APPLICATION FOR A PERMIT TO CONSTRUCT AND OPERATE A CLASS I LANDFILL FACILITY

MONITORING PLAN

REVISION 3

JUNGO DISPOSAL SITE
Humboldt County, Nevada

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1.0 INTRODUCTION

Environmental monitoring will be completed during the development of the Jungo Disposal Site and following closure. Environmental monitoring will include groundwater monitoring, leachate monitoring, and landfill gas monitoring. Surface water monitoring will not be completed because there is no nearby surface water body. However, storm water monitoring will be completed in accordance with NPDES requirements.

1.1 Location and Setting

The proposed Facility is located in the southern portion of Desert Valley, south of the groundwater divide that bisects the valley. The regional groundwater flow direction in the vicinity of the site has been documented to be toward the southwest (Berger, 1995), which is consistent with recent data collected from the site. In the five exploratory borings drilled at the site in January 2007, groundwater was encountered at a depth of approximately 60 feet below ground surface (4,105 to 4,115 ft MSL). No perched saturated zones were encountered above this depth. The thickness of the first-encountered water-bearing zone ranged from approximately 10 to 30 feet. Groundwater was found to occur most frequently in sand and silty sand/sandy silt units.

1.2 Monitoring Program

The monitoring plan focuses on detecting potential releases from the landfill. However, there are no nearby off-site groundwater wells that would be impacted by a release from the site. There are no municipal water wells within 10 miles of the site. The nearest groundwater well is used for agricultural purposes and is located more than one mile northeast of and upgradient from the landfill site.

This monitoring plan complies with the requirements of the Nevada Administrative Code (NAC) Chapter 444 Section 683 and the Code of Federal Regulations (40 CFR), Parts 258.51 and 258.53. The protocols outlined in this monitoring plan will serve as the basis for implementing the Facility's groundwater detection monitoring program, and for any subsequent assessment or corrective action monitoring, should it be required. This plan is designed to be protective of human health and the environment. As additional data is obtained through future site investigations and routine monitoring, or if changes in regional groundwater conditions are identified, it may be appropriate to revise and/or update this plan to ensure that it provides an effective and efficient means of monitoring groundwater quality in the vicinity of the disposal Facility.

The sampling and laboratory procedures proposed for groundwater monitoring at the Facility to ensure monitoring results representative of background and downgradient water quality are detailed in this plan. Included with these procedures are the required monitoring parameters, frequency of monitoring, and QC specifications for both field and laboratory activities. The proposed methods for data verification and statistical evaluation also are described.

The monitoring program will consist of three phases:

- Phase 1 – Initial Detection Groundwater Monitoring
- Phase 2 – Leachate Monitoring
- Phase 3 – Re-evaluation of the initial Phase 1 detection monitoring parameters

Phase 1 will be the initial groundwater monitoring program for the site. Monitoring wells will be sampled for 12 consecutive quarters for an alternative parameter list established under NAC 444.7487. Phase 1 will also include biennial sampling of groundwater monitoring wells for parameters listed in *Appendix II to Part 258 – List of Hazardous Inorganic and Organic Constituents*. Within 180 days of the conclusion of the 12 quarters of monitoring, statistical analysis required by NAC 444.7485 will be submitted.

Phase 2 monitoring includes sampling/monitoring of the landfill leachate sumps to determine the most appropriate detection monitoring parameters. Once leachate is detected in a leachate collection sump, the leachate will be sampled for 12 consecutive quarters for the parameters listed in *Appendix II to Part 258 – List of Hazardous Inorganic and Organic Constituents* and *Appendix A to Part 423 – Priority Pollutants List*. Within 180 days of the conclusion of the 12 quarters of leachate monitoring, an evaluation of the consistently detected compounds will be submitted, and a list of reliable groundwater detection parameters will be provided for inclusion into the Detection Monitoring Program.

Phase 3 involves submitting a re-evaluation of the initial Phase 1 monitoring parameters after 8 quarters of groundwater monitoring.

2.0 GROUNDWATER MONITORING NETWORK

This groundwater monitoring plan includes a description of the existing groundwater monitoring network (wells MW-1 through MW-4) as well as the conceptual expansion of the groundwater monitoring network as the area of waste placement extends laterally from the northeastern corner of the Facility.

A description of the current groundwater monitoring network and its appropriateness is provided in this section. Establishment of this initial monitoring network has been based on research of the Desert Valley basin hydrogeology and field investigations conducted at the site. The strategy for augmenting the network to maintain its effectiveness as the Facility expands over time is discussed.

Four of the five exploratory borings completed at the site were converted to groundwater monitoring wells, which comprise the current monitoring network (MW-1 through MW-4). The wells are located at the four corners of the site boundaries. Based on hydrogeologic conditions observed at the site, the wells were constructed to monitor appropriate locations and depths and to yield representative groundwater samples from the uppermost aquifer. A summary of well construction details is provided in ***Table 1.*** The well network and direction of groundwater flow are shown in ***Figure 1***.

Samples collected from these wells, prior to construction of the Facility, are providing background groundwater quality data, both upgradient of the proposed Facility site and at the boundary of the waste unit. Once waste placement commences, well MW-2 will be designated as a hydraulically-upgradient background well based on the groundwater flow direction determined from the field investigation (Section 2.1.5.2 Report of Design). Wells MW-1, MW-3, and MW-4 will be designated as detection monitoring wells, as they are located adjacent to the downgradient boundaries of the waste management unit. To provide for both pooled data (i.e. two sets of background data) and additional spatial information for integration into the background data, an additional background monitoring well will be installed along the northeastern (upgradient) Facility boundary (see well location BG-1 on ***Figure 2***). This additional background well will be installed at least one year prior to waste placement to allow for the completion of at least 4 separate sampling and testing events to establish background water quality conditions.

The interim groundwater monitoring system is established in accordance with NAC 444.7483. As required, the system at the proposed Facility currently consists of a sufficient number of wells installed at appropriate locations and depths to yield samples of groundwater from the uppermost aquifer. Details of the site hydrogeological setting, including lithology and stratigraphy of the basin deposits, estimates of hydraulic conductivity and effective porosities, and the direction / velocity of groundwater have been described in Section 2.1 of the Report of Design.

2.1 Groundwater Monitoring Network Expansion

As the waste modules at the Facility are filled over time, the monitoring network will be expanded to maintain the effectiveness of the monitoring program. The proposed waste fill sequence plan specifies initial waste placement in the northeastern corner, with subsequent cell construction and filling occurring from the northeastern corner toward the southwestern corner. Cell construction also will occur toward the west to allow for stable and efficient waste filling, though the primary direction of waste placement will proceed toward the south.

Initially, prior to the placement of waste at the landfill, four groundwater monitoring wells will be installed along the downgradient edge of the northeastern quarter of the landfill (***Figure 2***). The northwestern two wells (GW-1 and GW-2) will be installed downgradient of the two initial landfill leachate sumps, and the two southern wells (GW-3 and GW-4) will be installed at a similar well spacing downgradient of the remainder of the northeastern portion of the landfill. These wells will be located within the future landfill footprint and will be properly abandoned prior to landfill construction at each location. Based on the current development plan, the two northwestern wells and the western-most southern well (GW-1, GW-2, and GW-3) will be active for at least the first 25 years of landfill operation. The fourth well (GW-4) is located within the 10 year to 25 year landfill footprint, and will likely need to be destroyed during that time. After 25 years, the need for additional interim monitoring wells can be assessed as the landfill development proceeds.

As additional landfill cells are constructed to the south and west of the initial wells, groundwater monitoring wells will be installed along the southern and western boundary, directly adjacent to and downgradient of the waste modules (wells G-5 through G-13 on ***Figure 2***). These wells will comprise the final monitoring well network for the Facility, and will be installed incrementally to provide coverage downgradient of the additional landfill cells. A well spacing of approximately 950 feet is proposed as shown on ***Figure 2***. Monitoring wells along the southern boundary of the Facility will be installed directly downgradient of the leachate sumps. A leachate sump is the most likely location for landfill leakage, due to the flow of leachate toward the sump and the accumulation of leachate in the sump.

3.0 WATER SAMPLING PROCEDURES

An accurate representation of background and downgradient water quality will be obtained from the samples from the monitoring wells which were installed in accordance with NAC 444.7483. The methods and procedures for groundwater sampling are described below. These procedures for groundwater sampling are designed to provide consistent and reproducible results and ensure that the overall objectives of the monitoring program are achieved. As required by NAC 444.7484 (1), documentation for the sampling and analytical program is hereby placed in the operating record, and includes procedures and techniques for: 1) sample collection, preservation, and shipment; b) analytical procedures; c) chain-of-custody control; and d) quality assurance (QA) and quality control (QC). The following documents have been used as guidelines for the development of these procedures:

- Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities (EPA-530/SW-611, August 1977)
- RCRA Groundwater Monitoring Technical Enforcement Guidance Document (OSWER 9950.1, September 1986)
- Standard Guide for Sampling Groundwater Monitoring Wells (ASTM, D 4448-85a)
- Standard Practice for Decontamination of Field Equipment Used at Non-radioactive Waste Sites (ASTM, D 5088-90)
- Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well) (ASTM, D 4750-87)
- Test Methods for Evaluating Solid Waste: Physical/Chemical Methods (EPA SW-846, Base Manual [3rd edition, November 1986], through Update III [June 1997]).

Pursuant to requirements of NAC 444.7484 (subsections 2 and 3) the procedures outlined below are appropriate for groundwater sampling and will accurately measure all required constituents. These procedures are considered protective of human health and the environment.

3.1 Sample Collection

Sample collection procedures include equipment cleaning, well purging, and sampling are described in the following sections.

3.1.1 Equipment Cleaning

Before the sampling event, all equipment that is placed in the well or comes in contact with groundwater is disassembled and cleaned thoroughly with detergent water, and then steam cleaned or rinsed with de-ionized water. Any parts that may absorb contaminants, such as plastic pump valves, bladders, etc., are cleaned or replaced.

For electric submersible pumps used for purging wells, all external pump surfaces and the discharge tube are steam cleaned prior to lowering the pump into the well casing. An aqueous solution of Liquinox (phosphate-free detergent), followed by de-ionized water, is then run through the pump and discharge tubing to clean internal surfaces. Water is prevented from draining back though the pump by an in-line check valve located immediately above the pump.

3.1.2 Well Purging

Before sampling, standing water in the casing and sand pack is purged from the monitoring well using either a positive displacement polyvinyl chloride (PVC) hand pump, a portable or dedicated electric submersible pump, a PVC or polyethylene bailer, a centrifugal pump, a dedicated pneumatic bladder pump, or a peristaltic pump. Field measurements for pH, specific conductance, turbidity, and temperature are recorded at casing volume intervals during purging on water sample field data sheets. The field measurements are used as indicator parameters to determine when a representative sample can be taken. Purging is generally performed until stabilization (± 10 percent variation) of the indicator parameters takes place. If a well dries during purging, it will be allowed to recharge for up to 24 hours; samples will be collected as soon as sufficient volume is available. If a well does not recharge sufficiently within 24 hours, the well will be considered dry for that sampling event.

Once detection monitoring commences, all purge water will be containerized on site pending analytical results. Purge water will then be disposed of in accordance with applicable local, state, and federal regulatory requirements.

3.1.3 Well Sampling

Groundwater samples are collected using a Teflon bailer, an individually sealed disposable polyethylene bailer, a dedicated electric submersible or pneumatic bladder pump, or in-line through a peristaltic pump with clean tubing. Wells are sampled in progression from "clean wells" to wells yielding poorer-quality water. The purpose of this procedure is to reduce the potential for cross contamination of wells by purging or sampling equipment.

Clean glass bottles of at least 40 milliliters volume fitted with Teflon-lined septa are used to collect samples for volatile organic analyses. These bottles are completely filled to prevent air from remaining in the bottle. A positive meniscus forms when the bottle is completely full. A convex Teflon®-lined septum is placed over the positive meniscus to eliminate air. After capping, the bottles are inverted and tapped to verify that they do not contain air bubbles. The sample containers for other parameters are filled, filtered as required, and capped.

If dissolved concentrations of metals are required, appropriate field filtration techniques are used. When using a bailer for sampling, a transfer vessel is filled with sample and fitted with a disposable 0.45-micron acrylic copolymer filter. Air pressure is applied to the transfer vessel forcing the sample through the filter; the filtrate is then directed into the appropriate containers. If a pump is used for sampling, the filter is placed in-line at the end of the discharge tubing and the filtrate directed into the appropriate containers. Each filter is used once and discarded.

3.2 Sample Preservation and Shipment

Sample containers and preservatives vary with each type of analytical parameter. Container types and materials are selected to be non-reactive with the particular analytical parameter tested. Sample preservatives used are consistent with regulatory guidelines and specified analytical methods.

All sample containers are labeled immediately following collection. Samples are kept cool with blue ice until received by the laboratory. At the time of sampling, each sample is logged on a chain-of-custody record, which accompanies the samples to the laboratory. Water samples are transported from the site by the sampler to a state-certified laboratory facility or to a secure interim shipping location.

Upon receipt of the samples by laboratory personnel, the chain-of-custody record is signed and released, and a unique sample identification number is assigned to each sample container. This number is recorded on the chain-of-custody record and is used to identify the sample in all subsequent internal chain-of-custody and analytical records. The manager of the subcontracted laboratory ensures that the holding times for requested analyses are not exceeded.

3.3 Sample Documentation

The following procedures are used during sampling and analysis to provide chain of custody control during sample handling from collection through storage. Sample documentation includes the use of the following:

- Water sample field data sheets to document sampling activities in the field
- Labels to identify individual samples
- Chain-of-custody record sheets for documenting possession and transfer of samples

3.3.1 Water Sample Field Data Sheets

In the field, the sampler records the following information on a water sample field data sheet:

- Location
- Project number
- Client name
- Sample ID
- Name of sampler
- Regulatory agency
- Date and time
- Pertinent well data (e.g., casing diameter, depth to water, well depth)
- Calculated and actual purge volumes
- Purging equipment used
- Sampling equipment used

- Appearance of sample (e.g., color, turbidity, sediment)
- Results of field analyses (e.g., temperature, pH, specific conductance)
- Purge water containment
- General remarks, including well accessibility and integrity

The sampler signs the field data sheets.

3.3.2 Labels

Sample labels contain the following information:

- Project number
- Sample ID (e.g., well designation)
- Sampler's initials
- Date and time of collection
- Type of preservative used

3.3.3 Sampling and Analysis Chain-of-Custody Record

The sampling and analysis chain-of-custody record, initiated at the time of sampling, contains, but is not limited to, the well number, sample type, analytical request, date of sampling, and the name of the sampler. The record sheet is signed and dated by the sampler when transferring the samples. Custody transfers are recorded for each individual sample. The number of custodians in the chain of possession is kept to a minimum. A copy of the final sampling and analysis chain-of-custody record is returned to the sampling contractor with the laboratory analytical report.

3.4 Field Quality Assurance Procedures

The objectives of the field program are to generate monitoring data of the highest possible quality and to ensure that these data are defensible during review. In general, QA/QC protocols are based on published USEPA guidelines. Field QA/QC is further ensured by training requirements for all field technicians.

Field QA procedures are specified for each sampling event. Field QA typically includes documenting field instrument calibration, and collecting and analyzing trip blanks, field blanks, equipment blanks, and duplicate samples. The analysis of trip, field, and equipment blanks, prepared with organic-free water, are used to detect contamination introduced through sampling procedures, external field conditions, sample transportation, container preparation, sample storage, and the analytical process.

Trip blanks are prepared at the same time and location as the sample containers for a particular sampling event. Trip blanks accompany the containers to and from that event, but at no time are they opened or exposed to the atmosphere. Typically, one trip blank for volatile organic parameters will be included per sampling event.

Field blanks are prepared in the field so they are exposed to the ambient atmosphere at a specified monitoring point during sample collection to determine the influence of the external field conditions on sample integrity. Equipment blanks are prepared in the field to ensure that sampling equipment does not cross-contaminate water samples. Organic-free water is run through the properly cleaned or unused (if disposable) sampling equipment, collected and analyzed. One field blank or equipment blank for volatile organic parameters will typically be included per sampling event.

Duplicate samples are collected to assess sampling and analytical precision. For each sampling event including more than six wells, duplicate monitoring well samples will typically be collected at a frequency of 10 percent. Where possible, field duplicates are collected at sampling points known or suspected to contain chemical constituents of interest. Duplicates are packed and shipped blind to the laboratory for analysis with the samples from that particular event.

3.5 Monitoring Frequency

During the initial Phase 1 and Phase 2 monitoring periods, groundwater monitoring wells and leachate sumps will be sampled quarterly for 12 continuous quarters. After the initial 12 quarters of monitoring, the sampling frequency may be modified to a semi-annual schedule, if warranted (NAC 444.7488).

3.6 Groundwater Level and Total Depth Survey

Before each sampling event, the static water level will be measured in appropriate monitoring wells and piezometers. The water-level gauging will occur within a period of time short enough to avoid potential temporal variations in groundwater elevation. The monitoring wells are purged and sampled for chemical constituents after measuring water levels.

The water level in the wells and piezometers is measured with an electric sounder with cable markings stamped at 0.01-foot increments. The water level is measured by lowering the sensor into the monitoring well. A low current circuit is completed when the sensor contacts the water, which serves as an electrolyte. The current is amplified which activates an indicator light and audible buzzer, thus signaling when water has been contacted. A sensitivity control compensates for very saline or conductive water. The electric sounder is decontaminated by rinsing with a detergent solution then de-ionized water after each use. Depth to water is recorded to the nearest 0.01 foot on a water level data sheet. The groundwater elevation at the monitoring well is calculated by subtracting the measured depth to water from the surveyed elevation of the top of the well casing.

Total well depth is measured in monitoring wells scheduled for sampling by lowering a probe to the bottom of the well and recording the depth. Total well depth, used to calculate purge volumes and to determine whether the well screen is partially obstructed by silt, is typically recorded to the nearest 0.1 foot on the water level data sheet.

4.0 LABORATORY ANALYTICAL PROCEDURES

The monitoring parameters and methods for analysis are detailed in this section.

4.1 Water Quality Parameters

Phase 1 groundwater monitoring parameters, as specified by NDEP per NAC 444.7487, are presented in ***Table 2***. The recommended analytical method for these constituents is included in the table. Biennial monitoring parameters Phase 2 leachate parameters include *Appendix II to Part 258 – List of Hazardous Inorganic and Organic Constituents.*

As allowed by Section 7487, the list of routine constituents may be re-evaluated after a period of time to determine if any of these constituents should be removed from the list, should it become apparent that they are not reasonably expected to be in or derived from the waste units. This re-evaluation will occur after 8 quarters of groundwater monitoring (Phase 3) and 12 quarters of leachate monitoring (Phase 2).

4.2 Methods

Water samples collected for compliance monitoring will be analyzed by a Nevada state-certified laboratory. Samples will be analyzed in accordance with accepted and approved analytical procedures. The analytical procedures shall have detection and/or reporting limits that are sufficiently protective and of human health and the environment. The following publications are the primary references for analytical procedures:

- Methods for Chemical Analysis of Water and Wastes (EPA 600/4-79-020, Revised March 1983)
- Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater (EPA-600/4-82-057, July 1982)
- Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WPCF, 17th edition, 1989
- Test Methods for Evaluating Solid Waste: Physical/Chemical Methods (EPA SW-846, 3rd edition, November 1986)

4.3 Quality Assurance

Laboratory QA procedures are employed to ensure that results are accurate, precise, and complete so that the overall objectives of the monitoring program are achieved. Laboratory-specific procedures are included in the laboratory's QA manual, including the use of method blanks, surrogate spikes, laboratory control samples (and duplicates), and matrix spikes (and duplicates).

Method blanks are analyzed daily to assess the effect of the laboratory environment on the analytical results. Method blanks are performed for each parameter analyzed and are expected to be clean. The presence of the subject compound or analyte at a significant level indicates the potential for sample contamination.

Each sample analyzed for organic parameters contains surrogate spike compounds. The surrogate recovery is used to determine if the analytical instruments are operating within limits. Surrogate recoveries are compared to control limits established and updated by the laboratory based on its historical operation.

Laboratory control samples (LCS) and LCS duplicates are prepared and analyzed for each batch of samples to evaluate the accuracy and precision of the methods. A known amount of the subject analyte is spiked into a clean water sample; analysis for the subject analyte subsequently is conducted to assess the method accuracy. The recovery of the subject analyte must be within QC limits. If the LCS recovery does not pass, re-analysis of all samples in the batch should occur. A duplicate LCS is prepared and analyzed to assess the method precision.

Matrix spikes are analyzed at a frequency of approximately 10 percent. Matrix spike results are evaluated to determine whether the sample matrix is interfering with the laboratory analysis and provide a measure of the accuracy of the analytical data. Matrix spike recoveries are compared to control limits established and updated by the laboratory based on its historical operation.

Matrix spike duplicates are analyzed at a frequency of approximately 10 percent. Spike duplicate results are evaluated to determine the reproducibility (precision) of the analytical method. Reproducibility values are compared to control limits established and updated by the laboratory based on its historical operation.

Laboratory QC data will be reported with the analytical results. The review of QC data is an integral step in the data verification process and may identify potential laboratory errors or biases affecting the data.

4.4 Data Evaluation

The following activities are required to evaluate groundwater data collected from the monitoring network.

4.4.1 Data Review and Validation

Prior to entering data into the facility database and prior to conducting statistical evaluations, all analytical reports will be reviewed to verify that the reports are complete and correct. The use of proper QC measures should be verified. Any QC issues that occur and have the potential to affect the analytical results for site samples should be further evaluated prior to data acceptance. Re-testing may be a necessary step in data validation should a result appear suspect based on accompanying laboratory QC results or other data comparison.

The following steps can be part of the quality control process to ensure that the laboratory data is acceptable and that the proper sample analyses were run.

- Review the analytical results of field blanks to evaluate the adequacy of the equipment decontamination procedures and the possibility of cross-contamination.

- Review the analytical results of trip blanks to evaluate the possibility for contamination from the laboratory-prepared sample containers or the sample transport containers.
- Review the analytical results of laboratory blanks to evaluate the possibility of contamination caused by the analytical procedures.
- Qualify the sample data, as appropriate, if contaminants are detected in field or laboratory blanks.
- Review the sampling, extraction, and analysis dates to confirm that extraction and analyses were completed within the recommended EPA holding times.
- Note appropriate data qualifiers if holding times were exceeded.
- Calculate relative percent difference (RPD) for field duplicates.
- Implement appropriate corrective action if significant quality assurance problems are encountered.

4.4.2 Statistical Analysis

As required by NAC 444.7485, a statistical method will be used in the evaluation of groundwater monitoring data for each hazardous constituent. The amended Federal and State regulations provide a variety of statistical methods that may be used to evaluate water quality data. Selection of the most appropriate comparative methodology and data analysis cannot be performed until adequate background and monitoring information has been obtained. Therefore, the actual method used will be based on a review of the data set prior to the time that the statistical analysis is to be performed. Performance standards of the selected procedure will be in accordance with NAC 444.7485.

The number of samples collected to establish background data concerning the quality of groundwater will be consistent with the requirements of the selected statistical procedure. To establish a data set that will adequately characterize the background range of concentrations of constituents, a minimum of four sample sets are recommended to be collected from each well prior to placement of waste at the facility; however, certain statistical procedures may require eight data sets for the calculations. Sampling of the current monitoring network has occurred four times.

5.0 DETECTION MONITORING

Detection monitoring is required at all Class I waste management units. The detection monitoring program for the proposed Facility will follow the requirements of NAC 444.7488. Comparisons of detection monitoring results to established background values will occur with each semi-annual monitoring event in order to determine whether a statistically significant increase in constituent concentrations has occurred in accordance with NAC 444.7485.

Prior to the determination of a statistically significant release, the quality control procedures discussed in section 4.4 – Data Evaluation, will be reviewed for the constituent in question. Laboratory analytical results are uploaded into a database using electronic data files provided by the laboratory. The database upload includes error checking and data validation prior to input. The potential errors are flagged and can be corrected before the data enters the database. The historical data from each monitoring point can be a powerful data quality check. Analytical results that are outside of historical ranges can be evaluated for potential laboratory or sampling error. If data is outside of historical range and appears to be anomalous, the potential source of the anomaly will be investigated: the laboratory is contacted to verify the result and/or the other sample results are reviewed to determine if a sampling error occurred. In addition, outlier tests are performed on the data prior to statistical evaluations.

In the event a constituent in the monitoring program demonstrates a statistically significant increase, the following actions shall occur per NAC 444.7489.

Within 14 days of the finding, the landfill will place a notice in the operating record. The notice will indicate which constituents have shown increases. NDEP also will be notified of this action.

If the increase cannot be demonstrated to result from a source other than the waste units, an assessment monitoring program shall be established within 90 days. The assessment monitoring program will be established in accordance with NAC 444.749 and will include at a minimum, sampling for all Appendix II constituents.

Should the landfill determine that the increase is not a result of a release from the waste unit, but rather another source (e.g. natural variation, sampling or laboratory error) then a report documenting such must be placed in the operating record within 90 days.

Results of the semi-annual detection monitoring program will be submitted semi-annually to the required agencies in an acceptable format.

5.1 Assessment Monitoring and Corrective Measures

An assessment monitoring program is established to evaluate an indication of an increase of one or more monitored constituents. Should an assessment program be necessary, it will be initiated per NAC

444.749. If results of the assessment monitoring indicate one or more Appendix II constituents are present at a statistically significant level above the standard for the protection of groundwater, the actions required under subsection 3 of NAC 444.749 will be taken. As required, an assessment of corrective action measures will be initiated within 90 days.

6.0 LANDFILL GAS MONITORING

Landfill gas migration from the landfill is unlikely due to the presence of a low-permeability composite liner system and the use of an extraction system to collect and remove gas from the landfill. Perimeter subsurface landfill gas monitoring and indoor structure monitoring will be conducted to verify adequate control of landfill gas.

Perimeter landfill gas monitoring will consist of quarterly sampling and testing of gas probes located at the landfill property boundary. The probes will be spaced at maximum 1,000-foot intervals resulting in a total of 21 perimeter probes as shown in ***Figure 3.*** Each landfill gas probe will consist of two nested probes located in the upper silty sands at depths of approximately 30 feet and 15 feet with each probe containing a 5 to 10-foot long screen (***Figure 4***). The underlying silty clay layer, which is described in Section 2.1.4.2 of the Report of Design, should inhibit downward migration of landfill gas in the unlikely event that gas migrates from the landfill. Indoor air monitoring in the office and shop structures also will be conducted quarterly.

The concentrations of combustible gas (as methane), oxygen, carbon dioxide, and the barometric pressure will be measured using appropriate field instrumentation. Prior to use, all field instrumentation will be calibrated properly according to the manufacturer's recommendations. A minimum of one probe casing volume will be purged using the instrument's sample pump. Meter readings will be allowed to stabilize for 30 seconds before recording the gas concentrations. Landfill gas monitoring will be conducted to verify that explosive gas content does not exceed the lower explosive limit (LEL), equivalent to 5 percent methane by volume, at the perimeter boundary. Structure monitoring will be conducted to verify that concentrations remain below the allowable upper limit of 25 percent of the LEL, equivalent to 1.25 percent methane by volume.

In the event methane is detected at a concentration greater than 5 percent by volume in the perimeter probes, or greater than 1.25 percent by volume in a landfill structure, steps will be taken to protect human health and the source of the methane will be investigated. Corrective measures will be implemented to reduce methane concentrations to acceptable levels.

7.0 LEACHATE MONITORING

Leachate quantities will be recorded on a weekly basis for each leachate sump and secondary leachate sump. If leachate is detected in a previously dry primary or secondary leachate sump, the leachate will be sampled and analytical testing will be completed as described above.

The leachate samples will be collected as follows:

- One leachate sample will be collected per primary and secondary sump.
- For a given primary sump, if the secondary sump remains dry and the detected constituents and constituent concentrations in the primary sump remain relatively consistent for 5 annual sampling events, then future sampling frequencies may be reduced and/or eliminated.

TABLES

Table 1
Monitoring Well Construction Details

Well Designation	Ground Surface Elevation	Well TOC Elevation	Borehole Diameter	Well Casing Diameter	Total Depth of Boring	Well Casing Length	Screened Interval	Sand Pack Interval	First Encountered Water	Depth to Water (4/7/07)	Geologic Unit Monitored
	(Ft-MSL)	*(Ft-MSL)*	*(inches)*	*(inches)*	*(Ft-BGS)*	*(feet)*	*(Ft-BGS)*	*(Ft-BGS)*	*(Ft-BGS)*	*(from TOC)*	
MW-1	4,175.26	4,177.78	8	2	103	83	59 - 79	55 - 84	60	62.45	Sand, Silty sand/Sandy silt
MW-2	4,175.23	4,177.74	8	2	102	83	60 - 80	55 - 80	68	61.29	Sand, Silty sand/Sandy silt
MW-3	4,174.84	4,177.04	8	2	103	80	66 - 76	64 - 88	60	62.53	Silty clay/Clayey silt
MW-4	4,176.96	4,179.15	8	2	102	83	60 - 80	58 - 90.5	60	63.18	Sand

Notes:

Ft-MSL - Feet, mean sea level
Ft-BGS - Feet, below ground surface
TOC - Top of well casing

Table 2
Monitoring Parameters and Methods

Sample Designation Sampling Date	Recommended Method
Field Parameters	
pH	field
Specific Conductance	field
Phase 1 Parameters	
Total Organic Carbon (TOC)	EPA 415
Total Organic Halides (TOX)	EPA 9020
Chloride	EPA 300
Nitrate/Nitrite as N	EPA 353
Sulfate	EPA 300
Total Kjeldahl Nitrogen	EPA 351
Chemical Oxygen Demand (COD)	EPA 410
Biennial Phase 1 Parameters [1]	
Volatile Organic Compounds	EPA 8260
Semi-volatile Organic Compounds	EPA 8270
PCBs	EPA 8082
Organophosphorus Pesticides	EPA 8141
Chlorinated Herbicides	EPA 8151
Antimony	EPA 6010
Arsenic	EPA 6010
Asbestos	EPA 600
Beryllium	EPA 6010
Cadmium	EPA 6010
Chromium	EPA 6010
Copper	EPA 6010
Cyanide, total	EPA 9010
Lead	EPA 6010
Mercury	EPA 7470
Nickel	EPA 6010
Selenium	EPA 6010
Silver	EPA 6010
Thallium	EPA 6010
Zinc	EPA 6010
Phase 2 Parameters [2]	
Volatile Organic Compounds	EPA 8260
Semi-volatile Organic Compounds	EPA 8270
PCBs	EPA 8082
Organophosphorus Pesticides	EPA 8141
Chlorinated Herbicides	EPA 8151
Antimony	EPA 6010
Arsenic	EPA 6010
Barium	EPA 6010
Beryllium	EPA 6010
Cadmium	EPA 6010
Chromium	EPA 6010
Cobalt	EPA 6010
Copper	EPA 6010
Lead	EPA 6010
Mercury	EPA 7470
Nickel	EPA 6010
Selenium	EPA 6010
Silver	EPA 6010
Tin	EPA 6010
Thallium	EPA 6010
Vanadium	EPA 6010
Zinc	EPA 6010

1. Appendix A to Part 423 - Priority Pollutants List.
2. Appendix II to Part 258 - List of Hazardous Inorganic and Organic Constituents