be submitted including a description of special wastes previously handled at the landfill and a characterization of the contaminated groundwater, including:

A characterization of contaminated groundwater including any detected concentration(s) of assessment constituents defined in §330.409.

Detailed plans and an engineering report describing the proposed groundwater monitoring program under §330.405 are included in this plan as well as the proposed sampling, analysis, and statistical comparison procedures.

SKYLINE LANDFILL

APPENDIX F1

Monitoring Well Water Level Elevations Compared with Nearby Original Piezometer Water Level Elevation	F1-1
Existing Groundwater Monitoring System	F1-2
Proposed Groundwater Monitoring System	F1-3
Typical Monitoring Well Detail	F1-4
Subchapter J Permit Modification Approval Letter	F1-5



Skyline Landfill
Monitor Well Water Level Elevations Compared with Nearby Original Piezometer Water Level Elevation

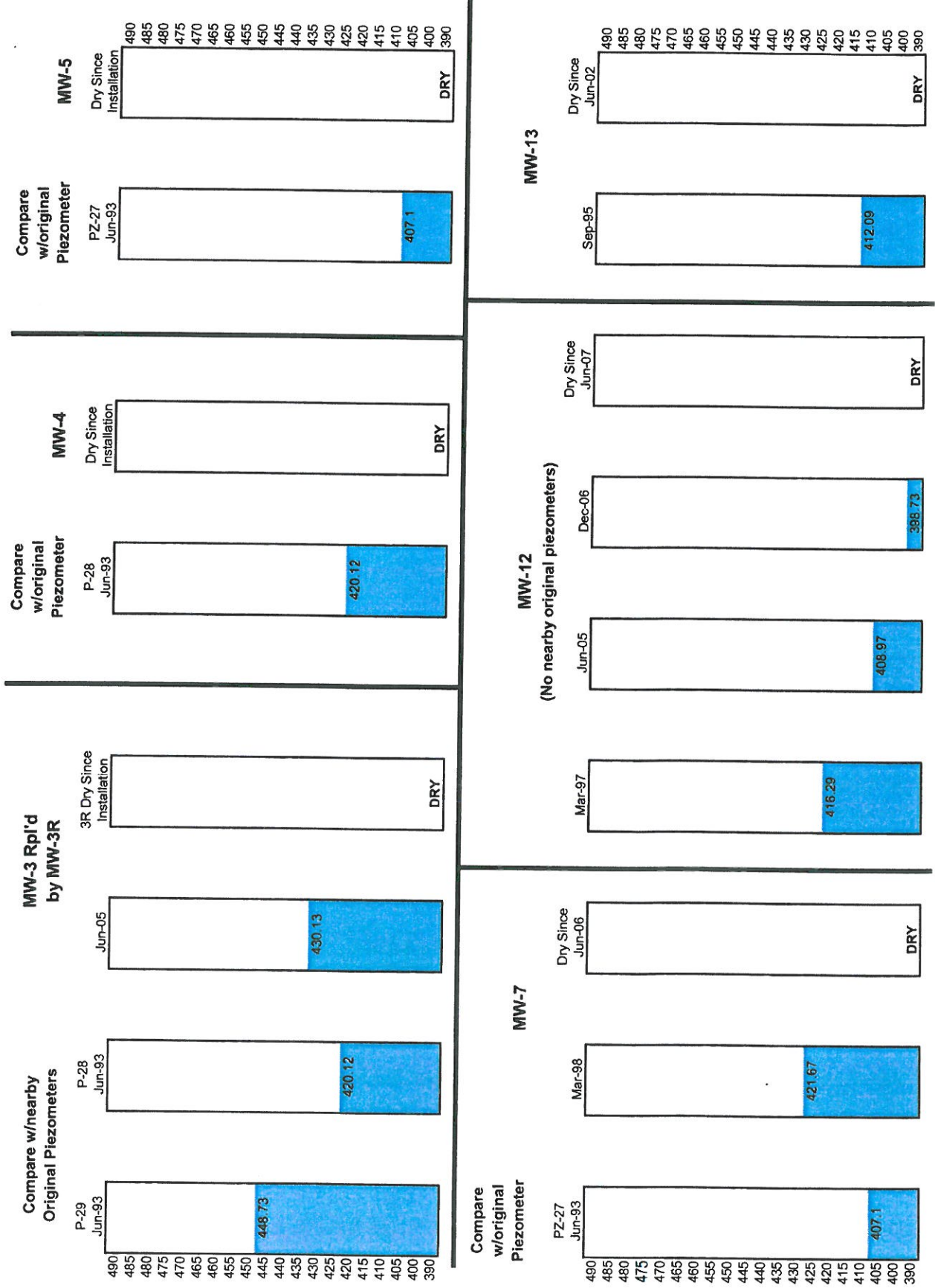


Figure F1-1

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TYPICAL MONITORING WELL INSTALLATION

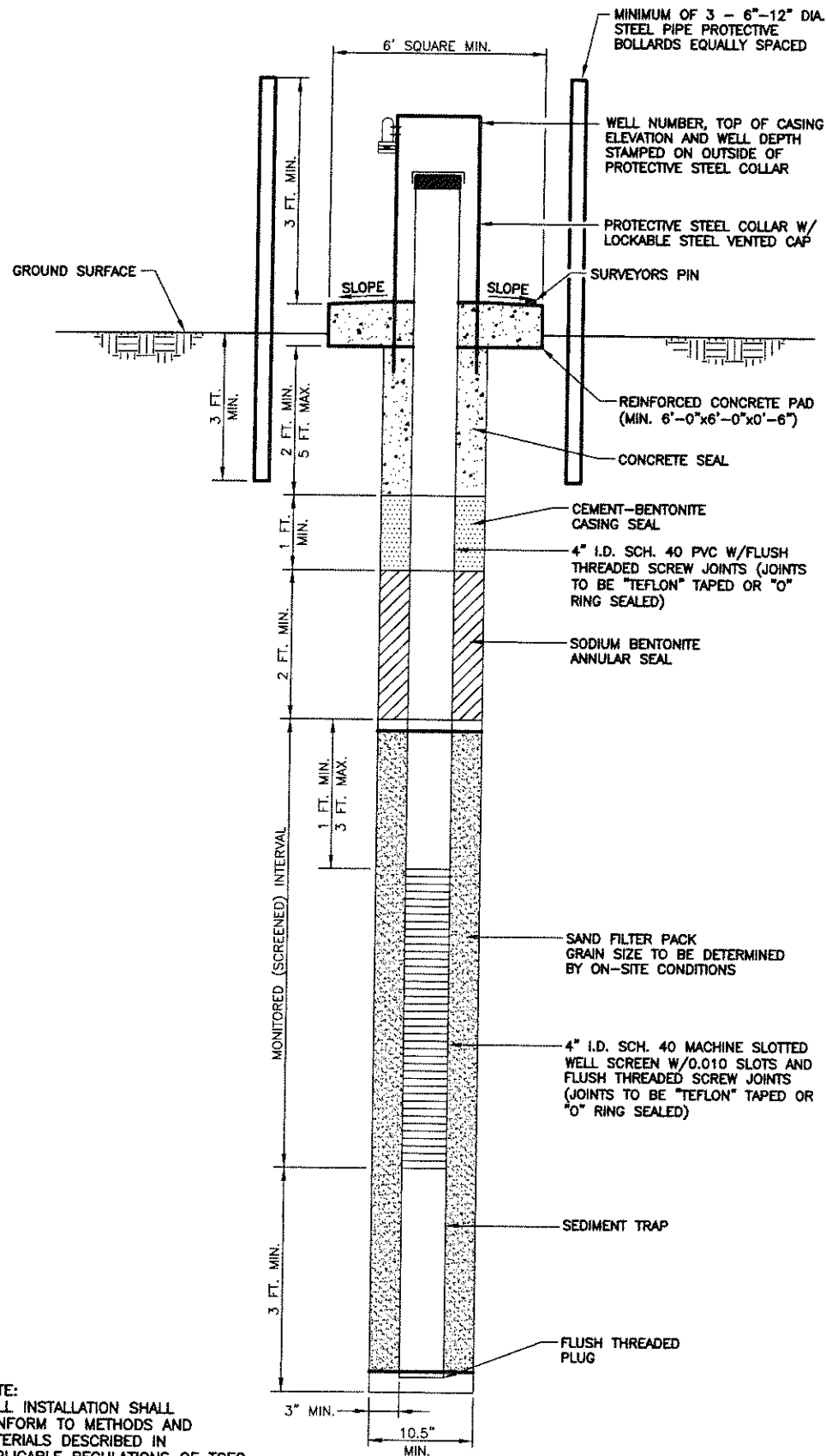
MONITORING WELL NO.	NORTHING	EASTING	GROUND ELEVATION (ft msl)	TOTAL DEPTH (ft bgs)	TOP OF CASING ELEVATION (ft msl)	SCREENED INTERVAL (ft)		FILTER PACK INTERVAL (ft)	
						FROM	TO	FROM	TO
MW-1	319720.13	2253216.98	491.06	55.0	506.78	32.0	55.0	30.0	55.0
MW-2R	320701.90	2252061.00	494.04	77.0	497.23	55.0	76.0	52.0	77.0
MW-3R	321546.48	2251466.19	473.63	63.0	476.68	41.0	62.0	38.0	63.0
MW-4	322475.59	2251185.93	433.85	25.0	437.00	7.0	25.0	5.0	25.0
MW-5	323325.95	2251534.93	421.92	32.0	425.14	7.0	32.0	5.0	32.0
MW-6	323815.10	2251655.05	416.81	25.0	419.96	7.0	25.0	5.0	25.0
MW-7	323934.73	2252352.96	429.73	25.0	432.67	7.0	25.0	5.0	25.0
MW-8R*	323890	2252698	453	25.0	455.5	25	15	25	13
MW-9	323636.73	2252503.70	418.19	38.0	421.64	15.0	38.0	13.0	38.0
MW-10	323581.93	2253918.94	415.30	49.0	417.53	26.0	49.0	23.5	49.0
MW-11R*	323820	2254607	425	30	427.5	30	20	30	18
MW-12	323853.99	2255389.37	417.83	22.0	420.95	7.0	22.0	5.0	22.0
MW-13	323053.52	2255575.75	432.23	25.0	435.22	7.0	25.0	5.0	25.0
MW-14	321954.21	2256209.38	463.51	32.5	466.71	10.0	32.5	8.0	32.5
MW-15	321692.30	2256899.70	448.66	25.5	452.20	8.0	25.5	6.0	25.5
MW-16	320374.94	2257092.88	446.36	24.5	449.56	7.0	24.5	5.0	24.5
MW-17	320243.51	2255846.00	489.85	57.5	492.75	35.0	57.5	33.0	57.5
MW-18	319705.86	2254847.83	467.00	47.5	470.20	25.0	47.5	23.0	47.5
MW-19	320896.00	2257066.39	441.25	31.0	444.45	8.5	31.0	7.0	31.0
MW-20R	319111.55	2256521.81	464.63	35.5	468.03	14.5	34.5	12.0	35.5
MW-21R*	323875	2252004	432	45	434.5	45	35	45	33
MW-22R*	323671	2253089	420	45	422.5	45	35	45	33
MW-23	323909.56	2254227.25	416.73	35.0	419.46	22.0	32.0	20.0	35.0
MW-24	323900.57	2254999.99	421.58	20.0	424.62	12.0	17.0	9.0	20.0
MW-25	322003.60	2255731.52	459.53	35.0	462.33	22.0	32.0	20.0	35.0
MW-26	321823.26	2256554.54	448.09	20.0	451.06	12.0	17.0	10.0	20.0
MW-27	321124.19	2251763.60	478.00	60.0	480.50	50.0	60.0	48.0	60.0

* DEPTHS ARE ESTIMATES ONLY. ACTUAL TOTAL DEPTH, SCREEN INTERVAL AND FILTER PACK DEPTHS WILL BE DETERMINED DURING INSTALLATION BASE ON FIELD OBSERVATIONS.

1. ALL INFORMATION SHOWN IN THIS TABLE IS APPROXIMATE AND BASED ON CURRENTLY AVAILABLE INFORMATION.
 2. INSTALLATION OF MW-14 THROUGH MW-19 APPROVED BY TNRCC PER MODIFICATION OF PERMIT 42-A.

NOTES:

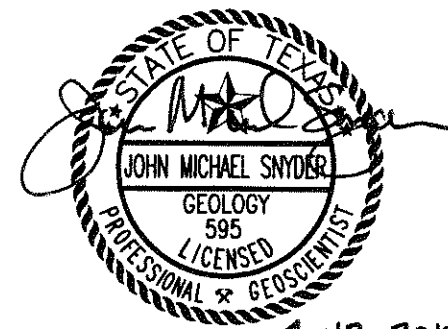
- MONITORING WELLS SHALL BE DRILLED BY A TEXAS-LICENSED DRILLER WHO IS QUALIFIED TO DRILL AND INSTALL MONITORING WELLS.
- THE WELL SHALL BE DRILLED BY A METHOD WHICH WILL ALLOW INSTALLATION OF THE CASING, SCREEN, ETC., AND THAT WILL NOT INTRODUCE CONTAMINANTS INTO THE BOREHOLE OR CASING. IF ANY FLUIDS ARE NECESSARY IN DRILLING OR INSTALLATION, THEN CLEAN, TREATED CITY WATER SHALL BE USED; OTHER FLUIDS MUST BE APPROVED IN WRITING.
- DURING DRILLING OF THE MONITORING WELL, A LOG OF THE BORING SHALL BE MADE BY A QUALIFIED GEOLOGIST OR ENGINEER WHO IS FAMILIAR WITH THE GEOLOGY OF THE AREA.
- THE WELL CASING SHALL BE NSF-CERTIFIED PVC SCHEDULE 40 OR 80 PIPE. FLUSH-THREAD, SCREW JOINT (NO GLUE OR SOLVENTS); POLYTETRAFLUORETHYLENE (PTFE, SUCH AS TEFLON) TAPE OR O-RINGS IN THE JOINTS; NO COLLAR COUPLINGS. THE CASING SHALL BE CLEANED AND PACKAGED AT THE PLACE OF MANUFACTURE; THE PACKAGING SHALL INCLUDE A PVC WRAPPING ON EACH SECTION OF CASING TO KEEP IT FROM BEING CONTAMINATED PRIOR TO INSTALLATION. THE CASING SHALL BE FREE OF INK, LABELS, OR OTHER MARKINGS. MANUFACTURE: THE PACKAGING SHALL INCLUDE A PVC WRAPPING ON EACH.
- THE SCREEN SHALL BE COMPATIBLE WITH THE CASING AND SHOULD GENERALLY BE OF THE SAME MATERIAL. THE SCREEN SHALL NOT INVOLVE THE USE OF ANY GLUES OR SOLVENTS FOR CONSTRUCTION. FIELD-CUTS SLOTS ARE NOT PERMITTED FOR WELL SCREEN. FILTER CLOTH SHALL NOT BE USED. SCREEN STERILIZATION METHODS ARE THE SAME AS THOSE FOR CASING. SELECTION OF THE SIZE OF THE SCREEN OPENING SHOULD BE DONE BY A PERSON EXPERIENCED WITH SUCH WORK.
- THE FILTER PACK, PLACED BETWEEN THE SCREEN AND THE WELL BORE, SHALL CONSIST OF PRE-PACKAGED, INERT, CLEAN SILICA SAND OR GLASS BEADS. THE FILTER PACK SHOULD BE PLACED WITH A TREMIE PIPE TO ENSURE THAT THE MATERIAL COMPLETELY SURROUNDS THE SCREEN AND CASING WITHOUT BRIDGING. THE TREMIE PIPE SHALL BE STEAM CLEANED PRIOR TO THE FIRST WELL AND BEFORE EACH SUBSEQUENT WELL.
- THE ANNULAR SEAL SHALL BE PLACED ON TOP OF THE FILTER PACK. THE SEAL SHOULD BE COMPOSED OF, IN ORDER OF PREFERENCE, COARSE-GRAIN SODIUM BENTONITE, COARSE-GRIT SODIUM BENTONITE, OR BENTONITE GROUT. SPECIAL CARE SHOULD BE TAKEN TO ENSURE THAT FINE MATERIAL OR GROUT DOES NOT PLUG THE UNDERLYING FILTER PACK. THE SEAL SHOULD BE PLACED ON TOP OF THE FILTER PACK WITH A STEAM-CLEANED TREMIE PIPE TO ENSURE GOOD DISTRIBUTION AND SHOULD BE TAMPED WITH A STEAM-CLEANED ROD TO DETERMINE THAT THE SEAL IS THICK ENOUGH. THE BENTONITE SHALL BE HYDRATED WITH CLEAN WATER PRIOR TO ANY FURTHER ACTIVITIES ON THE WELL AND LEFT TO STAND UNTIL HYDRATION IS COMPLETE (EIGHT TO 12 HOURS, DEPENDING ON THE GRAIN SIZE OF THE BENTONITE). IF A BENTONITE-GROUT (WITHOUT CEMENT) CASING SEAL IS USED IN THE WELL BORE, THEN IT MAY REPLACE THE ANNULAR SEAL DESCRIBED ABOVE.
- A CASING SEAL SHALL BE PLACED ON TOP OF THE ANNULAR SEAL TO PREVENT FLUIDS AND CONTAMINANTS FROM ENTERING THE BOREHOLE FROM THE SURFACE. THE CASING SEAL SHALL CONSIST OF A COMMERCIAL BENTONITE GROUT OR A CEMENT-BENTONITE MIXTURE.
- CONCRETE PAD. HIGH-QUALITY STRUCTURAL-TYPE CONCRETE SHALL BE PLACED FROM THE TOP OF THE CASING SEAL (TWO TO FIVE FEET BELOW THE SURFACE) CONTINUOUSLY TO THE TOP OF THE GROUND TO FORM A PAD AT THE SURFACE. THIS FORMED SURFACE PAD SHALL BE AT LEAST SIX INCHES THICK. THE TOP OF THE PAD SHALL SLOPE AWAY FROM THE WELL BORE TO THE EDGES TO PREVENT PONDING OF WATER AROUND THE CASING OR COLLAR.
- A STEEL PROTECTIVE PIPE COLLAR SHALL BE PLACED AROUND THE CASING "STICKUP" TO PROTECT IT FROM DAMAGE AND UNWANTED ENTRY. THE TOP OF THE COLLAR SHALL HAVE A LOCKABLE HINGED TOP FLAP OR COVER. A STURDY LOCK SHALL BE INSTALLED, MAINTAINED IN WORKING ORDER, AND KEPT LOCKED WHEN THE WELL IS NOT BEING BAILED/PURGED OR SAMPLED. THE WELL NUMBER OR OTHER DESIGNATION SHALL BE MARKED PERMANENTLY ON THE PROTECTIVE STEEL COLLAR.
- SEDIMENT TRAP APPROXIMATELY 6 INCHES IN MW-2R AND 3R.



NOTE: WELL INSTALLATION SHALL CONFORM TO METHODS AND MATERIALS DESCRIBED IN APPLICABLE REGULATIONS OF TCEQ.

TYPICAL MONITORING WELL INSTALLATION

NOT TO SCALE



4-12-2012

MONITORING WELL DETAIL

WASTE MANAGEMENT OF TEXAS, INC.
 SKYLINE LANDFILL
 MAJOR PERMIT AMENDMENT



BIGGS & MATHEWS
 ENVIRONMENTAL
 CONSULTING ENGINEERS

MANSFIELD • WICHITA FALLS
 817-563-1144

ISSUED FOR PERMITTING PURPOSES ONLY

REVISIONS						TSPE FIRM NO. F-256	TBPG FIRM NO. 50222
REV	DATE	DESCRIPTION	OWN BY	DES BY	CHK BY	APP BY	FIGURE
							F1-4

DSN. ESF DATE : 04/12
 DWN. SRC SCALE : GRAPHIC
 CHK. JMS DWG : F1-4_MW_Detail.dwg

Buddy Garcia, *Chairman*
Larry R. Soward, *Commissioner*
Bryan W. Shaw, Ph.D., *Commissioner*
Mark R. Vickery, P.G., *Executive Director*



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

April 14, 2009

Ms. Tracy Shrader
Divisional Environmental Manager
Waste Management of Texas, Inc.
P. O. Box 400
Ferris, TX 75125

Re: WMT Skyline Recycling & Disposal Facility - Ellis County
Municipal Solid Waste - Permit No. 42C
Subchapter J Permit Modification
Tracking No. 12571309; RN100542232 / CN600127856

Dear Ms. Shrader:

We have reviewed your application for a municipal solid waste permit modification dated March 25, 2008, and the revisions dated January 7, 2009, pursuant to 30 Texas Administrative Code (TAC) Section (§)330.401(b), regarding the revision of permits to comply with requirements which became effective on March 27, 2006, for Subchapter J, Chapter 330. The information presented is technically sufficient for a municipal solid waste permit modification.

Enclosed is a copy of the above referenced modification which is now part of your permit and should be attached thereto as part of Attachment A. The documentation prepared and submitted to support the modification request shall be considered as requirements of the permit.

If you have questions concerning this matter, please contact Mr. T. Wesley McCoy, P.G., Senior Geologist at (512) 239-6669. When addressing written correspondence please use mail code (MC 124).

This action is taken under authority delegated by the Executive Director of the Texas Commission on Environmental Quality.

Sincerely,

A handwritten signature in cursive script, appearing to read "Richard C. Carmichael".

Richard C. Carmichael, Ph.D., P.E.
Manager, Municipal Solid Waste Permits Section
Waste Permits Division

RCC/TWM/fp

cc: Mr. Michael Snyder, P.G., Biggs & Mathews Environmental

Enclosure

**SKYLINE LANDFILL
CITY OF FERRIS
DALLAS AND ELLIS COUNTIES, TEXAS
TCEQ PERMIT APPLICATION NO. MSW 42D**

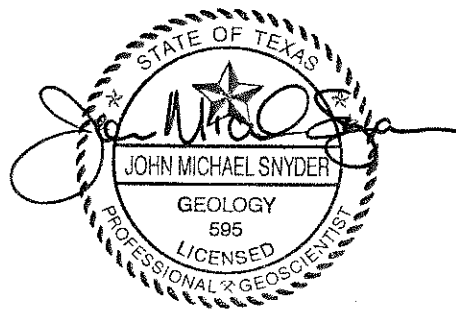
PERMIT AMENDMENT APPLICATION

**PART III – FACILITY INVESTIGATION AND DESIGN
APPENDIX F2
GROUNDWATER SAMPLING AND ANALYSIS PLAN**

Prepared for

Waste Management of Texas, Inc.

April 2012



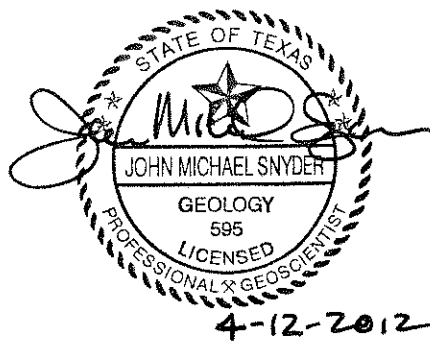
4-12-2012

BIGGS & MATHEWS ENVIRONMENTAL

1700 Robert Road, Suite 100 • Mansfield, Texas 76063 • 817-563-1144

TEXAS BOARD OF PROFESSIONAL ENGINEERS
FIRM REGISTRATION No. F-256

TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS
FIRM REGISTRATION No. 50222



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1 INTRODUCTION

The purpose of this document is to outline the sampling and analysis procedures implemented at the Skyline Landfill, TCEQ Permit No. MSW 42D. The procedures will ensure that the groundwater monitoring results provide an accurate representation of groundwater quality and are protective of human health and the environment.

WMTX will employ competent, qualified consultants and laboratories to assist in all aspects of the groundwater sampling and analysis requirements.

This plan has been prepared to meet or exceed the requirements of 30 TAC Subchapter J related to Groundwater Monitoring and Corrective Action, promulgated by TCEQ on March 27, 2006.

2 GROUNDWATER SAMPLING PROCEDURES

The following subsections summarize specific tasks involved in sampling the groundwater through the monitoring system.

2.1 Well Inspection

Prior to performing any purging or sampling each monitoring well will be inspected to assess its integrity. Each well will be inspected for any physical damage. The security of each well will be assessed in order to confirm that no outside source constituents have been introduced to the well. All inspection information, stabilization data, date and time, general weather conditions, and sampling personnel identification will be documented on the Field Information Form (Figure 2-1). If it has been determined that the integrity of the well has, or may have been, compromised, the necessary information will be documented and the TCEQ notified within 45 days of discovery of the compromised monitoring well.

2.2 Sample Collection

Each monitoring well in the groundwater monitoring system may have a dedicated sampling device installed in the well (i.e., a Well Wizard bladder pump (or equivalent) or a Teflon, PVC, or stainless steel bailer). If a non-dedicated sampling device is used, it will be disposable or properly decontaminated prior to use. Volatile samples will be collected first, followed by metals and, finally, other inorganics.

2.2.1 Equipment Decontamination

All equipment used for the collection of groundwater samples will be decontaminated prior to use at each well location unless the equipment is dedicated to a specific well. An appropriate decontamination procedure will be sufficient to avoid the introduction of any contaminant into a well and to not allow any contaminant to be transported between wells that will create false sample results or otherwise harm the environment.

2.2.2 Water Level Measurements

Prior to groundwater purging and sampling, water level measurements will be taken at each well location utilizing a portable water level indicator, fiberglass tape, or other suitable measuring device. The measuring device used will be calibrated to the manufacturer's specifications and capable of measuring to the nearest 0.01 foot. Water level measurements will be collected over a period of time short enough to avoid temporal variations in water levels. All measurements will be taken from the surveyed top of the well casing.

Sampling shall proceed from the well with the highest water level elevation to those with successively lower elevations unless contamination is known to be present, in which case wells not likely to be contaminated shall be sampled prior to those that are known to be contaminated.

2.2.3 Purging/Bailing

Prior to sampling at each well location, water will be evacuated until a minimum of three well volumes has been purged, until the well has been pumped or bailed dry, or until an appropriate amount of water has been purged to achieve the collection of a representative sample. Groundwater will be considered representative once pH, specific conductance, turbidity, and temperature have stabilized. This will ensure that samples are drawn from the water-bearing unit and not from stagnant water left in the well screen between sampling events. If the well contains less than three well volumes, the well will be pumped or bailed dry, allowed to recover and immediately sampled. If sufficient water is not available for sampling within 24 hours of purging for slowly recovering wells, the well will be considered dry.

Purged groundwater (and excess sample water) may be discharged to the ground surface away from the wellhead area, but only after analytical results for samples of that groundwater have been received, and only if the results demonstrate that it is not contaminated. Groundwater is considered contaminated if the concentration of any constituent of concern is greater than the background concentration. If analyses indicate the groundwater is contaminated, then the purge water (and any excess sample water) must be managed as contaminated water, and not discharged.

Low-flow purging and sampling may be conducted at the site contingent upon a successful demonstration to determine the viability of this technique for all wells using the low-flow techniques. However, until a successful demonstration is approved by the TCEQ, traditional purging and sampling methods (i.e., minimum purge of three well volumes) will be used at all wells.

2.3 Sample Preservation and Filtering

The appropriate sample container and preservative requirement for each analyte is listed on Table 2-1. The laboratory or sampling personnel for each sampling event may supply pre-labeled containers. The appropriate preservatives will be added to each sample container based on the required analytical method. Samples shall not be filtered prior to laboratory analysis.

2.4 Sample Shipment

After collection and sample preservation, the sample bottles will be wiped clean, labeled and placed into an insulated, plastic-shelled cooler or other suitable shipping container with frozen ice packs or ice. The temperature of the samples will be recorded when the cooler arrives at the analytical laboratory to assure that the appropriate sample temperature was

maintained during shipment. All samples included in the cooler will be packed in such a manner to minimize the potential for container breakage. Volatile Organic Analysis (VOA) vials and toxicology (TOX) bottles will not be placed directly on the ice packs (or ice). A Field Information Form (Figure 2-1) and Chain of Custody Form (Figure 2-2) will be sealed in a water resistant bag and placed with the appropriate sample bottle set.

2.4.1 Chain of Custody

Appropriate Chain of Custody procedures for samples will be implemented to ensure sample integrity and to provide technically and legally defensible groundwater quality data. At the time each sample is collected, Chain-of-Custody (Figure 2-2) and Field Information Forms (Figure 2-1) will be completed and placed in the cooler. The Field Information form will include general sampling event information including location, time, weather conditions, sampler identification, well integrity, any numerical field data values, and well purging procedures.

Upon arrival of the cooler at the laboratory, the cooler will be opened and the Chain of Custody forms will be signed and time/dated by the person taking custody of the cooler. The Bill of Lading or receipt for cooler shipment will be attached to the Chain of Custody form upon arrival at the analytical laboratory.

3 GROUNDWATER ANALYSIS PROCEDURES

3.1 Analytical Methods/Procedures

Table 3-1 presents the methodologies used by WMTX's designated laboratory for each parameter or group of parameters. All methods are USEPA approved.

3.2 Quality Assurance/Quality Control

Skyline Landfill has historically utilized a NELAC (National Environmental Laboratory Accreditation Council) certified laboratory for analysis of groundwater samples and will continue to use a NELAC certified laboratory for future groundwater analyses. Laboratory data analyses and/or a Laboratory Review Checklist will be performed and the facility will submit laboratory data and analysis prepared by a TCEQ accredited environmental testing laboratory, and in accordance with acceptable accreditation standards (e.g., NELAC). NELAC standards require that laboratories have an established quality system that includes a comprehensive laboratory quality manual (LQM) and an authorized quality assurance officer. A copy of the LQM will be maintained in the Skyline Landfill Site Operating Records (SOR) for use in data evaluation.

The laboratory calibrates equipment and instrumentation according to the laboratory's LQM and referenced methodologies. Quality control including matrix spikes, matrix spike duplicates or sample duplicates, laboratory control samples, method blanks, and surrogates are analyzed along with field groundwater samples and field QC samples also in accordance with LQM and method requirements. The laboratory evaluates and reports this information in a report with laboratory case narrative (LCN), with qualifiers and narrative detail where appropriate such that Skyline Landfill may ensure that all sample collection, preparation and analyses, and data management activities have been conducted. The laboratory report (including the LCN) will report the number of samples, sampling parameters, and sample matrix, the name of the laboratory (including subcontract labs) involved in the analysis, an explanation of each failed precision and accuracy measurement determined to be outside the laboratory and/or method control limits and whether such a quality control excursion represents a positive or negative bias and the limitations these excursions have on data quality. Additionally, exceedance of sample holding times and identification of matrix interferences shall be identified in the LCN. Any dilutions implemented due to sample matrix interference will be done to the smallest dilution possible to bring the sample into control for analysis.

In addition to the exceptions listed above, the LCN report for all problems and anomalies observed will be included in the laboratory report for each sampling event. The LCN will report, at a minimum, the following information:

1. The exact number of samples, testing parameters and sample matrix.
2. The name of the laboratory involved in the analysis. If more than one laboratory is used, all laboratories shall be identified in the case narrative.
3. The test objective regarding samples.
4. Explanation of each failed precision and accuracy measurement determined to be outside of the laboratory and/or method control limits.
5. Explanation if the effect of the failed precision and accuracy measurements on the results induces a positive or negative bias.
6. Identification and explanation of problems associated with the sample results, along with the limitations these problems have on data usability.
7. A statement on the estimated uncertainty of analytical results of the samples when appropriate and/or when requested.
8. A statement of compliance and/or noncompliance with the requirements and specifications. Exceedance of holding times and identification of matrix interferences must be identified. Dilutions shall be identified and if dilutions are necessary, they must be done to the smallest dilution possible to effectively minimize matrix interferences and bring the sample into control for analysis.
9. Identification of any and all applicable quality assurance and quality control (QA/QC) samples that will require special attention by the reviewer.
10. A statement on the quality control of the analytical method of the permit and the analytical recoveries information shall be provided when appropriate and/or when requested.

The analytical laboratory report for each sampling event will document the results and methods for each sample and analyte along with the quantification limit. The report will also include a copy of the chain-of-custody and an understandable correlation between the chain-of-custody and the sample results reported to the TCEQ. The analytical laboratory report will be submitted either electronically or in hard copy upon TCEQ request.

The Skyline Landfill shall ensure that a data reviewer consider the project data quality objectives as appropriate to determine if the results meet the project needs with respect to completeness, representativeness, and accuracy. Prior to submittal of the data to the Commission all analytical data will be examined to ensure that the data quality objectives are considered and met and that the results representing the samples are accurate and complete. The data will be reviewed, including the laboratory quality control results, the relative percent difference (RPD) of the monitor well results and its duplicate analysis (DUP) as a measure of accuracy. The data review will include a statement assessing data usability by a certified groundwater scientist with respect to the project data quality

objectives (primarily a statistical evaluation of the groundwater analytical data) and, when necessary, provide comment to further explain or supplement the quality control data on the laboratory report. If the facility determines that the analytical data may be utilized, any and all problems and corrective action that the laboratory identified during the analysis will be included in the report submitted to the TCEQ.

A record of laboratory sample receipt, storage and analysis procedures will be kept for each sample received. A summary of this record will be part of the laboratory analysis report. A copy of the NELAC Certified LQM is maintained as part of the facility's SOR. If at any time the site changes analytical laboratories, the new laboratory's LQM will be submitted by the laboratory and the site SOR updated.

Although the QA/QC procedures for use at this facility apply predominantly to groundwater analytical data, it is possible that soil sample analytical results may be reported in the future. If the data is from soils and/or sediment samples, it will be reported on a dry weight basis with the percent solids and the percent moisture reported so that any back calculations of the wet analysis may be performed.

Field Sampling QA/QC

Field and Trip Blanks. If volatile organic compounds (VOCs) are collected during the sampling event, additional QA/QC samples will be collected. A trip and field blank will be utilized during each round of sampling at the site. The trip blank, containing laboratory-grade distilled water or deionized water, will remain packaged and sent from and to the laboratory in the same manner as the site environmental samples. The trip blank will be provided by the analytical laboratory supplying the sample bottles and shipping containers and will remain unopened until analysis. Trip blanks will be analyzed for VOCs only. The field blank will be prepared in the field by pouring the supplied laboratory-grade distilled water or deionized water into one of the clean sample containers opened in the field. The field blank will then be sealed and shipped in the same manner as the environmental samples and typically analyzed for the same parameters.

If non-dedicated sampling equipment is used, an equipment blank will be collected by pouring supplied laboratory-grade distilled water or deionized water through the sampling device after sampling and decontamination into a clean, laboratory-provided sample container opened in the field. The equipment blank will then be sealed, shipped, and analyzed for the same parameters as the groundwater sample.

A field duplicate sample will be obtained to verify precision and accuracy of the laboratory during each routine sampling event. The duplicate sample is collected and analyzed for the same parameters and in the same manner as an environmental sample. Typically, a field duplicate sample is collected from a downgradient well.

Laboratory QA/QC

Analytical Blanks and Spikes. The selected laboratory will use method quality control procedures that are equivalent to those described in SW-846. Duplicate samples, method blanks, instrument/reagent blanks, matrix spikes, blank/water reagent spikes, and surrogate spikes are typical quality control checks performed throughout the analytical laboratory. With the exception of instrument/reagent blanks and surrogate spikes, these checks are performed at a frequency of 5% or 10% (i.e., 1 in 20 samples, 1 in 10 samples). Instrument/reagent blanks and surrogate spikes are performed on a daily or per sample (where required by method) frequency. Each of the applied QC checks will be compared against the acceptance criteria for each QC check to ensure that analytical quality is maintained.

The method blank is a blank solution, which is treated as a sample for the parameter being measured, including all pretreatment/preparation procedures. The blank is then analyzed in the same manner as the environmental samples to assess analytical accuracy and the potential for sample contamination. Instrument/reagent blanks are used on a daily basis (where used) to detect contamination or interferences related to the sample treatment solvents and chemicals and ensure that none of these systematically bias sample results.

Matrix spikes are environmental samples fortified with known concentrations of analytes expected to be in the sample. The percent recovery of any spiked analyte is taken as a measure of the bias of the analytical method caused by the sample matrix. Blank/reagent water spikes are blank solutions fortified with known concentrations of analytes expected to be in environmental samples. These spikes may (reagent water spikes) or may not (blank spike) be taken through the full analytical procedure prior to analysis. The percent recovery of any spiked analyte is taken as a measure of control on the analytical procedure. A surrogate spike is performed on every sample and QC sample where the analytical method requires it. Adding a known compound to the sample, which is not expected to be in the environmental sample, makes a surrogate spike. VOC analysis uses this type of spike to measure method extraction efficiency.

Instrument Calibration. Instruments are calibrated using calibration standards and method specified calibration criteria. A solution containing various compounds of known concentrations is diluted and analyzed to establish calibration curves. Calibration is performed daily or per the method to monitor the accuracy and precision of the instrument. Instrument calibration is verified by analyzing a solution containing a known concentration of the pure compound(s) of interest and comparing it against the calibration curve. The standard compound is taken from the same stock as that used to develop the calibration curve. Calibration verification is done at a 5% frequency (or as the method requires) to check the stability of the calibration curve as well as the accuracy and precision of the system or analyst.

All standards and reagents used in laboratory procedures will be inventoried, labeled, and logged in accordance with documented procedures. All stock standards are purchased as certified primary solutions from reputable, commercial lab suppliers, and prepared from neat chemicals with certified purity. Stock standards are combined and/or diluted into secondary dilution standards, which are then diluted into working standards.

Instrument Maintenance. Routine maintenance is performed and documented for all major instruments. Maintenance schedules to be followed for the major instruments are summarized in the analytical laboratory SOP.

Method Detection Limits (MDLs). The analytical laboratory uses the procedures described in Appendix B to 40 CFR 136 to determine MDLs. Each year, method specific upper and lower precision and accuracy limits are developed from historical matrix spike and duplicate data. MDLs will be checked on an annual basis to determine if a statistical difference exists between the former year's MDL and the yearly update. An appropriate outlier test will be used to determine if a statistical difference exists between the two years' mean values.

Practical Quantitation Limits (PQLs). Practical quantitation limit (PQL) is defined as the lowest concentration reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions, and is considered equivalent to the limit of quantitation (LOQ) described in the most recent NELAC Standard (www.nemc.us/epa12/2003standards.html). The PQL is method, instrument, and analyte specific and may be updated as more data becomes available.

To help ensure these practices will be observed the following information is provided:

- a. The PQL will be below the groundwater protection standard established for each analyte in accordance with 30 TAC §330.409(h) unless approved otherwise by the TCEQ.
- b. The precision and accuracy of the PQL initially will be determined from the PQLs reported over the course of a minimum of eight groundwater monitoring events. The results obtained from these events will be used to demonstrate that the PQLs meet the specified precision and accuracy limits. The PQL may be updated as more data becomes available.

Constituents / Chemicals of Concern	Precision (percent RSD)	Accuracy (percent recovery)
Metals	10	70-130
Volatiles	20	50-150
Semi-Volatiles	30	50-150

- c. The PQL will be supported by analysis of a PQL check sample, consisting of a laboratory reagent grade sample matrix spiked with constituents/chemicals of concern at concentrations equal to or less than the PQL. At a minimum, a PQL check sample will be performed quarterly during the calendar year to demonstrate that the PQL continues to meet the specified limits for precision and accuracy.
- d. Analytical results for data below the limit of detection ("non-detect" results) must be reported as less than the established PQL limit that meets those precision and accuracy requirements.

If a PQL cannot be established according to the specified precision and accuracy limits, the owner or operator will ensure that the laboratory provides sufficient documentation to justify the alternate precision and accuracy limits. This information will be reported to the TCEQ by the owner or operator and will be evaluated on a case-by-case basis.

4 ESTABLISHMENT OF BACKGROUND GROUNDWATER QUALITY

Background groundwater quality will be established for all new and replacement upgradient and downgradient wells in the groundwater monitoring system.

Constituents to be monitored for the establishment of background are listed in Table 4-1. This background constituent list, as required by §330.419, consists of constituents listed in 40 CFR Part 258, Appendix I.

In order to establish background concentrations for each constituent listed in Table 4-1, eight (8) statistically independent samples will be collected from each new or replacement monitoring well (upgradient and downgradient) in the groundwater monitoring system. Background monitoring samples will be collected and analyzed on a quarterly basis for two years. The statistical independence of samples will be achieved through the assignment of a proper sampling interval. Pursuant to the TCEQ guidance document, the appropriate time interval between sampling events can be estimated through the use of site-specific groundwater velocities to determine what time "fresh" formation groundwater will be found in the monitoring well after initial sampling.

For slow recovery wells that have not completed background collection within two years (due to lack of sufficient groundwater for sampling), the wells will then be sampled, or attempted to be sampled, for background during the subsequent regularly scheduled semi-annual events.

Based on existing data from piezometers and monitoring wells previously installed at the site, the groundwater velocity has been estimated to be approximately 2.0×10^{-4} ft/yr. This extremely slow rate is the result of water moving through the cracks and fissures in the clays at the site. Typically, the piezometers were installed dry and considerable time elapsed (several months) before water accumulated in the piezometer casings. Therefore, the procedure for collecting the independent samples will be to collect samples during each calendar quarter until a minimum of eight samples have been obtained. This method of sample collection will provide data to assess seasonal variations in groundwater quality. If additional samples are needed to adequately perform the statistical analysis procedure (discussed below), they will be collected no more frequently than quarterly.

Background constituent concentrations for each parameter listed in Table 4-1 will be derived from the analytical results. For the constituents that are in control, the background data set will be updated to control or correct for seasonal and spatial variability as well as temporal correlation in the data (30 TAC §330.405(f)(6)) no more frequently than every two (2) years if approved by the TCEQ.

On completion of background monitoring and during background updates, the facility will evaluate the background data to ensure that the data are representative of background groundwater constituent concentrations unaffected by waste disposal activities or other

sources of contamination. The evaluation will be documented in a report and submitted to the TCEQ before the next subsequent groundwater monitoring event following the updated (or initial) background period.

4.1 Statistical Methodology

The statistical approach presented in this GWSAP was developed through the interaction of a qualified statistician (Dr. Robert Gibbons, professor at the University of Illinois, Chicago) and the USA Waste Corporate Director of Hydrogeology. The use of intra-well statistical comparisons for evaluation of groundwater chemistry data is supported by the USEPA and is in widespread use.

4.1.1 Volatile Organic Compounds

It is well known that when a landfill facility actually produces a release to groundwater, multiple constituents contained in the leachate are associated with the source fluids and are subsequently detected by the groundwater monitoring program. A single constituent at very low concentration (i.e., below the PQL) typically is not the signature that is produced from an actual release from a municipal solid waste landfill (MSWLF) unit.

VOC detections may be indicators of a release from a MSWLF unit. Because these compounds are not routinely detected in background groundwater samples, establishing monitor well-specific limits for VOCs is generally not an option. Therefore, detection decision rules based on laboratory-specific PQLs will be used. Although this simple comparison to a fixed limit is not statistically based, a VOC detected and verified at a concentration above the PQL is considered statistically significant.

4.1.2 Inorganic Parameters

The statistical analysis methodology for inorganic parameters with a detection frequency greater than 25% will be based on a combined Shewhart-cumulative sum (CUSUM) control chart that is capable of detecting both sudden and gradual changes in groundwater chemistry (Gibbons, 1992; Gibbons, 1994). Combined Shewhart-CUSUM control charts will be constructed for each well and parameter monitored to provide a statistical/visual tool for detecting trends and abrupt changes in inorganic groundwater chemistry. For inorganic parameters with a detection frequency less than or equal to 25%, calculation of non-parametric or Poisson prediction limits will be conducted. Some facilities may require alternate methods (such as normal prediction limits) based on the number of statistical comparisons required for the site and the alternatives allowed to manage the site-wide false positive and false negative rates.

The combined Shewhart-CUSUM procedure requires a minimum of eight (8) historical independent samples (i.e., background data) to provide a reliable estimate of the mean and standard deviation of each constituent in each well. The combined Shewhart-CUSUM control chart procedure assumes that the data are independent and normally distributed with a fixed mean and constant variance. Shewhart-CUSUM control charts are not recommended for data sets of less than eight (8) independent samples except as time-

series plots and evaluation of trends. Once background data are obtained from each detection monitoring well, subsequent sample results are statistically compared to the estimated control limit both in terms of their absolute magnitude and cumulative sum. If necessary, the statistical method will include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.

If all inorganic parameter data collected during the background period (minimum of eight [8] independent events) are not detected in concentrations greater than the respective PQLs, the PQL will be used as the non-parametric prediction limit. The collection of 13 samples in background for this detection frequency provides a 99% confidence non-parametric prediction limit with one resample. Note that 99% confidence is equivalent to a 1% false positive rate and pertains to a single comparison (that is, well and constituent) and not the site-wide error rate (all wells and constituents), which is set to 5%. If the detection frequency is greater than zero but less than 25%, the non-parametric prediction limit is the largest of the 13 background samples (for 1 verification resample) or 8 background samples if a "pass 1 of 2" verification resampling program is implemented.

5 DETECTION MONITORING

The Detection Monitoring Program is summarized in the following subsections.

5.1 Groundwater Detection Monitoring Parameters

In accordance with §330.419, parameters that will be monitored during detection monitoring are found in 40 CFR Part 258, Appendix I. The site-specific detection monitoring constituent list has been included as Table 5-1.

In accordance with 30 TAC §330.419(b), those constituents “not reasonably expected to be in or derived from the waste contained in the unit” may be deleted from the detection monitoring list with approval from the executive director. At a future date, when leachate data are further evaluated, the detection monitoring parameter list may be revised to exclude compounds not found in the site leachate in sufficient quantity for statistical contrast.

In addition to the parameter list required for statistical analysis, WMTX may continue to monitor the water quality parameters listed in Table 5-2 but the results will not be included in statistical analyses.

5.2 Groundwater Detection Monitoring Frequency

After the establishment of background groundwater quality (refer to Section 4), the detection monitoring frequency for all constituents found in 40 CFR Part 258, Appendix I, identified in Table 5-1 will be semi-annual during the active life, closure, and post-closure care periods of the site, unless an alternate frequency is approved by the TCEQ.

5.3 Reporting Requirements

Within 60 days of each groundwater sampling event, a determination will be made whether an apparent or verified exceedance of a statistically calculated background limit has occurred. “Apparent SSI” and “apparent exceedance” correspond to the statistically significant increase (SSI) referred to in the first sentence of 30 TAC §330.407(b), and are based on the statistical evaluation of an initial sample during a detection monitoring event that has not yet been confirmed by verification resampling. An SSI over background of any tested constituent at any monitoring well will be verified in accordance with verification resampling portion of the statistical methodology described in Section 4.1. If an apparent SSI is observed, the executive director and any local pollution agency with jurisdiction that has requested notification will be notified in writing within 14 days of the apparent SSI determination. If an apparent SSI of any tested constituent at any monitoring well has

occurred, the following actions will be initiated, as appropriate for each separate apparent SSI incident, in accordance with 30 TAC §330.407(b).

(1) The facility shall immediately place a notice in the SOR describing the release and establish an assessment monitoring program meeting the requirements of §330.409 within 90 days of the date of the notice to the TCEQ, except as provided in (2) and (3) below:

(2) The facility shall submit results of resampling as appropriate for the statistical method within 60 days of determining the apparent SSI. The resample data may be used to statistically confirm or disprove the apparent SSI.

(3) If a SSI over background of any tested constituent at any monitoring well has occurred and the owner or operator has reasonable cause to think that a source other than a landfill unit caused the contamination or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality, then the owner may submit a report documenting the error or alternate source in accordance with §330.407(b)(3), as follows:

(A) Notify, in writing, the executive director and any local pollution agency with jurisdiction that has requested to be notified within 14 days of determining the SSI that the owner will make a demonstration of alternate source.

(B) Submit the demonstration, prepared and certified by a qualified groundwater scientist, within 90 days of SSI determination.

(C) Do not filter the sample for constituents addressed by the demonstration prior to laboratory analysis.

(D) Continue detection monitoring.

If the owner/operator does not make a demonstration satisfactory to the executive director within 90 days of the date of notice, as evidenced by a letter of denial from the TCEQ, the owner/operator shall initiate an assessment monitoring program at the well(s) exhibiting the SSI and at the immediately adjacent wells on each side of the well(s), unless an alternative subset of wells is designated by the TCEQ. If the facility receives a response that a demonstration is not satisfactory after the deadline for initiating assessment monitoring, then assessment monitoring will be initiated at the next regularly scheduled semi-annual monitoring event following receipt of the response.

5.3.1 Annual Report

Annually, within 90 days after the facility's last groundwater monitoring event in a calendar year, a report will be submitted that includes the following information gathered since the previous annual report:

(1) A statement regarding SSI(s) in any well and the status of same.

(2) The results of all groundwater monitoring, testing, and analytical work obtained or prepared under the requirements of the permit in hard copy format on form TCEQ-0312 – Groundwater Sampling Report, and any other format requested by the executive director (e.g., electronic files). The report will include a copy of the LCN, with either a laboratory checklist or a copy of the laboratory QA/QC data. The analytical data may be submitted in either hard copy or electronic format. A summary of background groundwater quality values, groundwater monitoring analyses, and statistical calculations, as well as graphs and drawings, will also be included.

(3) The facility will explain any problems or observed anomalies associated with the analysis by attaching additional information to the checklist or LCN.

(4) Any information required in the LCN that cannot be completed by the laboratory will be completed by the operator.

(5) Groundwater flow rate and direction in the uppermost aquifer, using the previous year's data collected, including documentation used to determine the flow rate and direction.

(6) Contour map(s) of piezometric water levels in the uppermost aquifer based on concurrent measurements at all monitoring wells, including supporting data.

(7) Any recommendations for changes to the groundwater monitoring program.

(8) Any other items requested by the executive director.

Figure 2-1 - Field Information Form
(For informational purposes only. Actual may vary.)

Figure 2-2 - Chain of Custody

(For informational purposes only. Actual may vary.)



Severn Trent Laboratories, Inc.

Chain of Custody Record

STL-4124 (07/01)

Client		Project Manager		Date		Chain of Custody Number	
Address		Telephone Number (Area Code)/Fax Number		Lab Number		Page <u>036068</u> of <u> </u>	
City	State	Zip Code	Slip Contact	Lab Contact	Analysis (Attach list if more space is needed)		
Project Name and Location (State)			Carrier/Weight Number		Special Instructions/ Conditions of Receipt		
Contract/Purchase Order/Quote No.			Main				
Sample ID, No. and Description (Roundness for each sample may be combined on one line)	Date	Time	Containers & Preservatives	<input type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Corrosive <input type="checkbox"/> Volatile <input type="checkbox"/> Toxic <input type="checkbox"/> Other <input type="checkbox"/> 24 Hours <input type="checkbox"/> 48 Hours <input type="checkbox"/> 7 Days <input type="checkbox"/> 14 Days <input type="checkbox"/> 21 Days <input type="checkbox"/> Other			
Possible Hazard Identification			Sample Disposal		<input type="checkbox"/> Return to Client <input type="checkbox"/> Dispose by Lab <input type="checkbox"/> Archive For _____ Months <input type="checkbox"/> 24 Hours <input type="checkbox"/> 48 Hours <input type="checkbox"/> 7 Days <input type="checkbox"/> 14 Days <input type="checkbox"/> 21 Days <input type="checkbox"/> Other		
Turn Around Time Required			1. Relinquished By		Date	Time	Time
			2. Relinquished By		Date	Time	Time
			3. Relinquished By		Date	Time	Time
Comments							

(A log may be accessed if samples are released longer than 3 months)

QC Requirements (Specify)

DISTRIBUTION: WHITE - Stays with the Sample; CANARY - Returned to Client with Report; PINK - Field Copy

Laboratory Data Package Cover Page

This data package consists of:

- This signature page, the laboratory review checklist, and the following reportable data:
- R1 Field chain-of-custody documentation;
- R2 Sample identification cross-reference;
- R3 Test reports (analytical data sheets) for each environmental sample that includes:
 - a) Items specified in NELAC Chapter 5 for reporting results, e.g., Section 5.5.10 in 2003 NELAC Standard
 - b) dilution factors,
 - c) preparation methods,
 - d) cleanup methods, and
 - e) if required for the project, tentatively identified compounds (TICs).
- R4 Surrogate recovery data including:
 - a) Calculated recovery (%R), and
 - b) The laboratory's surrogate QC limits.
- R5 Test reports/summary forms for blank samples;
- R6 Test reports/summary forms for laboratory control samples (LCSs) including:
 - a) LCS spiking amounts,
 - b) Calculated %R for each analyte, and
 - c) The laboratory's LCS QC limits.
- R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
 - a) Samples associated with the MS/MSD clearly identified,
 - b) MS/MSD spiking amounts,
 - c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
 - d) Calculated %Rs and relative percent differences (RPDs), and
 - e) The laboratory's MS/MSD QC limits
- R8 Laboratory analytical duplicate (if applicable) recovery and precision:
 - a) the amount of analyte measured in the duplicate,
 - b) the calculated RPD, and
 - c) the laboratory's QC limits for analytical duplicates.
- R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;
- R10 Other problems or anomalies.
- The Exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

Release Statement: I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Check, if applicable: [] This laboratory is an in-house laboratory controlled by the person responding to rule. The official signing the cover page of the rule-required report (for example, the APAR) in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name (Printed)	Signature	Official Title (printed)	Date

Laboratory Review Checklist: Reportable Data							
Laboratory Name:			LRC Date:				
Project Name:			Laboratory Job Number:				
Reviewer Name:			Prep Batch Number(s):				
# ¹	A ²	Description	Yes	No	NA ³	NR ⁴	ER# ⁵
		Chain-of-custody (C-O-C)					
R1	OI	Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? Were all departures from standard conditions described in an exception report?					
		Sample and quality control (QC) identification					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers? Are all laboratory ID numbers cross-referenced to the corresponding QC data?					
R3	OI	Test reports					
		Were all samples prepared and analyzed within holding times? Other than those results < MQL, were all other raw values bracketed by calibration standards? Were calculations checked by a peer or supervisor? Were all analyte identifications checked by a peer or supervisor? Were sample quantitation limits reported for all analytes not detected? Were all results for soil and sediment samples reported on a dry weight basis? Were % moisture (or solids) reported for all soil and sediment samples? If required for the project, TICs reported?					
R4	O	Surrogate recovery data					
		Were surrogates added prior to extraction? Were surrogate percent recoveries in all samples within the laboratory QC limits?					
R5	OI	Test reports/summary forms for blank samples					
		Were appropriate type(s) of blanks analyzed? Were blanks analyzed at the appropriate frequency? Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? Were blank concentrations < MQL?					
R6	OI	Laboratory control samples (LCS):					
		Were all COCs included in the LCS? Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? Were LCSs analyzed at the required frequency? Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs? Was the LCSD RPD within QC limits?					
R7	OI	Matrix spike (MS) and matrix spike duplicate (MSD) data					
		Were the project/method specified analytes included in the MS and MSD? Were MS/MSD analyzed at the appropriate frequency? Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? Were MS/MSD RPDs within laboratory QC limits?					
R8	OI	Analytical duplicate data					
		Were appropriate analytical duplicates analyzed for each matrix? Were analytical duplicates analyzed at the appropriate frequency? Were RPDs or relative standard deviations within the laboratory QC limits?					
R9	OI	Method quantitation limits (MQLs):					
		Are the MQLs for each method analyte included in the laboratory data package? Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? Are unadjusted MQLs included in the laboratory data package?					
R10	OI	Other problems/anomalies					
		Are all known problems/anomalies/special conditions noted in this LRC and ER? Were all necessary corrective actions performed for the reported data? Was applicable and available technology used to lower the SQL and minimize the matrix interference effects on the sample results?					

Laboratory Review Checklist: Supporting Data

Laboratory Name:		LRC Date:					
Project Name:		Laboratory Job Number:					
Reviewer Name:		Prep Batch Number(s):					
# ¹	A ²	Description	Yes	No	NA ³	NR ⁴	ER# ⁵
S1	OI	Initial calibration (ICAL)					
		Were response factors and/or relative response factors for each analyte within QC limits?					
		Were percent RSDs or correlation coefficient criteria met?					
		Was the number of standards recommended in the method used for all analytes?					
		Were all points generated between the lowest and highest standard used to calculate the curve?					
		Are ICAL data available for all instruments used?					
		Has the initial calibration curve been verified using an appropriate second source standard?					
S2	OI	Initial and continuing calibration verification (ICCV and CCV) and CCB⁶ :					
		Was the CCV analyzed at the method-required frequency?					
		Were percent differences for each analyte within the method-required QC limits?					
		Was the ICAL curve verified for each analyte?					
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?					
S3	O	Mass spectral tuning:					
		Was the appropriate compound for the method used for tuning?					
		Were ion abundance data within the method-required QC limits?					
S4	O	Internal standards (IS):					
		Were IS area counts and retention times within the method-required QC limits?					
S5	OI	Raw data (NELAC Section 1 Appendix A Glossary, and Section 5)					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?					
		Were data associated with manual integrations flagged on the raw data?					
S6	O	Dual column confirmation					
		Did dual column confirmation results meet the method-required QC?					
S7	O	Tentatively identified compounds (TICs):					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?					
S8	I	Interference Check Sample (ICS) results:					
		Were percent recoveries within method QC limits?					
S9	I	Serial dilutions, post digestion spikes, and method of standard additions					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?					
S10	OI	Method detection limit (MDL) studies					
		Was a MDL study performed for each reported analyte?					
		Is the MDL either adjusted or supported by the analysis of DCSs?					
S11	OI	Proficiency test reports:					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?					
S12	OI	Standards documentation					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?					
S13	OI	Compound/analyte identification procedures					
		Are the procedures for compound/analyte identification documented?					
S14	OI	Demonstration of analyst competency (DOC)					
		Was DOC conducted consistent with NELAC Chapter 5C?					
		Is documentation of the analyst's competency up-to-date and on file?					
S15	OI	Verification/validation documentation for methods (NELAC Chapter 5)					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?					
S16	OI	Laboratory standard operating procedures (SOPs):					
		Are laboratory SOPs current and on file for each method performed?					

Laboratory Review Checklist: Exception Reports	
Laboratory Name:	LRC Date:
Project Name:	Laboratory Job Number:
Reviewer Name:	Prep Batch Number(s):
ER # ⁵	DESCRIPTION

1. Items identified by the letter "R" must be available as a hard copy or as a .pdf file. Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable).
3. NA = Not applicable.
4. NR = Not reviewed.
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).
6. CCB = Continuing Calibration Blank.

TABLES

Table 2-1 - Sample Collection, Preservation, and Holding Times

<u>Parameter</u> ¹	<u>Sample Collection</u> ² <u>And Container</u>	<u>Sample</u> ^{3,4} <u>Preservation</u>	<u>Recommended</u> ⁵ <u>Holding Time</u>
Acid Extractables	1000 ml Glass, only (Amber) w/Teflon liner	Cool, 4°C	Extract within 7 days; analyze within 40 days
Alkalinity	100 ml P, G	Cool, 4°C	14 days
Ammonia	125 ml P, G	Cool, 4°C H ₂ SO ₄ to pH<2	28 days
Base/Neutral Extractables (priority pollutants)	1000 ml Glass, only (Amber) w/Teflon liner	Cool, 4°C	Extract within 7 days; analyze within 40 days
Biochemical Oxygen Demand, 5 day (BOD ₅)	1000 ml P, G	Cool, 4°C	48 hours
Calcium	500 ml P	HNO ₃ to pH<2	6 months
Chemical Oxygen Demand (COD)	125 ml P, G	Cool, 4°C H ₂ SO ₄ to pH<2	28 days
Chloride	250 ml P, G	None required	28 days
Coliform, fecal and total	100 ml P, G sterilized	Cool, 4°C	24 hours
Cyanide	1000 ml P, G	Cool, 4°C NaOH to pH>12 0.6 g ascorbic acid ⁶	14 days ⁷
Fluoride	250 ml P	None required	28 days
Hardness	100 ml P, G	HNO ₃ to pH<2	6 months
<u>Metals</u> Chromium (hexavalent)	200 ml P, G	Cool, 4°C	24 hours
Mercury (dissolved)	1000 ml P, G	Filter on site HNO ₃ to pH<2	28 days
Mercury (total)	1000 ml P, G	HNO ₃ to pH<2	28 days

Table 2-1 - Sample Collection, Preservation, and Holding Times

<u>Parameter</u> ¹	<u>Sample Collection</u> ² <u>And Container</u>	<u>Sample</u> ^{3, 4} <u>Preservation</u>	<u>Recommended</u> ⁵ <u>Holding Time</u>
Other metals, (dissolved) (Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium Vanadium, Zinc)	1000 ml P, G	Filter on site HNO ₃ to pH<2	6 months
Other metals, (total) (Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, Zinc)	1000 ml P, G	HNO ₃ to pH<2	6 months
Nitrate ⁷	125 ml P, G	Cool, 4°C	28 days
Nitrite	125 ml P, G	Cool, 4°C	48 hours
Oil and Grease	1000 ml, G only	Cool, 4°C H ₂ SO ₄ to pH<2	28 days
PCB (priority pollutant)	1000 ml, Glass only Amber w /Teflon liner	Cool, 4°C	Extract within 7 days; analyze within 40 days
Pesticides (Endrin, Lindane, Toxaphene, Methoxychlor	1000 ml, Glass only Amber w /Teflon liner	Cool, 4°C pH 5 - 9	Extract within 7 days; analyze within 40 days
pH (field)	25 ml P, G	None required	Analyze immediately
Phenols	500 ml G only	Cool, 4°C H ₂ SO ₄ to pH<2	28 days

Table 2-1 - Sample Collection, Preservation, and Holding Times

<u>Parameter</u> ¹	<u>Sample Collection</u> ² <u>And Container</u>	<u>Sample</u> ^{3,4} <u>Preservation</u>	<u>Recommended</u> ⁵ <u>Holding Time</u>
Phosphorous (total)	125 ml P, G	Cool 4°C H ₂ SO ₄ to pH<2	28 days
Semi-Volatile Organics	1000 ml, G	Cool, 4°C	7 days
Specific Conductance (field)	100 ml P, G	None required	Analyze immediately
Sulfate	50 ml P, G	Cool, 4°C	28 days
Temperature (field)	1000 ml P, G	None required	Analyze immediately
Total Dissolved Solids Residue on Evaporation (TDS/ROE) 180° C	1000 ml P	Cool, 4°C	7 days
Total Organic Carbon (TOC)	2-40 ml P	Cool, 4°C H ₂ SO ₄ to pH<2	28 days
Total Suspended Solids (TSS)	1000 ml P	Cool, 4°C	7 days
Volatile Organic Acids, priority pollutants	4-40 ml glass vial w/septum caps	Cool, 4°C HCl to pH<2	14 days
Volatile Organics	4-40 ml glass vial w/septum caps	Cool, 4°C HCl to pH<2	14 days

- Table may include more parameters than required for groundwater sampling. A general discussion on sampling water and industrial wastewater may be found in ASTM, Part 31, pages 72-81 (1976) Method D-3370.
- Plastic (P) or Glass (G). For metals, polyethylene with a polypropylene cap (no liner) is preferred.
- Sample preservation should be performed immediately upon sample collection. For composite samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then samples may be preserved by maintaining at 4 degrees C until compositing and sample splitting is completed.
- When any sample is to be shipped by common carrier or sent through the United States mail, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. The Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); nitric acid (HNO₃) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); sulfuric acid (H₂SO₄) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).
- Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still considered valid. Samples may be held for longer periods only if the permittee, or monitoring laboratory, has data on file to show that the specific types of sample under study are stable for the longer time, and has received a variance from the Regional Administrator. Some samples may not be stable for the maximum time period given in the table. A permittee, or monitoring laboratory, is obligated to hold the sample for a shorter time if knowledge exists to show this is necessary to maintain sample stability.
- Should only be used in the presence of residual chlorine.
- Maximum holding time is 24 hours when sulfide is present. Optionally, all samples may be tested with lead acetate paper before the pH adjustment in order to determine if sulfide is present. If sulfide is present, it can be removed by the addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.
- Sample preservation, handling, and analysis will meet the specifications described by "Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Third Edition (as revised)" (EPA Publication Number SW-846, 1986, December 1987, as revised) or an equivalent substitute.

Table 3-1 - Methodologies for Testing and Analysis*

<u>Parameter</u>	<u>Method Description</u>	<u>Method</u>
Acid Extractables (priority pollutants)	GC/MS	8270 (D)
Alkalinity	Colorimetric, Automated Methyl Orange	(A) 310.1
Ammonia	Colorimetric; Automated Phenate	(A) 350.1
Base/Neutral Extractables (priority pollutants)	GC/MS	8270 (D)
Biochemical Oxygen Demand, 5 day (BOD ₅)	BOD (5 day, 20°C)	(A) 405.1
Calcium	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Chemical Oxygen Demand (COD)	Colorimetric	(A) 410.4
Chloride	Colorimetric, Automated Ferricyanide	(A) 325.2/300.0 A
Coliform (fecal)	Delayed Incubation Procedure	(B) 909 C
Coliform (total)	Standard Membrane Filter Procedure	(B) 909 A
Cyanide (total)	Colorimetric, Automated UV	(A) 335.3/9012 (D)
Fluoride	Potentiometric, Ion Selective Electrode	(A) 340.2
Hardness	Calculation	(C) 2340 B

Table 3-1 - Methodologies for Testing and Analysis*

<u>Parameter</u>	<u>Method Description</u>	<u>Method</u>
<u>Metals, Dissolved</u>		
Arsenic	Atomic Absorption, furnace technique, ICP	(A) 206.2/6010 (D)
Barium	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Boron	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Cadmium	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Chromium	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Chromium (hex)	Atomic Absorption, Chelation, extraction, ICP	(A) 218.4/6010 (D)
Iron	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Lead	Atomic Absorption, furnace technique, ICP	(A) 239.2/6010 (D)
Magnesium	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Manganese	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Mercury	Atomic Absorption, cold vapor technique, ICP	(A) 245.2/7470 (D)
Nickel	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Potassium	Atomic Absorption, direct aspiration, ICP	(A) 258.1/6010 (D)
Selenium	Atomic Absorption, furnace technique, ICP	(A) 270.2/6010 (D)
Silver	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Sodium	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Thallium	Atomic Absorption, furnace technique, ICP	(A) 279.2/6020/6010
Vanadium	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Zinc	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)

Table 3-1 - Methodologies for Testing and Analysis*

<u>Parameter</u>	<u>Method Description</u>	<u>Method</u>
Metals, Total		
Antimony	Atomic Emission Spectrometric, ICP	(A) 200.7/6010/6020 (D)
Arsenic	Atomic Absorption, furnace technique, ICP	(A) 206.2/6010 (D)
Barium	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Beryllium	Atomic Emission Spectrometric, ICP	(A) 200.7/60106020 (D)
Boron	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Cadmium	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Chromium	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Cobalt	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Copper	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Iron	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Lead	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Magnesium	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Manganese	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Mercury	Atomic Emission Spectrometric, ICP	(A) 200.7/6010/7470 (D)
Nickel	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Potassium	Atomic Absorption, direct aspiration, ICP	(A) 258.1/6010 (D)
Selenium	Atomic Absorption, furnace technique, ICP	(A) 270.2/60106020 (D)
Silver	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Sodium	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Thallium	Atomic Absorption, furnace technique, ICP	(A) 279.2/6020/6010
Vanadium	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)
Zinc	Atomic Emission Spectrometric, ICP	(A) 200.7/6010 (D)

Table 3-1 - Methodologies for Testing and Analysis*

Parameter	Method Description	Method
Nitrate	Colorimetric, Automated, Hydrazine Reduction	(A) 353.1/353.2
Nitrite	Colorimetric, Automated, Hydrazine Reduction	(A) 353.1/353.2
Oil and Grease	Gravimetric, Separatory Funnel Extraction or Spectrometric, Infrared	(A) 413.1/9070 (D) or (A) 413.2
PCB (priority pollutants)	Gas Chromatograph	8270 (B)/8080 (D)
Pesticides	Gas Chromatograph	8270 (B)/8080 (D)
pH (field)	Electrometric	(A) 150.1
Phenols	Colorimetric, Automated 4-AAP with Distillation	(A) 420.2/9066 (D)
Phosphorous	Colorimetric, Automated Ascorbic Acid	(A) 365.4
Semi-Volatile Organics	GC/MS Acids & Base Neutrals	8270 (D)
Specific Conductance (field)	Wheatstone bridge	(A) 120.1
Sulfate	Turbidimetric	(A) 375.2/9038/300.0
Temperature (field)	Reversing Thermometer	(B) 212
Total Dissolved Solids Residue on Evaporation (TDS/ROE)	Gravimetric, Dried at 180°C	(A) 160.1
Total Organic Carbon (TOC)	Combustion or Oxidation	(A) 415.1
Total Suspended Solids (TSS)	Gravimetric, Dried at 103°-105°C	(A) 160.2
Volatile Organic Acids (PP/VOA), priority pollutants	Purge and Trap/GC/MS	8240 (D)/8260 (D)
Volatile Organics	Purge and Trap/GC/MS	8240 (D)/8260 (D)
DBCP, EDB	Microextraction	8260 (D)

*NOTE: On occasion, the analytical methods listed above may be substituted provided that they are appropriate for groundwater sampling, and accurately measure hazardous constituents and other monitoring parameters in groundwater samples.

References:

- A: Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-0920, EMSL, Cincinnati, Revision (March 1983).
- B: Standard Methods for the Examination of Water and Wastewaters, 15th Edition, APHA-AQWQA-WPCF, 1980.
- C*: Standard Methods for the Examination of Water and Wastewaters, 18th Edition, APHA-AWWA-WEF, 1992.
- D: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, Final Update 1, July 1992 (as revised).

Table 4-1 - Skyline Landfill - Background Groundwater Quality Parameter List*		
		CAS RN
Total Metals		
(1)	Antimony	Total
(2)	Arsenic	Total
(3)	Barium	Total
(4)	Beryllium	Total
(5)	Cadmium	Total
(6)	Chromium	Total
(7)	Cobalt	Total
(8)	Copper	Total
(9)	Lead	Total
(10)	Nickel	Total
(11)	Selenium	Total
(12)	Silver	Total
(13)	Thallium	Total
(14)	Vanadium	Total
(15)	Zinc	Total
Organic Constituents		
(16)	Acetone	67-64-1
(17)	Acrylonitrile	107-13-1
(18)	Benzene	71-43-2
(19)	Bromochloromethane	74-97-5
(20)	Bromodichloromethane	75-27-4
(21)	Bromoform (tribromomethane)	75-25-2
(22)	Carbon disulfide	75-15-0
(23)	Carbon tetrachloride	56-23-5
(24)	Chlorobenzene	108-90-7
(25)	Chloroethane (ethyl chloride)	75-00-3
(26)	Chloroform (trichloromethane)	67-66-3
(27)	Dibromochloromethane (chlorodibromomethane)	124-48-1
(28)	1,2-Dibromo-3-chloropropane (DBCP)	96-12-8
(29)	1,2-Dibromoethane (ethylene dibromide, EDB)	106-93-4
(30)	o-Dichlorobenzene (1,2-dichlorobenzene)	95-50-1
(31)	p-Dichlorobenzene (1,4-dichlorobenzene)	106-46-7
(32)	trans- 1,4-Dichloro-2-butene	110-57-6

Table 4-1 - Skyline Landfill - Background Groundwater Quality Parameter List*		
		CAS RN
(33)	1,1-Dichloroethane (ethyldidene chloride)	75-34-4
(34)	1,2-Dichloroethane (ethylene dichloride)	107-06-2
(35)	1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride)	75-35-4
(36)	cis-1,2-Dichloroethylene (cis- 1,2-dichloroethene)	156-59-2
(37)	trans-1,2-Dichloroethylene (trans- 1,2-dichloroethene)	156-60-5
(38)	1,2-Dichloropropane (Propylene dichloride)	78-87-5
(39)	cis- 1,3-Dichloropropene	10061-01-5
(40)	trans- 1,3-Dichloropropene	10061-02-6
(41)	Ethylbenzene	10041-4
(42)	2-Hexanone (methyl butyl ketone)	591-78-6
(43)	Methyl bromide (bromomethane)	74-83-9
(44)	Methyl chloride (chloromethane)	74-87-3
(45)	Methylene bromide (dibromomethane)	74-95-3
(46)	Methylene chloride (dichloromethane)	75-09-2
(47)	Methyl ethyl ketone (MEK, 2-butanone)	78-93-3
(48)	Methyl iodide (iodomethane)	74-88-4
(49)	4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1
(50)	Styrene	100-42-5
(51)	1,1,1,2-Tetrachloroethane	630-20-6
(52)	1,1,2,2-Tetrachloroethane	79-34-5
(53)	Tetrachloroethylene (tetrachloroethane, perchloroethylene)	127-18-4
(54)	Toluene	108-88-3
(55)	1,1,1-Trichloroethane (methylchloroform)	71-55-6
(56)	1,1,2-Trichloroethane	79-00-5
(57)	Trichloroethylene (trichloroethene)	79-01-6
(58)	Trichlorofluoromethane (CFC-11)	75-69-4
(59)	1,2,3-Trichloropropane	96-18-4
(60)	Vinyl acetate	108-05-4
(61)	Vinyl chloride	75-01-4
(62)	Xylenes (total)	1330-20-7

Table 5-1 - Skyline Landfill - Detection Monitoring Parameter List*

		CAS RN
Total Metals		
(1)	Antimony	Total
(2)	Arsenic	Total
(3)	Barium	Total
(4)	Beryllium	Total
(5)	Cadmium	Total
(6)	Chromium	Total
(7)	Cobalt	Total
(8)	Copper	Total
(9)	Lead	Total
(10)	Nickel	Total
(11)	Selenium	Total
(12)	Silver	Total
(13)	Thallium	Total
(14)	Vanadium	Total
(15)	Zinc	Total
Organic Constituents		
(16)	Acetone	67-64-1
(17)	Acrylonitrile	107-13-1
(18)	Benzene	71-43-2
(19)	Bromochloromethane	74-97-5
(20)	Bromodichloromethane	75-27-4
(21)	Bromoform (tribromomethane)	75-25-2
(22)	Carbon disulfide	75-15-0
(23)	Carbon tetrachloride	56-23-5
(24)	Chlorobenzene	108-90-7
(25)	Chloroethane (ethyl chloride)	75-00-3
(26)	Chloroform (trichloromethane)	67-66-3
(27)	Dibromochloromethane (chlorodibromomethane)	124-48-1
(28)	1,2-Dibromo-3-chloropropane (DBCP)	96-12-8
(29)	1,2-Dibromoethane (ethylene dibromide, EDB)	106-93-4
(30)	o-Dichlorobenzene (1,2-dichlorobenzene)	95-50-1
(31)	p-Dichlorobenzene (1,4-dichlorobenzene)	106-46-7

Table 5-1 - Skyline Landfill - Detection Monitoring Parameter List*

		CAS RN
(32)	trans- 1,4-Dichloro-2-butene	110-57-6
(33)	1,1-Dichloroethane (ethylidene chloride)	75-34-4
(34)	1,2-Dichloroethane (ethylene dichloride)	107-06-2
(35)	1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride)	75-35-4
(36)	cis-1,2-Dichloroethylene (cis- 1,2-dichloroethene)	156-59-2
(37)	trans-1,2-Dichloroethylene (trans- 1,2-dichloroethene)	156-60-5
(38)	1,2-Dichloropropane (Propylene dichloride)	78-87-5
(39)	cis- 1,3-Dichloropropene	10061-01-5
(40)	trans- 1,3-Dichloropropene	10061-02-6
(41)	Ethylbenzene	10041-4
(42)	2-Hexanone (methyl butyl ketone)	591-78-6
(43)	Methyl bromide (bromomethane)	74-83-9
(44)	Methyl chloride (chloromethane)	74-87-3
(45)	Methylene bromide (dibromomethane)	74-95-3
(46)	Methylene chloride (dichloromethane)	75-09-2
(47)	Methyl ethyl ketone (MEK, 2-butanone)	78-93-3
(48)	Methyl iodide (iodomethane)	74-88-4
(49)	4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1
(50)	Styrene	100-42-5
(51)	1,1,1,2-Tetrachloroethane	630-20-6
(52)	1,1,2,2-Tetrachloroethane	79-34-5
(53)	Tetrachloroethylene (tetrachloroethane, perchloroethylene)	127-18-4
(54)	Toluene	108-88-3
(55)	1,1,1-Trichloroethane (methylchloroform)	71-55-6
(56)	1,1,2-Trichloroethane	79-00-5
(57)	Trichloroethylene (trichloroethene)	79-01-6
(58)	Trichlorofluoromethane (CFC-11)	75-69-4
(59)	1,2,3-Trichloropropane	96-18-4
(60)	Vinyl acetate	108-05-4
(61)	Vinyl chloride	75-01-4
(62)	Xylenes (total)	1330-20-7

Table 5-2 - Skyline Landfill - Water Quality Parameters	
Calcium	Dissolved
Magnesium	Dissolved
Sodium	Dissolved
Potassium	Dissolved
Iron	Dissolved
Chromium	Dissolved
Chloride	
Sulfate	
Total Alkalinity	
Ammonia, Nitrogen	
Total Dissolved Solids	

Note: Additional information is provided in Section 5.1.