2016

Assessment of Suitability for Acceptance of TENORM Waste at IHD Solids Management Facility

Prepared for: McKenzie County, North Dakota Board of Commissioners

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1 Introduction

1.1 Purpose of Report

This report, prepared for the McKenzie County, North Dakota, Board of Commissioners, was drafted in response to IHD Solids Management's (IHD) application for a Major Permit Modification for TENORM Waste Acceptance, and evaluates the suitability of the facility to accept and dispose of technologically enhanced naturally occurring radioactive materials (TENORM). This evaluation considers, among other factors, site location, geology and hydrology, as well as the facility's design, construction and operational practices in order to determine adequacy for waste disposal and to recommend management practices that may enhance protection of human health and the environment.

1.2 Reference Documents

In preparing the report the following documents were reviewed:

- Permit For a Solid Waste Management Facility 0088
- Major Permit Modification Application (SCS Engineers, 2016)
- Pre-Application for Special Waste Landfill (Carlson McCain, 2012)
- Plan of Operation (SCS Engineers, 2016)
- Waste Acceptance Plan (SCS Engineers, 2016)
- IHD Solids Management Radiation Safety Program, Revision 1 (Kreger, 2016)
- Application for Special Waste Facility Permit (Carlson McCain, 2013(a))
- Engineering Report (Carlson McCain, 2013(b))
- High Instensity Soil Survey Report for the Indian Hills Special Waste Landfill Expansion (Prairie Soil Consulting, 2012)
- Technical Specifications for Cell1A Liner and Leachate Pond Construction, IHD Solids Management Facility (IHD Solids Management, 2011)
- Groundwater Monitoring Plan (Carlson McCain, rev 2015)
- 2015 Annual Groundwater Monitoring Report (Carlson McCain, 2016)
- 2013 Annual Groundwater Monitoring Report (Carlson McCain, 2014)

1.3 Site Location

The proposed site for disposal of TENORM waste is within a 147-acre parcel in the southwest quarter of Section 34, Township 153 North, Range 101 West in Tri Township, McKenzie County, North Dakota. This parcel is an expansion to the previously existing 96-acre IHD Solids Management special and small volume industrial waste landfill (permit number 0088), which is located at 14070 43rd Street Northwest, south of Williston, at the southwest intersection of US Highway 85 and 43rd Street Northwest (Carlson McCain, 2012). Information in the 2012 Pre-Application for Special Waste Landfill indicates that the facility meets the location standards set forth in North Dakota Administrative Code (NDAC) 33-20-04.1-01.2.

2 Site Assessment

2.1 Facility Layout

IHD Solids Management consists of a series of waste management areas including a former trench disposal and composting area (WMU-1) and the active, lined landfill (WMU-2). The landfill includes a leachate collection system and leachate evaporation pond, a storm water runoff control pond, and stockpiles for suitable plant growth material (SPGM) and topsoil. It consists of four disposal cells, Cells 1 through 4. Currently, Cells 1, 2 and 3 are in operation. Leachate from WMU-2 is collected in a lined evaporation pond located adjacent to the north of Cell 1A and Cell 1B (Carlson McCain, 2016).

The expansion area is located to the south and adjacent to WMU-2 on an approximately 147-acre parcel which will connect to the south edge of Cell 4 in the currently permitted disposal area. The expansion will include 8 additional cells (Cells 5 through 12) and will contain two leachate collection sumps on the east side of the landfill. The landfill expansion area is designated as Waste Management Unit 3 (WMU-3) (Carlson McCain, 2016). See Attachment B of this report for site layout drawings.

2.2 Geology

2.2.1 Soils

The Pre-Application prepared by Carlson McCain in 2012 characterizes the site's surficial geology as consisting of "loam, silt loam, and silty clay loam soil overlying sedimentary interbedded silt, clay, sand and lignite of the Sentinel Butte Formation" (Carlson McCain, 2012). Coleharbor glacial till is also present on much of the site. The Coleharbor till is classified primarily as lean clay with sand, and it ranges in thickness from 0 to 30 feet (Carlson McCain, 2012). This surficial geology is typical for the area and is not likely to cause any problems with respect to containment of waste in the landfill.

2.2.2 Bedrock

Bedrock geology is a more significant factor in determining the potential for groundwater contamination by landfilled waste. At the IHD Solids Management site the bedrock is loosely lithified, meaning that while it is technically referred to as "bedrock," it is characteristically similar to soil. Specifically, site characterization at the landfill divided the uppermost 65 feet below ground surface into six distinct depositional layers. These layers were labeled as, beginning with the shallowest layer and moving deeper, Upper Bedrock Unit (also called Aquitard 1), Upper Sand Unit, Aquitard 2, Lower Sand Unit, Aquitard 3, and Sand Unit 3. Generally, the aquitard units were classified as lean clay or fat clay with varying amounts of fine sand and/or silt, while the sand units contain silty sand with occasional finer-grained portions (Carlson McCain, 2012). Depending on the respective depth of landfill cells on the site in relation to these various bedrock layers, and the degree to which the clay aquitards may have been disturbed during cell construction, this bedrock geology could allow for possible contamination of groundwater under the facility in the event of a liner failure.

2.3 Hydrogeology

Among the identified bedrock strata under the existing site, both the Upper Sand Unit and the Lower Sand Unit were found to be water-bearing. The Upper Sand Unit is up to 50 feet thick and has a median

horizontal hydraulic conductivity of 2.0 E-04 as determined via in-situ hydraulic conductivity testing, also known as slug testing (Carlson McCain, rev 2015). This number differs from what was reported in the 2012 Pre-Application for Special Waste Landfill, which stated a hydraulic conductivity of 5.9 E-04 cm/sec (Carlson McCain, 2012). Regardless of this discrepancy, the Upper Sand Unit is a water-bearing unit and is the primary focus of groundwater monitoring as the uppermost water-bearing unit under much of the site.

The Lower Sand Unit is ranges from 2 to 50 feet thick and has a horizontal hydraulic conductivity of 2.2 E-03 cm/sec (Carlson McCain, rev 2015). Aquitard 2, which is comprised of clay, separates the two water-bearing strata and by definition exhibits much lower hydraulic conductivity. Laboratory analysis measured its vertical conductivity at 1.2 E-07 cm/sec (Carlson McCain, 2012). As a result of the low vertical conductivity in Aquitard 2, flow in the Upper Sand Unit is primarily horizontal. Aquitard 3 has a similar effect on the Lower Sand Unit. However, in the proposed expansion area, a lateral discontinuity exists in Aquitard 2 approximately one-quarter mile south into the area. Here there is no confining layer under the Upper Sand Unit, allowing water to infiltrate into the Lower Sand Unit, which has a much higher rate of horizontal hydraulic conductivity. Where Aquitard 2 is not present the Lower Sand Unit is the uppermost saturated unit. While clay aquitards may provide some protection of water-bearing units it remains likely that a liner failure would lead to contamination of groundwater.

With respect to the Upper Sand Unit there is a flow divergence oriented roughly north-south down the middle of the site. In general, groundwater flow direction beneath the facility is to the northeast under the eastern half of the facility, and north-northwest under the western half (Carlson McCain, 2012). Hydraulic gradients range from 0.004 to 0.02 ft/ft, and the resulting average linear groundwater velocity ranges from 0.8 to over 30 feet per year (Carlson McCain, rev 2015).

For the Lower Sand Unit groundwater movement is generally to the northeast with horizontal gradients ranging from approximately 0.008 to 0.002 ft/ft. This results in average linear groundwater velocity ranges from 4 to 60 feet per year. While the gradient in the Lower Sand Unit is less steep than in the Upper Sand Unit, potential linear velocity is greater due to the formation's higher hydraulic conductivity.

Of additional concern is that in the far northeast portion of the facility, the potentiometric groundwater surface in the Upper Sand Unit intersects the surface topography along the road ditch of Highway 85 and along a portion of the entrance road ditch approximately 400 feet south of the scale house, indicating possible springs or seeps may be present in these areas (Carlson McCain, rev 2015). This means groundwater under the eastern side of the landfill could potentially seep into surface water, where its migration would be much faster and contamination could spread more quickly. A potential intersection between groundwater and surface topography also exists west of the facility, where the surface elevation drops off toward a coulee running south to north approximately 500 feet west of the site. Because of the shallow nature of the Upper Sand Unit, it is possible that it intersects the surface at a lower elevation along the bank (Carlson McCain, 2016).

3 Hazards

3.1 Exposure and Exposure Pathways

Environmentally based human health hazards may pose risks to human health via three primary exposure pathways: inhalation (breathing), ingestion (swallowing) or direct contact. As it pertains to TENORM waste disposal at IHD, the primary pathways of concern are inhalation and ingestion; however, a person can also be exposed by injection or absorption through open wounds. Additionally, alpha-emitting TENORM materials produce daughter products that are beta emitters. Beta particles can penetrate the skin if a person is close enough to the source, so waste materials containing beta emitters deposited on clothing or the skin can affect an individual until removed and distanced from the individual. (Kreger, 2016)

It is important to note that humans are exposed to radiation every day, and that much of it is naturally occurring. However, some individuals receive higher than normal doses of radiation as the result of their lifestyle, the foods they eat, medical treatments and the materials and products they surround themselves with. (Kreger, 2016) IHD's Radiation Safety Program is based on the results of an evaluation they performed which indicated that "unmonitored occupational and public individuals are not likely to receive, in one year, a radiation dose in excess of 10% of the allowable limits in 10 CFR, Part 20." That suggests a maximum annual exposure limit of 100 mrem per year, which is not considered significant. While this evaluation is likely correct, proper precautions and operational conditions must be employed by the facility, as well as verified and enforced by the NDDH, to protect individuals from higher exposure levels.

Exposure prevention is the key to the success of IHD's radiation safety program. (Kreger, 2016) The Occupational Safety and Health Administration (OSHA) and the Nuclear Regulatory Commission (NRC) have stated there are three exposure-reducing tools available for workers to apply to the safe handling of radioactive material. These tools include time, distance and shielding. (Kreger, 2016) Reducing the time of exposure and increasing distance between an individual and a source material are both effective methods for limiting exposure to radioactive material. However, workers at IDH may be in close proximity to the waste for several hours, in which case the focus needs to be on shielding. For these workers, shielding is accomplished via personal protective equipment (PPE).

To protect against inhalation or ingestion of contamination at the facility, IHD and the permitting regulatory agency, the North Dakota Department of Health (NDDH), should focus on protection and/or mitigation of the following environmental media at the facitlity:

- Groundwater
- Surface water
- Air

3.2 Groundwater

3.2.1 Water Wells Near the Facility

According to the 2012 Pre-Application for a Special Waste Landfill, there are no drinking water supply wells on the proposed site. There are several shallow stock wells within two miles of the proposed site,

with depths ranging from 25 feet to over 500 feet below ground surface. One well (#26569) is completed for "municipal" use approximately 1.5 miles north of the proposed site. The well owner is listed as the ND State Highway Department, and the well is completed in sandstone at a depth of 600 to 648 feet below ground surface. It is unknown whether water from this well is used for human consumption. The nearest domestic use well is 2.5 miles northwest of the proposed site and owned by Bill or Arlene Heavilin (Carlson McCain, 2012).

3.2.2 Groundwater Monitoring Plan

As previously discussed, the uppermost saturated zone at or immediately below the basal elevation of the waste disposal unit is the zone targeted for groundwater monitoring. For the northern portion of the facility the primary monitoring zone is the Upper Sand Unit. However, under the southern half of the expansion area the Lower Sand Unit is the uppermost saturated unit due to the absence of Aquitard 2 (Carlson McCain, rev 2015).

3.2.2.1 Monitoring Wells

There are currently 27 groundwater monitoring wells, 11 water level piezometers, 1 leachate monitoring point and 1 surface water monitoring point comprising the monitoring network at the facility (Carlson McCain, 2016). See Attachment D of this report for Figures illustrating the location of monitoring wells.

The monitoring well network contains three classifications of monitoring wells: upgradient wells, sidegradient wells, and downgradient wells. The purpose of upgradient wells is to establish background concentrations of any contaminants present in groundwater which did not originate at the landfill. By subtracting concentrations of contaminants in the upgradient wells from the concentrations in downgradient wells, the groundwater impacts from the landfill can be measured.

The existing wells at IHD vary considerably in appearance and markings. Some of the wells are properly secured, while others require repair to their protective casings. This may not have any impact on the quality of water in the wells, but it is best management practice to keep wells securely locked and covered to prevent any potential contamination from surface water or tampering. Similarly, there is also variance among existing monitoring wells with respect to visibility, labeling, and protective measures. Some of the newer wells at the facility are easily located, clearly labeled, and protected by brightly colored, high-visibility bollards, while others are surrounded by weeds and have no protection from potential damage by onsite traffic. Concrete pads are noticeably absent each of the wells observed. The use of such pads for monitoring wells is recommended by the United States Environmental Protection Agency (EPA).

Monitoring well. Properly secured with padlock.

Monitoring Well. Unsecured (no cover or lock), unprotected (no bollards), and hidden by vegetation.

Newer monitoring well, properly labeled and protected with bollards. West of MWU-1.

Monitoring well MW-46. Clearly labeled to avoid confusion while collecting samples.

3.2.3 Groundwater Monitoring Results

3.2.3.1 2015 Groundwater Monitoring Report

Groundwater monitoring at the facility identified impacts to groundwater in the 2015 Annual Groundwater Monitoring Report (Carlson McCain, 2016). This contamination is likely the result of direct disposal of petroleum impacted soils in unlined trenches and, later, treating petroleum impacted soils by composting. These activities took place in the northwest portion of the facility in an area referred to as Waste Management Unit 1 (WMU-1) in the current permit. Direct disposal of petroleum impacted soils was discontinued in 1998, and treatment of such soils by composting was discontinued in 2011 (Carlson McCain, 2012 and 2016). Groundwater monitoring results can be found in Attachment E to this report.

Groundwater impacts from WMU-1 consist of elevated concentrations of chloride, which have been observed in wells located along the western edge of WMU-1. In response to these apparent impacts six new monitoring wells have been installed along the western and northern site boundaries. The new wells are designated as MW-46, MW-47, MW-48, MW-49, MW-50, and MW-51.

3.3 Surface Water

Storm water at the facility is segregated to be managed in a manner protective of public health and the environment. Any precipitation that falls in active cells or in other areas where it may contact waste material is captured within the cells and managed as leachate. Precipitation that does not come into contact with waste is managed separately. At the existing facility, storm water is routed to an unlined retention pond where it will ultimately infiltrate ground water, evaporate, or be used for dust control at the facility.

The 2015 Groundwater Monitoring Report, which also analyzes samples of leachate and water from the storm water pond, detected Diesel Range Organics (DRO) in both the leachate pond and the storm water pond in the spring and fall of 2015. While finding DROs in leachate is not surprising, finding them in the storm water sample is potentially problematic. First, since storm water is supposed to be segregated from contact with waste, finding contamination present in the sample likely indicates either onsite contamination originating outside the waste disposal area or a failure to properly segregate storm water. Additionally, storm water is used for dust mitigation at the facility, which indicates that DRO contamination was spread around the site during efforts to control dust. Further, the storm water pond is unlined, which allows surface water to infiltrate groundwater. Relevant data and figures from the 2015 Groundwater Monitoring Report can be found in Attachment E of this report.

Storm water retention pond (unlined) near the facility's eastern boundary.

Lined leachate pond with depth gauge.

Separation between lined leachate ponds with fan to augment evaporation as necessary.

3.4 Air

Currently no air monitoring is required to be performed at IHD Solids Management. Furthermore, since the licensee has determined that the activities at the facility are unlikely to generate exposures equal to of 10% of the regulatory limit, air monitoring is not required by state regulations with respect to the permit modification regarding TENORM waste disposal (Kreger, 2016). See Attachment G, Radiation Safety Plan, for further discussion of the evaluation and calculations that led to this conclusion.

3.4.1 Dust Control

According to the Plan of Operations, dust will be controlled by watering the surface and access roads when necessary, and by prompt establishment of vegetation over filled and covered cells (SCS, 2016). A water truck is available for watering access roads, active fill areas, and other areas where dust may be generated. In active fill areas, leachate will be used to control dust, while storm water may be used in other areas of the facility. Currently the requirements dictating when dust control will be required are very subjective, and are at the discretion of operators at the facility.

Water truck used for dust mitigation at IHD.

Filling water truck with storm water from retention pond.

4 Recommendations

After evaluating the relevant documentation pertaining to IHD Disposal's permit modification request, and considering existing regulations in North Dakota Administrative Code and North Dakota Century Code as well as best management practices for waste disposal facilities, it is recommended that the following major concepts be carefully scrutinized by the Commission:

- Liner Installation
- Waste Acceptance Criteria
- Dust Control and Air Monitoring
- Groundwater Monitoring
- Final Cover and Restricted Use

This section will summarize major recommendations and concepts protective of public health and the environment. A more detailed list of comments and recommendations can be found in Attachment A. The comments therein are meant to be comprehensive in order to provide several options for the Board of Commissioners to consider. Sufficient protection of human health and the environment is not achieved through any one particular technical aspect described in this report. Rather, it is accomplished through a cumulative effect of many protective measures augmented by proper regulation. There is, however, some room for variation from facility to facility as to which protective measures are implemented, as well as to how they are implemented.

To ensure protection of human health and the environment as it relates to IHD Solids Disposal, the Board of Commissioners, after careful consideration of the recommendations in this report, should issue comments to the NDDH during the public comment period for the Major Modification for TENORM Waste Acceptance. Ideally, the Commission's suggested requirements will be incorporated into the state-issued permit. Any such requirements included in the permit will be NDDH's responsibility to regulate and enforce. Alternatively, any requirements that are not incorporated into the state permit can be included in the Conditional Use Permit issued by the county, at the county's discretion. However, enforcement of requirements contained in the Conditional Use Permit will likely be the county's responsibility to enforce, and would require frequent inspections by a county representative.

4.1 Liner Installation

Proper liner construction and installation is imperative for containment of waste in the landfill. Attachment A of this report contains multiple recommendations regarding liner installation and related Construction Quality Assurance (CQA) practices and documentation. Robust requirements relating to liner installation are encouraged for protection of groundwater beneath the site.

Ideally all cell construction activity would be monitored, reviewed and certified in writing by a third party registered Professional Engineer. The certifying engineer should compile all required CQA documentation and be present on-site throughout the construction process for the purpose of conducting field tests and observing the collection of samples for laboratory analysis. After all relevant data has been collected and analyzed by the certifying engineer he or she should stamp and sign the certification package for submittal to NDDH and McKenzie County for review, comment, and acceptance prior to the placement of waste in a newly constructed cell.

It is also recommended that McKenzie County have a representative present at all construction-related meetings at the IHD facility both prior to and during new cell construction and liner installation, including the Preconstruction Conference, Progress Meetings and any Unscheduled Meetings as defined in the Technical Specifications for Cell1A Liner and Leachate Pond Construction, IHD Solids Management Facility (IHD Solids Management, 2011).

Installation of High Density Polyethylene (HDPE) geomembrane (liner). On the right is an anchor trench, used to fix the liner in place and prevent migration of the geomembrane down the side slope of the cell.

Seam Welding during HDPE liner installation.

4.2 Waste Acceptance Criteria

The waste disposal industry is highly dependent on proper waste characterization by waste generators. While many generators make an effort to characterize their waste appropriately, they occasionally make mistakes. Also, as with any industry, there are bad actors who will intentionally mischaracterize the waste they generate. For these reasons, verification of waste characteristics at IHD is very important.

It is recommended that an exposure rate meter, such as a Geiger counter, be fixed to the scale at the facility. This meter should be functional at all times, and properly calibrated regularly. Every load of waste brought to the facility should be screened for radioactivity, whether the load has been characterized as TENORM or not. Any load that exhibits radioactivity levels characteristic of TENORM that is not labeled as such in the waste manifest should not be accepted by the facility. The load should be sent back to the generator for proper characterization, and the event should be recorded and reported to the NDDH.

It is also important to ensure, to the extent possible, that little or no waste exceeding the allowable limit of 50 pCi/g be accepted by the facility. Radioactivity screening at the facility is primarily dependent on Exposure Rate Meters, such as Geiger Counters or similar monitoring equipment. While such equipment is reasonably reliable, it measures only exposure rates and not the actual concentration of radioactivity in the waste. As such, it is recommended that frequent samples of waste are collected at IHD and sent to an off-site laboratory for analysis to confirm contamination levels.

4.3 Dust Control and Air Monitoring

Dust control measures currently employed at IHD, and those proposed for operations subsequent to the proposed modification for TENORM acceptance, are loosely defined and highly subjective. Attachment A contains several comments and recommendations for more specifically defining these requirements. As explained in Attachment A, parameters and procedures for dust control should be clearly specified in the permit and its supporting documentation. Dispersion of dust and particulates of any kind at the facility should be minimized. If one water truck is not sufficient to ensure proper dust control, more trucks should be utilized.

In addition to dust control measures, air monitoring at the facility is strongly recommended despite not being required by state regulations. As described in Attachment A, the facility should perform air monitoring that incorporates the following elements:

- Continuous air monitoring during operating hours both upwind and downwind of active cells, with respect to prevailing wind patterns. This type of monitoring generally involves an air pump pulling air across a filtration media. The filter material should, at least quarterly, be collected and sent to a laboratory for analysis including gross alpha, gross beta, total thorium, total uranium and gamma radiation (see photograph on the following page).

- Thermoluminescent dosimeters (TLDs) should be placed in various locations along perimeter of the facility. These should be collected and evaluated quarterly as part of the facility's air monitoring program.

- Radon detectors should be also be placed in various locations along the facility boundary and evaluated periodically as part of the air monitoring program. Additionally, radon detectors should be placed in active cells and over any covered cells.

While the theoretical calculations in the facility's Radiation Safety Program may be accurate, monitoring the air is the only way to determine actual impacts from radioactive waste at the facility. The data will be useful in determining any potential exposures both within and beyond the boundaries of the landfill site. Also, sharing such data with the public will keep concerned citizens informed regarding actual potential for exposure from the facility. If air monitoring results show no dispersion of radiation above background level at the boundaries of the facility, it will ease concerns and help to close any potential gap between perceived risk and actual risk.

Example of air monitoring equipment recommended for use at IHD.

4.4 Groundwater Monitoring

Identification of impacts to groundwater under the facility is crucial to protection of aquifers. While IHD has a Groundwater Monitoring Plan in place, Attachment A contains comments and recommendations to enhance the program. Most notably, it is recommended that more wells be added to the monitoring network, and that sampling frequency be doubled. Currently sampling of groundwater is performed twice annually. Quarterly sampling would allow for faster identification of contamination, which in turn would expedite the implementation of remediation efforts if necessary.

Proper liner installation, leachate management, and waste acceptance and handling procedures should protect the groundwater from contamination. However, in the unlikely event that all of these efforts fail, a robust monitoring program will quickly identify the problem and facilitate its mitigation.

Additionally, it is recommended that IHD incorporate annual monitoring of all nearby wells outside the facility boundary into its monitoring program, including residential, commercial and agricultural wells. This data can be used to confirm that no contamination originating at the facility is present in other wells, and should also help ease the concerns of citizens residing near the facility.

4.5 Final Cover and Restricted Use

No calculations for radon attenuation through final cover material were included in the permit modification application materials. Also, no mention of a radon barrier was found in the technical specifications. After each cell is closed, and following eventual closure of the entire facility, radon gas will continue to pose a persistent hazard. It should be clearly illustrated that final cover is sufficiently protective against radon emissions. Further, future land use should be restricted as appropriate to ensure against future radon exposure at the site.

4.6 Addressing Potential Risks Identified by the Board of Commissioners

4.6.1 Radioactive Contamination to Potable Water Pipeline Adjacent to site

There is a potable water distribution line, orientated north-south, which runs between the site boundary and US Highway 85. This line is not likely to be contaminated by waste disposed of at IHD, even in the event of a liner failure, due to the fact that the water distribution line is pressurized. Any leaks in the pipe, which usually occur at pipe fittings such as bends and valves, would likely result in water exiting the pipe rather than entering it. Still, protection of groundwater at the facility is of utmost importance as contamination could lead to potential environmental and human health impacts.

4.6.2 Migration of Radiation to Aquifers and Contamination of Nearby Water Wells

This has been addressed in previous sections of the report, particularly where liner installation and groundwater monitoring are discussed. The potential for contamination does exist, but the risk is low as long as proper protective measures are implemented. In the event that groundwater is impacted by radiation, the slow migration of a contaminant plume should allow for proper mitigation actions to be implemented. Of the concerns raised by the Board of Commissioners, this is likely the most significant.

4.6.3 Radiological Risks to Residential, Agricultural and Commercial Neighbors

As described in Attachment G, Radiation Safety Program, radiological risks to neighbors around the IHD facility are quite low, particularly if proper protective measures are utilized. Groundwater is the most likely contaminated environmental media, which is why so many steps must be taken to protect it.

4.6.4 Radiological Risks to Drivers and Facility Workers

Risks to drivers and facility workers are discussed in detail in the Radiation Safety Program. The risks are real, but they are manageable. If proper waste handling procedures are employed, and proper PPE is consistently utilized, workers and drivers at the facility should be sufficiently protected from any significant health risks. However it is recommended, as described in Attachment A, that the facility's dosimetry monitoring be continued as long as radioactive waste is accepted at the facility. The current proposal states that workers will cease to wear dosimetry badges one year after TENORM operations commence, as long as no significant exposures are identified within that timeframe. Discontinuing such monitoring is not protective of the workers, and is discouraged.

4.6.5 Radiological Risks to Traveling Public

These risks are also discussed in the attached Radiation Safety Program (Attachment F). As described therein, risks to traveling public are very, very low. There should be no significant exposures to passersby, particularly if dust control measures are properly implemented.

Attachment A –

Comments

General Comments (Draft):

1. A detailed corrective action plan or plans should be developed prior to acceptance of TENORM waste at the facility. This plan will be enacted if contamination is detected in groundwater monitoring wells or air monitoring equipment. The plan should include various procedures for mitigating and/or remediating impacts caused by contamination originating at IHD. Currently the facility Groundwater Monitoring Plan indicates that such a plan will be written in response to groundwater contamination that exceeds the intervention levels defined in the Sampling and Analysis Plan. As these plans and procedures can take time to develop and must be approved by the North Dakota Department of Health (NDDH), the plan should be developed and approved in advance. That will allow for expeditious implementation in the case of a release from the facility.

2. It is recommend that IHD hold quarterly public citizens' meetings at the facility to inform concerned citizens regarding operations, including volumes or weights and types of waste received, groundwater and air monitoring results and any ongoing operational issues. It is important to maintain transparency with concerned citizens to help ease any concerns they may have regarding facility operations.

3. Please attach all supporting Plans and documentation to the state-issued permit for enforceability. Changes to said documentation, especially those that are not merely administrative but rather are substantive in nature, should be considered a modification to the Permit and should be evaluated by NDDH for approval and incorporation into Permit prior to being implemented at the site. This includes but is not limited to changes regarding the Radiation Safety Program, Plan of Operations, Waste Acceptance Plan, and Groundwater Monitoring Plan.

4. Construction Quality Assurance (CQA) should be performed by a third party, registered professional engineer. The third party engineer should compile all relevant and required Quality Assurance (QA) and Quality Control (QC) data, and should evaluate said data for adequacy. If the data is found to be acceptable, the third party engineer will certify in writing and stamp a complete CQA package for submittal to NDDH and McKenzie County for review, comment and acceptance prior to waste placement in any newly constructed cell, and prior to acceptance of any TENORM waste at the facility. No waste should be placed in the cell until the facility has received written acceptance of the certification package from both McKenzie County and the North Dakota Department of Health (NDDH).

Specific Comments (Draft):

- Plan of Operation

5. General – TENORM waste should be limited to 25% by weight of total waste disposed at the facility. This requirement will provide extra protection of the

environment in the event that some TENORM waste exceeding the allowable limit of 50 pCi/g is unknowingly disposed of at IHD.

6. Section 3.6.2 New Cell Filling Procedures – The first paragraph states "In no case should compaction equipment, refuse haul vehicles or other vehicles with tires be allowed to travel directly over the sand drainage layer on the liner without placing the initial layer of refuse." Please explain how this will be ensured and verified.

7. Section 3.6.2 New Cell Filling Procedures – The first paragraph states "After one freeze, three feet of waste must be in place on the liner by December 31 to serve as frost protection for the clay barrier layer." In any given year there will be numerous freezes prior to December 31, so the date appears to be largely arbitrary. Freezing causes desiccation (cracking) in the clay liner that may increase permeability of the liner. It is recommended that the date be removed, and that waste placement commence prior to the first freeze for newly constructed cells. Also, a protective soil layer should be place over the liner system prior to waste placement in a cell.

8. Section 3.6.4 Intermediate Cover – This section states "The working area surface will be managed to suppress dust by watering and/or covering with new waste as required." Please explain in more detail under what conditions water will be applied as well as the procedure for applying water.

9. Section 3.6.5 Final Cover – While it is understood that no TENORM waste shall be placed at a depth less than 10 feet below the final cover, per NDAC 33-20-11-01(4), and that calculations show little to no percolation through the final cover, EPA guidance and best management practice indicates that the final cover system should contain a radon barrier. Additionally, radon attenuation calculations should be performed submitted for review.

10. Section 3.7.2 Cold Weather – This section states "Placement of the waste during cold weather should be in thin layers of approximately 6 inches to allow for rapid compaction of the material." Please define "cold weather," and express in enforceable language such as "when temperatures fall below 35 degrees, waste shall be placed in lifts with a maximum thickness of 6 inches. All other times waste will be placed in lifts with a maximum thickness of 2 feet."

11. Section 3.7.3 Windy Weather – This section states "The site manager has the option to stop operation if weather conditions so dictate." Please define a maximum wind speed and any other appropriate weather parameters (such as temperatures and/or presence of precipitation) which shall forbid placement of waste in cells. Whether the waste being placed in the cell is TENORM or not, public perception will likely be that all waste being landfilled is radioactive in nature. Therefore, if waste is being placed in the cell under windy conditions, the public will likely be concerned with the activity.

12. Section 3.7.4 TENORM Waste – As with 3.7.3, please use more specific language restricting waste placement. This section states "This in general would be any unprotected winds in excess of 20 miles per hour." Please define, using enforceable language, the maximum wind speed allowable for placement of waste in the landfill. If that is 20 mph, please state "Under no circumstance shall waste be placed in the cell when sustained wind speed equals 20 mph or greater."

13. Section 3.8.1 Dust Control – Waste can be dispersed by wind and should be kept damp, particularly on windy days. Please specify what exact parameters will dictate when dust control is required in active fill areas and otherwise.

14. Section 3.9 Stabilization Pit Operation – States "When the material has stabilized to the point that it classifies as a solid waste, the material will be excavated from the pit…" When describing waste, the term Solid Waste generally includes semi-solids and liquids. Please describe the physical characteristics of Solid Waste as used in this section, and describe how waste in the receiving/mixing pit will be verified as "solid" before it is removed from the pit for placement in the cell. Please also describe any tests that will be performed, such as paint filter tests and load bearing tests, prior to placing waste in a cell.

15. Section 3.11 Emergency Services – Please list all specific emergency response equipment to be maintained at facility, including but not limited to fire extinguishers, fire water, spill kits and decontamination equipment. Also list any outside agencies that are available for emergency response at the facility, including but not limited to fire departments and ambulance services.

16. Section 3.13 General Worker Safety – Please describe specifically what additional personal protective equipment (PPE), such as Tyvek or a respirator, will be required for personnel working with specialty wastes and TENORM. Generally speaking, workers will likely be exposed to radon gas in the vicinity of the cell whether they are currently working with TENORM waste or not, as TENORM waste placed in previous lifts will decay to produce radon.

17. Section 3.16 Maintenance Requirements – In addition to the schedule provided, please specify what type of inspections, maintenance and repair will be performed in accordance with the schedule. Also describe how records of such maintenance will be maintained for verification by inspectors.

18. Section 4.2.1 Leachate Monitoring – The third paragraph states "If radionuclides are detected at concentrations greater than those listed below, the Sampling and Analysis Plan will be revised to include radionuclide parameters in on-going groundwater monitoring." Please amend this to state that groundwater monitoring for radionuclides will begin with the next sampling event following placement of TENORM in the cell.

19. Appendix B Inspection Checklists – Checklists should record time of the inspection as well as required frequency (daily, weekly, monthly, quarterly, annually), unless all

inspections are to be performed daily. Checklists should also describe acceptable and unacceptable conditions. For example, please define what qualifies as unacceptable slope erosion or settlement of covers and what amount of visible damage to access roads constitutes an unacceptable condition requiring repair.

20. General – It is recommended that a weather station equipped with a data logger be installed and maintained at the facility for purposes of accurately measuring weather conditions such as temperature and wind speed.

- Waste Acceptance Plan (WAP)

21. General – While state regulations (NDAC 33-20-11-01(1)) allow for TENORM concentration to be measured in terms of radium-226 and -228 and lead-210 only, there are other radioactive components associated with TENORM (uranium, thorium, polonium, et al) that should be considered when disposing of the waste. It is recommended that IHD analyze waste for concentrations of additional radioisotopes, including gross alpha, gross beta, uranium, thorium and gamma for radium-226.

22. General – Throughout the WAP, testing and acceptance exceptions are provided for "contaminated equipment." Please define "equipment" and explain why such exceptions are appropriate. In the absence of sufficient explanation and justification for the exemptions, all such exceptions and/or exemptions should be removed from the document.

23. Section 2.1.1 Special Wastes – The list of specific Exploration and Production (E&P) waste streams accepted at the facility includes "Other solid waste uniquely associated with Oil and Gas Exploration and Production." Some such wastes, such as filter socks, will be TENORM waste and will exceed the upper limit of 50 pCi/g radium-226 plus radium-228. Any wastes that exceed said limit shall not be accepted at the facility.

24. Section 2.1.5 TENORM Waste – States "Except for contaminated equipment, all TENORM waste described above requires testing prior to acceptance for disposal." Please specify the following with respect to testing TENORM:

    a. Number of samples to be taken per volume or mass of waste

    b. Laboratory that will perform analytical testing of samples and analytical methods to be utilized

    c. Any field equipment (such as Geiger counters or other exposure rate meters) used at the facility to characterize waste, including calibration information and how the equipment is to be utilized, including detailed procedures for screening waste

25. Section 2.2 Prohibited Waste – Please add "natural gas pipeline pigging waste" to the list of prohibited waste. Radon in natural gas pipelines decays to polonium-218 which is not represented when expressing radioactivity levels in terms of radium-226 and -228. Since waste acceptance limits are defined in such a manner, pigging waste containing polonium and its corresponding radiation emissions could exist in very high concentrations in the waste and the waste could still pass acceptance criteria, posing an unidentified hazard.

26. Section 2.2 Prohibited Waste – Consider adding filter socks to prohibited waste list, as many filter socks can exceed 200 pCi/g gross alpha. Alternatively, propose a rigorous sampling and verification procedure for filter socks to ensure no waste exceeding the TENORM threshold of 50 pCi/g is accepted for disposal at the facility.

27. Section 3.2 Waste Profiling and Documentation, page 6 – The second paragraph states "If the waste for each site remains consistent for a calendar year, the WMDS should be updated annually. If there are changes to the process or other factors that will change the characteristics of the waste, the WMDS should be updated at the time those changes take effect." Please replace the word "should" with the word "shall" for enforceability. Use of the word "should" implies that the requirement is merely suggested and may be optional.

28. Section 3.2 Waste Profiling and Documentation, page 7 – The second paragraph states "If the Operator is unsure or unable to determine the acceptability of a particular waste material from the laboratory test results submitted by the generator, the Operator shall request assistance from the NDDH before deciding upon the acceptability of the waste material in question." Without definitive laboratory test results to determine acceptability of the waste, the facility should either: a) Require further testing; or b) Reject the waste. Under no circumstance should waste be placed in a cell if the Operator is uncertain of its acceptability.

29. Section 3.2 Waste Profiling and Documentation, page 7 – Paragraph four states "Any waste to be stored at the Facility will be located on the lined area, and must be separated from other waste materials and stored in such a manner that it can be completely and efficiently removed from the Facility if it is determined to be unacceptable for disposal." Placement of waste in the cell without proper determination of acceptability should not be allowed. This practice increases the risk that unacceptable waste will be permanently disposed of at the facility, as it can be onerous to segregate and properly remove waste from the cell if it is determined to be unacceptable.

30. Section 3.2.1 TENORM Wastes, page 8 – The second paragraph allows for waste analysis to be performed by either grab or composite samples. Please explain the circumstances under which each sampling methodology is to be utilized, and why each methodology is most appropriate or representative of the waste for each of the circumstances described.

31. Section 3.2.1 TENORM Wastes, page 8 – The second paragraph provides an exception for exploration waste, but no justification for the exception is provided. Please strike the phrase "Except for exploration waste" from the second sentence of paragraph two.

32. Section 3.2.1 TENORM Wastes, page 8 – The last sentence of the second paragraph states "Random samples may be sent to an approved lab for verification." Please replace the word "may" with the word "shall" for enforceability, and define the frequency at which the samples will be collected and analyzed.

33. Section 3.3 Waste Inspection and Verification – The second paragraph states "If a significant discrepancy cannot be resolved, the load shall be rejected." Please describe, in detail, significant versus insignificant discrepancies, and how such discrepancies may be resolved.

34. Section 3.3.1 Inspection Procedure, page 8 – Please explain any and all circumstances under which the Operator shall extract or obtain a sample of the waste for observation or testing prior to acceptance of the material, and define a minimum frequency for verification sampling.

35. Section 3.3.1 Inspection Procedure, page 8 and 9 – In an effort to prevent any unknown TENORM waste from being accepted at the facility, ALL loads of waste entering the facility should be screened with an exposure rate meter. This meter can be fixed to the scale. Any load not characterized as TENORM that exhibits total radioactivity exceeding background level shall be rejected. While it is expected that many waste generators will comply with appropriate regulations and facility requirements, the only way for the facility Operator to verify that they have done so is to check all waste loads entering the facility.

36. Section 3.3.1 Inspection Procedure, page 8 and 9 – Please explain how field readings from exposure rate meters (e.g. Geiger counters) used for onsite screening will be interpreted with respect to total concentration of radioactivity in the waste, and provide technical justification for the interpretation.

37. Section 3.3.2 Random Special Waste Characterization – Please remove the parenthetical phrase "(unless waived by the NDDH)". This requirement should not be waived. Furthermore, 1% of the loads are far too few to determine compliance with permit and regulatory requirements. This sampling frequency should be increased significantly, and should certainly not be waived.

38. Section 3.3.2 Random Special Waste Characterization – The last paragraph on page 9 states "Wastes selected for random characterization of the production subset will be sample and analyzed prior to delivery or will be quarantined at the Facility over the lined area." As with the previous comment regarding placement of waste in a lined cell prior to verifying proper waste characterization, waste should be adequately

characterized prior to placement of waste in a lined cell. Please remove language regarding quarantined waste from this section.

39. Section 3.3.2 Random Special Waste Characterization – Special attention should be given to BTEX (benzene, toluene, ethyl benzene and xylene) content in waste received at the facility, as such aromatic hydrocarbons exhibit compatibility issues with polyethylene liners. It is recommended that firm limits be placed on concentration of aromatic hydrocarbons in waste total volume of waste which contains them. Alternatively, the liner system could be redesigned to minimize or prevent contact between aromatic hydrocarbons and the polyethylene liner.

40. Section 3.3.3 Sampling Procedures – The permit should describe prescriptive increased frequency of sampling for any waste coming from a generator or site that has had previous loads rejected. Additionally, this section currently states that sampling frequency "may" be increased for substantially similar wastes from other generators. Please change "may" to "shall," and define the increased frequencies at which they will be sampled and tested.

41. Section 4.2 TENORM Specific Procedures, page 12 – The fifth paragraph states "If the waste material appears to be dry and will result in formation of a dust cloud, water mist and watering of the load can be utilized to prevent air transport." Please change the word "can" to "shall" for enforceability. There should be no ambiguity in the permit with respect to dust control on the site, particularly as it pertains to TENORM waste. Wind dispersion is one of the primary risks for spreading radioactive contamination both around the site and beyond its boundaries, and is not acceptable under any circumstances. The permit should contain clear, quantitative and enforceable language regarding dust control and prevention of wind dispersion of contaminated material.

42. Section 4.2 TENORM Specific Procedures, page 12 – The sixth and final paragraph again refers to adverse weather events, which can include rain, wind and snow. The permit should be very specific in defining adverse weather conditions and should leave very little up to the subjective judgment of facility personnel. For example, a firm maximum wind speed of 20 mph should be applied, rather than provided as a loosely enforceable guideline.

- Radiation Safety Program (RSP)

43. Section 7.1.1. Occupational External Exposure – The last paragraph states "However, in accordance with the requirements of the NDDH, for a minimum of one year and until the NDDH agrees to waive the requirement, all occupational individuals who work with the waste shall be monitored in accordance with section 10.11 Personnel Dosimeter Program." It is recommended that such dosimetry continue beyond the one year period, and that the requirement not be waived by NDDH. While there are many protective procedures in place at IDH, the only true way to know about potential

exposures to employees at the facility is to monitor exposures. Please continue monitoring of employees indefinitely.

44. Section 7.1.3. Public Exposure – This section states "During transportation the waste is wrapped in plastic and tarped to avoid leaks or airborne material." Please describe how this will be verified by the facility, and what measures will be taken when it is determined that proper precautions were not taken during transport.

45. Section 9 Exposure Calculations – This section indicates that "prevention of acceptance of TENORM above 50 pCi/g ^{226}Ra and ^{228}Ra at the site will limit inhalation exposure risk. Therefore only external gamma radiation is considered for examples of the TEDE calculation." This statement further emphasizes the need for frequent verification sampling as part of the Waste Acceptance Plan. Also, this limit, even if enforced properly, does not eliminate the inhalation exposure risk. Therefore it is recommended that employees working near TENORM waste, such as within an active cell, should wear appropriate PPE, including a respirator.

46. Section 10.1 Employee Monitoring – Please describe the procedure for surveying employees' hand, arm, body and shoe sole.

47. Section 10.1 Employee Monitoring – The third paragraph again alludes to the possibility of discontinuing dosimeter monitoring. As previously stated, this is not advised. Please continue dosimetry monitoring as long as TENORM waste is accepted at the facility, regardless of the results of monitoring in the first year of operations.

48. Section 10.3 Air Monitoring – This section states "Since the licensee has determined that the activities are unlikely to generate an ALI of 10% of any required regulatory limit, air monitoring is not required." Despite the fact theoretical exposure at the facility will be below 10% of the allowable exposure, it is recommended that the facility employ an air monitoring program consisting of the following components:

    a. Continuous air monitoring during operating hours both upwind and downwind of active cells, with respect to prevailing wind patterns. This type of monitoring generally involves an air pump pulling air across a filtration media. The filter material should, at least quarterly, be collected and sent to a laboratory for analysis including gross alpha, gross beta, total thorium, total uranium and gamma radiation.

    b. Thermoluminescent domimeters (TLDs) should be placed in various locations along perimeter of the facility. These should be collected and evaluated quarterly as part of the facility's air monitoring program.

    c. Radon detectors should be also be placed in various locations along the facility boundary and evaluated periodically as part of the air monitoring

program. Radon detectors should also be placed in active cells and over any covered cells.

All air monitoring data should be submitted to the NDDH, and should be available for review by the public.

49. Section 11.2 PPE – The first paragraph states "Tasks or activities shall be evaluated by the RSO or the need to utilize PPE." This evaluation should be performed in advance of TENORM acceptance at the facility, and the required PPE for each corresponding task should be clearly defined in Radiation Safety Program.

50. Section 11.3 Truck Unloading – The first paragraph requires that "Drivers shall inspect their truck for residual contamination prior to exiting the landfill and if found coordinate with the landfill operator to clean contamination." Please clarify that they should not exit their truck in the active cell area. Please also require sampling of all trucks exiting the active cell area for radioactive contamination, describe sampling procedures, and describe decontamination procedures for trucks found to be contaminated.

51. Section 11.3 Truck Unloading – The second paragraph states "Where bulk material exceeding 10 pCi/g is loaded into a truck for transport to the landfill it is suggested that a plastic liner be utilized to prevent contamination of the trailer/truck body and ease decontamination procedures." Please change "suggested" to "required" and apply this requirement to all bulk TENORM waste.

52. Section 11.3 Truck Unloading – The fourth and final paragraph states "If the material appears to be dry and will result in formation of a dust cloud, water mist and watering of the load can be utilized to prevent air transport." Please replace the word "can" with "shall."

53. Section 11.4 Weather – This section indicated "Unloading of TENORM shall not take place during adverse weather events. These events can include heavy rain, high winds and heavy snow." Please specifically define heavy rain, high winds and heavy snow. If the intention is, for example, to prohibit placement of waste in a cell when winds exceed 20 mph, please state so in enforceable terms such as "under no circumstance will TENORM be placed in a cell when wind speeds reach or exceed 20 mph."

- 2013 Engineering Report (Carlson McCain, 2013)

54. Section 4.0 Facility Development Plan, page 5 – Paragraph one states "Final cover will be constructed on the finished slopes of a preceding cell as expeditiously as possible following construction of a subsequent new cell." Please propose an enforceable deadline for construction of final cover on preceding cells.

55. Section 5.1 Facility Foundation, page 8 – This section identifies a lateral discontinuity in Aquitard 2 in the proposed expansion area, approximately one-quarter mile south

of the existing parcel. Here the Lower Sand Unit is the upper most saturated unit; as such, more down-gradient monitoring wells should focus on the Lower Sand Unit, which has a higher rate of horizontal hydraulic conductivity than does the Upper Sand Unit.

56. Section 5.4 Final Cover System, page 10 – No mention is made of a radon barrier in the Final Cover System discussion. Because the proposed permit modification is for disposal of TENORM waste at the facility, radon attenuation must be considered in final cover design. Radium contained within the TENORM waste accepted for disposal at the facility will decay to produce radon gas, which must be contained under the cover system to the extent that radon emissions through the cover do not pose a health risk to anyone traversing the cover after closure of the facility.

57. Section 5.6 Storm Water Control System, page 12 – Storm water captured by the storm water control system at the facility should periodically be sampled for contamination to ensure the effectiveness of waste containment at the facility.

- Technical Specifications for Liner and Leachate Pond Construction

58. General – In order to achieve a more robust liner system and further protect groundwater from contamination by waste, it is recommended that a Geocomposite Clay Liner (GCL) be incorporated into the system between the CCL and geomembrane layers. Aromatic hydrocarbons, such as benzene, are not compatible with polyethylene and may cause issues with the liner.

59. General – As a best management practice (BMP), it is recommended that a geotextile layer be placed over the Granular Drainage Layer to prevent particulates from entering the leachate collection system. Additionally, a protective soil layer should be placed over the geotextile before waste is placed in the cell.

60. Section 01200 Meetings – Please add a requirement that the McKenzie County Board of Commissioners be notified in advance of any and construction-related meetings pertaining to new cell or leachate pond construction at the facility.

61. Section 01400 Quality Control, 1.01 Field Quality Control – Please ensure all quality control (QC) data shall be available for review by McKenzie County and the North Dakota Department of Health, in addition to the Owner or Owner's On-Site Representative. All QC data should be submitted to NDDH and McKenzie County for comment and acceptance prior to waste placement in a newly constructed cell.

62. Section 01400 Quality Control, 1.04 Owner's Construction Quality Assurance Program (CQA), paragraph A – This section states that "The CQA Program will consist of collecting random samples and performing tests on materials used in construction." Please define a minimum number of samples to be collected as well as frequency for sample collection, for each construction task defined in the Specifications.

63. Section 01400 Quality Control, 1.04 Owner's Construction Quality Assurance Program (CQA), paragraph B – As stated by Comment number 51, please define a minimum number of each test to be conducted per area, and define in detail the parameters for each test to be conducted.

64. Section 01400 Quality Control, 1.04 Owner's Construction Quality Assurance Program (CQA), paragraph B(5) – In addition to describing compaction tests to be performed during construction, please describe how each lift will be placed and compacted, and describe any equipment to be used to place and compact the lifts.

65. Section 01400 Quality Control, 1.04 Owner's Construction Quality Assurance Program (CQA), paragraph B(5) – Please also specify all soil classifications approved for use in clay liner construction.

66. Section 01400 Quality Control, 1.04 Owner's Construction Quality Assurance Program (CQA), paragraph B(5)(b) Clay Liner – It is recommended that testing or density and moisture content be performed with increased frequency, such as at each node of a 50-foot orthogonal grid, and to offset the grid 25 feet each direction for each lift rather than 50.

67. Section 01400 Quality Control, 1.04 Owner's Construction Quality Assurance Program (CQA), paragraph B(6) – Please indicate the frequency per area for permeability tests of the constructed clay liner. Please also describe what methods and equipment (such as Shelby Tubes) will be employed for gathering samples for laboratory permeability testing, and define test pass/fail criteria. Also describe what material and procedure will be utilized for filling holes left by sample collection.

68. Section 01400 Quality Control, 1.04 Owner's Construction Quality Assurance Program (CQA), paragraph C – All CQA test results should be precisely and thoroughly documented, including the date, time and location of the sample, as well as measured data and whether each test resulted in a pass or fail. All such data shall be available to McKenzie County and the NDDH for review at each entity's request, and should be submitted as part of a final certification package for review, comment and approval by the county and the state permitting agency.

69. Section 01400 Quality Control, 1.04 Owner's Construction Quality Assurance Program (CQA), paragraph D – States that "test results are property of the Owner and will be submitted to the Contractor at Owner's discretion." Please add language to allow for McKenzie County and the NDDH to review test results at their discretion.

70. Section 01500 Temporary Controls, Part 2 Products, 2.01(A) – States "Water used for dust control need not be potable, but must not be contaminated." Please describe how water, whether sourced on-site or off, will be verified as uncontaminated before being

utilized for dust control. This comment applies to all dust control activities on-site, whether during construction or normal operations.

71. Section 01500 Temporary Controls, Part 2 Products, 2.01(B) – States "More than one water tank truck may be required during Contractor's construction activities to sufficiently suppress dust." Please define the conditions considered sufficient for dust control, e.g. visual determination, weather conditions, on-site traffic, etc.

72. Section 01600 Receiving, Handling and Storage, 1.02 Shipping and Storage, Paragraph B – Please explain how condition of materials will be inspected and documented to ensure compliance with this requirement.

73. Section 01600 Receiving, Handling and Storage, 1.02 Shipping and Storage, Paragraph C – Indicates materials are subject to a receiving inspection by Owner, and that the Contractor shall conduct inspections to verify that item or materials furnished by Contractor meet the requirements of the Contract. Please explain how such inspections will be conducted, and at what frequency. Please also explain how Owner will verify that no damaged or off-spec material will be used by the Contractor during construction.

74. Section 01600 Receiving, Handling and Storage, 1.03 Submittals – Please require submittal of plan for storage and protection of liner materials to the NDDH and McKenzie County as well.

75. Section 02220 Excavating, Backfilling, and Compacting, Part 1.06 Job Conditions, Paragraph B – States "Contractor shall be solely responsible for determining the means and methods for meeting the compaction requirements unless otherwise specified herein…" These means and methods should be defined in the Technical Specifications. If the Owner wishes to allow flexibility for the contractor to achieve required compaction criteria, he may propose multiple methods as options for the contractor.

76. Section 02220 Excavating, Backfilling, and Compacting, Part 1.06 Job Conditions, Paragraph C(4) – Please define optimum moisture content.

77. Section 02220 Excavating, Backfilling, and Compacting, Part 1.06 Job Conditions, Paragraph C(6) – Please provide justification for using particles up to 3 inches in diameter. Such large particles are not easily moisturized and compacted for compacted clay liner (CCL) construction.

78. Section 02220 Part 3.02 Backfill and Compaction, Paragraph C(1) Clay Liner – Moisture conditioning procedures for clay should be defined in the Technical Specificaions. Any such conditioning performed should be documented for submittal with final certification package.

79. Section 02220 Part 3.02 Backfill and Compaction, Paragraph C(2) Clay Liner – States that "Clay shall be determined to be over-wetted if displacement of the clay occurs under the weight of vehicle traffic o if the required compaction cannot be achieved with a reasonable number of passes with compaction equipment." Clay should be verified to have proper moisture content before being placed for compaction.

80. Section 02220 Part 3.02 Backfill and Compaction, Paragraph C(5) Clay Liner – States "Contractor shall visually inspect the finished clay surface and remove unacceptable materials prior to installation of the geomembrane." Surface of the finished compacted clay liner should also be inspected and approved by a third party certifying engineer before installation of geomembrane commences.

81. Section 02220 Part 3.02 Backfill and Compaction, Paragraph H(1) Quality Control – States "Contractor shall have each lift properly tested and inspected prior to placement of additional lifts." Please define specifically how many and what type of tests are to be performed to verify proper compaction of Compacted Clay Liner (CCL).

82. Section 02770 Polyethylene (PE) Geomembrane, 1.03 Submittals, Paragraph D(5) Geomembrane Installation – Please specify all acceptable equipment types allowed for use by Contractor for panel layout, membrane seaming, and destructive and non-destructive testing.

83. Section 02770 Polyethylene (PE) Geomembrane, 1.03 Submittals, Paragraph E(1) Geomembrane Quality Control Documentation – Please specify all tests that shall be performed on seams, such as positive pressure decay, tensiometer, or other, and the minimum frequency per area of liner for each test. Also specifically describe what repair procedures will be used to repair holes left by destructive testing, or any unintentional damage to the liner during the installation process.

84. Section 02770 Polyethylene (PE) Geomembrane, 1.03 Submittals, Paragraph E(1) Geomembrane Quality Control Documentation – Please ensure all such documentation is made available to McKenzie County and the NDDH, as well as submitted in the final certification package.

85. Section 02770 Polyethylene (PE) Geomembrane, 1.03 Submittals, Paragraph G – In addition to the Installer's certification, surface preparation should also be verified and accepted in writing by third party engineer prior to installation of any geomembrane.

86. Section 02770 Polyethylene (PE) Geomembrane, 1.05 Preinstallation Conference, Paragraph A – A third party, certifying engineer should also be present at any such conference, and a representative of McKenzie County and the NDDH should be notified in advance and allowed to attend if they so choose.

87. Section 02770 Polyethylene (PE) Geomembrane, 3.01 Subgrade Inspection, Paragraph A – The surface should also be certified by a third party engineer.

88. Section 02770 Polyethylene (PE) Geomembrane, 3.04 Panel Layout and Placement, Paragraph B(7) – Indicates panels should be placed with "appropriate slack…to accommodate expansion and contraction without jeopardizing the integrity of the geomembrane." Please define appropriate slack and require inspection and documentation of appropriate slack during panel placement.

- Groundwater Monitoring Plan (Carlson McCain, rev 2015)

89. General – In accordance with state issued Permit For a Solid Waste Management Facility number 0088, Condition F.21. "The Permittee shall obtain and analyze a representative sample of water and/or leachate contained in any stormwater pond, surface impoundment, landfill leachate collection or accumulation or system, sump and/or other accumulation area at the same frequency and for the same parraters as the groundwater monitoring program." If contamination is found in the water of the unlined stormwater pond, the pond should be lined, as should any additional ponds to be constructed as the facility expands. Additionally, contaminated stormwater should not be utilized for dust control at the facility.

90. General – The 2012 Pre-Application for a Special Waste Landfill indicates there are no drinking water supply wells on the proposed site. Please confirm that no wells have been added in the area since the 2012 Pre-application was submitted.

91. General – The 2012 Pre-Application identifies several shallow stock wells within two miles of the proposed site, as well as one well (#26569) that is completed for "municipal" use approximately 1.5 miles north of the proposed site. The nearest domestic use well is 2.5 miles northwest of the proposed site and owned by Bill or Arlene Heavilin. Please add annual sampling of all wells within 2.5 miles of the facility, up to and including the domestic use well belonging to the Heavilins, to the groundwater monitoring program.

92. Section 3.1 Monitoring Well Network – The monitoring well network shows several possible gaps in coverage, both with respect to the proposed expansion area as well as former disposal area WMU-1, where groundwater impacts have already been identified. The following improvements are recommended with respect to the monitoring well network:

    a. Currently only MW-37B, a Lower Sand Unit well, would serve as an upgradient well for the expansion area. Once the proposed expansion has reached its southern most waste limit boundary, MW-37B will cease to serve as an upgradient well, and will become a downgradient well for the southwestern corner of the expansion area. More upgradient wells should be installed along the southern waste limit boundary to establish background concentrations for groundwater monitoring.

b. More downgradient wells are needed at the facility to adequately monitor potential groundwater impacts from the proposed expansion area. Currently only three such wells exist, all of which are Lower Sand Unit wells located along the eastern boundary of the facility. More downgradient, Lower Sand Unit wells should be added along the eastern facility boundary particularly at the northern and southern extremes.

c. There are no downgradient Upper Sand Unit wells along the northwest portion of the proposed expansion (northwest of MW-37B). If the Upper Sand Unit is present in this area, it should be monitored for contamination.

d. With respect to WMU-1, there is a significant void along the northwest portion of this area. Considering groundwater impacts have been identified in this location, more wells should be added here to properly characterize the contaminant plume.

e. Lastly, many monitoring wells at the facility are separated by 1000 to 1500 feet or more. This is a rather large interval, and it leaves potential for contamination to go unnoticed for a significant amount of time. It is recommended that, at least with respect to the proposed expansion, wells are placed at a higher frequency along the facility boundary.

93. Section 3.1 Monitoring Well Network – This section classifies existing groundwater monitoring wells at the facility as follows:

    a. Upgradient Wells: MW-16, MW-20, MW-23, MW-32, MW-37B, MW-47

    b. Sidegradient Wells: MW-18, MW-21

    c. Downgradient Wells: MW-1, MW-2, MW-3, MW-4, MW-30, MW-31, MW-33, MW-34, MW-35, MW-44, MW-45, MW-22, MW-25, MW-38, MW-46, MW-48, MW-49

    These classifications are inconsistent with the classifications on Figure 2 Facility Layout and Water Monitoring Network. Specifically, Section 3.1 calls wells MW-16 and MW – 47 Upgradient Wells, while Figure 2 labels them Downgradient Wells. Later, in Section 5.1 MCL Exceedances, MW-16 is again mentioned as a downgradient well. From the other text in the Groundwater Monitoring Plan it appears both wells would be upgradient with respect to the Lower Sand Unit (the unit in which the wells are completed). Please clarify these discrepancies.

94. Section 3.1 Monitoring Frequency and Parameters – This section states "Site wells are monitored semi-annually, and there will be no change to the monitoring frequency." Considering the heightened concern among citizens who live in the area, and that the facility has already impacted groundwater under the site, it is strongly

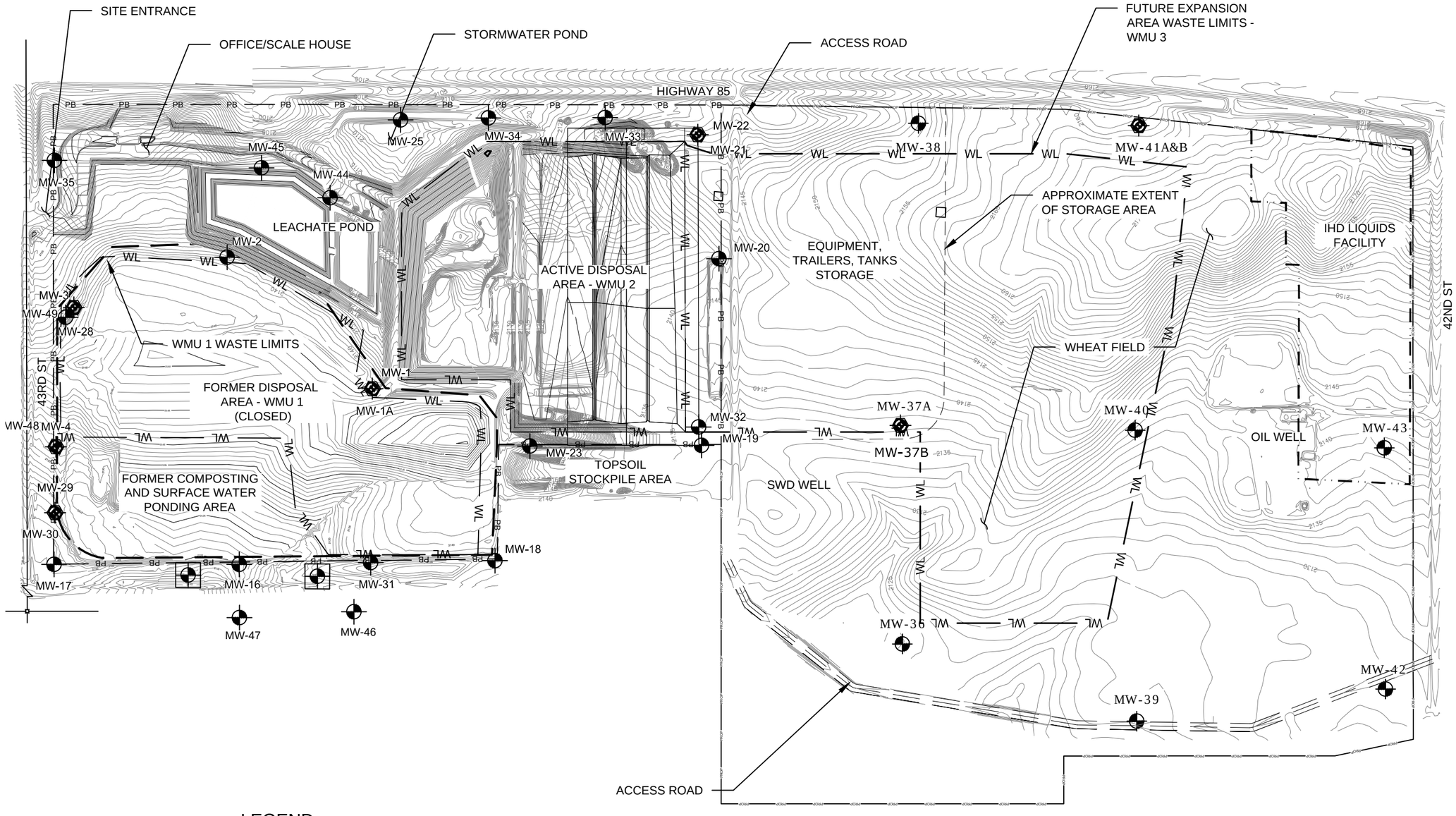
recommended that groundwater monitoring frequency be increased to quarterly to more quickly identify any potential contamination and take appropriate action as necessary to mitigate impacts to groundwater.

Attachment B –

Facility Layout

WATER MONITORING NETWORK

Groundwater Monitoring Wells
Upgradient Wells
MW 20
MW 23
MW 32
MW 37B
Sidegradient Wells
MW 18
MW 21
Downgradient Wells
MW 1
MW 2
MW 3
MW 4
MW 16
MW 22
MW 25
MW 30
MW 31
MW 33
MW 34
MW 35
MW 38
MW 44
MW 45
MW 46
MW 47
MW 48
MW 49
Water Level Piezometers
MW 1A
MW 17
MW 19
MW 28
MW 29
MW 36
MW 37A
MW 39
MW 40
MW 41A &B
MW 42
MW 43
Surface Water Sample Near MW-25
Leachate Sample from Leachate Pond



LEGEND

- MONITORING WELL/PIEZOMETER
- MONITORING WELL/PIEZOMETER NEST
- PROPOSED MONITORING WELL
- PB — PERMIT BOUNDARY
- PROP — EXPANSION AREA PROPERTY BOUNDARY
- WL — PERMITTED WASTE LIMIT
- WL — FUTURE EXPANSION WASTE LIMIT

N

0 200 400 800
SCALE IN FEET

NOTE: VERTICAL DATUM IS NAVD 88

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FIGURE 2

FACILITY LAYOUT AND WATER MONITORING NETWORK

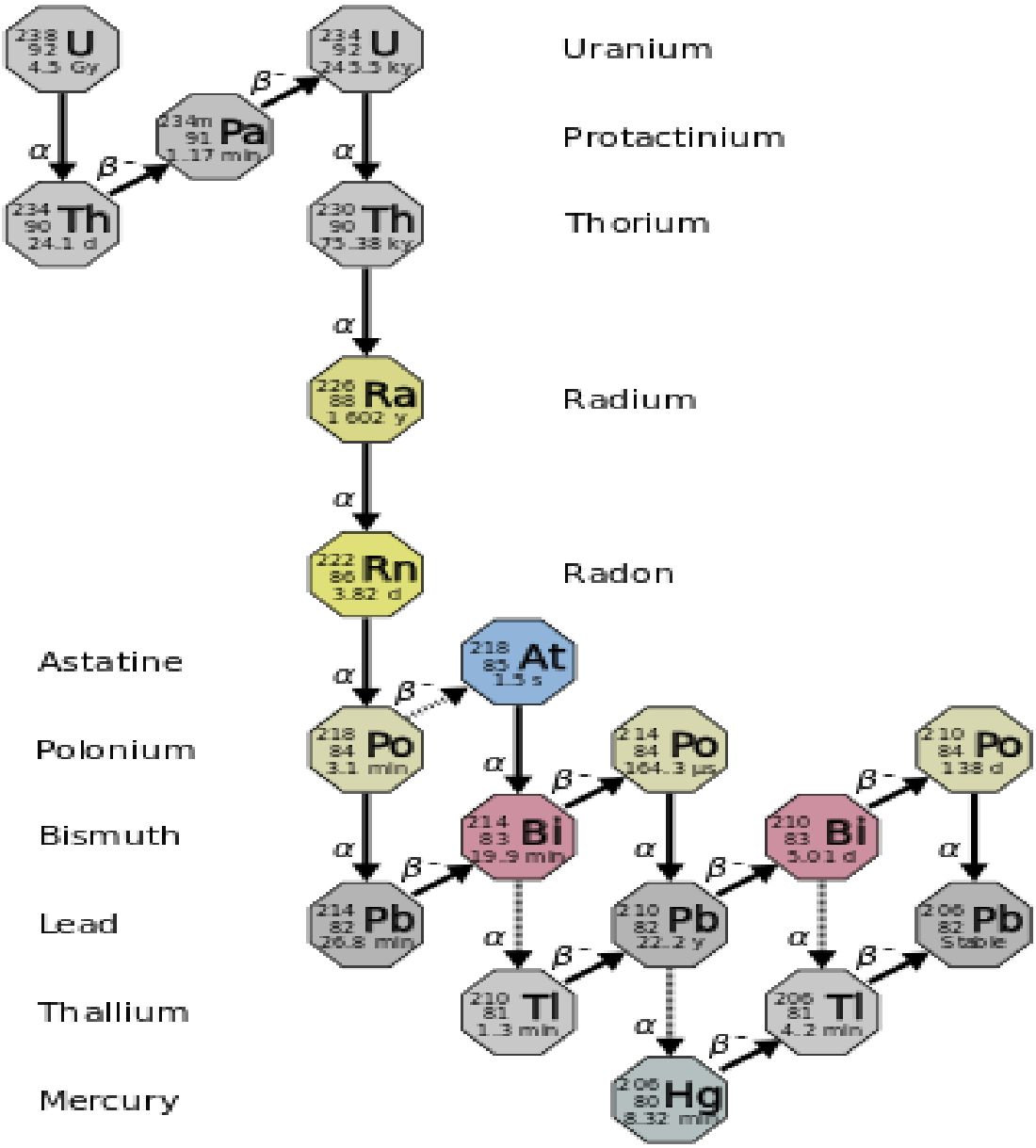
Groundwater Monitoring Plan
IHD Solids Management Facility

P:\Projects\IHD\IHD 1002\AMR\dwg\2014 Annual GW Monitoring Report Figs.dwg, 8/10/2015 3:15:53 PM, DWG To PDF.pc3

Attachment C –

Uranium Decay Chain

Uranium Decay Chain

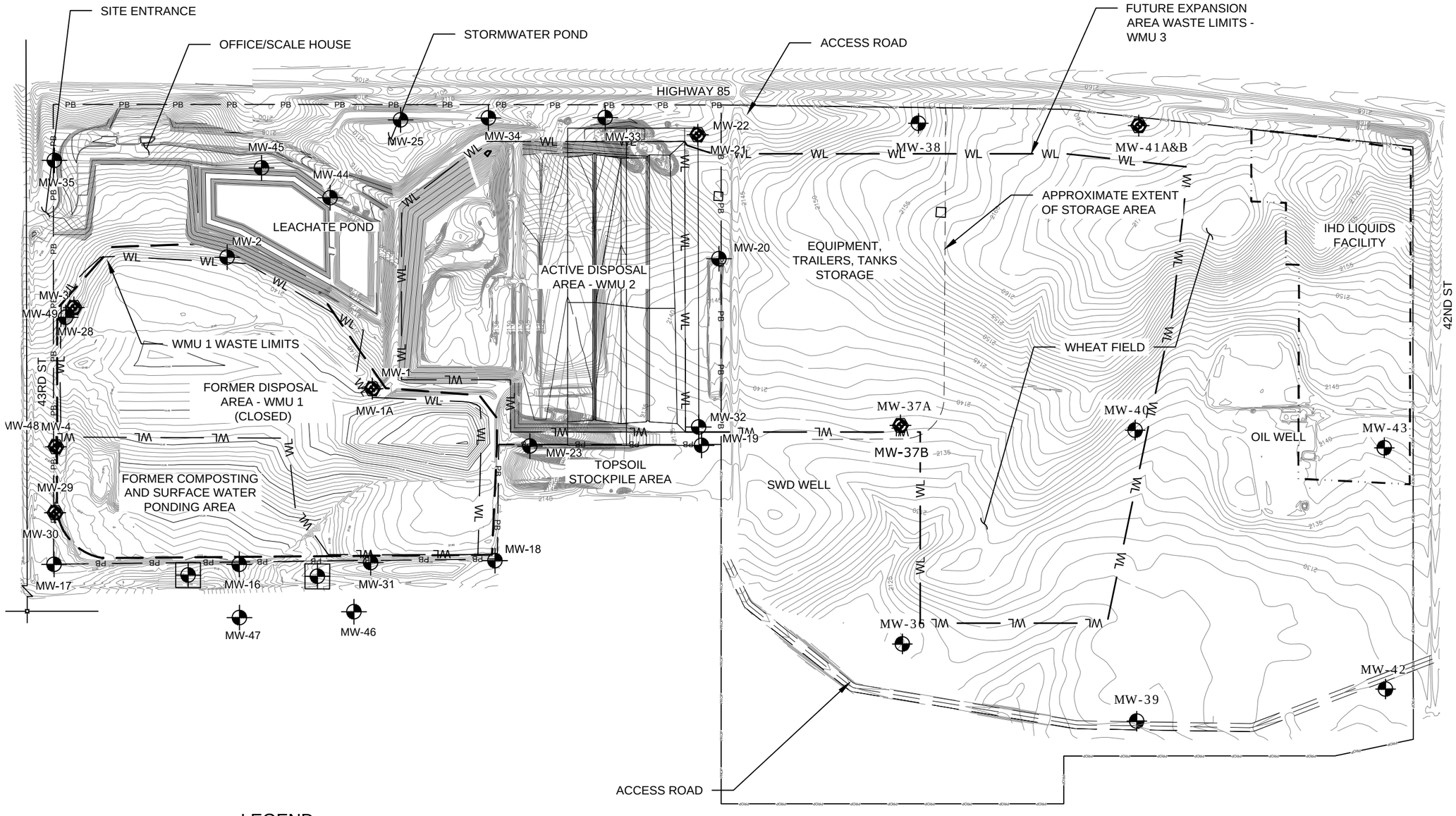


Attachment D –

Groundwater Monitoring Figures

WATER MONITORING NETWORK

Groundwater Monitoring Wells
Upgradient Wells
MW 20
MW 23
MW 32
MW 37B
Sidegradient Wells
MW 18
MW 21
Downgradient Wells
MW 1
MW 2
MW 3
MW 4
MW 16
MW 22
MW 25
MW 30
MW 31
MW 33
MW 34
MW 35
MW 38
MW 44
MW 45
MW 46
MW 47
MW 48
MW 49
Water Level Piezometers
MW 1A
MW 17
MW 19
MW 28
MW 29
MW 36
MW 37A
MW 39
MW 40
MW 41A &B
MW 42
MW 43
Surface Water Sample Near MW-25
Leachate Sample from Leachate Pond



LEGEND

- MONITORING WELL/PIEZOMETER
- MONITORING WELL/PIEZOMETER NEST
- PROPOSED MONITORING WELL
- PB — PERMIT BOUNDARY
- PROP — EXPANSION AREA PROPERTY BOUNDARY
- WL — PERMITTED WASTE LIMIT
- WL — FUTURE EXPANSION WASTE LIMIT

N

0 200 400 800
SCALE IN FEET

NOTE: VERTICAL DATUM IS NAVD 88

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FIGURE 2

FACILITY LAYOUT AND WATER MONITORING NETWORK

Groundwater Monitoring Plan
IHD Solids Management Facility

P:\Projects\IHD\IHD 1002\AMR\dwg\2014 Annual GW Monitoring Report Figs.dwg, 8/10/2015 3:15:53 PM, DWG To PDF.pc3

EXISTING PERMIT BOUNDARY

LEACHATE SUMP

FUTURE LEACHATE SUMPS

EXPANSION WASTE LIMIT WMU-3

2105.49

2105.60

2106.60

2117.11

UPPER SAND UNIT TRUNCATED BY TILL

MW-45

MW-25

MW-44

MW-35

MW-34

MW-33

MW-22

MW-21

MW-38

MW-41A&B

2121.15

2111.10

2110

LEACHATE POND

MW-2

2111.42

WL

FORMER DISPOSAL AREA LIMIT

2115

2120

WMU 2

2124.22

MW-20

EQUIPMENT, TRAILERS, TANKS STORAGE

IHD LIQUIDS FACILITY

MW-37

MW-49

MW-28

2118.26

WMU 1

MW-1

MW-1A

2125.22

2127.06

2131.86

MW-37A

MW-40

MW-43

MW-48

MW-4

2113.66

2115

MW-32

MW-19

MW-23

2129.33

2130

MW-37B

SWD WELL

MW-29

2120

2125

MW-30

2110.66

UPPER SAND UNIT TRUNCATED BY TILL

2117.95

MW-18

2122.33

MW-17

MW-16

MW-31

SOUTHERN LIMIT OF AQUITARD 2

MW-36

ACCESS ROAD

MW-42

MW-39

MW-47

MW-46

2112.55*

PROPOSED EXPANSION AREA PROPERTY BOUNDARY

LEGEND

MONITORING WELL/PIEZOMETER

MONITORING WELL/PIEZOMETER NEST

PROPOSED MONITORING WELL

2111.86 GROUNDWATER ELEVATION (FEET)

GROUNDWATER ELEVATION CONTOUR

*NOTE:
MW-46 GROUNDWATER ELEVATION NOT USED IN GENERATING CONTOUR MAP.

N

0 100 200 400
SCALE IN FEET

VERTICAL DATUM IS NAVD 88

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FIGURE 3
POTENTIOMETRIC SURFACE MAP
UPPER BEDROCK/UPPER SAND UNIT
04 MAY 2015
Groundwater Monitoring Plan
IHD Solids Management Facility

P:\Projects\IHD\IHD 1002\AMR\dwg\2014 Annual GW Monitoring Report Figs.dwg, Fig3 Up Sand WLs 5-4-15, 9/18/2015 10:54:47 AM

EXISTING PERMIT BOUNDARY

LEACHATE SUMP

FUTURE LEACHATE SUMPS

EXPANSION WASTE LIMIT WMU-3

HIGHWAY 85

SITE ENTRANCE

LEACHATE POND

WMU 2

WMU 1

EQUIPMENT, TRAILERS, TANKS STORAGE

IHD LIQUIDS FACILITY

FORMER DISPOSAL AREA LIMIT

FORMER PONDING AREA

SWD WELL

SOUTHERN LIMIT OF AQUITARD 2

ACCESS ROAD

FORMER DISPOSAL AREA LIMIT

PROPOSED EXPANSION AREA PROPERTY BOUNDARY

MW-1 MW-1A MW-2 MW-3 MW-4 MW-16 MW-17 MW-18 MW-19 MW-20 MW-21 MW-22 MW-23 MW-25 MW-28 MW-29 MW-30 MW-31 MW-32 MW-33 MW-34 MW-35 MW-36 MW-37A MW-37B MW-38 MW-39 MW-40 MW-41A&B MW-42 MW-43 MW-44 MW-45 MW-46 MW-47 MW-48 MW-49

2084.89 2086.20 2086.84 2092.79 2065.87 2078.50 2070.05 2080.80 2094.41 2096.94 2099.73 2097.39 2086.69 2100.18 2104.14 2103.69 DRY AT: 2084.94

2085 2090 2095 2100

LEGEND

- MONITORING WELL/PIEZOMETER
- MONITORING WELL/PIEZOMETER NEST
- PROPOSED MONITORING WELL
- 2111.86 GROUNDWATER ELEVATION (FEET)
- GROUNDWATER ELEVATION CONTOUR

0 100 200 400
SCALE IN FEET

VERTICAL DATUM IS NAVD 88

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FIGURE 4

POTENTIOMETRIC SURFACE MAP
LOWER SAND UNIT - 04 MAY 2015

Groundwater Monitoring Plan
IHD Solids Management Facility

P:\Projects\IHD\IHD 1002\AMR\dwg\2014 Annual GW Monitoring Report Figs.dwg, Fig4 Low Sand WLs 5-4-15, 9/18/2015 11:16:26 AM

Attachment E –

Groundwater Monitoring Report Data

Table 6

Analytical Data Summary for 5/05/2015 to 5/12/2015

Constituents	Units	EQUIP. BLANK	LEACHATE POND	MW-1	MW-16	MW-18	MW-2	MW-20	MW-21
Anion summation	meq/L	.0000	626.0000	167.0000	155.0000	168.0000		122.0000	115.0000
Arsenic	mg/L	<.0020	.0320	.0192	.0025	.0249		.0085	.0205
Barium	mg/L	<.1000	1.4000	<.1000	<.1000	<.1000		<.1000	<.1000
Benzene	ppb	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000		<1.0000	<1.0000
Bicarbonate	MG/L CACO3	<20.0000	161.0000	418.0000	449.0000	430.0000		685.0000	440.0000
Cadmium	mg/L	<.0010	<.0010	<.0010	.0051	<.0010		<.0010	<.0010
Calcium	mg/L	<1.0000	2160.0000	560.0000	1370.0000	414.0000		500.0000	530.0000
Carbonate	MG/L CACO3	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000		<20.0000	<20.0000
Cation summation	meq/L	.0000	567.0000	172.0000	158.0000	158.0000		143.0000	134.0000
Chloride	mg/L	<1.0000	21500.0000	354.0000	3980.0000	852.0000		26.3000	116.0000
Chromium	mg/L	<.0020	.0162	<.0020	<.0020	<.0020		<.0020	<.0020
Conductivity, field	umhos/cm		53187.0000	11170.0000	12807.0000	11680.0000		8580.0000	7889.5000*
DRO	ppm	<.2000	3.3000	<.2000	<.2000	<.2000		<.2000	<.2000
Ethylbenzene	ug/L	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000		<1.0000	<1.0000
Fluoride	mg/L	<.1000	.2300	.4400	.2400	.6700		.4800	.3700
GRO	ppm	<.2000	<.2000	<.2000	<.2000	<.2000		<.2000	<.2000
Hardness in grains/gallon	gr/gal	<.1000	392.0000	342.0000	366.0000	248.0000		222.0000	242.0000
Hydroxide	MG/L CACO3	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000		<20.0000	<20.0000
Iron	mg/L	<.1000	<.1000	<.1000	<.1000	<.1000		<.1000	<.1000
Lead	mg/L	<.0010	<.0010	<.0010	<.0010	<.0010		<.0010	<.0010
Magnesium	mg/L	<1.0000	320.0000	1080.0000	690.0000	780.0000		620.0000	685.0000
Manganese	mg/L	<.0500	16.7000	<.0500	.3400	<.0500		<.0500	.2700
Mercury	mg/L	<.0002	<.0002	<.0002	<.0002	<.0002		<.0002	<.0002
Nitrate-nitrite as n	mg/L	<.1000	<.1000	531.0000	.2200	17.3000		62.0000	54.2000
Nitrogen, ammonia	mg/L	<.1000	18.3000	<.1000	<.1000	<.1000		<.1000	<.1000
Percent error	%		<.0000	1.4300	.8500	<.0000		7.9200	7.8700
Percent sodium	%		74.2000	31.6000	20.1000	45.7000		46.0000	37.6000
pH	units	5.2000	7.4000	7.2000	6.8000	7.5000		7.0000	7.0000
pH Field	units		7.3500	6.9500	6.6200	7.2200		7.0500	6.9650*
Phenolphthalein alk	MG/L CACO3	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000		<20.0000	<20.0000
Phosphorus	mg/L	<.1000	.1300	<.1000	<.1000	<.1000		<.1000	.1000
Potassium	mg/L	<1.0000	462.0000	35.4000	37.4000	37.5000		39.0000	36.6000
Radium-226	pCi/L	<1.0000	1.3000	<1.0000	1.1000			<1.0000	<1.0000
Radium-228	pCi/L	<2.0000	<2.0000	<2.0000	<2.0000			<2.0000	3.6000
Selenium	mg/L	<.0020	.0636	.8895	.0309	1.1000		.2805	.9477
Silver	mg/L	<.0005	<.0005	<.0005	<.0005	<.0005		<.0005	<.0005
Sodium	mg/L	<1.0000	9650.0000	1250.0000	730.0000	1660.0000		1510.0000	1160.0000
Sodium adsorption ratio		.1700	51.3000	7.1100	4.0100	11.1000		10.7000	7.8400
Specific conductance	umhos/cm	1.0000	51094.0000	10870.0000	12289.0000	11596.0000		8441.0000	7893.0000
Sulfate	mg/L	<5.0000	767.0000	5330.0000	1630.0000	6430.0000		4940.0000	4740.0000
Temperature, field	DEGREES C		17.2000	9.7100	11.6000	11.2000		9.0800	10.4700*
Toluene	ppb	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000		<1.0000	<1.0000

* - The displayed value is the arithmetic mean of multiple database matches.

Prepared by: Carlson McCain, Inc.

Table 6

Analytical Data Summary for 5/05/2015 to 5/12/2015

Constituents	Units	EQUIP. BLANK	LEACHATE POND	MW-1	MW-16	MW-18	MW-2	MW-20	MW-21
Total alkalinity	MG/L CACO3	<20.0000	161.0000	418.0000	449.0000	430.0000		685.0000	440.0000
Total dissolved solids	mg/L	<12.5000	35000.0000	9390.0000	8710.0000	10400.0000		8110.0000	7590.0000
Total hardness as caco3	mg/L	<6.6200	6710.0000	5850.0000	6260.0000	4250.0000		3800.0000	4140.0000
Total suspended solids	mg/L	<1.0000	19.0000	2.0000	11.0000	2.0000		2.0000	18.0000
Xylenes (total)	ppb	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000		<3.0000	<3.0000

* - The displayed value is the arithmetic mean of multiple database matches.

Table 6

Analytical Data Summary for 5/05/2015 to 5/12/2015

Constituents	MW-22	MW-23	MW-23 DUP	MW-25	MW-3	MW-30	MW-31	MW-32	MW-32 DUP	MW-33
Anion summation	72.7000	134.0000	142.0000	134.0000	161.0000			11.4000	11.7000	155.0000
Arsenic	.0046	.0239	.0292	.0277	.0384			<.0020	.0022	.0321
Barium	<.1000	<.1000	<.1000	<.1000	<.1000			<.1000	<.1000	<.1000
Benzene	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000		<1.0000	<1.0000	<1.0000	<1.0000
Bicarbonate	363.0000	381.0000	381.0000	293.0000	413.0000		640.0000	358.0000	363.0000	638.0000
Cadmium	<.0010	.0012	.0010	<.0010	<.0010			<.0010	<.0010	<.0010
Calcium	274.0000	535.0000	505.0000	565.0000	418.0000			102.0000	96.5000	444.0000
Carbonate	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000		<20.0000	<20.0000	<20.0000	<20.0000
Cation summation	76.2000	137.0000	130.0000	137.0000	150.0000			11.8000	11.1000	156.0000
Chloride	69.7000	211.0000	214.0000	89.1000	274.0000		3470.0000	16.0000	16.1000	111.0000
Chromium	<.0020	<.0020	<.0020	<.0020	<.0020			<.0020	<.0020	<.0020
Conductivity, field	5932.0000	9249.0000		8892.0000	11227.0000		13271.0000	1186.0000		10118.5000*
DRO	<.2000	<.2000	<.2000	<.2000	<.2000			<.2000	<.2000	<.2000
Ethylbenzene	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000		<1.0000	<1.0000	<1.0000	<1.0000
Fluoride	.2400	.7100	.7300	.6000	.4900		.3200	.8400	.8000	.3900
GRO	<.2000	<.2000	<.2000	<.2000	<.2000		<.2000	<.2000	<.2000	<.2000
Hardness in grains/gallon	88.9000	274.0000	259.0000	217.0000	250.0000			30.9000	28.9000	274.0000
Hydroxide	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000		<20.0000	<20.0000	<20.0000	<20.0000
Iron	<.1000	<.1000	<.1000	<.1000	<.1000			<.1000	<.1000	<.1000
Lead	.0012	<.0010	<.0010	<.0010	<.0010			<.0010	<.0010	<.0010
Magnesium	203.0000	815.0000	770.0000	560.0000	785.0000			66.5000	61.6000	870.0000
Manganese	.3400	<.0500	<.0500	<.0500	<.0500			<.0500	<.0500	<.0500
Mercury	<.0002	<.0002	<.0002	<.0002	<.0002			<.0002	<.0002	<.0002
Nitrate-nitrite as n	.1500	253.0000	253.0000	34.0000	230.0000			18.8000	19.1000	104.0000
Nitrogen, ammonia	.5000	<.1000	<.1000	<.1000	<.1000			<.1000	<.1000	<.1000
Percent error	2.3200	1.2600	<.0000	1.0900	<.0000			1.5500	<.0000	.3000
Percent sodium	59.4000	31.0000	31.2000	45.2000	42.5000			8.7800	9.1100	39.1000
pH	7.1000	7.2000	7.4000	6.9000	7.3000		7.4000	7.2000	7.1000	7.3000
pH Field	7.2100	7.1100		6.9900	7.0300		6.7700	7.4400		6.9650*
Phenolphthalein alk	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000		<20.0000	<20.0000	<20.0000	<20.0000
Phosphorus	.5300	<.1000	<.1000	<.1000	<.1000			<.1000	<.1000	<.1000
Potassium	20.9000	42.8000	41.5000	29.1000	36.7000			7.6000	7.1000	37.6000
Radium-226	1.1000	<1.0000	<1.0000	<1.0000				<1.0000	<1.0000	<1.0000
Radium-228	<2.0000	<2.0000	<2.0000	<2.0000				<2.0000	<2.0000	<2.0000
Selenium	<.0020	1.1070	1.0700	1.4140	1.8770			<.0020	<.0020	1.5770
Silver	<.0005	<.0005	<.0005	<.0005	<.0005			<.0005	<.0005	<.0005
Sodium	1040.0000	980.0000	935.0000	1420.0000	1470.0000			23.8000	23.2000	1400.0000
Sodium adsorption ratio	11.6000	6.2300	6.1100	10.1000	9.7800			.4500	.4500	8.8900
Specific conductance	5661.0000	8691.0000	8716.0000	8994.0000	10801.0000		12856.0000	1053.0000	1029.0000	10101.0000
Sulfate	3050.0000	4920.0000	5320.0000	5910.0000	6190.0000		2890.0000	119.0000	125.0000	6310.0000
Temperature, field	12.7000	11.4000		10.2000	9.8500		10.4000	11.7000		9.7000*
Toluene	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000		<1.0000	<1.0000	<1.0000	<1.0000

* - The displayed value is the arithmetic mean of multiple database matches.

Prepared by: Carlson McCain, Inc.

Table 6

Analytical Data Summary for 5/05/2015 to 5/12/2015

Constituents	MW-22	MW-23	MW-23 DUP	MW-25	MW-3	MW-30	MW-31	MW-32	MW-32 DUP	MW-33
Total alkalinity	363.0000	381.0000	381.0000	293.0000	413.0000		640.0000	358.0000	363.0000	638.0000
Total dissolved solids	4880.0000	7990.0000	8270.0000	8780.0000	9650.0000			568.0000	566.0000	9660.0000
Total hardness as caco3	1520.0000	4690.0000	4430.0000	3720.0000	4280.0000			529.0000	495.0000	4690.0000
Total suspended solids	10.0000	7.0000	9.0000	26.0000	15.0000		984.0000	6.0000	54.0000	8.0000
Xylenes (total)	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000		<3.0000	<3.0000	<3.0000	<3.0000

* - The displayed value is the arithmetic mean of multiple database matches.

Table 6

Analytical Data Summary for 5/05/2015 to 5/12/2015

Constituents	MW-34	MW-35	MW-37B	MW-38	MW-4	MW-44	MW-45	SURFACE WATER	TRIP BLANK
Anion summation		192.0000	12.2000	12.7000		215.0000	178.0000	32.2000	
Arsenic		.0162				.0428		.0066	
Barium		<.1000				<.1000		<.1000	
Benzene	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000*
Bicarbonate	348.0000	703.0000	260.0000	386.0000		321.0000	488.0000	129.0000	
Cadmium		<.0010				<.0010		<.0010	
Calcium		426.0000	57.4000	7.8000	401.0000	392.0000	370.0000	180.0000	
Carbonate	<20.0000	<20.0000	<20.0000	<20.0000		<20.0000	<20.0000	<20.0000	
Cation summation		187.0000	12.1000	11.9000		211.0000	176.0000	31.0000	
Chloride	276.0000	121.0000	12.2000	6.3000		188.0000	117.0000	495.0000	
Chromium		<.0020				<.0020		<.0020	
Conductivity, field	14861.0000	13571.0000*	1184.0000	1655.0000	12006.0000	15142.0000	12496.0000	2840.0000	
DRO		<.2000	<.2000	<.2000		<.2000	<.2000	.2100	
Ethylbenzene	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000*
Fluoride	.6300	.2700	.2800	.4200		.6500	.4300	.5000	
GRO	<.2000	<.2000	<.2000	<.2000	<.2000	<.2000	<.2000	<.2000	<.2000*
Hardness in grains/gallon		239.0000	18.9000			308.0000		48.6000	
Hydroxide	<20.0000	<20.0000	<20.0000	<20.0000		<20.0000	<20.0000	<20.0000	
Iron		<.1000				<.1000		<.1000	
Lead		.0016				<.0010		<.0010	
Magnesium		735.0000	43.8000	5.4000	590.0000	1040.0000	875.0000	92.5000	
Manganese		<.0500				<.0500		<.0500	
Mercury		<.0002				<.0002		<.0002	
Nitrate-nitrite as n		295.0000	.6100	1.3200	400.0000	142.0000	19.7000	<.1000	
Nitrogen, ammonia		<.1000	.1500	.1400	<.1000	<.1000	<.1000	<.1000	
Percent error		<.0000	<.0000	<.0000		<.0000	<.0000	<.0000	
Percent sodium		55.7000	44.6000			49.6000		45.3000	
pH	7.2000	7.2000	7.1000	7.6000		7.5000	7.3000	7.4000	
pH Field	7.3600	7.0550*	7.5500	7.5600	7.4300	7.5600	7.2800	6.9900	
Phenolphthalein alk	<20.0000	<20.0000	<20.0000	<20.0000		<20.0000	<20.0000	<20.0000	
Phosphorus		<.1000	.2500	.3100	.1300	<.1000	<.1000	<.1000	
Potassium		48.8000	9.4000	3.7000	47.8000	43.8000	42.4000	14.6000	
Radium-226						<1.0000		<1.0000	
Radium-228						<2.0000		<2.0000	
Selenium		.6850				2.3100		.0524	
Silver		<.0005				<.0005		<.0005	
Sodium		2400.0000	124.0000	252.0000	1820.0000	2400.0000	1950.0000	323.0000	
Sodium adsorption ratio		16.3000	3.0000	17.0000		14.4000	12.6000	4.8800	
Specific conductance	14353.0000	13309.0000	1126.0000	1252.0000		14259.0000	12395.0000	2888.0000	
Sulfate	9930.0000	7390.0000	319.0000	225.0000		9290.0000	7860.0000	750.0000	
Temperature, field	8.0100	8.1200*	11.8000	13.2000	9.9900	7.5600	9.8100	11.3000	
Toluene	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000*

* - The displayed value is the arithmetic mean of multiple database matches.

Prepared by: Carlson McCain, Inc.

Table 6

Analytical Data Summary for 5/05/2015 to 5/12/2015

Constituents	MW-34	MW-35	MW-37B	MW-38	MW-4	MW-44	MW-45	SURFACE WATER	TRIP BLANK
Total alkalinity	348.0000	703.0000	260.0000	386.0000		321.0000	488.0000	129.0000	
Total dissolved solids		11800.0000	722.0000	733.0000		13700.0000	11500.0000	1930.0000	
Total hardness as caco3		4090.0000	324.0000	41.7000		5260.0000	4530.0000	830.0000	
Total suspended solids	53.0000	41.0000	6.0000			17.0000		13.0000	
Xylenes (total)	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000*

* - The displayed value is the arithmetic mean of multiple database matches.

Table 7

Analytical Data Summary for 10/27/2015 to 10/28/2015

Constituents	Units	EQUIP. BLANK	FIELD BLANK	LEACHATE POND	MW-1	MW-16	MW-18	MW-2	MW-20
Anion summation	meq/L	.0000	.0000	771.0000	170.0000	159.0000	169.0000		119.0000
Arsenic	mg/L	<.0020	<.0020	.0510	.0175	<.0020	.0194		<.0020
Barium	mg/L	<.1000	<.1000	<.1000	<.1000	<.1000	<.1000		<.1000
Benzene	ppb	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
Bicarbonate	MG/L CACO3	<20.0000	<20.0000	150.0000	409.0000	429.0000	408.0000	650.0000	677.0000
Cadmium	mg/L	<.0005	<.0005	<.0005	.0006	.0059	<.0005		<.0005
Calcium	mg/L	<1.0000	<1.0000	2590.0000	555.0000	1390.0000	480.0000		460.0000
Carbonate	MG/L CACO3	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000
Cation summation	meq/L	.0000	.0000	728.0000	173.0000	159.0000	180.0000		130.0000
Chloride	mg/L	<1.0000	<1.0000	26500.0000	333.0000	4090.0000	943.0000	167.0000	24.6000
Chromium	mg/L	<.0020	<.0020	<.0020	<.0020	<.0020	<.0020		<.0020
Conductivity, field	umhos/cm			58838.0000	10401.0000	12160.0000	11650.0000	11890.0000	8112.0000
DRO	ppm	<.2000	<.2000	2.7000	<.2000	<.2000	<.2000		<.2000
Ethylbenzene	ug/L	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
Fluoride	mg/L	<.1000	<.1000	.2500	.4300	.2200	.6800	.3600	.4700
GRO	ppm	<.2000	<.2000	<.2000	<.2000	<.2000	<.2000	<.2000	<.2000
Hydroxide	MG/L CACO3	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000
Iron	mg/L	<.1000	<.1000	<.1000	<.1000	<.1000	<.1000		<.1000
Lead	mg/L	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005		<.0005
Magnesium	mg/L	<1.0000	<1.0000	379.0000	1110.0000	695.0000	885.0000		565.0000
Manganese	mg/L	<.0500	<.0500	13.8000	<.0500	.3100	<.0500		<.0500
Mercury	mg/L	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002		<.0002
Nitrate-nitrite as n	mg/L	<.1000	<.1000	<.1000	638.0000	<.1000	18.6000		59.6000
Nitrogen, ammonia	mg/L	<.1000	<.1000	20.8000	<.1000	<.1000	<.1000		<.1000
Percent error	%			<.0000	1.0600	.0200	2.9600		4.2600
pH	units	6.0000	5.9000	7.0000	6.9000	6.7000	7.5000	7.3000	6.9000
pH Field	units			7.1400	6.9700	6.3500	7.2000	6.9100	6.6800
Phenolphthalein alk	MG/L CACO3	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000
Phosphorus	mg/L	<.1000	<.1000	<.1000	<.1000	.1000	<.1000		<.1000
Potassium	mg/L	<1.0000	<1.0000	685.0000	33.0000	34.6000	43.0000		32.4000
Radium-226	pCi/L	<1.0000	<1.0000	1.3000	1.1000	<1.0000			<1.0000
Radium-228	pCi/L	<2.0000	<2.0000	<2.0000	<2.0000	<2.0000			<2.0000
Selenium	mg/L	<.0020	<.0020	.0620	.9920	.0128	1.2360		.3246
Silver	mg/L	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005		<.0005
Sodium	mg/L	<1.0000	<1.0000	12600.0000	1230.0000	725.0000	1880.0000		1370.0000
Sodium adsorption ratio		.1700	.1700	61.2000	6.9300	3.9600	11.8000		10.1000
Specific conductance	umhos/cm	2.0000	2.0000	59596.0000	10964.0000	12719.0000	11662.0000	11743.0000	8589.0000
Sulfate	mg/L	<5.0000	<5.0000	982.0000	5120.0000	1680.0000	6400.0000	5910.0000	4840.0000
Temperature, field	DEGREES C			7.3500	8.0600	8.6300	9.6100	8.2800	8.6600
Toluene	ppb	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
Total alkalinity	MG/L CACO3	<20.0000	<20.0000	150.0000	409.0000	429.0000	408.0000	650.0000	677.0000
Total dissolved solids	mg/L	.0000	.0000	43800.0000	9260.0000	8870.0000	10900.0000		7760.0000

* - The displayed value is the arithmetic mean of multiple database matches.

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Table 7

Analytical Data Summary for 10/27/2015 to 10/28/2015

Constituents	MW-21	MW-21DUP	MW-22	MW-23	MW-25	MW-3	MW-31	MW-32	MW-33	MW-35
Anion summation	123.0000	115.0000	73.5000	120.0000	131.0000	162.0000		10.5000	153.0000	196.0000
Arsenic	.0147	<.0020	<.0020	.0266	.0171	.0300		<.0020	.0210	
Barium	<.1000	<.1000	<.1000	<.1000	<.1000	<.1000		<.1000	<.1000	
Benzene	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
Bicarbonate	441.0000	435.0000	356.0000	385.0000	290.0000	409.0000	625.0000	354.0000	645.0000	709.0000
Cadmium	.0008	.0007	<.0005	.0011	.0005	<.0005		<.0005	<.0005	
Calcium	490.0000	505.0000	275.0000	520.0000	570.0000	472.0000		94.0000	466.0000	446.0000
Carbonate	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000
Cation summation	122.0000	127.0000	75.3000	133.0000	141.0000	171.0000		11.4000	162.0000	196.0000
Chloride	109.0000	111.0000	65.6000	200.0000	79.5000	251.0000	2900.0000	19.5000	99.3000	109.0000
Chromium	<.0020	<.0020	<.0020	<.0020	<.0020	<.0020		<.0020	<.0020	
Conductivity, field	7408.0000		5475.0000	8303.0000	8441.0000		12634.0000	998.0000	9566.0000	13393.0000
DRO	<.2000	<.2000	<.2000	<.2000	<.2000	<.2000		<.2000	<.2000	
Ethylbenzene	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
Fluoride	.3600	.3700	.2400	.6500	.5800	.4600	.3300	.8700	.3900	.2900
GRO	<.2000	<.2000	<.2000	<.2000	<.2000	<.2000	<.2000	<.2000	<.2000	<.2000
Hydroxide	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000
Iron	<.1000	<.1000	<.1000	<.1000	<.1000	<.1000		<.1000	<.1000	
Lead	<.0005	<.0005	.0005	<.0005	<.0005	<.0005		<.0005	<.0005	
Magnesium	615.0000	640.0000	202.0000	795.0000	590.0000	890.0000		67.7000	905.0000	750.0000
Manganese	.2600	<.0500	.3700	<.0500	<.0500	<.0500		<.0500	<.0500	
Mercury	<.0002	<.0002	<.0002	<.0002	<.0002	<.0002		<.0002	<.0002	
Nitrate-nitrite as n	51.0000	48.2000	.1700	229.0000	33.3000	218.0000		16.5000	104.0000	280.0000
Nitrogen, ammonia	<.1000	<.1000	2.0000	<.1000	.1100	<.1000		<.1000	<.1000	<.1000
Percent error	<.0000	4.8700	1.2100	5.0500	3.9200	2.5400		4.1000	2.7600	<.0000
pH	7.0000	7.1000	7.1000	7.2000	6.9000	7.3000	7.3000	7.2000	7.2000	7.1000
pH Field	6.7200		7.0800	6.9500	6.8400		6.6700	7.1500	6.8400	7.0700
Phenolphthalein alk	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000
Phosphorus	.5400	.2500	<.1000	<.1000	<.1000	<.1000		<.1000	<.1000	.1300
Potassium	30.6000	32.1000	19.0000	39.6000	27.5000	39.8000		8.1000	36.5000	48.0000
Radium-226	1.1000	<1.0000	1.4000	<1.0000	<1.0000			<1.0000	<1.0000	
Radium-228	2.2000	<2.0000	<2.0000	<2.0000	4.0000			<2.0000	<2.0000	
Selenium	.9710	.9970	<.0020	1.0320	1.3600	1.9010		<.0020	1.3600	
Silver	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005		<.0005	<.0005	
Sodium	1070.0000	1100.0000	1020.0000	940.0000	1460.0000	1680.0000		22.0000	1450.0000	2540.0000
Sodium adsorption ratio	7.6000	7.6700	11.4000	6.0500	10.2000	10.5000		.4200	9.0200	17.0000
Specific conductance	7951.0000	7943.0000	5859.0000	8744.0000	9152.0000	10837.0000	12620.0000	1003.0000	10071.0000	13048.0000
Sulfate	5150.0000	4780.0000	3100.0000	4360.0000	5770.0000	6320.0000	2950.0000	82.5000	6240.0000	7640.0000
Temperature, field	8.6300		8.4400	9.0700	8.2800		9.1100	9.8000	8.6200	10.3000
Toluene	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000
Total alkalinity	441.0000	435.0000	356.0000	385.0000	290.0000	409.0000	625.0000	354.0000	645.0000	709.0000
Total dissolved solids	7780.0000	7480.0000	4900.0000	7310.0000	8700.0000	10100.0000		523.0000	9690.0000	12200.0000

* - The displayed value is the arithmetic mean of multiple database matches.

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Table 7

Analytical Data Summary for 10/27/2015 to 10/28/2015

Constituents	MW-37B	MW-38	MW-38DUP	MW-4	MW-44	MW-45	MW-51	SURFACE WATER	TRIP BLANK
Anion summation	11.7000	13.1000	12.8000		229.0000	185.0000		39.2000	
Arsenic	<.0020	<.0020	<.0020		.0479	.0128		<.0020	
Barium	<.1000	<.1000	<.1000		<.1000	<.1000		<.1000	
Benzene	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000		<1.0000	<1.0000
Bicarbonate	255.0000	377.0000	386.0000	273.0000	330.0000	512.0000	1300.0000	69.0000	
Cadmium	<.0005	<.0005	<.0005		<.0005	.0005		<.0005	
Calcium	57.3000	9.3000	8.9000		432.0000	444.0000		212.0000	
Carbonate	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	
Cation summation	12.1000	13.5000	13.2000		234.0000	212.0000		40.1000	
Chloride	10.9000	6.0000	6.2000	125.0000	176.0000	108.0000	39.2000	589.0000	
Chromium	<.0020	<.0020	<.0020		<.0020	<.0020		<.0020	
Conductivity, field	952.0000	1144.0000		11723.0000	13711.0000	12640.0000	12414.0000	3468.0000	
DRO	<.2000	<.2000	<.2000		<.2000	<.2000		.2400	
Ethylbenzene	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000		<1.0000	<1.0000
Fluoride	.2900	.4400	.4400	.5000	.7000	.4300	.4900	.3700	
GRO	<.2000	<.2000	<.2000	<.2000	<.2000	<.2000		<.2000	<.2000
Hydroxide	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	
Iron	<.1000	.6200	.4500		<.1000	<.1000		<.1000	
Lead	<.0005	<.0005	<.0005		<.0005	<.0005		<.0005	
Magnesium	43.4000	6.7000	6.4000		1160.0000	1060.0000		121.0000	
Manganese	.0500	.0600	.0600		<.0500	<.0500		<.0500	
Mercury	<.0002	<.0002	<.0002		<.0002	<.0002		<.0002	
Nitrate-nitrite as n	.5700	.3800	.4000		134.0000	17.0000		<.1000	
Nitrogen, ammonia	.3200	<.1000	<.1000		<.1000	<.1000		<.1000	
Percent error	1.7300	1.4900	1.4300		.9900	6.8900		1.0600	
pH	7.2000	7.6000	7.7000	7.2000	7.5000	7.3000	7.0000	7.4000	
pH Field	7.3500	7.5500		7.1200	7.3200	7.1700	6.7300	8.3100	
Phenolphthalein alk	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	<20.0000	
Phosphorus	.2700	.1700	.1700		.1800	.1400		<.1000	
Potassium	9.4000	4.4000	4.2000		46.6000	47.2000		18.9000	
Radium-226	<1.0000	<1.0000	<1.0000		<1.0000			<1.0000	
Radium-228	<2.0000	<2.0000	<2.0000		<2.0000			2.1000	
Selenium	.0021	<.0020	<.0020		2.2800	.7190		.0021	
Silver	<.0005	<.0005	<.0005		<.0005	<.0005		<.0005	
Sodium	124.0000	284.0000	278.0000		2660.0000	2340.0000		438.0000	
Sodium adsorption ratio	3.0100	17.3000	17.4000		15.1000	13.8000		5.9500	
Specific conductance	1100.0000	1284.0000	1310.0000	11695.0000	14500.0000	12192.0000	12232.0000	3686.0000	
Sulfate	299.0000	258.0000	235.0000	6140.0000	10000.0000	8190.0000	6620.0000	1020.0000	
Temperature, field	9.1600	8.6000		7.7400	11.0000	8.2100	7.9100	6.9400	
Toluene	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000	<1.0000		<1.0000	<1.0000
Total alkalinity	255.0000	377.0000	386.0000	273.0000	330.0000	512.0000	1300.0000	69.0000	
Total dissolved solids	698.0000	795.0000	771.0000		14800.0000	12500.0000		2440.0000	

* - The displayed value is the arithmetic mean of multiple database matches.

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Table 7

Analytical Data Summary for 10/27/2015 to 10/28/2015

Constituents	Units	EQUIP. BLANK	FIELD BLANK	LEACHATE POND	MW-1	MW-16	MW-18	MW-2	MW-20
Total hardness as caco3	mg/L	<6.6200	<6.6200	8030.0000	5960.0000	6330.0000	4840.0000		3480.0000
Total suspended solids	mg/L	<1.0000	<1.0000	111.0000	12.0000	115.0000	49.0000		14.0000
Xylenes (total)	ppb	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000

* - The displayed value is the arithmetic mean of multiple database matches.

Table 7

Analytical Data Summary for 10/27/2015 to 10/28/2015

Constituents	MW-21	MW-21DUP	MW-22	MW-23	MW-25	MW-3	MW-31	MW-32	MW-33	MW-35
Total hardness as caco3	3760.0000	3900.0000	1520.0000	4570.0000	3850.0000	4840.0000		514.0000	4890.0000	4200.0000
Total suspended solids	69.0000	480.0000	708.0000	19.0000	71.0000	39.0000		29.0000	26.0000	
Xylenes (total)	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000

* - The displayed value is the arithmetic mean of multiple database matches.

Table 7

Analytical Data Summary for 10/27/2015 to 10/28/2015

Constituents	MW-37B	MW-38	MW-38DUP	MW-4	MW-44	MW-45	MW-51	SURFACE WATER	TRIP BLANK
Total hardness as caco3	322.0000	50.8000	48.6000		5860.0000	5470.0000		1030.0000	
Total suspended solids	410.0000	154.0000	104.0000		22.0000	196.0000		29.0000	
Xylenes (total)	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000	<3.0000		<3.0000	<3.0000

* - The displayed value is the arithmetic mean of multiple database matches.

TABLE 8
HISTORICAL MCL EXCEEDENCES

Well	Date	Concentration
Arsenic	**MCL = 0.01 mg/L**	
MW-1	5/13/2003	0.017
MW-1	9/30/2003	0.0309
MW-1	8/17/2004	0.0388
MW-1	8/16/2005	0.0213
MW-1	5/22/2007	0.0442
MW-1	6/5/2008	0.0512
MW-1	6/24/2009	0.0558
MW-1	10/21/2009	0.0665
MW-1	07/21/2010	0.012
MW-1	5/16/2013	0.0553
MW-1	10/24/2013	0.0532
MW-1	5/7/2014	0.0452
MW-1	**5/5/2015**	**0.0192**
MW-1	**10/27/2015**	**0.0175**
MW-1A	5/13/2003	0.0108
MW-2	5/13/2003	0.0159
MW-2	6/5/2008	0.0334
MW-2	10/27/2009	0.0425
MW-2	07/28/2010	0.034
MW-2	5/16/2013	0.0758
MW-2	11/11/2013	0.0706
MW-3	5/16/2013	0.1172
MW-3	11/11/2013	0.1153
MW-3	5/7/2014	0.0865
MW-3	10/8/2014	0.0123
MW-3	**5/5/2015**	**0.0384**
MW-3	**10/27/2015**	**0.03**
MW-4	5/16/2013	0.0928
MW-4	11/11/2013	0.1163
MW-12A	11/19/1997	0.0278
MW-12A	6/23/1998	0.0111
MW-12A	4/6/1999	0.0156
MW-12A	11/10/1999	0.0139
MW-12A	4/4/2000	0.0203
MW-12A	8/29/2000	0.0152
MW-12A	5/13/2003	0.0119
MW-12A	6/5/2008	0.0448
MW-16	6/24/2009	0.0327
MW-16	10/21/2009	0.0349
MW-16	07/21/2010	0.012
MW-16	5/16/2013	0.0552
MW-16	11/11/2013	0.046
MW-16	5/6/2014	0.0586
MW-18	5/13/2003	0.0413
MW-18	6/5/2008	0.0642
MW-18	6/24/2009	0.0427
MW-18	10/21/2009	0.0482
MW-18	07/20/2010	0.013
MW-18	5/16/2013	0.0833
MW-18	11/11/2013	0.0584

TABLE 8
HISTORICAL MCL EXCEEDENCES

Well	Date	Concentration
MW-18	5/7/2014	0.0539
MW-18	**5/5/2015**	**0.0249**
MW-18	**10/28/2015**	**0.0194**
MW-20	10/8/2007	0.0112
MW-20	6/5/2008	0.0148
MW-20	6/24/2009	0.0177
MW-20	10/27/2009	0.0258
MW-20	5/16/2013	0.0206
MW-20	11/11/2013	0.0179
MW-20	5/6/2014	0.137
MW-21	6/24/2009	0.0427
MW-21	10/21/2009	0.0574
MW-21	07/21/2010	0.014
MW-21	5/16/2013	0.0598
MW-21	11/11/2013	0.0652
MW-21	5/6/2014	0.0428
MW-21	**5/5/2015**	**0.0205**
MW-21	**10/27/2015**	**0.0147**
MW-23	6/24/2009	0.0654
MW-23	10/21/2009	0.0772
MW-23	07/21/2010	0.016
MW-23	5/16/2013	0.075
MW-23	11/11/2013	0.081
MW-23	5/6/2014	0.0607
MW-23	10/8/2014	0.0104
MW-23	**5/5/2015**	**0.0239**
MW-23	**10/27/2015**	**0.0266**
MW-24	10/21/2009	0.1966
MW-25	10/21/2009	0.0254
MW-25	5/16/2013	0.068
MW-25	11/11/2013	0.0824
MW-25	5/7/2014	0.0601
MW-25	**5/5/2015**	**0.0277**
MW-25	**10/27/2015**	**0.0171**
MW-30	11/11/2013	0.1126
MW-31	6/24/2009	0.0179
MW-31	10/21/2009	0.0119
MW-31	5/16/2013	0.021
MW-31	11/11/2013	0.0113
MW-31	5/7/2014	0.0211
MW-33	10/27/2009	0.1467
MW-33	5/16/2013	0.0952
MW-33	11/11/2013	0.1034
MW-33	5/7/2014	0.0844
MW-33	10/7/2014	0.0121
MW-33	**5/5/2015**	**0.0321**
MW-33	**10/27/2015**	**0.021**
MW-34	10/27/2009	0.0902
MW-34	07/20/2010	0.014
MW-34	5/16/2013	0.1118
MW-34	11/11/2013	0.1084

TABLE 8
HISTORICAL MCL EXCEEDENCES

Well	Date	Concentration
MW-35	10/27/2009	0.0625
MW-35	07/20/2010	0.012
MW-35	5/16/2013	0.0438
MW-35	5/7/2014	0.0403
MW-35	**5/5/2015**	**0.0162**
MW-44	5/7/2014	0.1224
MW-44	10/7/2014	0.0219
MW-44	**5/5/2015**	**0.0428**
MW-44	**10/27/2015**	**0.0479**
MW-45	5/7/2014	0.0383
MW-45	**10/28/2015**	**0.0128**
Cadmium	**MCL = 0.005 mg/L**	
MW-12A	11/19/1997	0.01
MW-12A	6/5/2008	0.01
MW-16	11/20/1997	0.02
MW-16	10/8/2014	0.0058
MW-16	**5/5/2015**	**0.0051**
MW-16	**10/27/2015**	**0.0059**
MW-19	11/20/1997	0.01
MW-20	11/20/1997	0.02
Chromium	**MCL = 0.1 mg/L**	
MW-12A	6/5/2008	0.31
Nitrate-Nitrite as N	**MCL = 10 mg/L**	
MW-1	5/13/2003	340
MW-1	9/30/2003	401
MW-1	8/17/2004	497
MW-1	8/16/2005	426
MW-1	5/22/2007	407
MW-1	6/5/2008	602
MW-1	6/24/2009	374
MW-1	10/21/2009	487
MW-1	5/16/2013	418
MW-1	11/13/2013	414
MW-1	5/7/2014	464
MW-1	10/7/2014	505
MW-1	**5/5/2015**	**531**
MW-1	**10/27/2015**	**638**
MW-2	5/13/2003	462
MW-2	6/5/2008	468
MW-2	6/24/2009	381
MW-2	5/16/2013	387
MW-2	5/7/2014	406
MW-2	10/8/2014	394
MW-3	11/7/2011	74.4
MW-3	5/16/2013	228
MW-3	11/13/2013	149
MW-3	5/7/2014	194
MW-3	10/8/2014	191
MW-3	**5/5/2015**	**230**
MW-3	**10/28/2015**	**218**
MW-4	5/7/2014	382

TABLE 8
HISTORICAL MCL EXCEEDENCES

Well	Date	Concentration
MW-4	10/8/2014	389
MW-4	**5/5/2015**	**400**
MW-12A	4/6/1999	10.8
MW-12A	11/10/1999	15.7
MW-12A	4/4/2000	12.6
MW-12A	8/29/2000	14.8
MW-12A	5/13/2003	32.1
MW-12A	6/5/2008	35.4
MW-16	6/24/1998	13.2
MW-16	9/24/1998	13.2
MW-16	4/7/1999	12.9
MW-16	11/11/1999	12.2
MW-16	4/4/2000	12.2
MW-18	5/13/2003	16.3
MW-18	6/5/2008	16.2
MW-18	6/24/2009	11.8
MW-18	5/16/2013	16.8
MW-18	11/13/2013	17.3
MW-18	5/7/2014	13.7
MW-18	10/8/2014	22.7
MW-18	**5/5/2015**	**17.3**
MW-18	**10/28/2015**	**18.6**
MW-20	11/20/1997	89.7
MW-20	6/24/1998	96.2
MW-20	9/24/1998	75.5
MW-20	4/7/1999	84
MW-20	11/11/1999	81.6
MW-20	4/4/2000	54.1
MW-20	8/29/2000	70.5
MW-20	5/13/2003	75.3
MW-20	5/23/2006	75.6
MW-20	10/8/2007	71.9
MW-20	6/5/2008	74.8
MW-20	6/24/2009	108
MW-20	10/27/2009	74.4
MW-20	5/16/2013	61.2
MW-20	11/13/2013	65.4
MW-20	5/6/2014	59.2
MW-20	10/7/2014	62.6
MW-20	**5/5/2015**	**62**
MW-20	**10/27/2015**	**59.6**
MW-21	6/24/2009	53
MW-21	10/21/2009	58.3
MW-21	5/16/2013	54.8
MW-21	11/13/2013	56.4
MW-21	5/6/2014	51.4
MW-21	10/7/2014	54.6
MW-21	**5/5/2015**	**54.2**
MW-21	**10/27/2015**	**51**
MW-23	6/24/2009	267
MW-23	10/21/2009	283

TABLE 8
HISTORICAL MCL EXCEEDENCES

Well	Date	Concentration
MW-23	5/16/2013	228
MW-23	11/13/2013	250
MW-23	5/6/2014	235
MW-23	10/8/2014	247
MW-23	**5/5/2015**	**253**
MW-23	**10/27/2015**	**229**
MW-24	10/21/2009	57.4
MW-25	5/16/2013	29.2
MW-25	11/13/2013	33.6
MW-25	5/7/2014	35.2
MW-25	10/7/2014	37.9
MW-25	**5/5/2015**	**34**
MW-25	**10/27/2015**	**33.3**
MW-26	10/21/2009	355
MW-30	5/7/2014	134
MW-30	10/8/2014	141
MW-32	6/24/2009	15.1
MW-32	10/27/2009	20
MW-32	5/16/2013	11.2
MW-32	11/13/2013	18.4
MW-32	5/6/2014	11.4
MW-32	10/7/2014	18.3
MW-32	**5/5/2015**	**18.8**
MW-32	**10/27/2015**	**16.5**
MW-33	10/27/2009	109
MW-33	5/16/2013	100
MW-33	11/13/2013	100
MW-33	5/6/2014	94
MW-33	10/7/2014	102
MW-33	**5/5/2015**	**104**
MW-33	**10/27/2015**	**104**
MW-34	10/27/2009	28.6
MW-34	5/16/2013	28
MW-34	5/7/2014	27
MW-34	10/8/2014	25.3
MW-35	10/27/2009	336
MW-35	5/16/2013	277
MW-35	11/13/2013	294
MW-35	5/7/2014	284
MW-35	10/8/2014	273
MW-35	**5/5/2015**	**295**
MW-35	**10/28/2015**	**280**
MW-44	5/7/2014	134
MW-44	10/7/2014	136
MW-44	**5/5/2015**	**142**
MW-44	**10/27/2015**	**134**
MW-45	5/7/2014	18.8
MW-45	10/7/2014	19.5
MW-45	**5/5/2015**	**19.7**
MW-45	**10/28/2015**	**17**
Radium 226 & 228	**MCL = 5 pCi/L combined**	

TABLE 8
HISTORICAL MCL EXCEEDENCES

Well	Date	Concentration
MW-1	11/21/2012	5.262 ± 1.555
MW-18	11/21/2012	6.15 ± 2.13
MW-21	7/21/2010	5.389 ± 2.573
MW-35	4/30/2012	6.58 ± 3.42
MW-35	11/21/2012	6.40 ± 2.27
Selenium	**MCL = 0.05 mg/L**	
MW-1	5/13/2003	0.4037
MW-1	9/30/2003	0.7981
MW-1	8/17/2004	0.8408
MW-1	8/16/2005	0.8493
MW-1	5/22/2007	1.028
MW-1	6/5/2008	0.8774
MW-1	6/24/2009	0.7712
MW-1	10/21/2009	0.8968
MW-1	07/21/2010	0.908
MW-1	11/09/2010	0.929
MW-1	5/19/2011	0.92
MW-1	11/7/2011	0.79
MW-1	4/27/2012	0.78
MW-1	11/7/2012	0.818
MW-1	5/16/2013	0.8068
MW-1	10/23/2013	0.71
MW-1	5/7/2014	0.844
MW-1	10/7/2014	0.9012
MW-1	**5/5/2015**	**0.8895**
MW-1	**10/27/2015**	**0.992**
MW-2	5/13/2003	0.3886
MW-2	6/5/2008	0.4922
MW-2	10/27/2009	0.4608
MW-2	07/28/2010	0.441
MW-2	11/09/2010	0.404
MW-2	5/19/2011	2.4
MW-2	11/7/2011	1.5
MW-2	4/27/2012	1.2
MW-2	11/7/2012	1.16
MW-2	5/16/2013	1.302
MW-3	5/19/2011	0.27
MW-3	11/7/2011	0.88
MW-3	4/27/2012	0.99
MW-3	11/7/2012	1.18
MW-3	5/16/2013	2.031
MW-3	10/23/2013	1.61
MW-3	5/7/2014	1.815
MW-3	10/8/2014	1.903
MW-3	**5/5/2015**	**1.877**
MW-3	**10/28/2015**	**1.901**
MW-4	5/19/2011	2.1
MW-4	11/7/2011	1.4
MW-4	5/16/2013	1.635
MW-12A	4/6/1999	0.0628
MW-12A	11/10/1999	0.0579

TABLE 8
HISTORICAL MCL EXCEEDENCES

Well	Date	Concentration
MW-12A	8/29/2000	0.0876
MW-12A	5/13/2003	0.2057
MW-12A	6/5/2008	0.3006
MW-16	11/20/1997	0.94
MW-16	6/24/1998	0.912
MW-16	9/24/1998	0.86
MW-16	4/7/1999	1.22
MW-16	11/11/1999	0.765
MW-16	4/4/2000	0.668
MW-18	5/13/2003	1.005
MW-18	6/5/2008	1.04
MW-18	6/24/2009	0.7046
MW-18	10/21/2009	0.5158
MW-18	07/20/2010	0.787
MW-18	11/08/2010	0.862
MW-18	5/19/2011	0.51
MW-18	11/7/2011	0.75
MW-18	5/1/2012	0.66
MW-18	11/7/2012	1.08
MW-18	5/16/2013	1.246
MW-18	10/23/2013	0.7272
MW-18	5/7/2014	0.9018
MW-18	10/8/2014	1.26
MW-18	**5/5/2015**	**1.1**
MW-18	**10/28/2015**	**1.236**
MW-1A	5/13/2003	0.0674
MW-20	11/20/1997	0.297
MW-20	6/24/1998	0.248
MW-20	9/24/1998	0.184
MW-20	4/7/1999	0.332
MW-20	11/11/1999	0.188
MW-20	4/4/2000	0.182
MW-20	8/29/2000	0.257
MW-20	5/13/2003	0.2296
MW-20	5/23/2006	0.2864
MW-20	10/8/2007	0.307
MW-20	6/5/2008	0.299
MW-20	6/24/2009	0.2938
MW-20	10/27/2009	0.3163
MW-20	07/20/2010	0.304
MW-20	11/08/2010	0.341
MW-20	5/19/2011	0.28
MW-20	11/7/2011	0.28
MW-20	5/1/2012	0.3
MW-20	11/7/2012	0.256
MW-20	5/16/2013	0.2886
MW-20	10/23/2013	0.2451
MW-20	5/6/2013	0.2466
MW-20	10/7/2014	0.2744
MW-20	**5/5/2015**	**0.2805**
MW-20	**10/27/2015**	**0.3246**

TABLE 8
HISTORICAL MCL EXCEEDENCES

Well	Date	Concentration
MW-21	6/24/2009	0.7338
MW-21	10/21/2009	0.8048
MW-21	07/21/2010	0.92
MW-21	11/09/2010	0.912
MW-21	5/19/2011	1
MW-21	11/7/2011	1
MW-21	5/1/2012	0.87
MW-21	11/7/2012	0.81
MW-21	5/16/2013	0.96
MW-21	10/23/2013	0.89
MW-21	5/6/2014	0.86
MW-21	10/7/2014	1.003
MW-21	**5/5/2015**	**0.9477**
MW-21	**10/27/2015**	**0.971**
MW-23	6/24/2009	1.142
MW-23	10/21/2009	1.168
MW-23	07/21/2010	1.15
MW-23	11/09/2010	1.15
MW-23	5/19/2011	1.2
MW-23	11/7/2011	0.93
MW-23	4/27/2012	0.83
MW-23	11/7/2012	0.96
MW-23	5/16/2013	1.138
MW-23	10/23/2013	0.978
MW-23	5/6/2014	1.015
MW-23	10/8/2014	1.111
MW-23	**5/5/2015**	**1.107**
MW-23	**10/27/2015**	**1.032**
MW-24	10/21/2009	1.395
MW-24	07/20/2010	2.55
MW-24	11/08/2010	2.47
MW-24	5/19/2011	2.2
MW-25	11/08/2010	1
MW-25	5/19/2011	1.3
MW-25	11/7/2011	1
MW-25	5/1/2012	1
MW-25	11/7/2012	0.943
MW-25	5/16/2013	1.136
MW-25	10/23/2013	1.117
MW-25	5/7/2014	1.087
MW-25	10/7/2014	1.26
MW-25	**5/5/2015**	**1.414**
MW-25	**10/27/2015**	**1.36**
MW-26	10/21/2009	0.727
MW-26	07/20/2010	0.686
MW-26	11/09/2010	0.694
MW-26	5/19/2011	0.57
MW-31	6/24/2009	0.1222
MW-31	10/21/2009	0.0667
MW-33	10/27/2009	1.895
MW-33	07/20/2010	2.69

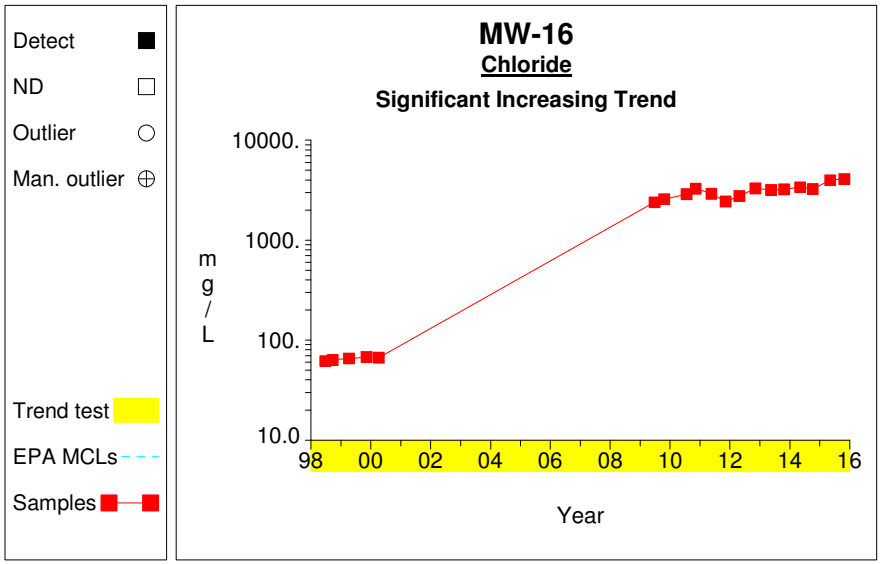
TABLE 8
HISTORICAL MCL EXCEEDENCES

Well	Date	Concentration
MW-33	11/08/2010	2.28
MW-33	5/19/2011	2.4
MW-33	11/7/2011	2
MW-33	4/27/2012	1.5
MW-33	11/7/2012	1.48
MW-33	5/16/2013	1.578
MW-33	10/23/2013	1.534
MW-33	5/7/2014	1.488
MW-33	10/7/2014	1.629
MW-33	**5/5/2015**	**1.577**
MW-33	**10/27/2015**	**1.36**
MW-34	10/27/2009	1.268
MW-34	07/20/2010	0.62
MW-34	11/08/2010	0.726
MW-34	5/19/2011	0.46
MW-34	11/7/2011	1
MW-34	5/16/2013	1.676
MW-35	10/27/2009	0.7346
MW-35	07/20/2010	0.777
MW-35	11/8/2010	0.871
MW-35	5/19/2011	0.75
MW-35	11/7/2011	0.62
MW-35	4/27/2012	0.65
MW-35	11/7/2012	0.629
MW-35	5/16/2013	0.695
MW-35	10/23/2013	0.6008
MW-35	5/7/2014	0.6735
MW-35	10/8/2014	0.7279
MW-35	**5/5/2015**	**0.685**
MW-44	5/7/2014	2.208
MW-44	10/7/2014	2.402
MW-44	**5/5/2015**	**2.31**
MW-44	**10/27/2015**	**2.28**
MW-45	5/7/2014	0.666
MW-45	10/7/2014	0.7131
MW-45	**10/28/2015**	**0.719**

Table 9
HISTORICAL VOC DETECTIONS

Well	Parameter	Date	Unit	Concentration
MW-2	Toluene	11/9/2010	ppb	1.0
	DRO	11/5/2012	mg/L	0.55
	Toluene	11/2/2012	ppb	1.2
MW-3	DRO	11/5/2012	mg/L	0.7
MW-4	Toluene	11/2/2012	ppb	1.4
MW-12A	Toluene	5/13/2003	ppb	1.3
	Toluene	6/5/2008	ppb	1.3
MW-16	DRO	9/24/1998	ppm	0.17
MW-20	DRO	11/5/2012	mg/L	0.76
MW-25	DRO	11/5/2012	mg/L	0.62
	DRO	10/23/2013	mg/L	0.29
MW-31	DRO	6/24/2009	mg/L	0.73
	Xylenes	6/24/2009	ppb	5.4
MW-34	Toluene	4/23/2012	ppb	2.1
S.W. Pond	DRO	4/23/2012	mg/L	1.3
	DRO	5/7/2014	mg/L	0.38
	DRO	**5/5/2015**	**mg/L**	**0.21**
	DRO	**10/27/2015**	**mg/L**	**0.24**
Leachate Pond	DRO	11/5/2012	mg/L	2.3
	DRO	5/7/2014	mg/L	3.9
	DRO	10/7/2014	mg/L	2.9
	DRO	**5/5/2015**	**mg/L**	**3.3**
	DRO	**10/27/2015**	**mg/L**	**2.7**
	Xylenes	10/7/2014	ppb	5.7
	Toluene	10/7/2014	ppb	1.4

Time Series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Outlier
Man. outlier
Trend test
EPA MCLs
Samples
MW-16
Chloride
Significant Increasing Trend
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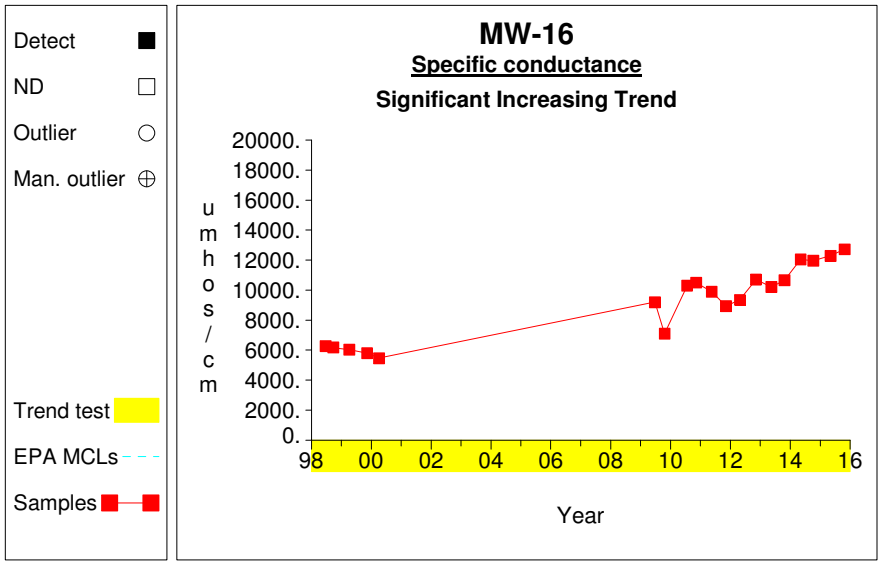
10.0
98 00 02 04 06 08 10 12 14 16
Year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Outlier
Man. outlier
Trend test
EPA MCLs
Samples
MW-16
Specific conductance
Significant Increasing Trend
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2000.
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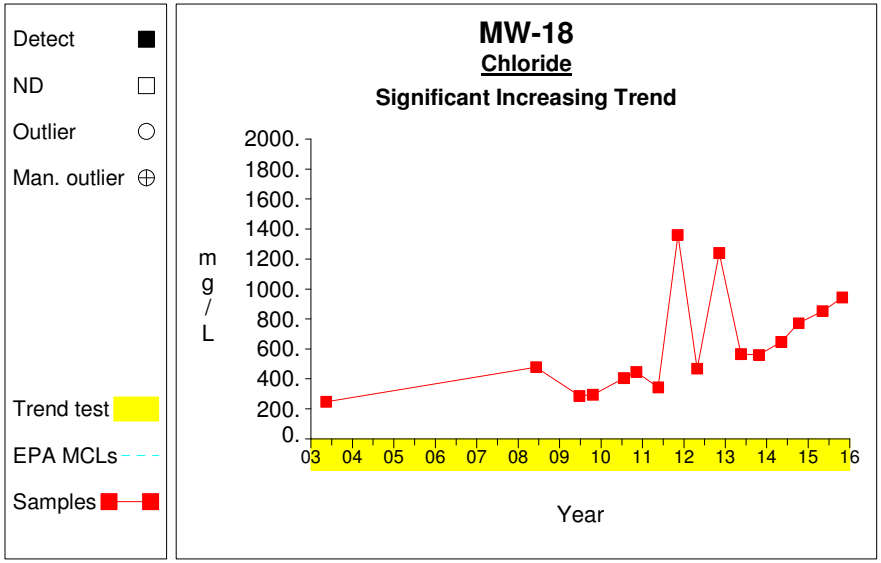
98 00 02 04 06 08 10 12 14 16
Year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Outlier
Man. outlier
Trend test
EPA MCLs
Samples
MW-18
Chloride
Significant Increasing Trend
mg/L
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1600.
1400.
1200.
1000.
800.
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400.
200.
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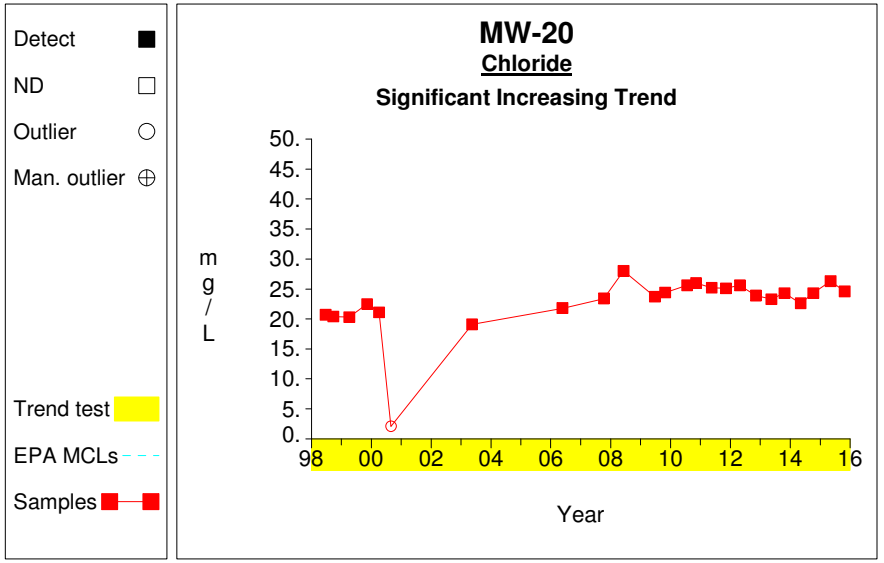
Year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Outlier
Man. outlier
Trend test
EPA MCLs
Samples
MW-20
Chloride
Significant Increasing Trend
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35.
30.
25.
20.
15.
10.
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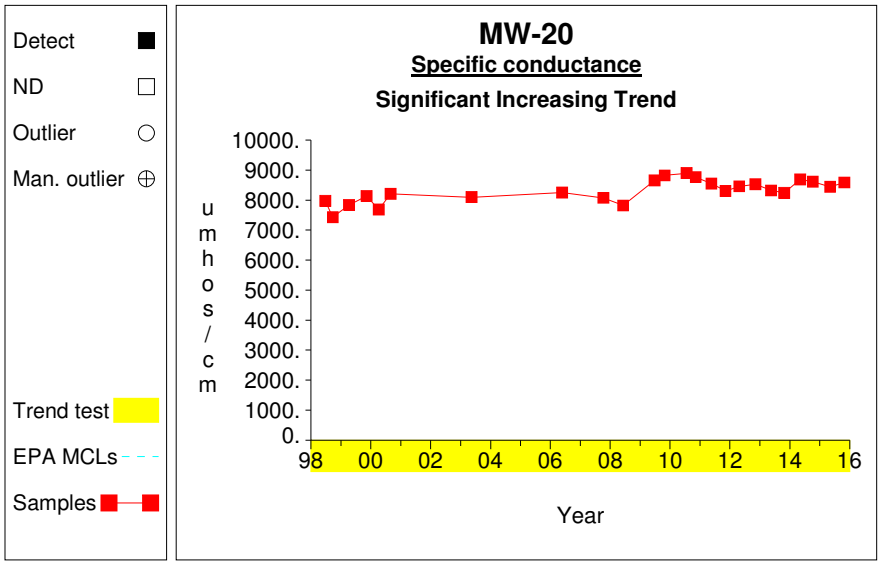
Year

Time Series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Man. outlier
Trend test
EPA MCLs
Samples
MW-20
Specific conductance
Significant Increasing Trend
umhos/cm
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8000.
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2000.
1000.
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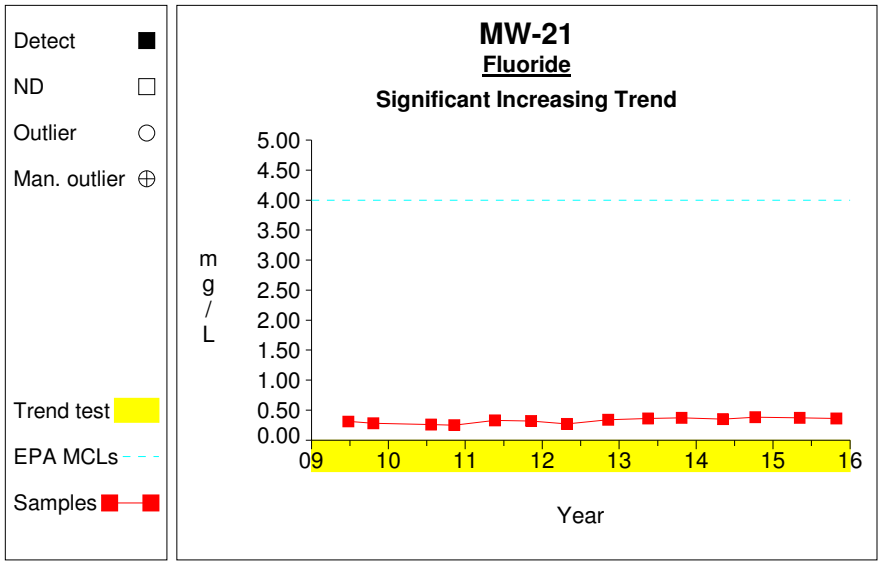
98 00 02 04 06 08 10 12 14 16
Year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Outlier
Man. outlier
Trend test
EPA MCLs
Samples
MW-21
Fluoride
Significant Increasing Trend
mg/L
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4.00
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3.00
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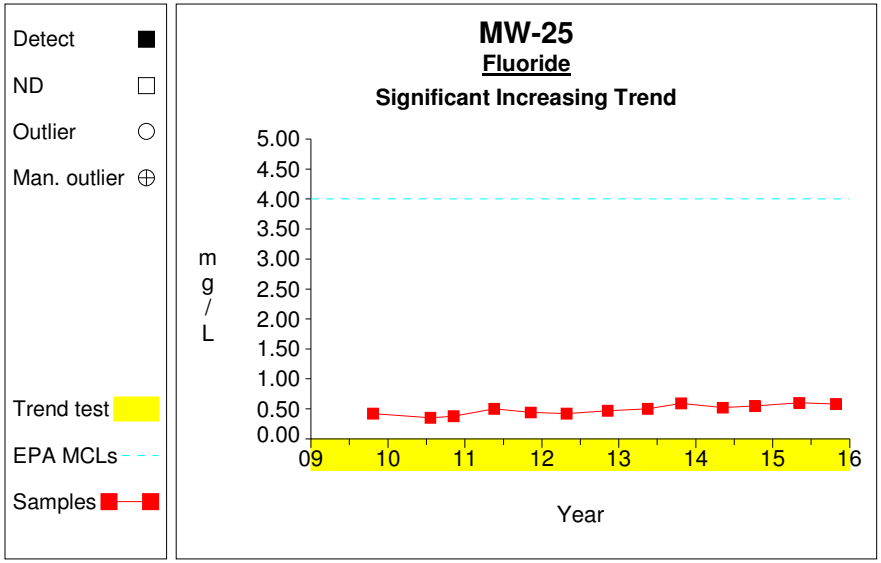
2.00
1.50
1.00
0.50
0.00
09 10 11 12 13 14 15 16
Year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Outlier
Man. outlier
Trend test
EPA MCLs
Samples
MW-25
Fluoride
Significant Increasing Trend
mg/L
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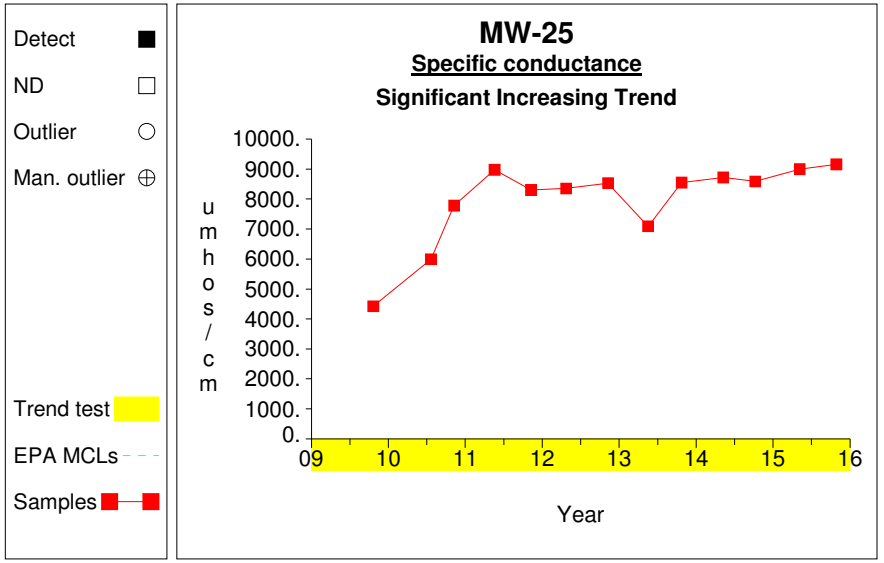
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
09 10 11 12 13 14 15 16
Year


Detect
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Outlier
Man. outlier
Trend test
EPA MCLs
Samples
MW-25
Specific conductance
Significant Increasing Trend
umhos/cm
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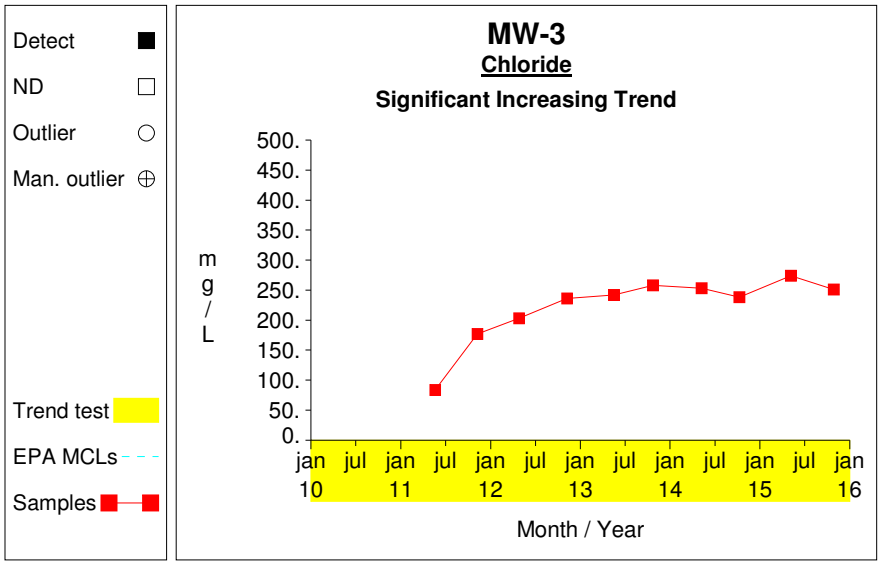
9000.
8000.
7000.
6000.
5000.
4000.
3000.
2000.
1000.
0.
09 10 11 12 13 14 15 16
Year

Time Series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Outlier
Man. outlier
Trend test
EPA MCLs
Samples
MW-3
Chloride
Significant Increasing Trend
mg/L
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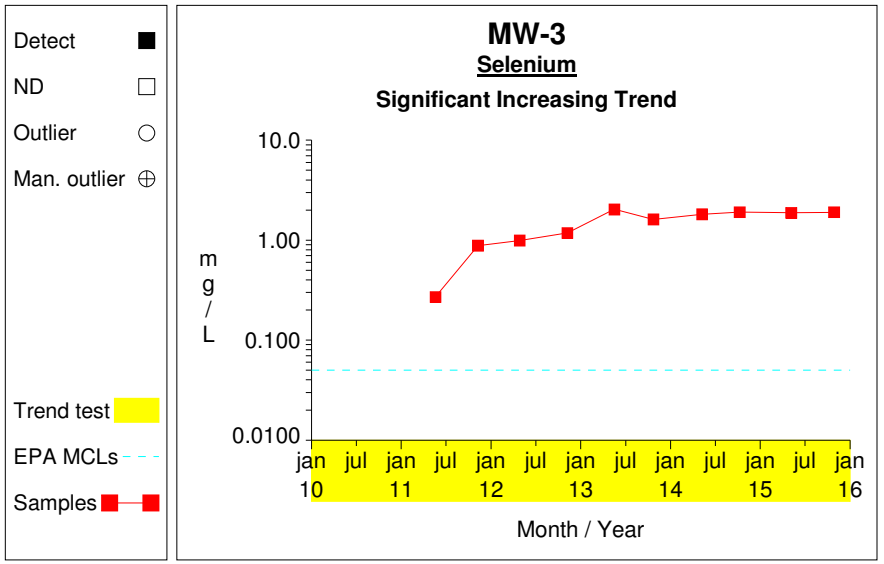
450.
400.
350.
300.
250.
200.
150.
100.
50.
0.
jan jul jan jul jan jul jan jul jan jul jan jul jan
10 11 12 13 14 15 16
Month / Year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ND
Outlier
Man. outlier
Trend test
EPA MCLs
Samples
MW-3
Selenium
Significant Increasing Trend
mg/L
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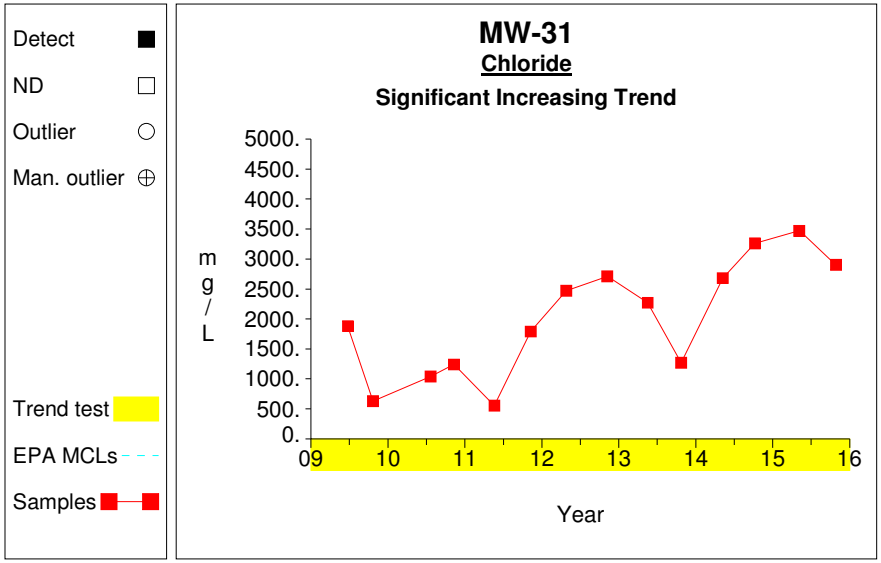
1.00
0.100
0.0100
jan jul jan jul jan jul jan jul jan jul jan jul jan
10 11 12 13 14 15 16
Month / Year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ND
Outlier
Man. outlier
Trend test
EPA MCLs
Samples
MW-31
Chloride
Significant Increasing Trend
mg/L
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4500.
4000.
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3000.
2500.
2000.
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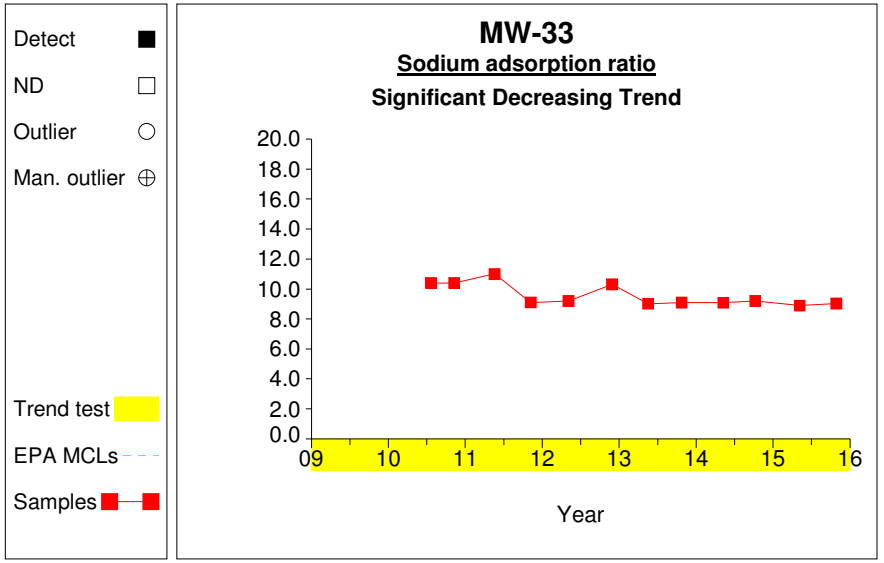
09 10 11 12 13 14 15 16
Year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Outlier
Man. outlier
Trend test
EPA MCLs
Samples
MW-33
Sodium adsorption ratio
Significant Decreasing Trend
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8.0
6.0
4.0
2.0
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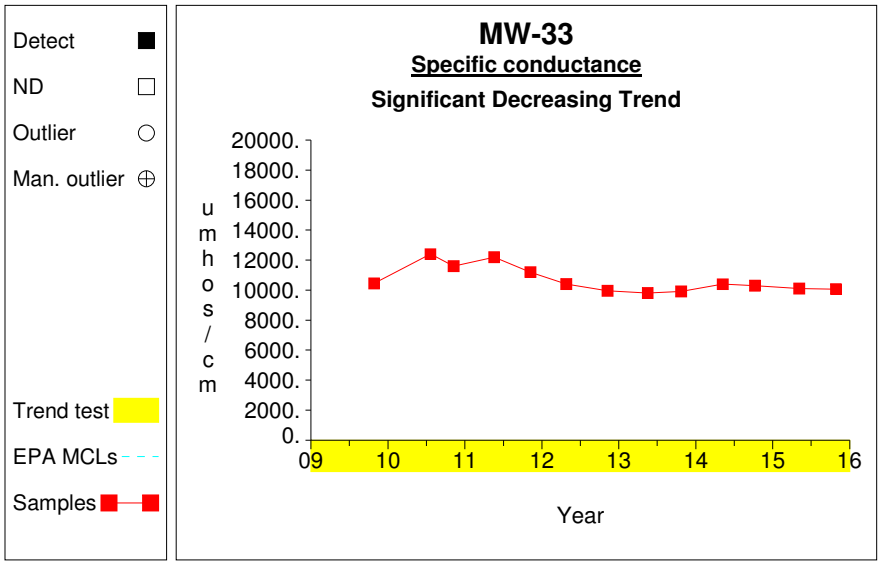
09 10 11 12 13 14 15 16
Year

Time Series


Detect
ND
Outlier
Man. outlier
Trend test
EPA MCLs
Samples
MW-33
Specific conductance
Significant Decreasing Trend
umhos/cm
20000.
18000.
16000.
14000.
12000.
10000.
8000.
6000.
4000.
2000.
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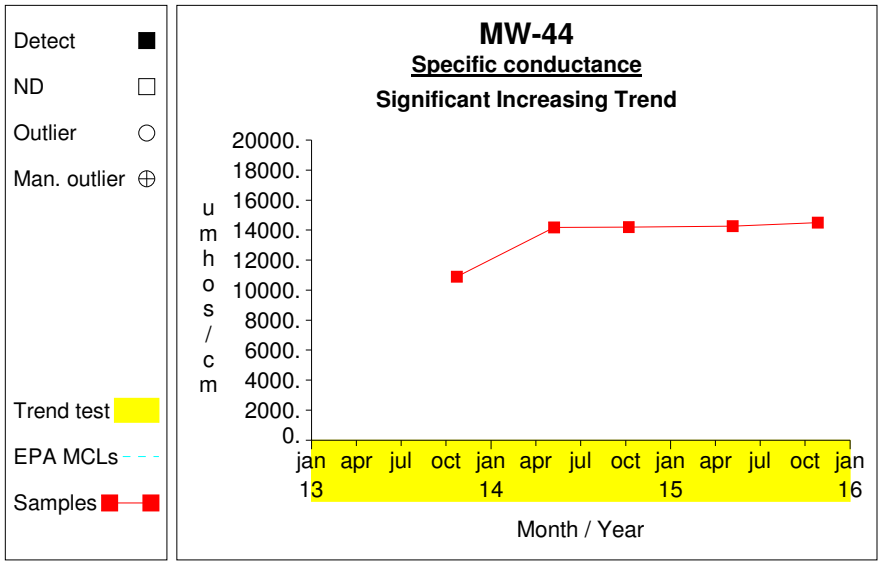
15
16
Year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ND
Outlier
Man. outlier
Trend test
EPA MCLs
Samples
MW-44
Specific conductance
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10000.
8000.
6000.
4000.
2000.
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jan
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Month / Year

Attachment F –

Permit For A Solid Waste Management Facility Permit #0088

PERMIT FOR A SOLID WASTE MANAGEMENT FACILITY

NORTH DAKOTA DEPARTMENT OF HEALTH — DIVISION OF WASTE MANAGEMENT
TELEPHONE: 701-328-5166 • REV. 02/12

Pursuant to Chapter 23-29 of the North Dakota Century Code (NDCC), (Solid Waste Management and Land Protection Act), and Article 33-20 of the North Dakota Administrative Code (NDAC), (Solid Waste Management Rules), and in reliance on statements and representations heretofore made by the owner or owner's representative designated below, a permit is hereby issued authorizing such owner/operator to construct and operate a solid waste management facility at the designated location under any and all conditions.

A. Owner/Operator:

1. **Name:** IHD Solids Management, LLC

2. **Mailing Address:** 14070 43rd Street NW, Alexander, ND 58831

3. **Location Address:** 14070 43rd Street NW, Alexander, ND 58831

B. Permit Number: 0088

C. Solid Waste Management Units:

1. Special and Small Volume Industrial Waste Landfill

2. Two (2) Surface Impoundment Units for runoff from the Special and Small Volume Industrial Waste Landfill.

3. Transfer Station

4. Treatment (Solidification) Unit

D. Location:

1. **General:** W1/2 of **Sec** 34, **TWP** 153N, **R** 101W in McKenzie County

2. **Permit Area:** See Permit Modification Drawings - Existing Conditions – Sheet 2 of 14, dated January 15, 2013, Carlson McCain, IHD Solids Management, LLC, Alexander, ND. Also see Sheet 1 – IHD Land Use and Layout Map contained in the IHD Solids Management, LLC – Supplemental information to SP-0088 Permit Application, dated April 2015.

E. General Conditions:

E.1. The owner/operator of the facility is subject to the Solid Waste Management and Land Protection Act (Chapter 23-29 NDCC), the Solid Waste Management Rules (Article 33-20 NDAC), all other North Dakota and federal laws, rules or regulations and orders now or hereafter effected by the North Dakota Department of Health (hereinafter the Department), and to any and all conditions of this permit.

E.2. Compliance with terms of this permit does not constitute a defense to any order issued or any action brought under NDCC 23-29, NDAC 33-20, NDCC 23-20.3, NDAC 33-24, Sections 3013, 7003, or 3008(a) of RCRA, Sections 106(a), 104 or 107 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 9601 et. seq.) or any other law providing for protection of public health or the environment.

E.3. Issuance of this permit does not convey property rights of any sort or any exclusive privilege, nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of state or local law or regulations.

E.4. It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

E.5. This permit is based on the premise that the information submitted by the owner/ operator is accurate and that the facility will be or has been constructed and will be operated as specified in the application and all related documents. Any inaccuracies or misrepresentations found in the application may be grounds for the termination or modification of this permit. The Permittee must inform the Department of any deviation from, or changes in, the information in the application which would affect the Permittee's ability to comply with the applicable rules or permit conditions.

E.6. The Permittee shall at all times properly operate and maintain the facility and systems of disposal, storage, and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance/quality control procedures. This provision requires the operation of backup or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this permit.

E.7. The Permitee shall give notice to the Department of any planned physical alterations or additions to permitted waste management units. Any physical change in, or change in the method of operation of, a treatment or disposal operation shall be considered to be construction, installation or establishment of a new operation. No construction, installation or establishment of a new operation shall be commenced unless the owner/

operator thereof shall file an application for, and receive, a permit to construct and operate from the Department.

a. The Permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

b. Whenever the Permittee becomes aware that the Permittee failed to submit any relevant facts in the permit application, or submitted incorrect information in the permit application or in any report to the Department, the Permittee shall promptly submit such facts or information.

E.8. The owner/operator shall construct, operate, maintain, and close the waste management units and the facility according to the criteria of law and rule, conditions of this permit, and other reasonable precautions to prevent or minimize, if applicable, any environmental impacts including, but not limited to, fugitive dust emissions, objectionable odors, air toxics and gas emissions, spills, litter and contamination of surface water and groundwater.

E.9. The Permittee shall furnish to the Department within thirty (30) days, any relevant information which the Department may request to determine whether cause exists for modifying, reissuing or terminating this permit, or to determine compliance with this permit. The Permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

E.10. This permit may be modified, revoked and reissued, or terminated for cause as specified in Section 33-20-02.1-06 NDAC. The filing of a request for permit modification, revocation and reissuance, termination, or the notification of planned changes or anticipated noncompliance on the part of the Permittee does not stay the applicability or enforceability of any permit condition.

This permit may be renewed as specified in Section 33-20-02.1-07 NDAC. Review of any application for a permit renewal shall consider improvements in the state of control and measurement technology, compliance with state rules and permit, as well as changes in applicable regulations.

E.11. This permit does not supersede local zoning authority or any other requirements of any political subdivision of the state.

E.12. Within sixty (60) days of the issuance of this permit, if not already completed, the owner/operator shall record a notarized affidavit with the County Recorder. The affidavit shall specify that this facility, as noted in the legal description, is permitted to accept solid wastes for disposal. This affidavit shall specify that another affidavit must be recorded upon the facility's final closure.

a. Upon closure, a second affidavit shall be recorded specifying any final details regarding the types of waste disposed of at the facility, as well as any final details regarding the facility's location, construction, management, and other pertinent information.

b. The Department must be provided a copy of both affidavits, certified by the County Recorder of the county in which the facility is located. The copies must be forwarded to the Department within thirty (30) days of recorded dates, or if notification has already been completed, within thirty (30) days of the permit issuance date.

E.13. Any entity that controls the permit holder (Permittee) agrees to accept responsibility for any remedial measures, closure and postclosure care or penalties incurred by the permit holder (Permittee). For purposes of this permit, "control" means ownership or control, directly, indirectly, or through the actions of one or more persons of the power to vote 25% or more of any class of voting shares of a permit holder, or the direct or indirect power to control in any manner the election of a majority of the directors of a permit holder, or to direct the management or policies of a permit holder, whether by individuals, corporations, partnerships, trusts, or other entities or organizations of any type. Within thirty (30) days of the issuance of this permit, if not previously provided with the application, or within thirty (30) days of the existence of any new controlling entity, the Permittee shall submit to the Department the name of the controlling entity, a statement signed by the controlling entity in which the controlling entity agrees to accept responsibility for any remedial measures, closure and postclosure care or penalties incurred by the Permittee, and a disclosure statement from the controlling entity containing the same information as required from permit applicants under NDCC § 23-29-07.11.

E.14. Within sixty (60) days of permit issuance, the Permittee shall implement an approved plan regarding Waste Transportation Requirements, Solid Waste Facility Waste Acceptance Requirements, and an Action Plan for Waste Spillage or Releases from Transport Vehicles. This plan must include the issues addressed in *Guideline 40 - "Waste Transportation and Spillage Issues for Solid Waste Facilities"* (see Attachment 1) intended to ensure compliance and full cooperation between the facility and all waste generators and waste transporters.

E.15. The owner or operator shall provide adequate funding to the Department to pay for inspection, oversight, report review, sampling and analysis of the operation and waste materials. A fund of $20,000.00 shall be provided to cover the cost of inspections and sampling. This amount may be adjusted annually for inflation and/or may be increased, decreased or discontinued by the Department depending on the work and expenses involved and the compliance history of the facility. The owner or operator shall provide funds within thirty (30) days of issuing the initial permit, prorated based upon time left in the state fiscal year, and the full amount by July 31 of each following year. Should adequate funds not be provided on an annual basis, the facility must discontinue operations and begin closure of the facility.

E.16. Recordkeeping and reporting shall be in accordance with the Department's *Guideline 4A – Recordkeeping and Reporting by Owners or Operators of Solid Waste Facilities*, (Attachment 2), with this permit, and any supporting documents. The Operating Record shall be maintained in a single location at or near the facility and shall be accessible to the Department for inspection. Records shall be maintained throughout the life of the facility, including the postclosure care period. Upon completion of each document required in the Operating Record, the Department shall be notified of its placement in the Operating Record. Within two (2) months of the permit issuance date, the Permittee shall notify the Department of the location of the Operating Record.

E.17. **General Training Requirements:** Within sixty (60) days of the permit issuance date and within thirty (30) days of employment of any new employee, operational personnel involved in solid waste acceptance, screening, handling and in the facility operation or monitoring must be provided a copy of this permit and shall be instructed in specific details of the facility plans and procedures to ensure compliance with the permit, the facility plans and the state rules as necessary to ensure orderly operation, and to prevent accidents and environmental impacts. Documentation of training such as names, dates, description of instruction methods and copies of certificates awarded must be placed in the facility's Operating Record. Training on permit, plans, and rule requirements shall be repeated as specified in this permit and as needed to ensure all employees know their responsibilities.

E.18. Prior to the onset of any construction or operation, adequate training must be provided to all consultants, facility staff, equipment operators, contractors, subcontractors and any other personnel used in facility construction or operation to ensure the facility, sub-base, liners, leachate systems, and supporting structures, roads, access areas, etc., are properly built in accordance with the plans, state environmental laws and rules, the solid waste permit, the stormwater permit, the stormwater pollution prevention plan, and other pertinent requirements.

This training shall address suitable plant growth material (SPGM) topsoil and subsoil segregation, including staking and training of scraper operators by a Registered Professional Soil Scientist, management, signage, erosion control and revegetation, location, management and signage of SPGM topsoil and subsoil stockpiles. Documentation of such training shall be incorporated into the facility records and a summary provided to the Department prior to the onset of waste acceptance.

E.19. Prior to the onset of any earthmoving or construction, appropriate stormwater and erosion control Best Management Practices and features shall be installed to minimize erosion and impacts to nearby waterways, drainageways and wetlands. The measures must be inspected by the Department prior to site disturbance. Erosion and sediment controls must be adapted, improved or updated as necessary to minimize and control impacts.

Prior to the onset of any construction and should questions or issues arise, the Permittee and/or his consultants shall contact the Department at 701-328-5166.

F. Special Conditions:

F.1. Unless approved in a facility waste acceptance plan, in this permit, or through Departmental correspondence, the facility shall not be used for the disposal of household garbage and putrescible waste; animal carcasses; waste grain, seed and elevator screenings; sludges, or liquids. This facility shall not be used for the disposal of unrinsed pesticide containers; lead-acid batteries; used oil; scrap metal; metal appliances; PCB waste/oils; hazardous wastes [i.e., ignitables (solvents, paints and fuels), corrosives (acids and alkalies), reactives, toxicity characteristic wastes, and listed wastes]; electronic waste (televisions, computers, monitors, printers, copiers, materials containing circuit boards, ballasts, capacitors, etc.); mercury-containing devices (fluorescent lighting, switches, thermometers, thermostats, etc.); hazardous materials; manure; septic tank pumpings, infectious wastes; or regulated radioactive waste.

F.2. This facility will be authorized for treatment and/or disposal of those special wastes identified in the permit application, Departmentally-approved facility waste acceptance plan, elsewhere in this permit, or through Departmental correspondence. This facility is further limited to EPA-exempt natural gas and crude oil exploration and production wastes; petroleum-contaminated wastes associated with leaking underground storage tanks; petroleum-contaminated wastes associated with releases from aboveground storage tanks; petroleum-contaminated wastes associated with releases from automobiles, trucks and equipment; natural gas and/or crude oil-impacted wastes associated with pipeline transportation releases; floor drain and sump sludges associated with car wash facilities and automotive repair facilities; inert waste; and similar wastes as described in the permit application information on file with the Department. This facility may accept other types of special waste upon Departmental approval. The amounts of waste authorized for disposal in this facility are as follows: a total of 1,000,000,000 tons of special waste per year; 25,000 tons of industrial waste per year resulting from releases associated with underground storage tanks, aboveground storage tanks, natural gas and/or crude oil-impacted wastes associated with pipeline transportation releases, sump sludges associated with car wash facilities and 10,000 tons of inert waste per year

F.3. Except as modified by conditions of this permit, this facility and related waste management units and structures shall be designed, constructed, operated, and closed in accordance with previous correspondence and documents contained in Departmental files pertaining to this facility and as described in the documents listed below, which are hereby incorporated by reference in this permit:

a. Revised Application for a Solid Waste Management Facility Permit – North Dakota Department of Health – Division of Waste Management SFN 19269 (3-2007) enclosed with the "Application for Solid Waste Management Facility Permit – IHD Solids Management Facility – Permit #SP-088" revised in April 2011 and received by the Department on May 2, 2011;

b. Closure/Post-Closure Plan – IHD Solids Management, LLC – Permit #SP-088, revised on May 11, 2011 and received by the North Dakota Department of Health via e-mail from John McCain on May 11, 2011;

c. Groundwater Monitoring Network Implementation Report - Indian Hills Disposal Facility – prepared by McCain and Associates, Inc. - dated October 2009 and received by the North Dakota Department of Health on November 5, 2009;

d. Groundwater Monitoring Plan – Indian Hills Disposal Facility – prepared by McCain and Associates, Inc. - dated October 28, 2009 and received by the North Dakota Department of Health on November 5, 2009;

e. Application for a Solid Waste Management Facility Permit – North Dakota Department of Health – Division of Waste Management SFN 19269 (4-2010) dated May 14, 2013, signed by Jon McCreary, Larry Kelter and John McCain, and enclosed with a cover letter and drawings from Carlson McCain dated May 17, 2013;

f. Application for a Solid Waste Management Facility Permit – North Dakota Department of Health – Division of Waste Management SFN 19269 (4-2010) dated January 21, 2013, signed by Jon McCreary, Chris Kreger, Lori K. Herfurth, and John McCain, and enclosed with a cover letter from Carlson McCain dated January 23, 2013;

g. IHD Solids Management, LLC – Supplemental information to SP-0088 Permit – Application dated January 15 2013: Design and Plan of Operation of IHD MSW Transfer Station – Design and Plan of Operation IHD Solidification Facility dated April 1, 2015 and prepared by Chris Kreger; and

h. Future submittals approved by the Department may supersede or supplement items listed above.

F.4 This facility is limited to accepting those nonhazardous special wastes, as defined by definition, exclusion rule, or as otherwise specified by conditions of this permit. Prior to storage, treatment or disposal of such wastes, the Permittee will obtain, at a minimum, the following information:

a. Name and address of the generator;

b. A generator contact person and telephone number;

c. The source of the waste (facility's name and legal description of location);

d. The name of the company managing the waste, if other than the generator;

e. Physical description of the waste (e.g., solid, liquid, sludge);

f. Amount of wastes (e.g., tons, yards, drums, etc.);

g. Description of the process through which the waste was generated (e.g., tank bottoms, reserve pit mud, etc.);

h. Appropriate analysis specific to that waste, if the waste is not uniquely associated with crude oil and natural gas exploration and production, to identify any hazardous characteristics; and

i. Signed statement by the generator that, to their knowledge, this waste is not, by definition, a hazardous or regulated radioactive waste. This information shall be retained for the life of the facility and copies of such information will be included with the annual report.

F.5. The following natural gas and crude oil production and transportation wastes shall be analyzed for Technologically Enhanced Naturally Occurring Radioactive Material (TENORM), specifically, Ra-226 and Ra-228 concentrations and Lead-210, by a state-approved analytical procedure or screening process prior to acceptance at this facility:

a. Accumulated materials, including: solids, scale, sediment, production sand, emulsion, sludges and other tank bottoms from storage facilities, separators, heater treaters, vessels, tanks and production impoundments that hold product or exempt waste;

b. Pipe scale, hydrocarbon solids, hydrates and other deposits removed from tubular goods, piping, casing, filters, clean-out traps and other equipment;

c. Pigging wastes from gathering lines; and

d. Any waste material suspected to contain TENORM or likely to have accumulated TENORM in concentrations equal to or greater than 5.0 pCi/gm.

If the total laboratory-measured Ra-226 plus Ra-228 or Lead-210 activities are equal or greater than 5.0 pCi/gm, the waste will not be allowed for acceptance, treatment or disposal at this facility but shall be rejected. The Permittee shall note the source, amount, generator, and other identifying information about the rejected waste and shall notify the Department within five (5) days of the rejection of such material. The 5.0 pCi/gm requirement is for the waste stream as measured using a Department-approved analytical method and procedures.

F.6. Should it be discovered that waste containing TENORM with a radioactivity level greater than 5 pCi/gm above the background radioactivity level has been delivered or accepted at the facility, unless such waste has been quarantined in accordance with the Waste Acceptance Plan, the owner/operator shall immediately discontinue acceptance,

treatment and/or disposal of that waste stream, shall isolate the waste material, and within one (1) working day contact the Department of the exceedance. The owner/operator shall immediately discontinue acceptance, treatment or disposal of additional waste. It may be necessary to revise financial assurance provisions, operating plans and haul material off-site to a facility approved for acceptance of such waste. Additional waste acceptance, treatment and/or disposal shall remain suspended until written Departmental approval is provided.

F. 7. This permit does not authorize any waste or product centrifuging, filtering or similar processing to separate oil, water and/or solids on this site. This permit does not authorize any blending at the facility to reduce TENORM levels.

F.8. Random Special Waste Characterization and Screening shall be conducted as follows:

a. The Permittee shall randomly collect a composite representative sample of waste from 1% of the incoming loads of the production waste subset of special waste and have the sample analyzed for Total Petroleum Hydrocarbons (TPH) as Diesel Range Organics (DRO) and Gasoline Range Organics (GRO); RCRA metals; TENORM radioactivity level for combined Ra-226 plus Ra-228; TENORM radioactivity level for Lead-210; Benzene, Toluene, Ethyl benzene and Xylene (BTEX); ignitability and free liquids using both a visual assessment and an EPA Paint Filter Test.

b. The Permittee shall develop a waste characterization plan for the exploration subset of special waste. The plan shall be consistent with Departmental guidance, including random sampling, analysis and reporting. The plan must be submitted prior to June 1, 2015 for Department approval. Upon approval, the Permittee shall implement the approved exploration waste characterization plan.

The sampling methodologies and testing criteria for random special waste characterization shall conform to the requirements of a Department-approved sampling and analysis plan using approved screening and analytical methods. The Department shall be informed of the sampling protocol and schedule and shall be afforded the opportunity to observe sampling and take a split sample for replicate analysis if deemed necessary. For any test that exceeds a regulatory waste acceptance limit, both the waste generator and the Department shall be notified within five (5) days following the receipt of the waste analysis. No further waste may be accepted from that generator without Departmental approval. A summary of all waste analysis information shall be submitted electronically with the next regular facility report.

F.9. Oilfield special waste exceeding concentrations of 50 ppm Benzene shall not be accepted at this facility unless a plan provided by IHD Solids Management, describing appropriate management procedures, is approved by the Department.

F.10. REJECTED WASTE REPORTING: The Permittee shall notify the Department within five (5) days of any waste loads not accepted by the facility and the reason why

the waste was rejected. This includes wastes listed in this permit, approved waste acceptance plan or other reason. The notification must include:

a. Name, address, North Dakota Waste Transport Permit Number, telephone number, and vehicle license number of the transporter;

b. Name and address of the facility that rejected the waste;

c. Quantity or volume and description of waste rejected;

d. Reason why the waste was rejected;

e. Company name, address, telephone number and contact name of the owner or generator (i.e., rig identification, injection well identification, contractor identification or other identification information);

f. Address or location where the waste was initially accepted for transport, if different from subdivision e; and

g. Signature from waste transporter acknowledging waste rejection reporting requirements.

F.11. **Report Requirements: To help reduce paper, save time and ensure more orderly management of records, routine reports shall be submitted to the Department in a digital or electronic format as a searchable pdf format or an MS Word document unless otherwise requested. In some cases, the Department may request hard copies in addition to electronic format.**

Operating Report Requirements: In addition to the reports required by rule and this permit, the Permittee shall submit monthly reports to the Department. These reports shall include pictures and a summary of the past month's site construction, operation, inspections, the solid waste landfill, the surface impoundment and adjacent areas, roads, access routes, soil storage areas and other pertinent information. The report shall detail precipitation, melt water or runoff/run-on issues; stormwater and erosion issues; the conditions of all berms, dikes, roads, ditches, erosion control structures and other pertinent structures; erosion control measures; any spillage and subsequent cleanup; surface water management issues; personnel training during the period; the establishment, maintenance and status of vegetation on the site, including all areas affected by site operations including, but not limited to, disturbed and reclaimed areas; and any other information necessary to keep the Department apprised of the facility's operation and compliance with state law and rules, the approved plans and this permit. If necessary, to maintain communication, the Department reserves the right to amend and/or require more frequent reporting. The Department may also reduce the reporting requirement based on satisfactory operation. The reports shall also include a summary of all logbooks and inspections and must be sufficiently detailed to address any additional issues contained in the attached guideline on solid waste facility report

requirements (see *Attachment 2, Guideline 4A - Recordkeeping and Reporting by Owners or Operators of Solid Waste Facilities*).

For the Landfill Unit, the reports shall also include a summary of the disposal operation including, but not limited to: (1) the size and location of the operational area in square feet, including a map or diagram of the operating areas, areas with interim cover, areas brought to grade and areas formally closed or scheduled for closure; (2) waste placement, lift thickness, and compaction (number of passes with heavy equipment); (3) waste-covering activities and implementation of Sequential Partial Closure requirements of NDAC 33-20-04.1-05; (4) placement of interim cover; (5) cell construction and testing of liners, final cover subsoil and topsoil SPGM and associated features of the approved plans; (6) schedule and/or implementation of erosion controls, cover crop seeding and condition and status of native vegetation on closed and/or reclaimed areas; (7) the amounts, types and analytical results of waste accepted for disposal; (8) leachate generation, leachate head above liner, leachate analysis, and leachate management; and (9) all other information needed to ensure compliance with state law and rules, the approved plans and this permit.

For the Surface Impoundment, the reports shall include a summary of the pond operation including, but not limited to: (1) the amount of water contained in the unit, the amount of freeboard; (2) the measures taken to manage, reduce or dispose the liquid waste in the impoundment; (3) the amount of water evaporated and/or removed and where it was disposed; (4) a description of significant stormwater or leachate generation and management issues or events; (5) the condition of the liner, pumps, evaporative systems and other unit features; (6) the condition of the dam, the berms, dikes and slopes for vegetative growth, significant erosion, cracking, and a description of any repairs or modifications; (7) establishment, maintenance or repair of erosion controls, cover crop, seeding, condition and status of native vegetation on dikes, berms and dams; (8) results of water quality analysis and observations; (9) results of routine (at least monthly and after significant rainfall events) inspections for deep-rooted weeds or woody plants, seepage, deterioration, malfunctions, improper operation of control systems, sudden drops in the level of the impoundments contents, and severe erosion, seepage or other signs of deterioration in the liner, dikes or other containment devices; and (10) the pond construction, testing of liners, erosion control features and associated issues of the approved plans and operation.

For the Transfer Station, the reports shall include a summary of the transfer station operations including, but not limited to: (1) types and amounts of waste managed for transfer, (2) types and amounts recyclable materials accepted, and (3) completed transfer station compliance inspection checklist.

For the Treatment (Solidification) Unit, the reports shall include, but not be limited to: (1) types and amounts of waste managed within the unit and (2) completed treatment/solidification compliance checklist.

F.12. Financial assurance provisions shall be in conformance with NDAC Chapter 33-20-14, this permit and the Department's *Guideline 18 - Financial Assurance Mechanisms for Closure and Post–Closure for Publicly and Privately Owned Landfills* (Attachment 3).

F.13. **Specific Training Requirements:** All staff shall have ready access to and receive adequate education and training on the state permits, state law and rules, pertinent guidance documents, facility plans, Plan of Operation, waste acceptance procedures, radioactive material issues, facility operation, emergency/contingency procedures, safety procedures, erosion controls, stormwater management (including the Surface Water Implementation Plan (SWIP)) requirements, final cover evaluation, inspection procedures and forms, and similar information necessary to ensure orderly, safe and environmentally protective operation. All employees shall also be provided a copy of this permit; replacement copies shall be readily available at the work site.

At minimum, this training and education shall be completed:

a. For any new staff members, contractors or other personnel, prior to their working in active waste areas, leachate or stormwater management or in waste review and acceptance;

b. Every month for all employees for their first twelve (12) months of operation;

c. Every six (6) months thereafter; and

d. More often as needed should problems or issues arise, if operational errors occur and/or if compliance issues arise.

Untrained staff shall not be allowed to operate or oversee the facility. The Permittee must ensure all employees, contractors and workers are properly trained in facility procedures, and documentation of the training shall be included in the facility's Operating Record and in the routine reports to the Department.

F.14. Prior to facility operation, the Permittee shall coordinate pertinent issues with local emergency, firefighting, ambulance officials, etc., and update the Emergency/ Contingency Plan, if needed. A copy of any updated plan shall be provided to the Department along with a statement that is signed by the local officials stating they are aware of the facility and are satisfied with the Emergency/Contingency Plan. Updating of these procedures shall be considered as needed, at least on an annual basis and whenever there is a significant change in the facility that may affect the emergency/contingency plans and procedures.

F.15. Waste accepted during the duration of this permit shall not be stored, stockpiled or placed anywhere on the facility other than in the appropriate storage and/or disposal unit such as the Special and Small Volume Industrial Waste Landfill Unit, transfer station unit, or treatment/solidification unit.

F.16. SPGM topsoil and subsoil shall be carefully removed, stockpiled and vegetated. During removal, soil monuments shall be provided to help inspectors monitor SPGM removal. Stockpiled soil materials and disturbed areas shall be promptly mulched and planted to a cover crop and planted to the approved native grass mixture if they will not be disturbed for more than a year. If vegetation does not become established, if the soil or vegetation is damaged or is likely to be damaged, or if significant wind or water erosion problems arise, prompt corrective action must be taken to ensure adequate controls and vegetation. SPGM topsoil and subsoil stockpiles shall be clearly designated with durable signs stating what the stockpiles contain and stating "No unauthorized removal" and state the facility contact name and telephone number.

F.17. Noxious weeds shall be controlled on a regular basis, at least twice during the growing season. In addition, fertilizer shall not be used in the establishment of early grass growth so as to minimize the promotion of weed growth.

F.18. The facility construction and operation activities, including plans and operations for stockpiling soil, SPGM, and cover as well as for stabilizing exposed dikes, berms and all disturbed areas, shall include appropriate erosion controls, rip-rap, mulch, vegetative cover, weed control, stormwater controls, etc., to minimize off-site impacts and minimize short-term and long-term erosion.

F.19. Inspection of erosion control measures and stormwater structures, practices, measures, silt fences and revegetated areas shall be performed and documented in writing after each rainfall event and/or every week when erosion may reasonably be expected to occur. The inspections shall include, but not be limited to: all disturbed areas subject to erosion; the proposed landfill, surface impoundments, stormwater ponds, areas with routine or interim cover; SPGM topsoil and subsoil stockpiles; all soil stockpiles; berms, ditches, drainageways and other areas where erosion may occur; surface impoundment structures; and the final cover on closed solid waste management units and shall include all piping inlets, outlets, drop structures, chutes, etc., used to convey stormwater off the landfill cover.

F.20. **Stormwater:** The Construction and Industrial Stormwater Pollution Prevention (SWPP) Plan and Erosion Control Handbook shall be provided to the Division of Waste Management and to the Division of Water Quality for review and approval prior to the onset of any construction, operation and/or waste acceptance. A Construction Stormwater Permit must be obtained from the Division of Water Quality prior to the onset of construction or disruption of the site and a copy must be provided to the Division of Waste Management.

An Industrial Stormwater Permit must be obtained prior to the onset of facility operation. The plan shall address all areas to be disturbed or where erosion may reasonably be expected, including, but not limited to, the areas identified in the approved plans and the areas identified for inspection discussed elsewhere in this permit. The plans shall be updated annually for any appropriate changes or updates

which shall be provided to both the Department's Divisions of Water Quality and Waste Management for approval.

In addition, staff shall attend a stormwater control training program within one (1) year of the permit issuance date.

Implementation of erosion controls must be in place prior to significant excavation, construction or other activity in which erosion may occur. Additional controls must be incorporated as conditions change or problems arise. No construction or operation is authorized until the Permittee sends a signed documentation to the Department that appropriate and effective erosion controls are in place. The Department reserves the right to inspect the site prior to or during any such activities. Should the Department find erosion controls are not adequate, any further operation, excavation or construction (other than those necessary to properly control stormwater and erosion impacts) must cease immediately. No additional operation, excavation or construction may take place until the Department deems the erosion controls and any remedial action is adequate.

F.21. The Permittee shall obtain and analyze a representative sample of water and/or leachate contained in any stormwater pond, surface impoundment, landfill leachate collection or accumulation or system, sump and/or other accumulation area at the same frequency and for the same parameters as the groundwater monitoring program. The analytical results shall be submitted to the Department with the groundwater monitoring report.

F.22. During excavation and construction of any disposal unit, surface impoundment storage area, or other solid waste unit, any layers of materials with a high hydraulic conductivity, including, but not limited to, areas of sand, silty sand, gravel and/or lignite over eight (8.0) inches in thickness, or any areas where in-situ clay-rich soils underlying the base of the solid waste unit are less than three (3) feet thick, the base shall be over-excavated and replaced with at least three (3) feet of carefully compacted clay-rich soil to establish a geologic barrier to leachate migration. At minimum, sand or lignite zones less than eight (8.0) inches in thickness shall be scarified, mixed with in-situ shale or clay-rich sediments to a depth of 12 inches, visually classified, recompacted and tested as described in Section IV, Subbase Preparation, of the Department's *Guideline 5 - Quality Assurance for Construction of Landfill and Surface Impoundment Liners, Caps and Leachate Collection Systems*, (see Attachment 4). Replacement of the zones of higher hydraulic conductivity and the placement of compacted clay shall be addressed in the final quality assurance/quality control report to the Department.

F.23. An amended groundwater monitoring plan shall be provided for the Department's review and approval within three (3) months of the permit issuance date. The plan shall address NDAC 33-20-13-02 and provide an evaluation of the nature and extent of the apparent groundwater impacts located at the western perimeter of WMU-1.

G. Municipal Solid Waste Transfer Station Unit Condition:

G.1. Metal items, including, but not limited to, major appliances, metal furniture, scrap

metal, etc., may not be collected or transported for disposal to any solid waste disposal unit or facility unless such unit or facility has provision for intermediate storage and recycling of these materials and all such materials are appropriately segregated for recycling.

G.2. This facility unit is authorized for management of municipal wastes. "Municipal waste" means solid waste that includes garbage, refuse and trash generated by households, motels, hotels and recreation facilities, by public and private facilities, and by commercial, wholesale and private and retail businesses. The term does not include special waste or industrial waste. The facility is limited to accepting an average of no more than 200 tons of waste per day. The calculation for the average daily municipal waste tonnage accepted shall be based on a 365-day year.

G.3. All personnel involved in solid waste handling and in the facility operation or monitoring must be provided a copy of this permit and shall be instructed in specific procedures to ensure compliance with the permit, the facility plans and the state rules, guidelines and safety procedures. A resource for training includes, but is not limited to, EPA Publication:

Waste Transfer Stations: A Manual for Decision-Making;
http://www.epa.gov/osw/nonhaz/municipal/pubs/r02002.pdf

Personnel should also consider attendance at training programs such as the North Dakota Department of Health Annual Solid Waste Facility Operator Training, regional symposiums, workshops, etc. Documentation of training such as names, dates, description of instruction methods and copies of certificates awarded must be placed in the facility's Operating Record. In addition, a copy of this permit, pertinent rules, guidelines and forms shall be posted at a prominent location within the facility.

Should questions or issues arise, the owner or operator shall contact the North Dakota Department of Health at 701-328-5166.

G.4. The facility shall implement measures to minimize the potential for accidents, including, but not limited to, safety issues due to vehicles backing into the facility, workers or the public falling into the pit, and other safety and environmental issues as needed.

G.5. Containers and areas that receive or contain waste shall be fenced and controlled to minimize waste spillage, windblown debris and water contact with waste. Waste located on the tipping floor within the transfer facility is allowed to be stored overnight but is not to exceed seven (7) consecutive nights. All areas shall be cleaned of all litter or waste materials as needed. If, upon inspection, the Department determines that either additional or different cleaning methods will need to be implemented at the facility, the owner/operator of the facility will be committed to discussing cleaning requirements and options.

G.6. No municipal waste may be stored outside of the building or outside approved covered waste containers unless approved by the Department.

G .7. The owner/operator and the employees shall evaluate and monitor the facility on an on-going basis as part of the normal operation to ensure compliance at all times. Results of daily inspections, waste acceptance and other compliance issues shall be documented in the facility logbook and records. At least once per month, as part of the ongoing inspections, the owner/operator shall document an inspection of the facility and its operations using the attached inspection checklist. This inspection shall include pictures of the tipping floor, the area of the active waste container, and all operational areas outside of the facility as part of each monthly inspection.

Copies of all records and inspections shall also be maintained at the IHD Solids Management Facility (0088). Upon request and contingent upon acceptable compliance, the Department may allow a reduction of the frequency of inspection to quarterly.

H. Treatment (Solidification) Unit Condition:

H.1. The design of the treatment/solidification unit shall be modified as follows:

a. The Permittee shall incorporate, at minimum, a 30-mil HDPE liner under the main concrete floor to minimize leakage should the concrete floor crack or should contaminants migrate through the concrete. A leak detection system is also recommended.

b. The Permittee shall include provisions to monitor for and remove fluid buildup or leakage between the metal mixing container and the concrete bin.

c. Design plans for the modified treatment/solidification unit shall be submitted for review and approval.

d. Inspection and reporting conditions for the leak detection system shall be in the same manner and frequency as for other leachate systems regulated in this permit.

H.2. This facility unit will be authorized for treatment and/or disposal of those special wastes identified in the permit application, Departmentally-approved facility waste acceptance plan, elsewhere in this permit, or through Departmental correspondence. This facility is further limited to EPA-exempt natural gas and crude oil exploration and production wastes; petroleum-contaminated wastes associated with leaking underground storage tanks; petroleum-contaminated wastes associated with releases from aboveground storage tanks; petroleum-contaminated wastes associated with releases from automobiles, trucks and equipment; natural gas and/or crude oil-impacted wastes associated with pipeline transportation releases; floor drain and sump sludges associated with car wash facilities and automotive repair facilities; inert waste; and similar wastes

as described in the permit application information on file with the Department. No TENORM waste will be considered for this unit unless the Permittee incorporates a Department-approved engineered liner and leak detection system.

H.3. The facility shall implement measures to minimize the potential for accidents, including, but not limited to, safety issues due to vehicles backing into the facility, workers or the public falling into the pit, and other safety and environmental issues as needed.

H.4. Solid waste must be confined to the stabilization pit. The stabilization pit must provide sufficient excess capacity to prevent nuisances, environmental impacts, or health hazards in the event of mechanical failure or unusual waste flows.

H.5. All solid waste, recovered materials, or residues must be controlled and stored in a manner that does not constitute a fire or safety hazard or sanitary nuisance.

H.6. Areas that receive or contain waste shall be controlled to minimize waste spillage, windblown debris and water contact with waste. All areas shall be cleaned of all litter or waste materials as needed. If, upon inspection, the Department determines that either additional or different cleaning methods will need to be implemented at the facility, the owner/operator of the facility will be committed to discussing cleaning requirements and options.

H.7. The owner/operator and the employees shall evaluate and monitor the facility on an on-going basis as part of the normal operation to ensure compliance at all times. Results of daily inspections, waste acceptance and other compliance issues shall be documented in the facility logbook and records. At least once per month, as part of the ongoing inspections, the owner/operator shall document an inspection of the facility and its operations using the attached inspection checklist. This inspection shall include pictures of the tipping floor, the area of the active waste container, and all operational areas outside of the facility as part of each monthly inspection.

Copies of all records and inspections shall also be maintained at the IHD Solids Management Facility (0088). Upon request and contingent upon acceptable compliance, the Department may allow a reduction of the frequency of inspection to quarterly.

I. Surface Impoundment Units Conditions:

I.1. The surface impoundment units shall be maintained and inspected to ensure orderly operation and ensure adequate storage capacity. After significant runoff events, prior to winter freeze-up, and/or in anticipation of a period of heavy precipitation, the pond's capacity shall be restored as soon as practicable to ensure at least 25-year, 24-hour stormwater management capacity. The composite-lined surface impoundments shall

not be used for management of stormwater that has not been in contact with waste. The surface impoundments shall be protected from surface water run-on from adjacent areas.

I.2. The owner/operator shall obtain and analyze a representative sample of water or leachate contained in any surface impoundment and/or other accumulation area at the same frequency and for the same parameters as the groundwater monitoring program. The analytical results shall be submitted to the Department with the groundwater monitoring report.

J. Special and Small Volume Waste Industrial Waste Landfill Conditions:

J.1. For final cover, an erosion control, revegetation and cover implementation and inspection plan will be developed in cooperation with plant, soils and erosion professionals. The plan shall address the issues described in the Department's Guideline 28 entitled *"Evaluating Final Vegetative Cover of Closed Landfill Areas"* (see Attachment 5). The Department reserves the right to require modifications to the operational and closure plans if erosion is not controlled and/or exceeds standards allowed by the North Dakota Solid Waste Management Rules.

J.2. Sequential closure shall be implemented in as timely manner as practicable. The working area for disposal shall be limited to as small an area as practicable and not to exceed 17.9 acres. In the spring and fall, or more often as needed, for areas that are not formally closed and/or revegetated and that will not be used for disposal within the next four (4) months of operation, the owner/operator shall implement erosion control measures and plant a cover crop. Areas that have been planted shall be inspected to ensure the erosion control and vegetation measures are effective.

In consideration of information provided regarding the facility and its operation and in consideration of the conditions above, the North Dakota Department of Health hereby issues a permit to IHD Solids Management, LLC.

This permit is effective as of June 22, 2015 and shall remain in effect until June 22, 2025, unless modified, superseded or revoked under Section 33-20-02.1-06 NDAC or continued in accordance with Section 33-20-02.1-07 NDAC.

Scott A. Radig

Scott A. Radig, P.E., Director
Division of Waste Management

6-23-2015
Date

Attachments:

1. Guideline 40 - Waste Transportation and Spillage Issues for Solid Waste Facilities

2. Guideline 4A - Recordkeeping and Reporting by Owners or Operators of Solid Waste Facilities

3. Guideline 18 - Financial Assurance Mechanisms for Closure and Post-Closure for Publicly and Privately Owned Landfills

4. Guideline 5 - Quality Assurance for Construction of Landfill and Surface Impoundment Liners, Caps and Leachate Collection Systems

5. Guideline 28 - Evaluating Final Vegetative Cover of Closed Landfill Areas

6. Guideline 24 - Native Grass Seeding

GUIDELINE 40 – WASTE TRANSPORTATION, ACCEPTANCE AND SPILLAGE ISSUES FOR SOLID WASTE FACILITIES

North Dakota Department of Health - Division of Waste Management
918 E. Divide Ave., 3rd Fl., Bismarck, ND 58501-1947
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Revised: 04-2015

To ensure efficient and compliant waste transport and waste acceptance procedures for solid waste facilities, the North Dakota Department of Health (Department) developed this guideline to increase communication and cooperation between waste generators, facility operators and commercial solid waste transporters. This guideline is intended to help prevent issues of waste spillage during delivery, inadequately prepared or loaded waste, inadequate waste characterization, unpermitted waste haulers, unsafe transport practices, and similar issues. Applicants for a solid waste facility permit or permit holders who are required to address this guideline via application review, permit condition or Department correspondence, should develop procedures as part of the facility plan of operation required under North Dakota Administrative Code (NDAC) 33-20-04.1-03. Pertinent portions of the rules for the plan of operation include:

33-20-04.1-03. Plan of operation. All solid waste management facilities, except those permitted by rule, shall meet the requirements of this section.

a. A description of waste acceptance procedures, including categories of solid waste to be accepted and waste rejection procedures as required by subsection 2 of section 33-20-05.1-02 or subsection 8 of section 33-20-06.1-02 or subsection 2 of section 33-20-07.1-01 or subsection 4 of section 33-20-10-03;

b. A description of waste handling procedures;

c. A description of facility inspection activities required by subsection 2, including frequency;

d. A description of contingency actions for the following:

(1) Fire or explosion;

(2) Leaks;

(3) Ground water contamination;

(4) Other releases (for example, dust, debris, failure of run-on diversion or runoff containment systems); and

(5) Any other issues pertinent to the facility.

f. Safety procedures;

h. A description of industrial waste or special waste management procedures, which include:

(1) A procedure for notifying solid waste generators and haulers of the facility operating requirements and restrictions;

(2) A procedure for evaluating waste characteristics, liquid content, the specific analyses that may be required for specific wastes, and the criteria used to determine when analyses are necessary, the frequency of testing, and the analytical methods to be used;

(3) A procedure for inspecting and for identifying any special management requirements, and the rationale for accepting or rejecting a waste based on its volume and characteristics;

(4) Procedures for managing the following solid waste, as appropriate:

(a) Bulk chemical containers which contain free product or residue;

(d) Radioactive waste;

(j) Sludges, including ink sludges, lime sludge, wood sludge, and paper sludge;

(m) Oil and gas exploration and production waste;

(n) Wastes containing free liquids;

(o) Contaminated soil waste from cleanup of spilled products or wastes; and

(p) Any other solid waste that the owner or operator plans to handle.

(5) The owner or operator must describe any solid waste that will not be accepted at the facility; and

i. The owner or operator must amend the plan whenever operating procedures, contingency actions, waste management procedures, or wastes have changed. The owner or operator shall submit the amended plan to the department for approval or disapproval.

2. The owner or operator shall inspect the facility to ensure compliance with this article, a permit, and approved plans. The owner or operator shall keep an inspection log including information such as the date of inspection, the name of the inspector, a notation of observations made, and the date and nature of any repairs or corrective action taken.

In addition, solid waste facilities must address NDAC 33-20-04.1-09. General disposal standards, which states, in part:

2. Construction and operation standards for solid waste management facilities regulated by this section:

    b. Roads must be constructed and maintained to provide access to the facility. Access roads must be cleaned and decontaminated as necessary.

Note: Other portions of the rules that may apply to these issues include:

33-20-01.1-04. Care and disposal of solid waste.
33-20-01.1-05. Collection and transportation vehicles.
33-20-02.1-01. Solid waste management permit required.
33-20-02.1-03. Permit compliance.
33-20-03.1-03. Permit application review and action.

The full text of NDAC Article 33-20 can be accessed at the Department's website at www.ndhealth.gov/WM/.

Or

NDAC Article 33-20 is at www.legis.nd.gov/information/acdata/html/33-20.html.

Waste Acceptance and Transportation Requirements

Prior to accepting waste from industrial or special waste generator or waste source, the solid waste facility permittee (Waste Facility) must provide adequate information on the facility's approved waste acceptance and transportation requirements. The Waste Facility must also receive signed documentation from each industrial or special waste generator that they are fully aware of the waste management requirements and that they will provide this information to any companies they will use for transporting waste to the facility.

In addition to specific Waste Facility requirements, the Department's waste management requirements include:

1. All industrial and special waste intended for transport and disposal shall be properly characterized, treated, stabilized, and handled.

2. All commercial waste transporters must have a valid permit unique to that company to transport solid waste issued by the Department. All waste must be transported in compliance with applicable permits, state laws and rules, and the facility requirements. If a waste transporter is subcontracting for another waste transporter, the subcontractor must have their own unique waste transport permit (see endnote).

3. The Waste Facility must take reasonable efforts to verify commercial transporters do indeed have a North Dakota Department of Health Waste Transporter Permit and that the permit is unique to that company.

4. All loads brought to the facility must be carefully loaded and transported such that waste will not fall, leak, spill, or release airborne waste materials during transit. No waste containing free liquids, other than household quantities, will be accepted. Windblown dust or airborne contaminants from waste or waste impacted materials is considered waste spillage.

5. Waste transporters are responsible for educating each individual driver under their employ and must monitor the loads to ensure all requirements are met. In the event a vehicle driver or operator notes the vehicle appears over-loaded, the waste appears likely to or is actually spilling or otherwise released, or should free liquids (including excess precipitation or snow melt on the waste) be observed from or within the load, the operator shall take appropriate actions and, if possible, without further release of waste, return the waste promptly to the waste generator for appropriate remedial measures. Covered or containerized waste loads are encouraged.

6. Should waste spillage or release occur, the collector or transporter must immediately cleanup and return spilled waste to the vehicle or container and clean and decontaminate the area. Transporters are encouraged to train vehicle operators on appropriate measures and to equip each transport vehicle with some basic cleanup equipment (shovels, bags, brooms, absorbent, plastic sheeting, etc.).

7. The Waste Facility must ensure adequate space for vehicle cleanup is afforded in an approved area in or close to the landfill unit. All spilled or cleanup materials must be properly handled, containerized and disposed as soon as practicable.

8. The outer surface areas and tires of transportation vehicles leaving the active landfill or unloading area where industrial or special waste is unloaded must be inspected by both the hauler and the facility staff to ensure the vehicle is adequately cleaned before exiting the landfill.

9. Adequate cleaning measures must ensure no waste is clinging to the outside or on the front, back, side-rails and tires of any vehicle, trailer, side dump, container or other equipment.

10. No cleaning of truck or trailer surfaces may take place outside of the active landfill cell or other area approved by the Department unless appropriate provisions are provided to contain all waste materials.

11. The Waste Facility shall provide adequate and repeated education to waste generators and haulers on proper waste handling and approved routes of access to the facility, including traffic flow, safety advisories, vehicle cleanup procedures, and similar information to ensure safe delivery of waste.

12. The Waste Facility shall monitor and document waste loads brought to the facility to ensure applicable requirements are met and that the vehicle or unit has been carefully loaded, moved, unloaded and cleaned.

Signage at or near the scale entrance to facility must clearly and boldly indicate:

a. "North Dakota Solid Waste Transporter Permit Required" and

b. "All loads brought to this facility must be carefully loaded and transported such that waste will not fall, leak, spill or release airborne waste materials during transit. Waste containing free liquids will not be accepted for disposal."

c. "All waste must be cleaned from outer vehicle surfaces and tires before exiting this facility."

Signage at or near the active disposal cell must also clearly state "All waste must be cleaned from outer truck surfaces and tires before exiting this facility." Additional signs may be needed to guide vehicle operators to the appropriate area for cleanup activities. Appropriate equipment and containers shall be provided to facilitate vehicle cleanup procedures.

Solid Waste Facility Waste Acceptance Requirements

In addition to the waste characterization and profiling information, prior to accepting any individual load of industrial or special waste, the Waste Facility shall record:

a. The Department's waste transporter permit number and the transport company name;
b. The vehicle license number;
c. The driver's name, address, phone number, email address, and any other pertinent information;
d. The company address, phone number, email address, and any other pertinent information;
e. The waste generator name, address, phone number, email address;
f. The location where waste was generated;
g. Any issues on waste characterization, liquid content, spillage, etc.; and
h. Any other pertinent information reasonably necessary to ascertain that waste has been properly transported and disposed at the facility in accordance with state law, rules and this permit.

If a waste transporter does not have a waste transporter permit unique to their company, the transport company and the waste generator must be promptly notified of the issue of noncompliance and the transporter must obtain a permit or waste loads will no longer be accepted from that transporter.

For any commercial transporter and/or waste generator who does not take timely measures to meet the facility waste acceptance and waste handling criteria; who does not address the Department's waste transportation permit requirements; who has repeated incidents of waste spillage or release; who does not properly load, unload, decontaminate equipment, and cleanup spillage; who does not

operate in a safe manner or who otherwise does not cooperate with the facility and state waste management and transportation requirements, the Waste Facility shall reject further loads and contact the transport company, the waste generator, and the Department regarding the incident. The Waste Facility shall complete a Waste Rejection Report form SFN 60120 and file it with the Department and the waste generator.

A Waste Rejection Report form SFN 60120 shall also be provided to the waste transporter who must also file this report with the Department.

Action for Waste Spillage or Releases from Transport Vehicles

Dependent on facility location in relation to traffic flow and access from major transportation arteries, the Waste Facility shall address appropriate inspection and cleanup procedures for the facility haul roads, access roads, and other facility areas as well as adjacent county roads as appropriate. Where waste transport vehicles turn off public roads, highways, and intersections to gain access to the facility, the inspections should monitor spillage issues within at least a mile of the turnoff facility entrance on an ongoing basis at least twice per operational day or more often if necessary to ensure that any waste that may have fallen, spilled, leaked, become airborne or otherwise escaped the confines of the transportation vehicle or container is promptly cleaned. Particular attention should be provided to areas where waste transport vehicles slowdown, stop or turn to gain access to the facility. Inspection records (which may include pictures) shall be retained as part of the facility operating record.

Inspection and cleaning of access roads and public roads must follow safe and prudent procedures. The North Dakota Department of Transportation (NDDOT) has information on its website for the "Adopt a Highway" program, which includes safety procedures, personnel protection as well as appropriate agreement forms. For public roadways and highways, facility managers must work with the NDDOT and/or county or local transportation officials as appropriate to ensure activities are safe and that appropriate procedures are followed. For cleaning waste from roadways, NDDOT may require more formal information such as insurance coverage, and other prudent information. The "Adopt a Highway" program information is on the NDDOT website at www.dot.nd.gov/public/adopt.htm.

The contact information for the NDDOT "Adopt a Highway" program is typically through the NDDOT district office. See www.dot.nd.gov/travel/districtinfo.htm.

Contact for county or city road departments is typically available on the local website; however, the NDDOT information may help address common issues of concern.

Normally it is the transporter's responsibility to clean waste spillage; however, if the transporter is not available or otherwise fails to clean and decontaminate the area in a timely manner, not to exceed four hours from identification of the incident, the facility must take appropriate measures. Any waste spilled or released must be promptly cleaned up and the area decontaminated in a safe manner as soon as practicable, typically no later than facility closure or by sunset of the day of operation, whichever is earlier. The Waste Facility staff, if appropriate, may do the cleanup, or the facility shall follow the incident spill report process and contact a third party cleanup crew to clean

and decontaminate the spill. A summary of the waste spillage and cleanup incidents noted by the Waste Facility shall be included in the facility reports. Facilities need to address appropriate measures to keep the roadways clean of regulated waste that is normally transported to the facility. Cleanup of litter and other debris not necessarily related to spillage incidents reflects well on a solid waste facility and demonstrates a good faith effort to Keep North Dakota Clean.

For waste loads arriving at the facility, if one or more loads are noted to have spilled or released waste, show evidence of waste spillage on the outside of the transport vehicle, contain free liquids, or otherwise do not meet the waste acceptance requirements, the transporter, driver and the waste generator shall be reminded of the state and facility waste management requirements. Facility staff must also inform waste transporters, drivers and waste generators that the waste loading and transport procedures must be properly amended to prevent further spillage. If a transporter and/or generator do not cooperate, further waste from that transporter and that generator is no longer approved for transport or disposal until compliance is achieved. For serious incidents or repeated incidents, the Department's Division of Waste Management shall be informed of the incident by phone or email and the Department's Waste Rejection Report form SFN 60120 shall be completed and submitted.

Waste transporters and/or generators who fail to comply with the requirements shall not be allowed to dispose further waste at the facility until they have clearly amended their waste handling practices to preclude further releases, have completed any additional remediation necessary, and have filed a report with the facility and the Department indicating what measures they have taken to be in full accordance with state and facility waste acceptance practices. Records of such issues shall be maintained in the facility operating records.

In the event of any spill or release of waste that has the potential to impact surface water, human health or the environment, the transporter or Waste Facility shall take appropriate remedial measures and file an Environmental Incident Report. Contact the North Dakota Department of Health (1.701.328.5210 or 5166) or online at www.ndhealth.gov/ehs/eir/Eirform.htm.

Note: A waste transporter permit may not be required for equipment that is rented by, operated for, and under direct control of a waste transporter that is already permitted by the North Dakota Department of Health so long as it is operated by and is insured by that permitted waste transporter, and all activities are in accord with state and facility requirements. The permitted waste transport company should include regular updates on the use of rented equipment in a notification to both the Department and the Waste Facility. In such instances, the transportation company holding the permit to transport solid waste shall educate the drivers on the state and Waste Facility requirements and assumes liability for transportation issues regarding waste materials.

GUIDELINE 4A - RECORDKEEPING AND REPORTING BY OWNERS OR OPERATORS OF SOLID WASTE FACILITIES (other than Municipal Solid Waste Landfills)

North Dakota Department of Health - Division of Waste Management
918 E. Divide Ave., 3rd Fl., Bismarck, ND 58501-1947
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Updated 02-2014

I. Introduction

The owners or operators of all waste management facilities, except those permitted by rule, are required to keep operating records and make routine reports to the North Dakota Department of Health. The owner or operator is required to maintain records of demonstrations, inspections, monitoring results, design documents, plans, operational procedures, notices, cost estimates and financial assurance documentation. A new facility is not allowed to accept waste until the Department has received and approved a report, which includes narrative, drawings and test results which certify that the facility was constructed in accordance with approved plans and specifications and as required by the permit. In addition, the owners or operators must maintain records on the categories and weights or volumes of solid waste received at the facility.

Appropriate maps, pictures and diagrams should be included with the regular records and reports to describe the site. Information with the pictures should include (1) the name of the facility; (2) the subject; (3) the location; (4) the date and time; (5) the photographer; (6) weather conditions; and (7) pertinent comments and observations. It is beneficial to formalize the reporting requirements so that they are consistent and easily tracked. It is suggested that the owner and operators keep copies of all information for their facility files maintained at the approved site. In addition, it is often beneficial to file copies of the reports with any local governmental bodies, health districts or other interested regulatory or governmental officials.

Note: Municipal solid waste landfills must comply with the recordkeeping requirements found in 40 CFR § 258.29. The Department has a separate guideline (Guideline 4) for municipal solid waste facility owners/operators.

Certain smaller facilities, such as small inert landfills and small community transfer stations also may not be required to address this specific guideline.

II. Recordkeeping Requirements

The operating record should be maintained in a single location. The location may be at the facility or at corporate headquarters or city hall, but should be near the facility within the state of North Dakota. Records should be maintained throughout the life of the facility, including the postclosure care period. Upon completion of each document required in the operating record, the Department should be notified of its placement in the operating record. Recordkeeping at the facility should include the following:

1. Location restriction demonstrations. Demonstrations are required for any location restrictions. The location restrictions apply to:

    a. Airports

b. Floodplains
c. Faulted areas
d. Seismic impact zones
e. Unstable areas
f. The General Location Standards of NDAC 33-20-04.1-01.

2. Inspection records, training procedures and notification procedures. Inspection records should include:

   a. Date and time wastes were received during the inspection;
   b. Names of the transporter and the driver;
   c. Source of the wastes;
   d. Vehicle identification numbers; and
   e. All observations made by the inspector

   Training records should include procedures used to train personnel for waste acceptance requirements, including recognition of hazardous waste, PCB waste, asbestos, radioactive materials, and other problem or prohibited waste requirements.

   Notification to EPA, state and local agencies should be documented.

3. Demonstration, certification, monitoring, testing, or analytical findings required by the groundwater criteria. Documents to be placed in the operating record include:

   a. Documentation of design, installation, development and decommission of any monitoring wells, piezometers and other measurement, sampling and analytical devices;

   b. Certification of the number, spacing and depths of the monitoring systems;

   c. Documentation of sampling and analysis programs and statistical procedures;

   d. Notice of finding a statistically significant increase over background for one or more of the constituents at any monitoring well at or the compliance boundary;

   e. Certification that an error in sampling, analysis, statistical evaluation, or natural variation in groundwater caused an increase (false positive) of constituents, or that a source other than the Solid Waste Management Unit (SWMU) caused the contamination (if appropriate);

   f. A notice identifying any constituents that have been detected in groundwater and their concentrations;

   g. A notice identifying the constituents that have exceeded the groundwater protection standard;

   h. A certification that a source other than a SWMU caused the contamination or an error in sampling, analysis, statistical evaluation, or natural groundwater variation caused the statistically significant increase (false positive) in constituents (if applicable);

i. The remedies selected to remediate groundwater contamination; and

j. Certification of remediation completion.

4. Closure and postclosure plans and any monitoring, testing or analytical data associated with these plans.

   The facility owner or operator is required to place a copy of the closure plan, postclosure plan and a notice of intent to close the facility in the operating record. Monitoring, testing or analytical data associated with closure and postclosure information generated from groundwater and any other required monitoring must be placed in the operating record. A copy of the notation on the deed to the SWMU property, as required following closure along with certification and verification that closure and postclosure activities have been completed in accordance with their respective plans, also must be placed in the operating record.

5. Estimates and financial assurance documentation required. The following documents must be placed in the operating record:

   a. An estimate of the cost of hiring a third party to close the largest area of all SWMUs ever requiring final cover;

   b. Justification for the reduction of the closure cost estimate and the amount of financial assurance (if appropriate);

   c. A cost estimate cost of hiring a third party to conduct postclosure care;

   d. An estimate and financial assurance for the cost of a third party to conduct corrective action; and

   e. A copy of each financial assurance mechanism.

III. Reporting Requirements

Nonhazardous solid waste facilities such as landfills, surface impoundments, land treatment facilities, waste piles, transfer stations, treatment facilities, and other types of facilities in North Dakota are required to submit regular reports to the North Dakota Department of Health as required in the North Dakota Solid Waste Management Rules, approved plans and/or permit conditions. These guidelines supply guidance to help meet appropriate reporting requirements. **Please review your facility permit to see if additional reporting requirements apply.**

Electronic Record Submittal: To help reduce paper, save time and ensure more orderly management of records, unless otherwise requested, routine reports should be submitted to the Department in a digital or electronic format such as a readable and searchable PDF format, Excel Tables for data or similar format consistent with the Department's recordkeeping system. Pursuant to NDAC 33-20-04.1-04, the original signed report must be retained with the facility operating record, which must be kept at the facility or at a location near the facility within North Dakota and approved by the Department. In some cases, the Department may require printed copies in addition to electronic format.

Regular reports help keep the Department informed as to the status of the operation and site conditions. The reports should essentially be a summary of the daily log books, inspections and records kept onsite by the operational personnel and any inspections conducted by other facility personnel. The report should include pictures, maps, diagrams, checklists, etc., to help document site conditions.

Different types of facilities will need to adapt these guidelines to meet their reporting needs. Reporting requirements may be modified, increased or decreased through permit conditions, permit modification, operational plans, or correspondence.

For further information on specific issues, please refer to Department Publications and Guidelines, which are on-line at www.ndhealth.gov/wm/Publications/.

A. Waste Accepted, Disposed, Handled, Recycled, and/or Rejected at Facility.

Disposal facilities must keep records on the types and amounts of waste accepted; the generators of the waste; waste analysis and characteristics; where it is disposed in the facility; and any waste rejected or not accepted. For waste types and amounts of waste disposed, recycled or composted at the facility, computer spreadsheet (Excel) or table summarizing information could be used; a suggested format would be as follows:

Date	Source of Waste	Waste Hauler	Waste Type	Loads	Yardage	Weight (tons)

For facilities that receive regular shipments of waste from a specific generator, the waste record could be reported as a weekly or monthly summary. Facilities that receive small amounts of waste from numerous generators (i.e., individual home-owners in pickups, trailers, etc.) could provide a simple summary of the quantities. Any additional information on the waste characteristics, analysis, liquid content, waste rejection, or other issues should be provided as well as an identification of the disposal area for the wastes. Waste management units or areas should be identified by general dates on a map or diagram. In addition, any special handling for any wastes disposed or allowed to be disposed or otherwise managed at the facility (i.e., asbestos waste, oil contaminated soil, yard wastes, etc.) should be explained and appropriately identified. Any specific problems in the types of wastes or the inclusion of hazardous materials, liquids, ignitable materials, radioactive materials, or other issues with the waste stream should be clearly identified.

Waste Reduction and Recycling information as appropriate should also be included in a spreadsheet or table as above on any wastes or recyclable material segregated, stockpiled, composted, or otherwise handled (i.e., scrap metal, appliances, clean or reusable wood, compost piles, etc.). The Department encourages permittees to work with their customers and haulers to encourage recycling and waste reduction activities consistent with NDCC 23-29-02(8), which established a forty percent waste reduction/ recycling goal.

Waste Acceptance and Rejection issues should be tracked in the routine reports (similar to waste accepted as described above); however, in the event that hazardous, radioactive, ignitable, explosive, or other unacceptable wastes are brought to the facility, or if liquid wastes are likely to have been released or spilled on roads, such issues should be reported as soon as practicable and a waste rejection report must be filed to inform the Department of the issue within 5 days of the rejection of the waste. The Waste Rejection Form is available on the NDDoH website at www.nd.gov/eforms/Doc/sfn60120.pdf

B. Capacity of Solid Waste Units.

It is important for the Department to have knowledge of solid waste capacity for operating solid waste units, the anticipated dates of closure and a discussion of significant permit modifications. Capacity or airspace questions in this section relate to all cells/units of the approved facility operated under the current permit regardless of whether the cells/units are closed or are not contiguous at the time of this report. If there are more than one type of solid waste units covered under this permit (i.e., a municipal solid waste landfill, an inert waste landfill, waste pile or compost unit, transfer station, etc.), please provide estimations for each separate unit. Landfill units that are formally closed may also be identified as separate units in the report.

Tonnage questions must be based on scale records or, if approved, a reasonable conversion factor for converting cubic yards of waste **as placed (compacted) in the unit** to tons (or vice versa). For landfills, the Total Airspace Filled estimation must cover the period between the opening date (onset of disposal) of the unit and the end of the reporting year of the report (11:59:59 p.m. or 24:00 hours, December 31). The Airspace Used of Reporting Year must be for the calendar year of the reporting year. If an aerial or ground survey has not been completed within the calendar year, an updated survey must be completed the next year. Airspace measurements include daily and intermediate cover, but not final cover.

FOR EACH SOLID WASTE DISPOSAL UNIT OR ACTIVITY (Landfill, Surface Impoundment, Surface Impoundment Being Closed with Waste In Place, Waste Pile, Compost Unit, etc.):

1. Total (maximum) airspace (original or initial capacity) approved in permit (cubic yards):
2. Total airspace filled or used (cubic yards) by the end of the reporting year?
3. Total airspace filled or used (cubic yards) at the end of the previous year?
4. Amount of airspace filled or used (cubic yards) during the reporting year?
5. Remaining airspace or capacity?
6. Anticipated date when the facility will be full?
7. Tonnage disposed during reporting period:
   a. If conversion factors are used to convert waste tonnage to cubic yards, what are the factors?
8. Average density of waste disposed in place (tons/cubic yard) and how calculated?
9. Do you plan on constructing any new lined areas, cells or expansions (including vertical expansions) within the next year?
10. Do you foresee applying for a major permit modification in the near future?
    a. If so, please describe what and when?

11. Date facility last surveyed (most facilities should do an annual survey or assessment):
12. Attach copy of last survey, if not already on file.

C. Operators and Training.

Please list the operating staff, their duties, a description of training they have received, and if they are certified or trained by the state of North Dakota, the last date of such training/certification:

Name:
Duties (Operator, Gate Monitor, Manager, etc.):
Years of experience – On this facility: At other facilities:
Training or certification type and expiration date (NDDoH, SWANA, Stormwater, Composting, etc.) – list on separate sheet if needed:
Will this employee be attending training during the oncoming year?
If so, please describe:

D. Equipment.

Describe routine equipment used on the site, the condition and repair issues, and the source and type of equipment used as backup or contingency management of the site in the event of equipment breakdown, unusual circumstances and/or emergencies.

E. Control of Spillage, Windblown Debris, Dusts, Odors, and Vermin.

Assess any waste spillage and subsequent cleanup, decontamination of access roads, haul roads and/or in waste management areas and solid waste units. Discuss any significant release of windblown waste, dust and/or debris to the surrounding area and subsequent cleanup of windblown debris. The generation of dust, odors or vermin should also be regularly assessed and appropriate control measures detailed. Corrective measures to prevent or minimize spillage, dust, debris, etc., can also be addressed.

F. Condition of Berms, Small Stormwater Impoundments, Dams and Noncontact Surface Water Containment Structures.

This section should address the construction, repair, maintenance or replacement of any berms, dams, ponds or other containment structures around the waste management areas and any water or waste contained in them. Inspection procedures may adapt some the measures discussed below for large surface impoundments.

G. Surface Water Run-on and Runoff Control, Stormwater Management and Erosion Control.

This section should discuss any significant surface water run-on or runoff events, including flow into the solid waste management areas, flow out of the management area, surface water interception and erosion control by berms, dams, and other stormwater management measures and any other pertinent information. To help monitor surface water run-on and runoff controls, all facilities should keep regular track of how

much rain falls in the area of the facility and during spring thaws, and any appreciable run-on/runoff from snowmelt. Appropriate maps or diagrams should be provided to show the areas of management activity and the surface water management/erosion control features. If appreciable amounts of water accumulate onsite or around the site, some surface water analysis may be required to document water quality. Any controlled or uncontrolled release of water should be addressed. Departmentally approved procedures must be followed if any water is to be released from the site. Surface water quality and management information, as required or necessary, should also be submitted in this section of the report. A copy of any information required for a Stormwater Pollution Prevention Plan should also be provided to the Division of Waste Management in addition to the Division of Water Quality.

H. Removal and Stockpiling of Suitable Plant Growth Topsoil and Subsoil.

Disposal facilities must remove all suitable plant growth material (soil A and upper part of the B horizons) from areas to be disturbed. This should include the material in the disposal area and any other areas disturbed by operation activities, including haul roads, equipment storage, parking areas, etc. The report and maps should address suitable plant growth material (SPGM) removal and stockpiling, revegetation of stockpiles, erosion controls, and any removal of topsoil SPGM or subsoil SPGM from stockpiles for management or respreading on reclaimed areas. Topsoil SPGM and subsoil SPGM stockpiles must be protected and adequate signs placed at the piles to inform others that the piles are not to be disturbed or material removed without authorization. The signs must include a contact name and phone number should any questions arise. For newly stripped areas, monuments should be left as necessary to document the depths of SPGM topsoil and subsoil removal. The stockpiles, revegetation, signage, and any removal, erosion or other issues should be routinely inspected and discussed in the routine reports.

I. Liner Protection and Integrity, Geologic and Soil Conditions in the Solid Waste Management Areas.

Facilities with liners and leachate management/collection systems should routinely assess the condition of these construction features, looking for erosion, cracking of soil liners, tears in synthetic materials, erosion or vegetation in clay liners, and any other significant features. Desiccation and freeze-thaw conditions significantly affect clay liners. Unprotected liners may need to be assessed and/or rebuilt in part or in whole. As appropriate for the disposal facility, this section should address the types of geologic materials or soils encountered in the solid waste management areas or excavations.

This section should especially address any significant variations in normal operating procedures or conditions. This might include interception of any lignite, sand, gravel, or fractured materials; any interception of groundwater; any breaching or damage to the liner; and the general condition of the liners underlying the facility. For any liner construction or repair, appropriate Departmentally approved Quality Assurance/Quality Control procedures must be followed and appropriate plans and detailed reports filed with the Department.

J. The Condition, Operation and Maintenance of Leachate Collection or Management Systems.

Owners/operators of facilities with leachate collection or extraction systems need to regularly inspect and maintain such systems. This would include, but not be limited to an assessment of the condition of leachate collection sand bedding, gravel sumps, piping, pumping equipment, manholes, and other structures should be provided. Any damage to such facilities and/or subsequent repair should be addressed. A quantification and schedule or frequency of the leachate removed from the site, the level of leachate within the facility, the quality of the leachate and its management should be addressed. Piping and access points need to be jetted or cleaned, at minimum, on an annual basis.

K. The Status of Disposal Operations.

This section should address a description of the condition of the operation or disposal area and the filling of the facility. Sequential partial closure must be implemented as necessary to keep the disposal area as small as practicable and to close filled areas in a timely manner to facilitate final reclamation and closure. At minimum, the report should include a summary of routine inspections and inspection checklists.

For landfills, the report should evaluate and discuss (1) the square footage of the working face or open area of a landfill (which normally must be limited in size to as small an area as practicable); (2) the slope of the working face (nearly level is best, but should not exceed 25% slope) to ensure optimal access and compaction; (3) waste placement and spreading (placement at the base of the working face with spreading and compaction working upslope) to ensure adequate placement and compaction; (4) waste compaction (routine compaction with three to five passes of heavy equipment over each square foot of waste) helps maximize usage of landfill space and minimize water infiltration and windblown waste; (5) placement of routine cover and interim cover; (6) water management, including measures to minimize concentration of water on the waste, to prevent ponding of surface water, to minimize infiltration of surface water, to control erosion, to prevent runoff off-site and other considerations; (7) as necessary, discuss any fires and measures to control fires; (8) any settlement, slumping or erosion of filled areas; (9) control windblown dust; and (10) other issues necessary or required to keep the Department informed of operational issues.

L. Composting, Land Treatment, Waste Treatment Activities.

For waste treatment, compost facilities, land farms, or other treatment units or facilities or solid waste facilities that maintain an operation for treating oil, gasoline or other hydrocarbon contaminated soil, the report should document appropriate activities as outlined in the permit, rules and guidelines. This should include the summary of waste accepted or handled, the adequacy of treatment, materials removed, the amount of materials in the process, and any spillage, release, runoff or run-on controls, dust or other issues in the operation. Additional information specific to treatment activities would include the inspection schedule; rates of waste application or treatment; appropriate waste characterization; the application of any fertilizer, water, amendments, inoculants, or other additives; treatment activities; material sampling and waste breakdown rates; stormwater control; dust control; and any other pertinent information.

For facilities that operate and maintain compost units for yard wastes, manure, sludge, or other biodegradable wastes, general information should be provided as outlined in this guideline as well as the monitoring of compost pile odors, moisture, temperature, and general condition. A summary of the pile size, frequency of turning, moisture conditions, and maintenance should be provided. Include a summary of any admixtures or other waste materials (food waste, car wash sump waste, sewage sludge, manure, animal remains, etc.) that are co-composted. The results of any routine analysis of the compost material should be included in the report. Marketing or use of compost should also be addressed to help meet state waste reduction goals.

M. Surface Impoundments.

Any impoundments onsite for managing regulated waste materials, leachate, and water that has been in contact with or degraded by solid waste materials, or for stormwater management, should be assessed in the regular reports. Inspection procedures and checklists shall be developed to address, at minimum, appropriate design, operation, inspection, evaluation and maintenance measures as outlined in the following publications and guidelines:

- North Dakota Dam Design Handbook
- Technical Manual for Dam Owners – Impacts of Plants on Earthen Dams (FEMA 534)
- Technical Manual for Dam Owners – Impacts of Animals on Earthen Dams (FEMA 473)
- Federal Guidelines for Dam Safety – Glossary of Terms (FEMA)
- Technical Manual: Conduits through Embankment Dams (FEMA)
- Filters for Embankment Dams – Best Practices for Design and Construction (FEMA)
- Technical Manual: Outlet Works Energy Dissipators (FEMA)
- Guidance Document for Coal Waste Impoundment Facilities & Coal Waste Impoundment Inspection Form, West Virginia Water Research Institute, West Virginia University, Prepared for: National Technology Transfer Center, Wheeling Jesuit University; Dec. 2005.

An inspection procedures manual and checklist should be developed pursuant to referenced guidance, facility plans and state law and rules. An electronic copy of the manual and checklists shall be submitted to the North Dakota State Water Commission and the Department who reserve the right to require modifications or additions, if deemed necessary.

Identified issues regarding the erosion evaluation, assessment of piping, animal burrowing, evaluation of valves, inspection procedures, vegetation control, evaluation and maintenance of piping and valves, any repair, and any other prudent measures to maintain the surface impoundments shall be incorporated into the routine inspection, training and record-keeping requirements and shall be summarized in routine reports for this facility.

Reports shall also include, but not be limited to the volume in the pond; remaining capacity (excepting the two feet of freeboard); the amount of freeboard; the condition of any liners, piping, spillways, or other features; any leakage, spillage, overtopping, or other unforeseen events; and other appropriate management measures.

The report shall include, at minimum, annual representative analysis of water and/or waste contained in the impoundment for the parameters reasonably expected to be contained in the waste or water, the parameters for the approved groundwater monitoring plan and/or a list of parameters approved by the Department.

For surface impoundments to be closed with waste in place, many of the issues regarding landfill operation (see above) may be adapted for such facilities to show orderly filling, maintenance, operation, and closure.

N. Site Reclamation.

All facilities will need to be cleaned up, debris removed and areas regraded as necessary. Nondisposal facilities should ensure the area is properly closed and revegetated as appropriate.

For disposal facilities, this section should address the final covering as it is completed and, as appropriate, as identified in the Facility Operation and Closure Plan. This should include the condition of the final slope of the site as identified in the plans and as provided in closure guidance; the construction of a low permeability cap over the landfilled wastes utilizing compacted clay or other material as approved by the Department; the placement of additional fill soil or drainage media; the replacement of any buffer soil and suitable plant growth material; and the final revegetation of filled areas of the site. A description of the Quality Assurance/Quality Control procedures for site capping and reclamation should be addressed and appropriate plans and reports filed with the Department.

Closed facilities must be periodically inspected to address vegetation establishment and condition, weed control, plant coverage, and any significant surface water erosion, settling, repair of settled areas, cover repair, drop structures, or any other pertinent issues. Drainage swales and the condition of berms, diversions, etc., must be evaluated. Some steeper facilities may have additional requirements to monitor erosion and vegetation.

O. Groundwater and Surface Water Monitoring and Assessment of any Leachate Seepage.

The report should include a section on groundwater and surface water monitoring for the reporting period or this could be in a separate report. This information should include water levels and laboratory analysis as required in the facility permit. The inspection procedures should also evaluate the condition of the wells and any springs or leachate seepage in or around the site.

P. General Site Operation Standards.

The report should include a summary of the general disposal standards. An example for a landfill would be the standards as outlined on a specific facility checklist. The assessment should be made on a regular basis as required in the permit or operating plans or, at a minimum, on a weekly basis for inert waste sites. Most facilities should monitor these conditions every day the site is open; however, the checklist could be completed weekly. A checklist should be adapted and developed for the various types of facilities. The appropriate checklist should be completed, maintained with the facility

records and a summary of the inspection reports should be filed with the Department. Department staff can assist in developing appropriate checklists.

Q. Permit and Site Development and Operating Plan.

A facility owner/operator should regularly review the site development plans, operating plans, contingency plans, and other specific facility plans as well as the permit and the North Dakota Solid Waste Management Rules to ensure that the facility is in compliance with all necessary requirements. Any anticipated or necessary changes may necessitate a change in the plans and/or the permit. Copies of all necessary documents, the permit and the state rules should be readily available at the site and site personnel should be well trained in their requirements. Any updates of the contingency plans or site plans are subject to Departmental approval. Significant changes in or changes in the method of operation of a facility may necessitate a formal modification of the permit.

IV. Conclusion

The Department appreciates the work and effort to adequately inspect facilities, keep records and provide routine reports. **Again, submittal of electronic reports and submittals in a readable and searchable PDF format, Excel Tables for data or similar format consistent with the Department's recordkeeping system is strongly encouraged to help reduce paper, save time and ensure more orderly management of records.** Should you have any questions or comments, please feel free to contact the Department.

For further information on other issues, please refer to the Publications page of the Division website.

GUIDELINE 18 - FINANCIAL ASSURANCE MECHANISMS FOR CLOSURE AND POST-CLOSURE FOR PUBLICLY AND PRIVATELY OWNED LANDFILLS

North Dakota Department of Health - Division of Waste Management
918 E. Divide Ave., 3rd Fl., Bismarck, ND 58501-1947
Telephone: 701.328.5166 • Fax: 701.328.5200 • Website: www.ndhealth.gov/wm
Revised 03-2015

I. Introduction

This guidance document was prepared to assist your facility in meeting the financial assurance requirements of Chapter 33-20-14 of the North Dakota Solid Waste Management Rules.

The purpose of financial assurance is to ensure that funds are available to cover the costs of closure and post-closure care if the owner or operator is unwilling or unable to do so. Therefore, it is important that the mechanisms demonstrating financial assurance are correctly prepared.

New or expanded facilities must demonstrate financial assurance prior to acceptance of solid waste.

Initial cost estimates must be in current dollars, and cost estimates must be adjusted annually for inflation. The inflation adjusted financial assurance documents for publicly and privately owned facilities must be submitted no later than August 31 of each year.

Should you have any questions regarding the preparation of your financial assurance documents feel free to contact Division of Waste Management.

II. Reserve Account

Your facility may use a savings account or Certificate of Deposit (CD) or other account where the monies have been set aside to cover the costs for closure and post-closure.

Reserve accounts must be **funded in its entirety**. No monthly or year payments into the reserve account are allowed. At the bank you should ask for an "assignment" of a CD or savings account to the Department. The bank will put a hold on the CD or savings account and your facility will not be able to remove funds from these accounts unless you have prior approval from the Department.

III. Trust Fund

After your facility has set up a trust fund in accordance with Section 33-20-14-07.1 NDAC, a trust agreement **and** certification of acknowledgment must be submitted. A trust agreement for a trust fund as specified in section 33-20-14-07.1 must be worded as follows, except that instructions in brackets are to be replaced with the relevant information and the brackets deleted.

TRUST AGREEMENT

TRUST AGREEMENT, the "AGREEMENT" entered into as of [Effective date] by and between [name of the owner or operator] a [name of state] [Choose *one*: Corporation, partnership, association or proprietorship], the "GRANTOR," and [name of financial institution acting as trustee], [insert "incorporated in the state of (state)" **or** "a national bank"], the "TRUSTEE".

Whereas, the North Dakota Department of Health "DEPARTMENT" a regulatory agency of the state of North Dakota, has established certain regulations applicable to the GRANTOR requiring that an owner or operator of a solid waste management facility shall provide assurance that funds will be available when needed for closure or post-closure, or both, care of the facility,

Whereas, the GRANTOR has elected to establish a trust to provide all or part of such financial assurance for the facilities identified herein,

Whereas, the GRANTOR acting through its duly authorized officers has selected the TRUSTEE to be the trustee under this agreement and the TRUSTEE is willing to act as trustee,

Now, therefore, the GRANTOR and the TRUSTEE agree as follows:

Section 1. Definitions. As used in this AGREEMENT:

(a) The term GRANTOR means the owner or operator who enters into this AGREEMENT and any successors or assigns of the GRANTOR.

(b) The term TRUSTEE means the TRUSTEE who enters into this AGREEMENT and any successor TRUSTEE.

Section 2. Identification of Facilities and Cost Estimate. This agreement pertains to the facilities and cost estimates identified on attached *Schedule A*.

Section 3. Establishment of Fund. The GRANTOR and the TRUSTEE hereby establish a trust fund, the FUND, for the benefit of the DEPARTMENT. The GRANTOR and the TRUSTEE intend that no third party have access to the FUND, except as herein provided. The FUND is established initially as consisting of the property which is acceptable to the TRUSTEE and described in *Schedule B* attached hereto. Such property and any other property subsequently transferred to the TRUSTEE is referred to as the FUND, together with all earnings and profits thereon, less any payments or distributions made by the TRUSTEE pursuant to this AGREEMENT. The FUND must be held by the TRUSTEE, IN TRUST, as herein provided. The TRUSTEE is not responsible, nor may it undertake any responsibility for the amount or adequacy of, nor any duty to collect from the GRANTOR any payments necessary to discharge any liabilities of the GRANTOR established by the DEPARTMENT.

Section 4. Payment for Closure and Post-closure Care. The TRUSTEE shall make payments from the FUND as the DEPARTMENT shall direct, in writing, to provide for the payment of the cost of closure, and/or post-closure care of the facilities covered by this AGREEMENT. The TRUSTEE shall reimburse the GRANTOR or other persons as specified by the DEPARTMENT from the FUND for closure and post-closure expenditures in such amounts as the DEPARTMENT shall direct in writing. In addition, the TRUSTEE shall refund to the GRANTOR such amounts as the DEPARTMENT specifies in writing. Upon refund such funds shall no longer constitute part of the FUND as defined herein.

Section 5. Payments Comprising the FUND. Payments made to the TRUSTEE for the FUND must consist of cash or securities acceptable to the TRUSTEE.

Section 6. TRUSTEE Management. The TRUSTEE shall invest and reinvest the principle and income of the FUND and keep the FUND invested as a single FUND without distinction between principle and income in accordance with general investment policies and guidelines which the GRANTOR may communicate in writing to the TRUSTEE from time to time, subject however to the provisions of this Section. In investing, reinvesting, exchanging, selling, and managing the FUND, the TRUSTEE shall discharge his duties with respect to the trust fund solely in the interest of the beneficiary and with the care, skill, prudence, and diligence under the circumstances then prevailing which persons of prudence, acting in a like capacity and familiar with such matters, would use in the conduct of an enterprise of a like character and with like aims; except that:

(a) Securities or other obligations of the GRANTOR or any other owner or operator of the facilities or any of their affiliates as defined in the Investment Company Act of 1940, as amended, 15 U.S.C. 80a-2(a), may not be acquired or held unless they are securities or other obligations of a federal or state government;

(b) The TRUSTEE is authorized to invest the FUND in time or demand deposits of the TRUSTEE, to the extent insured by an agency of the federal or state government; and

(c) The TRUSTEE is authorized to hold cash awaiting investment or distribution uninvested for a reasonable time and without liability for the payment of interest thereon.

Section 7. Commingling and Investment. The TRUSTEE is expressly authorized in its discretion:

(a) To transfer from time to time any or all of the assets of the FUND to any common, commingled, or collective trust fund created by the TRUSTEE in which the FUND is eligible to participate, subject to all of the provisions thereof, to be commingled with the assets of other trusts participating therein; and

(b) To purchase shares in any investment company registered under the Investment Company Act of 1940, 15 U.S.C. 80a-1 et seq., including one which may be created, managed, underwritten, or to which investment advice is rendered or the shares of which are sold by the TRUSTEE. The TRUSTEE may vote such shares in its discretion.

Section 8. Express Powers of TRUSTEE. Without, in any way, eliminating the powers and discretions conferred upon the TRUSTEE by the other provisions of this AGREEMENT or by law, the TRUSTEE is expressly authorized and empowered:

(a) To sell, exchange, convey, transfer, or otherwise dispose of any property held by it, by

public or private sale. No person dealing with the TRUSTEE is bound to see the application of the purchase money or to inquire into the validity or expediency of any such sale or disposition;

(b) To make, execute, acknowledge, and deliver any and all documents of transfer and conveyance and any and all other instruments that may be necessary or appropriate to carry out the powers herein granted;

(c) To register any securities held in the FUND in its own name or in the name of a nominee and to hold any security in bearer form or in book entry, or to combine certificates representing such securities with certificates of the same issue held by the TRUSTEE in other fiduciary capacities, or to deposit or arrange for the deposit of such securities in a qualified central depository even though, when so deposited, such securities may be merged and held in bulk in the name of the nominee of such depository with other securities deposited therein by another person, or to deposit or arrange for the deposit of any securities issued by the United States Government, or any agency or instrumentality thereof, with a federal reserve bank, but the books and records of the TRUSTEE shall at all times show that all such securities are part of the FUND;

(d) To deposit any cash in the FUND in interest bearing accounts maintained or savings certificates issued by the TRUSTEE, in its separate capacity, or in any other banking institution affiliated with the TRUSTEE to the extent insured by an agency of the federal or state government; and

(e) To compromise or otherwise adjust all claims in favor of or against the FUND.

Section 9. Taxes and Expenses. All taxes of any kind that may be assessed or levied against or in respect of the FUND and all brokerage commissions incurred by the FUND shall be paid from the FUND. All other expenses incurred by the TRUSTEE in connection with the administration of this TRUST, including fees for legal services rendered to the TRUSTEE, the compensation of the TRUSTEE to the extent not paid directly by the GRANTOR and all other proper charges and disbursements of the TRUSTEE, must be paid from the FUND.

Section 10. Annual Valuation. The TRUSTEE shall annually, at least thirty days prior to the anniversary date of establishment of the FUND, furnish to the GRANTOR and to the DEPARTMENT a statement confirming the value of the TRUST. Any securities in the FUND must be valued at market value as of no more than sixty days prior to the anniversary date of establishment of the FUND. The failure of the GRANTOR to object in writing to the TRUSTEE within ninety days after the statement has been furnished to the GRANTOR and the DEPARTMENT, constitutes a conclusively binding assent by the GRANTOR barring the GRANTOR from asserting any claim or liability against the TRUSTEE with respect to matters disclosed in the statement.

Section 11. Advice of Counsel. The TRUSTEE may from time to time consult with counsel, who may be counsel to the GRANTOR, with respect to any question arising as to construction of this AGREEMENT or any action to be taken hereunder. The TRUSTEE shall be fully protected to the extent permitted by law in acting upon the advice of counsel.

Section 12. TRUSTEE Compensation. The TRUSTEE is entitled to reasonable compensation for its services as agreed upon in writing from time to time with the GRANTOR.

Section 13. Successor TRUSTEE. The TRUSTEE may resign or the GRANTOR may replace the TRUSTEE, but such resignation or replacement is not effective until the GRANTOR has appointed a successor trustee and this successor accepts the appointment. The successor trustee shall have the same powers and duties as those conferred upon the TRUSTEE hereunder. Upon the successor trustee's acceptance of the appointment, the TRUSTEE shall assign, transfer, and pay over to the successor trustee the funds and properties then constituting the FUND. If for any reason, the GRANTOR cannot or does not act in the event of the resignation of the TRUSTEE, the TRUSTEE may apply to a court of competent jurisdiction for the appointment of a successor trustee or for instructions. The successor trustee shall specify the date on which it assumes administration of the TRUST in a writing sent to the GRANTOR, the DEPARTMENT, and the present TRUSTEE by certified mail ten days before such change becomes effective. Any expenses incurred by the TRUSTEE as a result of any of the acts contemplated by this section must be paid as provided in section 9.

Section 14. Instructions to the TRUSTEE. All orders, requests, and instructions by the GRANTOR to the TRUSTEE must be in writing, signed by such persons as are designated in the attached *Exhibit A*, or such other designees as the GRANTOR may designate by amendment to *Exhibit A*. The TRUSTEE shall be fully protected in acting without inquiry in accordance with the GRANTOR'S orders, requests, and instructions. All orders, requests, and instructions by the DEPARTMENT to the TRUSTEE must be in writing, signed by an authorized DEPARTMENT representative and the TRUSTEE shall act and be fully protected in acting in accordance with such orders, requests, and instructions. The TRUSTEE shall have the right to assume, in the absence of written notice to the contrary, that no event constituting a change or a termination of the authority of any person to act on behalf of the GRANTOR or the DEPARTMENT hereunder has occurred. The TRUSTEE shall have no duty to act in the absence of such orders, requests, and instructions from the GRANTOR or the DEPARTMENT, or both, except as provided for herein.

Section 15. Notice of Nonpayment. The TRUSTEE shall notify the GRANTOR and the DEPARTMENT by certified mail within ten days following the expiration of the thirty-day period after the anniversary of the establishment of the TRUST if no payment is received from the GRANTOR during that period. After the pay-in period is completed, the TRUSTEE is not required to send a notice of nonpayment.

Section 16. Amendment of AGREEMENT. This AGREEMENT may be amended by an instrument in writing executed by the GRANTOR, the TRUSTEE and the DEPARTMENT, or by the TRUSTEE and the DEPARTMENT, if the GRANTOR ceases to exist.

Section 17. Irrevocability and Termination. Subject to the right of the parties to amend this AGREEMENT as provided in section 16, this TRUST is irrevocable and continues until terminated at the written agreement of the GRANTOR, the TRUSTEE, and the DEPARTMENT, or by the TRUSTEE and the DEPARTMENT, if the GRANTOR ceases to exist. Upon termination of the TRUST, all remaining trust property, less final trust administration expenses, must be delivered to the GRANTOR.

Section 18. Immunity and Indemnification. The TRUSTEE may not incur personal liability of any nature in connection with any act or omission made in good faith in the administration of this TRUST or in carrying out any directions by the GRANTOR or the DEPARTMENT issued in accordance with this AGREEMENT. The TRUSTEE must be indemnified and saved harmless by the GRANTOR or from the TRUST, or both, from and against any personal liability to which the TRUSTEE may be subjected by reason of any act or conduct in its official capacity, including all expenses reasonably incurred in its

defense in the event the GRANTOR fails to provide such defense.

Section 19. Choice of Law. This AGREEMENT must be administered, construed, and enforced according to the laws of the state of North Dakota.

Section 20. Interpretation. As used in this AGREEMENT, words in the singular include the plural and words in the plural include the singular. The descriptive headings for each section of this AGREEMENT do not affect the interpretation or the legal efficacy of this AGREEMENT.

In Witness Whereof the parties have caused this AGREEMENT to be executed by their respective officers duly authorized and their corporate seals to be hereunto affixed and attested as of the date first above written: The parties below certify that the wording of this AGREEMENT meets the requirements specified in subsection 1 of North Dakota Administrative Code section 33-20-14-07 as such regulation was constituted on the date first above written.

[Signature of GRANTOR]	[Signature of TRUSTEE]
[Title]	[Title]
[Attest:]	[Attest:]
[Title]	[Title]
[Corporate Seal]	[Seal]

CERTIFICATION OF ACKNOWLEDGMENT

State of _____

County of _____

On this [Date], before me personally came [Name of owner or operator (grantor)] to me known, who, being by me duly sworn, did depose and say that [she/he] resides at [Address, City, State, Zip], that [she/he] is [Title of owner/operator] of [Name of business], the corporation described in and which executed the above instrument, that [she/he] knows the seal of said corporation, that the seal affixed to such instrument is such corporate seal, that it was so affixed by order of the Board of Directors of said corporation, and that [she/he] signed [her/his] name thereto by like order.

Signature of notary public: _____

[Notary Seal]

EXHIBIT A

The following persons, acting singly or collectively, shall have the right to issue instructions to the Trustee pursuant to Section 14 of the Agreement:

Name	Title	Address

[If more than one person has been designated by the GRANTOR to provide orders, requests and instructions to the TRUSTEE, provide the name, title and address for each person.]

SCHEDULE A

On Schedule A, for each facility list the name, address, unit(s), and the current final closure, post-closure care cost estimates, or portions thereof, for which financial assurance is demonstrated by this agreement.

Name and address of Facility:

Name:_____
Address:_____
City, State, Zip:_____
Business Contact person:_____
Contact phone:_____
Permit number:_____

Closure cost estimate: $_____
Post-closure cost estimate $_____
Total cost estimates $_____

[If this Agreement demonstrates financial assurance for more than one facility, provide the name, address and closure and/or postclosure estimated for each facility.]

SCHEDULE B

On Schedule B, list the amount the trust is funded. If the trust is a standby trust, list the amount the trust would have in it, if it were funded. Select from **one** of the options below according to the type of financial assurance used. If none of the options pertain, contact the Department.

Option 1
SCHEDULE B-Fully Funded
This trust fund is funded on [Date] in the amount of [Dollar amount spelled out] U.S. dollars ($____).

Option 2
SCHEDULE B-Surety Bond
The corpus of this trust is now empty and when funded the amount will be [Dollar amount spelled out] U.S. dollars ($_____) from [Name of surety bond company]. The surety bond number is _____.

Option 3
SCHEDULE B-Letter of Credit
The corpus of this trust is now empty and when funded the amount will be [Dollar amount spelled out] U.S. dollars ($_____) from [Name of financial institution]. The letter of credit number is _____.

Option 4
Schedule B-Payment into Trust

This trust is funded on the [Day] day of [Month], [Year], in the amount of [Dollar amount spelled out] U.S. dollars ($_____).

This amount represents the first payment into the trust as provided in NDAC Section 33-20-14-07.1.c.

The second installment in the amount of [Dollar amount spelled out] U.S. dollars ($_____) will be deposited into the trust on or before [Date].

The third and final installation in the amount of [Dollar amount spelled out] U.S. dollars ($_____) will be deposited into the trust on or before [Date].

IV. Surety Bond

A. **Guarantee Bond.** If you are using a surety bond guaranteeing payment into a trust fund as specified in subsection 2 of section 33-20-14-07 it must be worded as follows, except that instructions in brackets are to be replaced with the relevant information and the brackets deleted. In addition you must establish a standby trust fund and the trust agreement must be submitted to the Department with the surety bond. Wording for the trust agreement in this document should be used.

FINANCIAL GUARANTEE BOND

Date bond executed: _____
Effective date: _____
Surety's bond number: _____

Principal: [Legal name and business address of owner or operator]

Type of organization: [Choose *one*: "individual", "joint venture," "partnership" or "corporation"]

State of incorporation: _____

Surety(ies): [Name(s) and business address(es)]

Permit number, name, address, and closure or post-closure, or both, amount for each facility guaranteed by this bond: _____

[List each facility separately]
Closure cost estimate: $_____
Post-closure cost estimate: $_____
Total penal sum of bond: $_____

Know all persons by these presents that we the PRINCIPAL and SURETY(IES) hereto are firmly bound to the North Dakota Department of Health (hereinafter called the DEPARTMENT) in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, successors and assignors jointly and severally: provided that where the SURETY(IES) are corporations acting as cosureties, we, the SURETIES, bind ourselves in such sum "jointly and severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each SURETY binds itself, jointly and severally with the PRINCIPAL, for the payment of such sum only as is set forth opposite the name of such SURETY, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

Whereas said PRINCIPAL is required under North Dakota Century Code chapter 23-29-07 to have a permit in order to own or operate each solid waste management facility identified above, and

Whereas said PRINCIPAL is required to provide financial assurance for closure or closure and post-closure care as required by Article 33-20 NDAC or as a condition of the permit, and

Whereas said PRINCIPAL shall establish a standby trust fund as is required when a surety bond is used to provide such financial assurance;

Now, therefore, the conditions of the obligation are such that if the PRINCIPAL shall faithfully, before the beginning of final closure of each facility identified above, fund the standby trust fund in the amounts identified above for the facility,

Or, if the PRINCIPAL shall fund the standby trust fund in such amounts within fifteen days after an order to begin closure is issued by the DEPARTMENT or a state or other court of competent jurisdiction,

Or, if the PRINCIPAL shall provide alternate financial assurance as specified in North Dakota Administrative Code Chapter 33-20-14, as applicable, and obtain the DEPARTMENT'S written approval of such assurance within ninety days after the date of notice of cancellation is received by both the PRINCIPAL and the DEPARTMENT from the SURETY(IES), then this obligation shall be null and void, otherwise it is to remain in full force and effect.

The SURETY(IES) shall become liable on this bond obligation only when the PRINCIPAL has failed to fulfill the conditions described above. Upon notification by the DEPARTMENT that the PRINCIPAL has failed to perform as guaranteed by this bond, the SURETY(IES) shall place funds in the amount guaranteed for the facility(ies) into the standby trust fund as directed by the DEPARTMENT.

The liability of the SURETY(IES) shall not be discharged by any payment or any succession of payments hereunder, unless and until such payment or payments shall amount in the aggregate to the penal sum of the bond, but in no event shall the obligation of the SURETY(IES) hereunder exceed the amount of said penal sum.

The SURETY(IES) may cancel the bond by sending notice of cancellation by certified mail to the PRINCIPAL and to the DEPARTMENT, provided, however, that cancellation shall not occur during the one hundred twenty days beginning on the date of receipt of the notice of cancellation by both the PRINCIPAL and the DEPARTMENT as evidenced by the return receipts.

The PRINCIPAL may terminate this bond by sending written notice to the SURETY(IES) provided, however, that no such notice shall become effective until the SURETY(IES) receive(s) written authorization for termination of the bond by the DEPARTMENT.

**The following paragraph is an optional rider that may be included, but is not required.

The PRINCIPAL and SURETY(IES) hereby agree to adjust the penal sum of the bond yearly so that it guarantees a new closure or post-closure, or both, amount, provided that the penal sum does not increase by more than twenty percent in any one year, and no decrease in the penal sum takes place without the written permission of the DEPARTMENT.

In witness whereof, the PRINCIPAL and SURETY(IES) have executed this financial guarantee bond and have affixed their seals on the date set forth above.

The persons whose signatures appear below hereby certify that they are authorized to execute this surety bond on behalf of the PRINCIPAL and SURETY(IES) and that the wording of this surety bond meets the requirements specified in subsection 2 of North Dakota Administrative Code section 33-20-14-07 as such rule was constituted on the date this bond was executed.

PRINCIPAL	CORPORATE SURETY(IES)
[Signature(s)]	[Name and address]

[Name(s)]
[Title(s)]
[Corporate seal]

State of Incorporation: _____
Liability limit: $_____
[Signature(s)]
[Name(s) and Title(s)]
[Corporate seal]

Bond premium: $_____

[For every cosurety, provide signature(s), corporate seal, and other information in the same manner as for surety above.]

B. **Performance Bond.** If you are using a surety bond guaranteeing performance of closure or post-closure care as specified in subsection 2 of section 33-20-14-07 it must be worded as follows, except that the instructions in brackets are to be replaced with the relevant information and the brackets deleted. In addition you must establish a standby trust fund and the trust agreement must be submitted to the Department with the surety bond. Wording for the trust agreement in this document should be used.

PERFORMANCE BOND

Date bond executed: _____
Effective Date: _____
Surety's bond number: _____

PRINCIPAL: [Legal name and business address of owner or operator]
Type of organization: [Choose *one*: "Individual," "joint venture," "partnership," or "corporation"]
State of Incorporation: _____
SURETY(IES): [Name(s) and business address(es)]

Permit number, name, address and closure or post-closure, or both, amount(s) for each facility guaranteed by this bond: _____

[List each facility separately]
Closure cost estimate: $_____
Post-closure cost estimate: $_____
Total penal sum of bond: $_____

Know all persons by these presents, that we the PRINCIPAL and SURETY(IES) hereto are firmly bound to the North Dakota Department of Health (hereinafter called the DEPARTMENT), in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, successors and assigns jointly and severally: Provided that, where the SURETY(IES) are corporations acting as cosureties, we the SURETIES bind ourselves in such sum "jointly and severally" only for the purpose of allowing a joint action or actions against any or all of us and for all other purposes each SURETY binds itself jointly and severally with the PRINCIPAL for the payment of such sum only as is set forth opposite the name of each SURETY, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

Whereas said PRINCIPAL is required under North Dakota Century Code chapter 23-29-07 to have a

permit to own or operate each solid waste management facility identified above, and

Whereas said PRINCIPAL is required to provide financial assurance for closure, or closure and post-closure care as required by Article 33-20 NDAC or as a condition of the permit, and

Whereas said PRINCIPAL shall establish a standby trust fund as is required when a surety bond is used to provide such financial assurance;

Now, Therefore, the conditions of this obligation are that if the PRINCIPAL shall faithfully perform closure, when required to do so, of each facility for which this bond guarantees closure, in accordance with the closure plan and other requirements of the permit as such plan and permit may be amended pursuant to all applicable laws, statutes, rules, and regulations, as such laws, statutes, rules, and regulations may be amended.

And if the PRINCIPAL shall faithfully perform post-closure care of each facility for which this bond guarantees post-closure care, in accordance with the post-closure plan and other requirements of the permit as such plan and permit may be amended pursuant to all applicable laws, statutes, rules, and regulations, as such laws, statutes, rules, and regulations may be amended,

Or, if the PRINCIPAL shall provide alternate financial assurance as specified in North Dakota Administrative Code chapter 33-20-14 and obtain the DEPARTMENT'S written approval of such assurance within ninety days after the date notice of cancellation is received by both the PRINCIPAL and the DEPARTMENT from the SURETY(IES) then this obligation shall be null and void, otherwise it is to remain in full force and effect.

The SURETY(IES) shall become liable on this bond obligation only when the PRINCIPAL has failed to fulfill the conditions described above.

Upon notification by the DEPARTMENT that the PRINCIPAL has been found in violation of the closure requirements of North Dakota Administrative Code article 33-20 for a facility for which this bond guarantees performance of closure, the SURETY(IES) shall either perform closure in accordance with the closure plan and other permit requirements or place the closure amount guaranteed for the facility into the standby trust fund as directed by the DEPARTMENT.

Upon notification by the DEPARTMENT that the PRINCIPAL has been found in violation of the post-closure requirements of North Dakota Administrative Code article 33-20 for a facility for which this bond guarantees performance of post-closure care, the SURETY(IES) shall either perform post-closure care in accordance with the post-closure plan and other permit requirements or place the post-closure amount guaranteed for the facility into a standby trust fund as directed by the DEPARTMENT.

Upon notification by the DEPARTMENT that the PRINCIPAL has failed to provide alternate financial assurance as specified in North Dakota Administrative Code chapter 33-20-14 and obtain written approval of such assurance from the DEPARTMENT during the ninety days following receipt by both the PRINCIPAL and the DEPARTMENT of a notice of cancellation of the bond, the SURETY(IES) shall place funds in the amount guaranteed for the facility(ies) into the standby trust fund as directed by the DEPARTMENT.

The SURETY(IES) hereby waive(s) notification of amendments to closure plans, permits, applicable laws, statutes, rules, and regulations and agree(s) that no such amendment shall in any way alleviate its

(their) obligation on this bond.

The liability of the SURETY(IES) shall not be discharged by any payment or succession of payments hereunder, unless and until such payment or payments shall amount in the aggregate to the penal sum of the bond, but in no event shall the obligation of the SURETY(IES) hereunder exceed the amount of said penal sum.

The SURETY(IES) may cancel the bond by sending the notice of cancellation by certified mail to the PRINCIPAL and to the DEPARTMENT, provided, however, that cancellation shall not occur during the one hundred twenty days beginning on the date of receipt of the notice of cancellation by both the PRINCIPAL and the DEPARTMENT as evidenced by the return receipts.

The PRINCIPAL may terminate this bond by sending written notice to the SURETY(IES) provided, however, that no such notice shall become effective until the SURETY(IES) receive(s) written authorization for termination of the bond by the DEPARTMENT.

**The following paragraph is an optional rider that may be included, but is not required.

PRINCIPAL and SURETY(IES) hereby agree to adjust the penal sum of the bond yearly so that it guarantees a new closure or post-closure, or both, amount, provided that the penal sum does not increase by more than twenty percent in any one year, and no decrease in the penal sum takes place without the written permission of the DEPARTMENT.

In Witness Whereof, the PRINCIPAL and SURETY(IES) have executed this performance bond and have affixed their seals on the date set forth above.

The persons whose signatures appear below hereby certify that they are authorized to execute this surety bond on behalf of the PRINCIPAL and the SURETY(IES) and that the wording of this surety bond meets the requirements in subsection 2 of North Dakota Administrative Code section 33-20-14-07 as such rule was constituted on the date this bond was executed.

PRINCIPAL	CORPORATE SURETY(IES)
[Signature(s)]	[Name and Address]
[Name(s)]	State of Incorporation: _____
[Title(s)]	Liability Limit: $_____
[Corporate Seal]	[Signature(s)]
	[Name(s) and Title(s)]
	[Corporate Seal]
	Bond premium: $_____

[For every cosurety, provide signature(s), corporate seal, and other information in the same manner as for surety above].

V. Letter of Credit

If you use a letter of credit as specified in subsection 3 of section 33-20-14-07 it must be worded as follows except that instructions in brackets are to be replaced with the relevant information and the brackets deleted.

COVER LETTER

[Date]

Director
North Dakota Dept of Health
Division of Waste Management
918 East Divide Ave, 3rd Floor
Bismarck ND 58501-1947

Pursuant to the requirements of the letter of credit financial assurance mechanism, the following information is provided:

Owner or Operator of Solid Waste Facility:
Name: _____
Address: _____
City, State, Zip: _____
Telephone Number: _____

Solid Waste Facility
Name: _____
Address: _____
City, State, Zip: _____
Permit Number: _____

Letter of Credit
Letter of Credit Number: _____
Issuing Institution: _____
Date of Letter of Credit: _____
Amount assured by the letter of credit: $_____

[Signature of Owner or Operator]
[Title]
[Name and Title (Typed)]

IRREVOCABLE STANDBY LETTER OF CREDIT

Director
North Dakota Dept of Health
Division of Waste Management

918 East Divide Ave, 3rd Floor
Bismarck ND 58501-1947

Dear Sir or Madam:

We hereby establish our Irrevocable Standby Letter of Credit Number _____ in your favor, at the request and for the account of [Owner/operator name and address] up to the aggregate amount of [Dollar amount written out] U.S. dollars $_____, available upon presentation of

(1) Your sight draft bearing reference to this letter of credit no. _____, and
(2) Your signed statement reading as follows: "I certify that the amount of the draft is payable pursuant to regulations issued under authority of North Dakota Century Code chapter 23-29".

This letter of credit is effective as of [Date] and shall expire on [Date at least one year later], but such expiration date shall be automatically extended for a period of [At least one year date after expiration] on [Date] and on each successive expiration date, unless, at least one hundred twenty days before the current expiration date, we notify both you and [Owner or operator's name] by certified mail that we have decided not to extend this letter of credit beyond the current expiration date. In the event you are so notified, any unused portion of the credit shall be available upon presentation of your sight draft for one hundred twenty days after the date of receipt by both you and [Owner or operator's name], as shown on the signed return receipts.

When this letter of credit is drawn on under and in compliance with the terms of this credit, we shall duly honor such draft upon presentation to us, and we shall deposit the amount of the draft directly into the standby trust fund of [Owner or operator's name] in accordance with your instructions.

We certify that the wording of this letter of credit is meets the requirements specified in subsection 3 of North Dakota Administrative Code section 33-20-14-07 as such rule was constituted on the date shown immediately below.

[Signature(s) of Official(s) of issuing institution]

[Title(s)]

[Date]

This credit is subject to [Insert "the most recent edition of the "Uniform Customs and Practice for Documentary Credits", published by the International Chamber of Commerce", **OR** "the Uniform Commercial Code"].

VI. Insurance

If you use a certificate of insurance as specified in subsection 4 of section 33-20-14-07 it should be worded as follows, except that instructions in brackets are to be replaced with the relevant information and the brackets deleted.

CERTIFICATE OF INSURANCE FOR CLOSURE OR POST-CLOSURE CARE

Name and address of insurer (hereinafter called the "INSURER"): _____
Name and address of Insured (hereinafter called the "INSURED"): _____

Facilities covered: [List each facility separately]

Facility Permit Number: _____
Name: _____
Address: _____

Closure cost estimate: $_____
Post-closure cost estimate: $_____

Policy face amount: $_____
Policy Number: _____
Effective Date: _____

The INSURER hereby certifies that it has issued to the INSURED the policy of insurance identified above to provide financial assurance for [Insert "closure" **or** "closure and post-closure care" **or** "post-closure care"] for the facilities identified above. The INSURER further warrants that such policy conforms in all respects with the requirements of subsection 4 of North Dakota Administrative Code section 33-20-14-07, as applicable and as such regulations were constituted on the date shown immediately below. It is agreed that any provision of the policy inconsistent with such rules is hereby amended to eliminate such inconsistency.

When requested by the North Dakota Department of Health (DEPARTMENT) the INSURER agrees to furnish to the DEPARTMENT a duplicate original of the policy listed above, including all endorsements thereon.

I hereby certify that the wording of this certificate meets the requirements specified in subsection 4 of North Dakota Administrative Code section 33-20-14-07 as such rule was constituted on the date shown immediately below.

_____
Authorized signature for INSURER

[Name of person signing]

[Title of person signing]

Signature of witness or notary: _____
[Date]

VII. Financial Test and Corporate Guarantee

A. **Financial Test**. To demonstrate the financial test you should use a letter from the chief financial officer. It should be worded as follows, except that instructions in brackets are to be replaced with the relevant information and the brackets deleted. Don't forget to send in the Accountant's Opinion on your firm's financial statement and the Special Report from the Independent CPA with the Letter from Chief Financial Officer.

** If your company/corporation does not have a Chief Financial Officer then the highest official dealing with financial operations should sign the letter and his/her title should be inserted into the letter in place of "Chief Financial Officer".

LETTER FROM CHIEF FINANCIAL OFFICER

Director
North Dakota Dept of Health
Division of Waste Management
918 East Divide Ave, 3rd Floor
Bismarck ND 58501-1947

I am the chief financial officer of [Insert name and address of firm]. This letter is in support of this firm's use of the financial test to demonstrate financial assurance for closure and/or post-closure costs, as specified in sections 33-20-14-02 through 33-20-14-07.

Instructions: *Fill out the following paragraphs regarding facilities and associated cost estimates. If your firm has no facilities that belong in a particular paragraph, write "**None**" in the space indicated. For each facility, include its permit number, name, address, and current closure and/or post-closure cost estimates. Identify each cost estimate as to whether it is for closure or post-closure care.*

1. This firm is the owner or operator of the following facilities for which financial assurance for closure and/or post-closure care is demonstrated through the financial test specified in sections 33-20-14-02 through 33-20-14-07. The current closure and/or post-closure cost estimates covered by the test are shown for each facility:

Name: _____
Address: _____
City, State, Zip: _____
Permit No.: _____

Closure cost estimate: $_____
Post-closure cost estimate: $_____
Total cost estimate: $_____

2. This firm guarantees, through the guarantee specified in sections 33-20-14-02 through 33-20-14-07, the closure and/or post-closure care of the following facilities owned or operated by the guaranteed party. The current cost estimates for the closure and/or post-closure care so guaranteed are shown for each facility:

Name: _____

Address: _____
City, State, Zip: _____
Permit No.: _____

Closure cost estimate: $_____
Post-closure cost estimate: $_____
Total cost estimate: $_____

The firm identified above is [Insert one or more: (1) The direct or higher-tier parent corporation of the owner or operator; (2) owned by the same parent corporation as the parent corporation of the owner or operator, and receiving the following value in consideration of this guarantee; or (3) engaged in the following substantial business relationship with the owner or operator, and receiving the following value in consideration of this guarantee]. *[Attach a written description of the business relationship or a copy of the contract establishing such relationship to this letter].*

This firm [Choose *one*: "is required" **or** "is not required"] to file a form 10K with the Securities and Exchange Commission for the latest fiscal year.

The fiscal year of this firm ends on [Insert month, day]. The figures for the following items marked with an asterisk are derived from this firm's independently audited, year-end financial statements for the latest completed fiscal year, ended [Insert date].

(Comment: the figures for the following items must be contained in the audited financial statements from the most recently completed fiscal year.)

Instructions: *Choose only one of the following alternatives.*

Alternative I

1. Sum of current closure and post-closure cost estimate *(total of all cost estimates shown in the five paragraphs above* ..... $_____

*2. Total liabilities *(if any portion of the closure or post-closure cost estimates is included in total liabilities, you may deduct the amount of that portion from this line and add that amount to lines 3 and 4* ..... $_____

*3. Tangible net worth ..... $_____

*4. Net worth ..... $_____

*5. Current assets ..... $_____

*6. Current liabilities ..... $_____

*7. Net working capital *(line 5 minus line 6)* ..... $_____

*8. The sum of net income plus depreciation, depletion, and amortization $_____

*9. Total assets in United States *(required only if less than 90% of firm's assets are located in the United States.)* ..... $_____

		YES	NO
10.	Is line 3 at least $2 million?	_____	_____
11.	Is line 3 at least 4 times line 1?	_____	_____
12.	Is line 7 at least 4 times line 1?	_____	_____
*13.	Are at least 90% of firm's assets located in the United States? *If not, complete line 14*	_____	_____
14.	Is line 9 at least 4 times line 1?	_____	_____

Alternative II

1. Sum of current closure and post-closure cost estimates *(total of all cost estimates shown in the five paragraphs above)* ..... $_____

2. Current bond rating of most recent issuance of this firm and name of rating service ..... $_____

3. Date of issuance of bond ..... _____

4. Date of maturity of bond ..... _____

*5. Tangible net worth *(if any portion of the closure and post-closure cost estimates is included in "total liabilities" on your firm's financial statements, you may add the amount of that portion to this line)* ..... $_____

*6. Total assets in United States *(required only if less than 90% of firm's assets are located in the United States)* ..... $_____

		YES	NO
7.	Is line 5 at least $2 million?	_____	_____
8.	Is line 5 at least 4 times line 1?	_____	_____
*9.	Are at least 90% of firm's assets located in the United States? *If not, complete line 10*	_____	_____
10.	Is line 6 at least 4 times line 1?	_____	_____

I hereby certify that the wording of this letter is meets the requirements specified in subsection 5 of section 33-20-14-07 as such regulations were constituted on the date shown immediately below.

[Signature]
[Name]

[Title]
[Date]

B. **Corporate Guarantee.** If you are using a corporate guarantee, as specified in subsection 5 of section 33-20-14-07, it must be worded as follows, except that instructions in brackets are to be replaced with the relevant information and the brackets deleted. You will also need to submit the Letter from Chief Financial Officer to prove that you meet the requirements of Section 33-20-14-07.5 a through e NDAC.

CORPORATE GUARANTEE FOR CLOSURE OR POST-CLOSURE CARE

Guarantee made this [Date] by [Name of guaranteeing entity], a business corporation organized under the laws of the state of [Insert name of state], herein referred to as guarantor. This guarantee is made on behalf of the [Name of owner or Operator] of [Business address], which is [Insert one of the following: "our subsidiary"; "a subsidiary of [name and address of common parent corporation], of which guarantor is a subsidiary"; or "an entity with which guarantor has a substantial business relationship"] to the Department.

Recitals

1. Guarantor meets or exceeds the financial test criteria and agrees to comply with the reporting requirements for guarantors as specified in subsection 5 of section 33-20-14-07.

2. [Name of Owner or Operator] owns or operates the following solid waste management facility(ies) covered by this guarantee:

Name: _____
Address: _____
City, State, Zip: _____
Permit No.: _____

Closure cost estimate: $_____
Post-closure cost estimate: $_____
Total cost estimate: $_____

3. "Closure plans" and "post-closure plans" as used below refer to the plans maintained as required by sections 33-20-04.1-05, 33-20-04.1-09, and 33-20-14-02 for the closure and post-closure care of facilities as identified above.

4. For value received from [Name of Owner or Operator], guarantor guarantees to the Department that in the event that [Name of Owner or Operator] fails to perform [Insert one of the following choices: "closure", "post-closure care", or "closure and post-closure care"] of the above facility(ies) in accordance with the closure or post-closure plans and other permit or interim status requirements when required to do so, the guarantor shall do so or establish a trust fund as specified in chapter 33-20-14, as applicable, in the name of [Name of Owner or Operator] in the amount of the current closure and/or post-closure cost estimates as specified in sections 33-20-14-02 through 33-20-14-07.

5. Guarantor agrees that if, at the end of any fiscal year before termination of this guarantee, the guarantor fails to meet the financial test criteria, guarantor shall send within ninety days, by certified mail,

notice to the Department and to [owner or operator] that he intends to provide alternate financial assurance as specified in sections 33-20-14-02 through 33-20-14-07, as applicable, in the name of [Name of Owner or Operator]. Within one hundred twenty days after the end of such fiscal year, the guarantor shall establish such financial assurance unless [Name of Owner or Operator] has done so.

6. The guarantor agrees to notify the Department by certified mail, of a voluntary or involuntary proceeding under title 11 (Bankruptcy), United States Code, naming guarantor as debtor, within ten days after commencement of the proceeding.

7. Guarantor agrees that within thirty days after being notified by the Department of a determination that guarantor no longer meets the financial test criteria or that he is disallowed from continuing as a guarantor of closure or post-closure care, he shall establish alternate financial assurance as specified in sections 33-20-14-02 through 33-20-14-07, as applicable, in the name of [Name of Owner or Operator] unless [Name of Owner or Operator] has done so.

8. Guarantor agrees to remain bound under this guarantee notwithstanding any or all of the following: amendment or modification of the closure or post-closure plan, amendment or modification of the permit, the extension or reduction of the time of performance of closure and/or post-closure, or any other modification or alteration of an obligation of the owner or operator.

9. Guarantor agrees to remain bound under this guarantee for as long as [Name of Owner or Operator] must comply with the applicable financial assurance requirements of sections 33-20-14-02 through 33-20-14-07 for the above-listed facilities, except as provided in paragraph 10 of this agreement.

10. **Instructions:** *Insert the following paragraph only if the guarantor is (a) a direct or higher-tier corporate parent, or (b) a firm whose parent corporation is also the parent corporation of the owner or operator otherwise ignore it.*

Guarantor may terminate this guarantee by sending notice by certified mail to the Department and to [Name of Owner or Operator], provided that this guarantee may not be terminated unless and until [Name of Owner or Operator] obtains, and the Department approve(s), alternate closure and/or post-closure care coverage complying with section 33-20-14-03.3.

Instructions: *Insert the following paragraph only if the guarantor is a firm qualifying as a guarantor due to its "substantial business relationship" with its owner or operator otherwise ignore it.*

Guarantor may terminate this guarantee one hundred twenty days following the receipt of notification, through certified mail, by the Department and by [Name of Owner or Operator].

11. Guarantor agrees that if [Name of Owner or Operator] fails to provide alternate financial assurance as specified in section 33-20-14-03.3, as applicable, and obtain written approval of such assurance from the Department within ninety days after a notice of cancellation by the guarantor is received by the Department from guarantor, guarantor shall provide such alternate financial assurance in the name of [Name of Owner or Operator].

12. Guarantor expressly waives notice of acceptance of this guarantee by the Department or by [Name of Owner or Operator]. Guarantor also expressly waives notice of amendments or modifications of the closure and/or post-closure plan and of amendments or modifications of the facility permit(s).

I hereby certify that the wording of this guarantee meets the requirements specified in subsection 5 of section 33-20-14-07 as such regulations were constituted on the date first above written.

Effective date:

[Name of guarantor]
[Authorized signature for guarantor]
[Name of person signing]
[Title of person signing]

Signature of witness or notary: _____

[Notary Seal]

GUIDELINE 5 – QUALITY ASSURANCE FOR CONSTRUCTION OF LANDFILL AND SURFACE IMPOUNDMENT LINERS, CAPS AND LEACHATE COLLECTION SYSTEMS

North Dakota Department of Health – Division of Waste Management
918 E. Divide Ave., 3rd Floor, Bismarck ND 58501-1947
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Revision: 11/2010

I. Introduction

Quality Assurance (QA) procedures are necessary to assure proper construction of solid waste landfills and surface impoundments. The purpose of this document is to provide detailed recommendations to field personnel, engineers and permit applicants regarding the minimum quality assurance procedures for the construction of facilities and to ensure documentation of construction. These QA recommendations do not in any way reduce the responsibilities of individual contractors or permittees to achieve facility design or performance specifications.

Quality assurance refers to the function of the owner or owner's representative, usually an independent testing company, to monitor construction activity and review construction data and reports from contractors, manufacturers and suppliers. Contractors, manufacturers and suppliers must supply Quality Control (QC) information for their products and equipment. The information becomes part of the project quality assurance/documentation report that is often submitted to the Department.

A specific sequence of procedures is necessary for the construction of liners. These procedures are usually provided with an application for a permit and occasionally required by a permit. Documentation of each procedure becomes necessary to demonstrate that design or performance specifications have been achieved. Visual inspection, survey, field and laboratory testing will be undertaken as appropriate. Recommendations for certifications are listed, including testing frequencies and product specifications. A qualified QA inspector and/or surveyor, independent of the owner or owner's representative, can provide oversight to certify proper construction.

This document has been prepared by the Department for the purpose of assisting owners and operators to fulfill regulatory and permit requirements. Questions and comments are welcome, and can be addressed to the Division of Waste Management, North Dakota Department of Health, 918 E. Divide Ave., 3rd Fl., Bismarck, ND 58501-1947.

II. Soil Investigation

The soil material to be used for the construction or installation of any backfill or subliner, subbase, clay liner, drainage layer, or landfill cap must be clearly identified and described in a soil investigation to be submitted to the Department with any permit application or as deemed necessary (NDAC 33-20-03.1-02, subsection 6). The soil investigation should include a map and a description of borings along with a determination of soil parameters for any material to be used during construction. Appropriate soil parameters for a soil investigation include, but are not limited to:

1. In-place moisture-density
2. Atterberg limits
3. Grain-size distribution
4. Laboratory moisture-density relationship (ASTM D698 or D1557)
5. Coefficient of permeability

III. Backfill or Subliner Installation

For some landfills in strip mined areas, it is necessary to raise the bottom elevation of the disposal units. The earthen materials used for backfill must be selected and placed to ensure proper stability for the landfill and the liners and to help minimize leachate constituent migration. The backfill placement should be documented as follows:

1. A grid pattern should be established at the base and sides of the excavation, generally 100 foot spacing. Survey points should be taken and recorded on drawings to be submitted to the Department in the QA report.

2. Minimum one (1) standard or modified proctor test for every 10,000 cubic yards with an additional test for any change in the major soil type.

3. Grain-size distribution and soil classification of backfill tested, at minimum, once each 5000 cubic yards, with any changes in the major soil type.

4. Suitability of backfill, at minimum each twelve inches, tested as follows:

    a. Visual check of soil characteristics as the material is placed.

    b. Density test. Meet 90 percent modified or 95 percent standard proctor density, one test per 100 foot grid.

Location method of all tests should be documented for reports.

IV. Subbase Preparation

Construction of appropriate berms, embankments and subbase preparation will occur prior to liner installation. A survey of the subgrade area is necessary prior to the start of liner construction. The subgrade surface should be smooth and free from material prior to the start of liner construction. The subgrade should be documented as follows:

1. A grid pattern should be established with additional points placed at the toe of all slopes and at the low point in each cell. Survey points should be taken and recorded on drawings for inclusion with reports.

2. Tests of the top six inches of the subgrade are needed as follows:

    a. Minimum one (1) standard or modified proctor test (minimum 5-point curve) with an additional test for any change in major soil type.

    b. Density and in-place moisture testing. Determine in-place moisture content and meet, at minimum, 90 percent modified proctor or 95 percent standard proctor density, one test per 100 foot grid.

    c. Soil classification. Atterberg limits and grain-size distribution once per 1000 cubic yards of subgrade surface area, at a minimum, and with any change in the major soil type.

    d. Location method of all tests should be documented for reports.

V. Lysimeter Installation

Lysimeters should be installed in accordance with appropriate design details. The subgrade elevations and pipe invert elevations should be addressed in permit applications or as may be required by the Department. All values should be entered in appropriate tables. The lysimeter construction should be visually inspected during installation.

VI. Clay Liner Specifications

For clay liner (and clay caps), the selection and placement of clay soils is critical to meet the required hydraulic conductivity of 1×10^{-7} centimeters per second or less. The condition and moisture level of the soil material has to be monitored closely. Processing of the soil is very important. If the material consists of a claystone, a rock crusher and screen may be utilized to pulverize the material to an adequate consistency.

Appropriate precautions are needed to avoid rocks and gravel larger than 3/4 inch in the liner materials. At minimum, for clay liner soils placed within two feet of the top of the clay liner surface (the upper two feet of the liner), rocks and gravel larger than 3/4 inch must be screened or removed from the soil. A road reclaimer or tillage equipment may be used to break up soil clods. The addition of water or, if necessary, any drying of the soil must be provided for. Placement of the clay soil should be as follows:

1. The clay soils should be placed to achieve a maximum thickness of six inches per compacted lift and compacted to a minimum 90 percent modified proctor or 95 percent standard proctor density. Additional compaction effort may be necessary based on the moisture-density relationship and permeability information.

2. The clay should be compacted 2 to 5 percent wetter than the moisture content at maximum proctor density.

3. Placement and/or compaction of frozen soils is not recommended. Therefore, if frozen soils are identified, they should be removed from the liner. Special precautions to prevent freezing of the clay liner will be necessary. These methods may include soil cover and/or insulation.

4. Proper compaction equipment and methods are necessary. The tamp foot or sheeps foot compactor should weigh, at minimum, 30,000 pounds. However, equipment in the range of 60,000 to 70,000 pounds is better. It is necessary that field equipment properly breaks clay lumps and kneads the clay materials together. <u>At minimum</u>, four to six passes of the compaction equipment per lift of soil are necessary to assure structural improvement of the soil.

5. Visual control to eliminate unacceptable material is necessary. Appropriate testing and documentation during clay liner and clay cap construction are necessary. The soil testing and documentation recommendations follow:

    a. Density and as-placed moisture content tests, as discussed in item No. 1 above, one (1) density and as-placed moisture content test per 100-foot grid pattern on the base of the cell on every lift and offset on each subsequent lift. Nuclear density testing may be utilized rather than sand cone; however, some limited sand cone testing should be utilized to verify nuclear testing methods. Use of a twelve (12) inch probe could allow for reduced frequency of testing since the probe will effectively monitor two (2) lifts per test. Nuclear

density testing holes must be filled with clay or bentonite. Greater testing frequency should be utilized in confined areas, small facilities, or where thinner liners are allowed.

b. Moisture-density (Proctor) testing (minimum 5 point curve), at minimum, on every 5000 cubic yards or less of material used and with any change in the major soil type with a minimum of one test per lift of soil. Modified proctor density testing is preferred to standard proctor testing.

c. Laboratory determination of as-placed moisture content, dry density and Atterberg limits at a minimum frequency of one (1) test per every 5000 cubic yards of material used.

d. Soil classification tests for grain-size distribution and soil classification at a frequency of, at minimum, one (1) test per every 5000 cubic yards of clay placed or at a frequency of one (1) test per acre and with any change in the major soil type.

e. Hydraulic conductivity testing of the liner at a frequency equivalent to every third grain-size sample required under item No. 3 above with a minimum of three tests per site or construction phase. Laboratory testing methods utilizing a Shelby tube or on hand carved samples from the liners are inferior and have been documented to under represent actual hydraulic conductivities by a factor of 900 to 1300. Some in situ testing of liner and cap construction utilizing single or double ring devices is preferable to verify lab testing results. Landfill leachate may be used instead of water in the liner tests.

f. Porosity should be calculated in conjunction with permeability tests.

VII. Clay Side Liner Specifications

Clay side liners may be constructed parallel to the sidewall in instances where side slopes are not overly steep. Problems could arise in achieving adequate compaction and uniform thickness on steeper slopes. Where slopes are steeper (especially steeper than 2.5 to 3 H:l V) liners should be built in horizontal lifts with a horizontal thickness equivalent to the scraper width. Horizontal lifts should be tied together and should not contain layers of coarse material. More permeable zones in horizontal lifts could result in seepage. Side/liner construction and testing should be similar to that for the requirements for bottom liners, except for horizontal lifts, where the density and as-placed moisture content testing requirement should be completed on each 200 lineal feet of sidewall for each lift and the testing should be offset on each subsequent lift.

When the trench is open for use, liners should be protected to minimize the damaging effects of desiccation (drying), freezing, erosion and traffic on the liners. Recompaction or reconstruction of damaged liners may be necessary.

VIII. Synthetic Liner Installation

Installation procedures for synthetic liners should be fully described in the permit application. All synthetic liner installation must be performed under the daily supervision of a master seamer. All personnel performing seaming operations should be qualified by experience or by successfully passing seaming tests. The experience record of each of the installer's technicians should be given to the QA inspector prior to the start of synthetic liner placement. No seamer should be allowed to work until their qualifications have been reviewed by the inspector.

The manufacturer shall provide quality control (QC) certification forms with results of plant testing of the geomembrane. These forms must certify that the geomembrane rolls shipped to the site meet or exceed the material property requirements of the project specifications. These QC certification forms should be received by the QA inspector prior to any synthetic liner installation.

A preconstructing meeting is necessary prior to synthetic liner placement to discuss schedule, responsibilities, testing frequencies and to review the installer's panel layout drawing.

The geomembrane rolls must be inspected upon arrival to ensure that the materials meet the project specifications. The QA inspector should record all roll numbers to verify rolls as shipped and note in a daily field report any damage to the rolls.

Prior to the placement of the liner, both installer and the QA inspector must inspect the clay liner for any uneven areas, rocks, foreign objects, etc. that may damage the liner. The installer should sign an acceptance form accepting the clay liner condition prior to synthetic liner placement. During the deployment of the liner, the inspector should be present to observe deployment, record roll numbers and panel numbers, and mark any areas with visible damage on the liner. A panel placement form should be filled out by the inspector detailing weather conditions, etc. during deployment.

Before seaming begins, trial welds must be taken, tested and recorded. The frequency of trial welds should be specified in the permit application. If a trial weld fails, the seamer must be required to make another complete trial seam. If this additional test fails, the seaming apparatus or seamer should not be accepted until the deficiencies are corrected and two consecutive passing trial seams are made.

Continuity (nondestructive) testing should be performed using a vacuum box unit or appropriate pressure testing methods over the entire length of each seam. This process should be observed by the QA inspector and any leaks noted, repaired and retested. This testing should follow along the seaming process, not at the completion of all seaming.

Destructive test samples must be taken at the minimum frequency of one test per every 500 feet of seam length. These samples should be taken on a daily basis and sent to an independent laboratory for testing. The locations of these tests should be recorded and included on the as-built panel placement drawing.

IX. Cap and Liner Protection and Repair

Damage to both synthetic and clay liners and caps may occur due to exposure to wind, rain, freezing, drying, equipment traffic and other factors. The owner/operator of a landfill should address liner protection, maintenance and repair in the permit application. The owner/operator or his representative should perform regular inspections of the cap or liner condition and repair damaged areas.

Caps and lines should be protected from damage during freezing conditions. All lined areas should have at least six feet of solid waste in place on the liner by December 15 of each year. No disposal should take place on uncovered areas after December 15 without testing the liner integrity; Department approval may be necessary.

X. Drainage Layer or Blanket Placement

Installation of the granular drainage material must be performed in a manner that prevents equipment from coming in direct contact with the liner. Placement should start at the edge of the cell and proceed by pushing the material out over the liner surface. Placement of drainage material on sidewalls should be completed by pushing the material up. Placement of drainage material around, adjacent or over leachate collection pipe and leachate collection pipe trenches should be carefully monitored.

Documentation and testing for the drainage blanket construction must include:

1. Hydraulic Conductivity. One test, at minimum, for every 2000 cubic yards of material with a minimum of one test per borrow area. At minimum, every site must be tested for at least four samples.

2. Gradation. Minimum of one (1) gradation to a 200-mesh sieve per 1000 cubic yards placed, with a minimum of one per borrow area.

3. Porosity. Calculated in conjunction with the hydraulic conductivity tests.

Lab hydraulic conductivity of the drainage blanket must be of a sample remolded to in-place density. Constant head permeability tests (D 2434) are appropriate for this material. The Department may require that leachate be used in the tests and may require both chemical and physical durability be tested. Appropriate survey control should be used to document drainage layer thickness.

XI. Leachate Collection Transmission Pipes

Pipes must be placed in locations and elevations as shown on plans provided with the permit application. Transmission line joints and PVC pipes should be sealed with solvent-based glue. Slip joints for leachate collection lines may be approved if calculations suggest that substantial subsidence may occur. Pipes should be properly supported to prevent movement and concentration of loads. The coarse aggregate used as pipe bedding and cover should be tested for gradation and compared with gradation of drainage blanket at a frequency of twice per cell. Geomembrane, granular filters or filter fabric placed around the pipe bedding should be appropriately specified, based on results of material gradations, and properly placed. Deflection testing of the collection pipe should be conducted using a mandrel. The cable should be strung through the pipe sections as they are installed. The mandrel should be attached and pulled through the pipe following placement of the granular drainage layer.

XII. Landfill Caps

Construction of the landfill cap should be completed in a manner similar to the construction of landfill clay liners. Special precautions are necessary to assure the disposed waste will support the landfill cap as constructed.

XIII. Quality Assurance/Construction Documentation Report

Authorization to utilize a new facility is usually contingent upon Departmental review and approval of a quality assurance/construction documentation report.

An acceptable report includes, at a minimum, the following information:

1. As-built engineering drawings depicting the following information:

a. Completed subbase elevations.
b. Final liner grades.
c. Top of drainage blanket grades.
d. Leachate collection lines, clean-outs and manholes with spot elevation every 100 feet along the lines and at all manhole entrances and exits.
e. Drainage features.
f. All monitoring devices.
g. Spot elevations at all breaks and slope and on approximate 100-foot centers.
h. All test locations.
I. Other site information as appropriate.

2. Engineering cross sections, a minimum of one east-west and one north-south through the completed area.

3. A comprehensive narrative explaining how construction of the project was accomplished along with an analysis of the soil, liner and any other testing data. This report should also include an appendix containing all the raw data from the field and laboratory testing.

4. A series of 35mm color prints documenting all major aspects of the site construction.

5. Construction of the site should be certified by a registered professional engineer to have been completed in accordance with the approved plans. Any deviations from the plan should be noted and explained.

The Department reserves the right to require any measures necessary to assure proper construction and documentation of the landfill or disposal cell.

XIV. References:

Daniel, David. 1989. Landfill liner case studies, presentation at "Sanitary Landfill Design" course, University of Wisconsin.

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Daniel, David. 1985. Summary of testimony before Illinois Pollution Control Board. Day, Steven R. and Daniel, David E. 1985. Hydraulic Conductivity of Two Prototype Clay Liners.

U. S. Environmental Protection Agency. 1983. "Lining of Waste Impoundment in Disposal Facilities," EPA-SW-870, 448 pp.

Day, Steven R. and Daniel, David E. 1985. Field permeability test for clay liners, "Hydraulic Barriers in Soil and Rock," American Society of Testing and Materials (ASTM) 04-874004-38.

Parametrix, Incorporated. 1987. Solid Waste Landfill Design Manual, Washington State Department of Ecology: Belview, Washington, 578 pp.

USEPA Summary, Research and Development EPA/600/SR-93/183 September 1995: Quality Assurance and Quality Control for Waste Containment Facilities, 11pp (available on USEPA 8 website).

GUIDELINE 28 - EVALUATING FINAL VEGETATIVE COVER OF CLOSED LANDFILL AREAS

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Revised 03-2010

I. Introduction

Revegetating a closed landfill or portion of a landfill is one of the most important steps in a facility's design, operation and maintenance, to control water infiltration, reduce erosion, minimize leachate generation, limit long-term liability for the owner/operator, and protect the environment. Once a landfill area has been covered, the timely establishment of erosion control measures, cover crop seeding, and establishment of native grass is essential to stabilize and reclaim the site. This guideline is intended to help guide facility owners/operators reclaim facilities and assess whether the vegetative cover is effective. Design, slope and soil features common to landfills may make revegetation difficult.

For at least two to three years after site closure, the landfill facility should be checked monthly (except when frozen) to ensure vegetation reestablishment and to monitor any erosion or settling of the final cover. The closed landfill should continue to be monitored on a less frequent basis for up to 30 years after site closure, particularly after significant rainfall events. These inspections also are needed to check for dead or stressed vegetation due to landfill gas, leachate seepage, significant erosion, etc.

II. Evaluating the Final Vegetative Cover

Following the second growing season, use the following guidelines to determine adequacy of stands and if reseeding or reinforcement seeding is required:

A. It should be recognized that environmental factors such as climate, insects, soils, and fertility affect time required for establishment of stands. Timeliness of precipitation, drought, extreme temperatures, severe winds, or late soil thaw can delay seedling (young grass grown from seed) emergence and/or development.

B. Areas heavily vegetated with weeds may exhibit erosion and channelization. Native grasses and grasses in general have a much more fibrous root system than most weeds. Weeds are generally considered to have a taproot system. Fibrous root systems hold the soil in place much better than a taproot system. Erosion damage may not be easy to see in areas of weedy growth unless the site is walked.

C. Rhizomatous (sod forming) grass species have roots that will spread and will continue to fill in the open spaces; whereas native bunchgrasses grow upright with spaces between each bunch. Bunchgrass stands may develop gaps if the initial establishment is sparse, but can help stabilize erosion prone areas.

D. Native grass seedling emergence should be relatively uniform over the area. The

density of established plants should be effective in minimizing soil loss due to erosion. Stand counts should indicate a density of at least 70 percent cover per square foot of area. If at least three rhizomatous species are present, the lower limit of 70 percent cover per square foot is adequate. Ninety percent cover per square foot is necessary when all are bunchgrass species or a mixture of rhizomatous and bunchgrass species.

E. The adequacy of a stand (a group of several grass plants growing together in one place) will be based on density of established plants and stage of morphological development needed to ensure perenniality (lasting more than two growing seasons). To be considered established, a grass plant must have a well-developed root system and should exhibit signs of tillering (shoot growing from the base of a stem, especially the stem of a grass) or rhizome (thick underground horizontal stem that produces roots and has shoots that develop into new plants) development.

F. Preliminary stand evaluation can be made four to eight weeks after germination; evaluate for progress and management problems (i.e., weeds, insects, etc.) – not for final establishment.

G. Stands resulting from late fall (dormant) or spring seeding must go through the first growing season and subsequent winter; evaluation for establishment can be made any time during the second growing season.

H. Stands resulting from late summer seeding cannot be evaluated for establishment until the end of the subsequent, full growing season.

I. Most stands will require two growing seasons to become established; warm-season species may require three growing seasons for establishment.

J. Stand counts may be done, using either a square foot frame or the row count method:

1. **If a frame count is used**, all plants rooted within the frame should be counted. A predetermined number of steps should be taken diagonal or perpendicular to the drill rows and the frame dropped at the toe of the foot on the final step. The frame should be dropped in a consistent alignment to the drill rows. (See description of how to do a frame count below.)

2. **If the row count method is used**, two side-by-side rows should be counted, the length to be determined by the row spacing. A 6-inch row spacing would require the observer to count all plants in two rows for a length of 12 inches; a 7-inch row spacing would require a 10.3-inch length of two rows; and an 8-inch row spacing would require a 9-inch length. The same procedure would be used for a row count as for a frame count. However, instead of dropping the frame at the toe of the foot, this point would then mark the beginning of the row count.

K. The number of samples required depends on factors such as stand uniformity and the number of species to be counted. Generally, a minimum of 10 counts (or frames) per 10 acres or less of the field size would result in a representative sample. End rows, turn around areas or other areas that may have been double seeded should be avoided. Ten counts per 10 acres of field size should be used only as a starting point.

For example, a 70- to 80-acre pasture planting with a uniform stand may be sampled accurately using 40 counts or less. Whatever the situation, enough counts must be taken so that a representative sample is obtained.

(From USDA-NRCS, North Dakota, May 2008, FOTG, Section I, Plant Materials, Herbaceous Vegetation Establishment Guide.)

Frame Count Measurement of Groundcover: Use a folding rule to create a 12- x 12-inch square. Stand over this area, look directly down, and estimate the amount of ground that is covered by plants. Take a photo of the square for documentation. For each square, record groundcover at about 30 random locations, look at the variation (highest and lowest values) and calculate the average. Also, look for more visual signs of erosion and soil loss such as gullies, rills and tunneling; washing of soil; litter along fence lines and around plants; muddy and silted dams; and muddy streams with high sediment loads. Monitor groundcover regularly to assess progress. *Source: Greg Lodge, NSW DPI*

At 20% groundcover
Runoff water loss = 160mm per year
Soil loss = 8.5mm per year
Poor plant production and sustainability
Low green leaf and plant vigor
Low water infiltration
Plants exposed to temperature extremes
Low litter
Low microbial activity
Poor organic matter content
Poor soil structure and surface sealing of soil

At 40% groundcover
Still too low
Runoff water loss = 90mm per year
Soil loss = 4mm per year
Poor pasture and soil health

At 70% groundcover
Runoff water loss = 10mm per year
Soil loss = 0.3mm per year
Good plant production and sustainability
High green leaf and plant vigor
High water infiltration
Plant bases protected from temperature extremes
High litter levels
Good microbial activity
High organic matter content
Good soil structure and soil surface

At 90% groundcover
Reduced runoff water and soil loss
On slopes, groundcover should target 100% to retain top soil nutrients and to promote stable pasture conditions
Weed colonization will be reduced when bare ground is removed

(From a Joint Initiative of Australian Wool Innovation *and* Meat & Livestock Australia; *Making More from Sheep, Copyright 2008; www.makingmorefromsheep.com.au/healthy-soils/tool_6.2.htm.)*

III. Maintaining Final Cover

The closed landfill site would benefit from mowing, haying or light grazing, depending on the post-closure use that has been approved. Grazing would be limited to an approved NRCS grazing plan.

1. **Weed Control** - During the establishment period, excessive amounts of competitive weeds must be controlled. Control weeds that compete with seedlings for sunlight

and/or moisture during the growing season of the species planted. The first weed control operation will be needed as recommended or prior to weed seed maturity. Repeated weed control operations may be needed. Competitive weeds can be controlled either mechanically or chemically, or by a combination of these methods.

2. **Mechanical** - When controlling competitive weeds by clipping or mowing, adjust the equipment to cut above the new seedlings, and clip before the weeds set seed or mature. If the clippings are dense enough to smother the new seedlings, promptly remove clippings from the field.

   a. **Mowing Height**. Eight to 10 inches is the preferred stubble height. This will be over the top of most 1- to 2-year-old forb and legume species in early summer. Certain species are especially sensitive to clipping height, and removal of the basal leaves may result in death of the plant. Some grass species such as switchgrass have high growing points, and once established should not be mowed at a height less than 10 inches until after the growing season.

   b. **Equipment**. Swathers generally work best because of operator visibility, maneuverability and ease of height adjustment. The operator can quickly raise or lower the platform. If the windrows are heavy enough to smother new seedlings, they should be promptly removed. Sickle bar mowers are good if an adequate, consistent stubble height can be maintained. Rotary mowers can work well if they are set at the highest wheel setting. This will usually result in about an 8-inch clipping height. A level mowing height should be maintained and travel speed as appropriate to disperse the clippings. A sharp blade is essential.

   c. **Timing**. Mowing must be done early enough in the season before most of the weed seed becomes viable and so the seeded species can still benefit from the "opened canopy" and put on new growth before fall. Multiple mowings in a season may be necessary with high density/biomass weed competition. Mowing in late summer or early fall provides little benefit to the seeded species and probably causes more harm than good. Check local/state regulations of individual conservation practices for the earliest allowable mowing dates. Whenever a new seeding is mowed, some injury occurs to the seeded species. Young forb and legume seedlings are especially vulnerable and may be killed by driving over them. If weeds are a competition problem to the new seeding, then mowing is probably justified. Spot mowing is encouraged whenever possible. This eliminates damage to the seeded species in areas where you don't have to mow, and maintains the taller wildlife cover. Spot mowing also creates "edge" structure which enhances landscape diversity within the field and may provide additional wildlife benefits.

3. **Chemical** -To control competitive weeds with herbicides, use the appropriate herbicide(s) applied according to the manufacturer's label. The best control will generally be obtained when weeds are in the early stages of growth. Precautions should be taken to ensure that grass or legume seedlings are not injured by the selected herbicide(s). Refer to North Dakota State University, Agricultural Weed Control Guide (Cir. W-253 Rev.) for specific herbicide recommendations on forage crops in North Dakota.

4. **Noxious weeds** must be controlled in accordance with state law.

   a. **Insect Control.** Insects can be a threat to seedlings. Contact the County Extension Service for recommendations on control of specific insects affecting seeded species.

CAUTION: When using any pesticides (herbicides or insecticides), read and follow the manufacturer's label recommendations. Read and follow all directions and precautions on the label. Use of pesticides must be consistent with the label and in accordance with state and federal laws and regulations.

(From USDA-NRCS, North Dakota, May 2008, FOTG, Section I, Plant Materials, Herbaceous Vegetation Establishment Guide.)

IV. Repairing Final Cover

As appropriate, the landfill site may need additional covering applied, additional erosion control structures or measures installed, and/or reseeding of the vegetative cover. See the North Dakota Department of Health's "General Native Grass Seeding" guideline for recommendations.

1. If evaluation reveals a marginal stand, consideration should be given to allowing a second growing season for establishment. Seedings that contain a high percentage of "hard seed" are more likely to produce new seedlings during the second growing season.

2. The alternative of a partial reinforcement seeding, in lieu of the full seeding rate, should be considered during the evaluations.

3. "Spot" seeding weak areas may be a logical alternative in the case of spotty or intermittent stands, in lieu of whole field reseeding.

(From USDA-NRCS, North Dakota, May 2008, FOTG, Section I, Plant Materials, Herbaceous Vegetation Establishment Guide.)

References:

1. A Joint Initiative of Australian Wool Innovation and Meat & Livestock Australia - Making More from Sheep, Copyright 2008.
2. North Dakota Department of Health, Division of Waste Management, General Native Grass Seeding.
3. North Dakota State University, Agricultural Weed Control Guide (Cir. W-253 Rev.).
4. USDA-NRCS, North Dakota, May 2008, FOTG, Section I, Plant Materials, Herbaceous Vegetation Establishment Guide.
5. USDA-NRCS - North Dakota, August 2002, FOTG, Section IV, Conservation Practices, Conservation Practice Standard 342, Critical Area Planting.

GUIDELINE 24 - GENERAL NATIVE GRASS SEEDING

North Dakota Department of Health – Division of Waste Management
918 E. Divide Ave., Bismarck, ND 58501-1947
Telephone: 701.328.5166 • Fax: 701.328.5200 • Website: www.ndhealth.gov/wm
Updated 04-2009

Native grass plantings on solid waste facilities help control erosion and minimize longer term closure costs. Most native grass species develop a strong root system that helps control erosion and contributes to an increase in soil fertility by recycling nutrients while alive and returning vital nutrients to the soil as the roots decompose. Because many native grasses are adapted to survive in almost any soil conditions, they require no fertilizer or irrigation after planting. Thus, over the long-term, planting native grasses (and wildflowers) can reduce maintenance costs. The North Dakota Department of Health recommends facility owners review their reclamation plans with staff and consult with local Natural Resources Conservation Service (NRCS) offices. Because of the specialties of landfill closure and the need to have long-term durable plantings, seeding rates are recommended to be higher than native grassland not impacted by waste management activities. The Department of Health's guideline on "Evaluating Final Vegetative Cover of Closed Landfill Areas" also can help guide facility owner/operators in this essential element of facility closure.

Suggested Native Grass Mixture

Species	PLS* Pounds/Acre	Percent of Mixture**	Warm or Cool Season	Bunchgrass or Rhizomatous	Minimum Root Depth
Western Wheatgrass *(Pascopyrum smithii)*	4	21%	Cool	Rhizomatous	20" +
Green Needlegrass*** *(Nassella viridula)*	4	21%	Cool	Bunchgrass	14" +
Slender Wheatgrass *(Elymus trachycaulus)*	2	10.5%	Cool	Bunchgrass	16" +
or Canada Wildrye *(Elymus Canadensis)*	2	10.5%	Cool	Bunchgrass	16" +
Sideoats Grama*** *(Bouteloua curtipendula)*	2	10.5%	Warm	Rhizomatous	12" +
Switchgrass *(Panicum virgatum)*	2	10.5%	Warm	Rhizomatous	12" +
Big Bluestem*** *(Andropogon gerardii)*	2	10.5%	Warm	Bunchgrass, sometimes with short rhizomes	20" +
Little Bluestem*** *(Schizachyrium scoparium)*	1.5	8	Warm	Bunchgrass, sometimes with short rhizomes	14" +
Blue Grama*** *(Bouteloua gracilis)*	1.5	8	Warm	Bunchgrass, forming short rhizomes	16" +
Total Seed (min)	**19 pounds**	**100%**			

*PLS - Pure Live Seed (based on 50 PLS/sq feet)

**Percent Mixture – Contingent upon soil requirements. Adjust mixture based on NRCS map.

***Chaffy or awned seeds (i.e., bluestems, indiangrass and blue grama) are extremely difficult to plant with a grain drill. It is recommended that a grass drill be used for these types of grasses. Proper agitation is needed to prevent "bridging" of seed in the seedbox, and the feeder mechanism must be capable of metering a uniform flow of seed at the desired rate. Very few grain drills have this capability. Use of debearded seeds is strongly recommended when considering seeding chaffy or awned seeds in a grain drill.

1. The seedbed should be firmly packed (footprints left in the soil should be less than 1/2-inch deep).
2. Erosion control and establishing a cover crop.

   Upon soil placement on landfill areas, erosion control measures must be incorporated immediately to minimize erosion of soil layers. Applying and incorporating wheat straw at a rate of at least 2,000 pounds per acre is a common practice. Other measures are appropriate, especially in erosion prone areas. Straw mulch should be free of noxious weeds. Bromegrass is not an advisable mulch. Approximately 10 percent of the soil surface should be visible through the mulch. Excessive cover which will smother seedlings should be avoided.

   In spring: A cover crop of oats or barley at 10 PLS pounds/acre is recommended for seeding the disturbed area prior to native grass seeding. It is ideal to mow the cover crop to a height of 8 inches when the grain in the head is forming but still immature to produce standing stubble.

   In fall: The recommendation would be to seed a cover crop of winter wheat in September/October for an immediate cover crop. In the spring, the cover crop should be chemically killed with Roundup, and then the native grass seeded into the residual cover crop material. Winter wheat is aggressive and will make a good cover; however, because it is so successful in beating back the invasives, it will also tend to out-compete the native grass they try to seed later (hence the Roundup before seeding in the spring).

3. An early spring seeding (before May 24) is preferred, and should not extend past June 15 at the latest. A dormant fall seeding (after October 20) is acceptable; however, the mixture should be dominated heavily with cool-season species. If moisture levels and weather conditions are optimal, planting at other times may be considered. At anytime, if the planting is not successful, reseeding must be addressed when appropriate.

4. The native grass seed should be planted through the standing cover stubble during the following growing season at a soil depth of 1/2 inch, depending on site conditions. Precautions must be taken not to plant the seed too deeply in the soil or poor germination will result. A drill designed specifically for grass seeding will give the best results.

5. Fertilizer should not be applied before the native grass has established.

6. **Use North Dakota certified seed, northern origin cultivars, northern-adapted cultivars, or approved varieties by the NRCS.** Refer to Table 2 of the USDA-NRCS - North Dakota, May 2008, FOTG.

Note: This native grass mixture is a suggestion for general purposes (such as the closure of small inert waste landfills, disturbed waste sites, etc.), where there are not significant soil problems (salinity, wetness, high sand content, etc.) and where climactic factors or slope factors are not significant. Sites that have other factors affecting plant selection, especially in eastern or western North Dakota, steeper slopes, or where alternative covers are used, should consult the Department of Health and the local NRCS office to tailor the native seed selection. Sites with slopes exceeding 15 percent should plant at a heavier rate, such as 25-30 PLS pounds/acre. Alternative covers also should ensure a mixture of cool and warm season grasses, with both shallow and deep roots. Larger landfills also should have a seed selection tailored to their facility while addressing the principles outlined in this guideline.

References:

USDA-NRCS - North Dakota, May 2008, FOTG - Section I - Reference Subject - Plant Materials, Herbaceous Vegetation Establishment Guide.

USDA-NRCS - North Dakota, August 2002, FOTG - Section IV - Conservation Practices, Conservation Practice Standard – 342, Critical Area Planting.

Attachment G –

Radiation Safety Program

Radiation Safety Program

For the disposal & transportation of TENORM contaminated waste materials or soils in North Dakota.

July 2016 Revision 1

Prepared By: Chris Kreger, Environmental Manager, JMAC Corporate Services, LLC for IHD Solids Management, LLC, 14070 43rd Street Northwest, Alexander ND 58831

People First, Safety Always

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1. Purpose

This document is provided to guide operations of IHD Solids Management, LLC. (IHDS) related to the disposal of TENORM wastes in its facility located in the East Half of Section 34, Township 153 North Range 101 West McKenzie County in North Dakota: if the materials contain, or are contaminated at, radiation levels that are equal to or exceed five picocuries per gram (5.0 pCi/g), excluding natural background, of any combination of radium-226 and radium-228. The document is intended to meet the requirements of the North Dakota Department of Health, Air Quality, Radiation Control Program. Disposal of TENORM Waste requires a Specific License (NDAC 33-10-23-11) and is regulated under North Dakota Administrative Code (NDAC) Chapter 33-10 for Air Quality Radiation Control and NDAC 33-20 for the Solid Waste Department.

2. Company Background

IHDS is a Special Waste Landfill located between 42nd and 43rd Streets on the West side of Highway 85 between Williston and Alexander North Dakota. The facility has been in operation since the early 1980's and has been accepting wastes from the exploration and production of oil and gas. It also accepts a limited amount of industrial and inert waste. An application for an expansion and renewal of the existing permit was submitted to the Department of Health in January of 2013 and the new permit was issued to IHDS in June of 2015. In conjunction with the application for this Specific License, IHDS is completing a Major Permit Modification Application to modify its current solid waste/special waste permit to provide for the acceptance of the material described herein.

3. Summary

This document provides information relevant to the activities described in this Program and includes health and safety information, exposure and exposure limit information, operational procedures, protection from exposure and financial assurance information required to safely and properly excavate, load, haul and unload the wastes. The information provided herein is intended to protect the general public and IHDS employee's from exposures that would be detrimental to their health and well being and obtain a license for such activities from the Department.

This document also provides the basis and data necessary to train IHDS employees to carry out the activities described herein.

It should be noted that based on past monitoring and testing of activities described in this document, no employee or individual should ever be exposed to levels even close to the regulatory requirements for the general public or employees. The Department's own studies support this conclusion.

This document references the Nuclear Regulatory Commission (NRC) but has been prepared for the North Dakota Department of Health (NDDH), who is the regulatory authority in North Dakota. The NDDH has adopted most of the NRC regulations. Where reference is made to the NRC or a CFR it shall be read as and have the same meaning as if it had referenced the NDDH and their Administrative Code.

4. Administration

This Program is administered by IHDS's Radiation Safety Officer (RSO) in cooperation with crew supervisors and upper management. This document and program may be modified from time to time based on changes in procedures, operations, work practices, identified risks and hazards that present themselves while performing the work described.

The IHDS team shall insure that they are trained and have the knowledge required to identify potential TENORM radiation exposures, conduct scans required to verify exposure limits and determine the measures needed to protect employees and the general public from those exposures.

The team shall also cause the appropriate employee training required, to be completed and provide the resources and time to do so. This may also include training subcontractors, if utilized.

5. Definitions

ALARA Principle:
ALARA Stands for "As Low As Reasonably Achievable" and refers to the reduction of exposure to radiation as a best practice, that can be achieved by reasonable cost and manner, as a method to avoid any undesirable affects to life. The term is not intended to be a limit for exposure and implies the opposite. It was originally developed in response to a general lack of knowledge about the effects of radiation. The result of the principle therefore can lower the risk of exposure well below any normally accepted risks we take in our regular lives.

ALI:
Annual limit on intake (ALI) means the derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the reference man that would result in a committed effective dose equivalent of 5 rems (0.05 Sv) or a committed dose equivalent of 50 rems (0.5 Sv) to any individual organ or tissue.

Alpha particle (alpha radiation, alpha ray):
A positively charged particle (a Helium-4 nucleus) made up of two neutrons and two protons. It is the least penetrating of the three common forms of radiation, being stopped by a sheet of paper. It is not dangerous to living things unless the alpha-emitting substance is inhaled or ingested or comes into contact with the lens of the eye.

Background radiation:
The radiation of man's natural environment, originating primarily from the naturally radioactive elements of the earth and from the cosmic rays.

Beta particle (beta radiation, beta ray):

An electron of either positive charge (ß+), or negative charge (ß-), which has been emitted by an atomic nucleus or neutron in the process of a transformation. Beta particles are more penetrating than alpha particles but less than gamma rays or x-rays.

Curie:
The curie is a unit of ionizing radiation (radioactivity), symbolized by Ci and equal to 3.7×10^{10} (=37,000,000,000) disintegrations or nuclear transformations per second. This is approximately the amount of radioactivity emitted by one gram (1 g) of radium-226. The unit is named after Pierre Curie, a French physicist.

CDE:
Committed Dose Equivalent is the dose to some specific organ or tissue that will be received from the intake of radioactive material by an individual during a 50 year period following the intake.

CFR:
Code of Federal Regulations

Daughter Products:
In nuclear physics, a **decay product** (also known as a **daughter product**, **daughter isotope** or **daughter nuclide**) is the remaining nuclide left over from radioactive decay. Radioactive decay often proceeds via a sequence of steps (decay chain). For example, ^{238}U decays to ^{234}Th which decays to ^{234m}Pa which decays, and so on, to ^{206}Pb (which is stable).

A nucleus formed by the radioactive decay of a different (parent) nuclide.

Department:
The North Dakota Department of Health.

Dosimetry:
Whilst **Dosimetry** in its original sense is the measurement of the absorbed dose delivered by ionizing radiation, the term is better known as a scientific sub-specialty in the fields of health physics and medical physics, where it is the calculation and assessment of the radiation dose received by the human body.

Ionizing Radiation:
Ionizing (or **ionising** in British English) **radiation** is radiation that carries enough energy to free electrons from atoms or molecules, thereby ionizing them. Ionizing radiation is made up of energetic subatomic particles, ions oratoms moving at high speeds (usually greater than 1% of the speed of light), and electromagnetic waves on the high-energy end of the electromagnetic spectrum.

Gamma rays, X-rays, and the higher ultraviolet part of the electromagnetic spectrum are ionizing, whereas the lower ultraviolet part of the electromagnetic spectrum, and also the lower part of the spectrum below UV, including visible light (including nearly all types of laser light), infrared, microwaves, and radio waves are

all considered non-ionizing radiation. The boundary between ionizing and non-ionizing electromagnetic radiation that occurs in the ultraviolet is not sharply defined, since different molecules and atoms ionize at different energies. Conventional definition places the boundary at a photon energy between 10 eV and 33 eV in the ultraviolet (see definition boundarysection below).

Typical ionizing subatomic particles from radioactivity include alpha particles, beta particles and neutrons. Almost all products of radioactive decay are ionizing because the energy of radioactive decay is typically far higher than that required to ionize.

Licensee
The entity holding a license from the North Dakota Department of Health to handle TENORM materials as defined by the regulations.

Licensed Material
TENORM material above 5 pCi/g combined RA^{226} and RA^{228} to be handled by the licensee and subject to the regulations.

NDAC:
North Dakota Administrative Code

NDDH:
North Dakota Department of Health

NORM:
Naturally Occurring Radioactive Material is material that is present in soil, rocks and many of the things that surround us. These items include many of the food items we eat every day, things we come in contact with daily, items we use and the raw materials or ore that is used to create nuclear fuel. Even NORM can be dangerous to human health, if it emits adequate Ionizing Radiation.

NORM includes all of the parent products the radioactive material comes from like Uranium and Thorium and all of the daughter products that decay from the parent until the material becomes stable. This decay process takes several billion years and results in many different changes in the nature type of the radioactivity in the process. For example Radium shows up in the decay chain of Uranium.

NRC:
Nuclear Regulatory Commission.

OSHA:
Occupational Health and Safety Administration.

Parent Products:

A radionuclide that decays to another nuclide which may be either radioactive or stable. Once the decay occurs, the result becomes the parent product for the next element in the chain.

pCi/g:
This is the symbol used to designate pico-curies per gram of material. A pico is one trillionth of a curie and is expressed as $1x10^{-12}$ or 0.000,000,000,001.

PPE:
Personal protective equipment (**PPE**) refers to protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection. The hazards addressed by protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter. Protective equipment may be worn for job-related occupational safety and health purposes, as well as for sports and other recreational activities. "Protective clothing" is applied to traditional categories of clothing, and "protective gear" applies to items such as pads, guards, shields, or masks, and others.

The purpose of personal protective equipment is to reduce employee exposure to hazards when engineering and administrative controls are not feasible or effective to reduce these risks to acceptable levels. PPE is needed when there are hazards present. PPE has the serious limitation that it does not eliminate the hazard at the source and may result in employees being exposed to the hazard if the equipment fails.

Any item of PPE imposes a barrier between the wearer/user and the working environment. This can create additional strains on the wearer; impair their ability to carry out their work and create significant levels of discomfort. Any of these can discourage wearers from using PPE correctly, therefore placing them at risk of injury, ill-health or, under extreme circumstances, death. Good ergonomic design can help to minimize these barriers and can therefore help to ensure safe and healthy working conditions through the correct use of PPE.

Progeny Products:
See “Daughter Products”

RAD:
Radiation Absorbed Dose. The basic unit of an absorbed dose of ionizing radiation.

REM:
The **roentgen equivalent** in **man** (or mammal[1]:579) (abbreviated **rem**; symbol **rem**, or often but incorrectly **R**) is an older, CGS, unit of equivalent dose, effective dose, and committed dose. Quantities measured in rem are designed to represent the stochastic biological effects of ionizing radiation, primarily radiation-induced cancer. These quantities are a complex weighted average of absorbed dose, which is a clear physical quantity measured in rads. There is no universally applicable conversion constant from rad to rem.

The rem is defined since 1976 as equal to 0.01 sievert, which is the more commonly used SI unit outside of the United States.

One rem carries with it a 0.055% chance of eventually developing cancer. Doses greater than 100 rem received over a short time period are likely to cause acute radiation syndrome (ARS), possibly leading to death within weeks if left untreated. Note that the quantities that are measured in rem were not designed to be correlated to ARS symptoms. The absorbed dose, measured in rad, is the best indicator of ARS.

A rem is a large dose of radiation, so the **millirem** (**mrem**), which is one thousandth of a rem, or microrem (micro/R) which is one millionth of a rem is often used for the dosages commonly encountered, such as the amount of radiation received from medical x-rays, background sources and wastes.

Restricted Area:
The area containing elevated TENORM radiation levels that are at or above 5 pCi/g and is designated as the hot zone in a Site Specific Health and Safety plan or is an area at a permanent licensed facility that is designated as the restricted zone.

Roentgen:
The **roentgen** (**R**, also **röntgen**) is a legacy unit of measurement for the exposure of X-rays and gamma rays up to several megaelectronvolts. It is a measure of the ionization produced in air by X-rays or gamma radiation and it is used because air ionization can be measured directly. It is named after the German physicist Wilhelm Röntgen, who discovered X-rays. Originating in 1908, this unit has been redefined and renamed over the years.[3] It was last defined by the US National Institute of Standards and Technology (NIST) in 1998 as 2.58×10^{-4} C/kg, (1 C/kg = 3876 R,) with a recommendation that the definition be given in every document where the roentgen is used.

RSO:
"Radiation safety officer" means an individual with the responsibility for the overall radiation safety program on behalf of the licensee and who meets the requirements of NDAC section 33-10-23-28. Generally this means: the person within an organization responsible for the safe use of radiation and radioactive materials as well as regulatory compliance. An organization licensed by the Nuclear Regulatory Commission or the Department to use possess, transport of dispose of radioactive materials must designate a Radiation Safety Officer in writing.

TEDE (Total Effective Dose Equivalent):
The **Total effective dose equivalent** (TEDE) is a radiation dosimetry quantity defined by the US Nuclear Regulatory Commission to monitor and control human exposure to ionizing radiation. It is defined differently in the NRC regulations and NRC glossary. According to the regulations, it is the sum of effective dose equivalent from external exposure and committed effective dose equivalent from internal exposure, thereby taking into account all known exposures. However, the NRC glossary defines it as the sum of the deep-dose equivalent and committed effective dose equivalent, which would appear to exclude the effective dose to the skin and eyes from non-penetrating radiation such as beta. These surface doses are

included in the NRC's **shallow dose equivalent**, along with contributions from penetrating (gamma) radiation.

Regulatory limits are imposed on the TEDE for occupationally exposed individuals and members of the general public.

TENORM:
"Technologically enhanced naturally occurring radioactive material (TENORM)" means naturally occurring radioactive material whose radionuclide concentrations are increased by or as a result of past or present human practices. TENORM does not include background radiation or the natural radioactivity of rocks or soils. TENORM does not include "source material" and "byproduct material" as both are defined in the Atomic Energy Act of 1954, as amended [42 U.S.C. 2011 et seq.] and relevant regulations implemented by the United States nuclear regulatory commission.

Unrestricted Area:
All areas not designated as the Restricted Area.

Wastes:
Wastes are items that are not intended for reuse or recycling; or as the result of the nature of the material and any contamination, cannot be reused or recycled. This can include soils, fluids, cuttings, structures, piping and other materials.

6. Elements of Concern

6.1.Radium (Ra)

The longest lived, and most common, isotope of radium is Radium 226, an alpha emitter with a half-life of 1,600 years. Ra 226, occurs in the decay chain of Uranium 238 and 235. Ra 228 occurs in the decay chain of Thorium 232 but only has a half life of 5.7 years and is a beta emitter. These two isotopes are commonly found in wastes related to oil and gas exploration and production.

6.2.Lead (Pb)

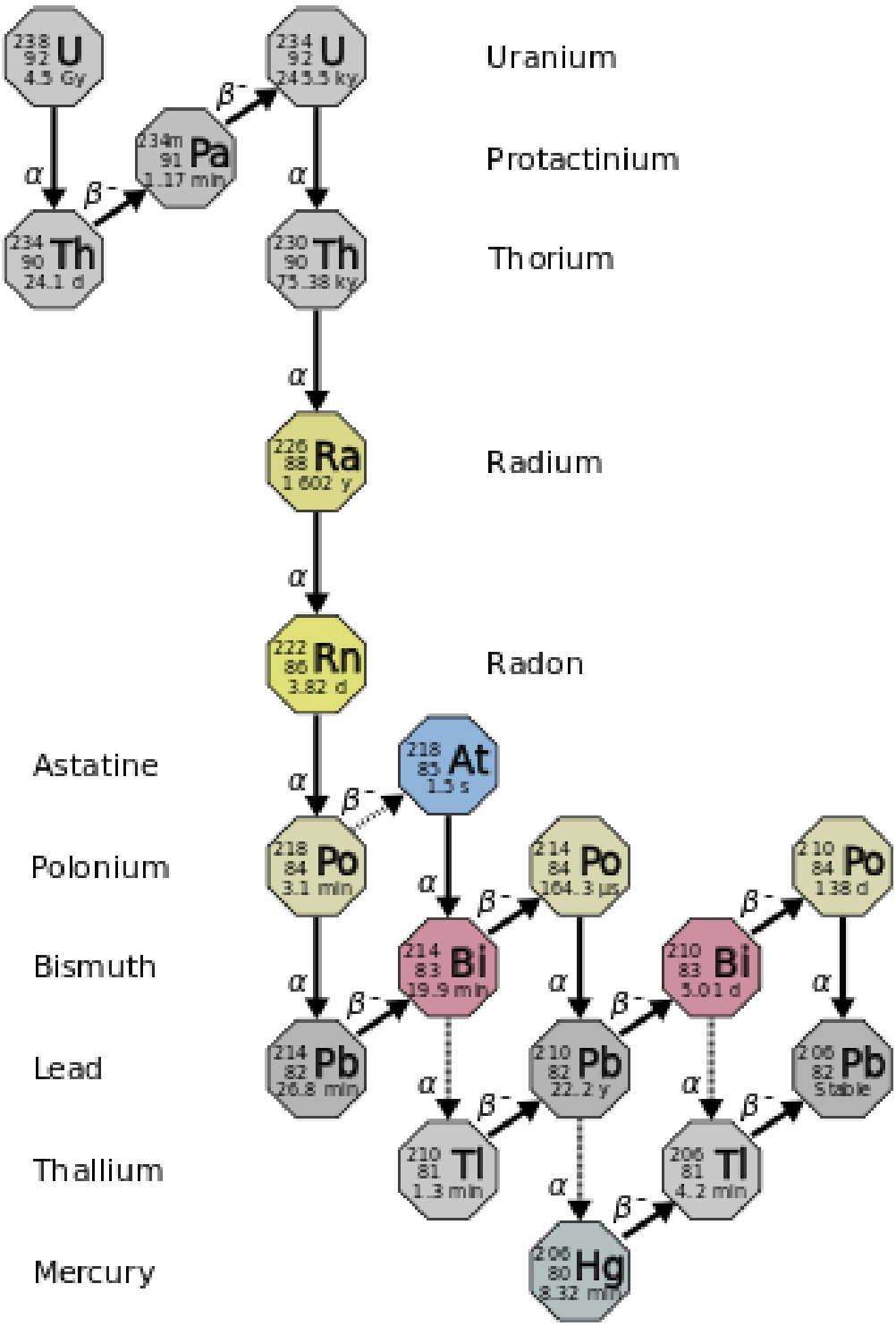
Lead 210 is a beta emitter and has a half life of 22.6 years. It occurs naturally in the decay chain of primordial uranium-238 . This isotope is often found in wastes related to natural gas production.

6.3.Radon (Rn)

Radon 222 is a radioactive gas that is a Beta emitter. Its half life is very short at 3.8 days. However, as with all isotopes discussed here the daughter products produced from the parent isotopes all have different half lives and are radioactive until it has reached its final stable element: usually a form of lead.

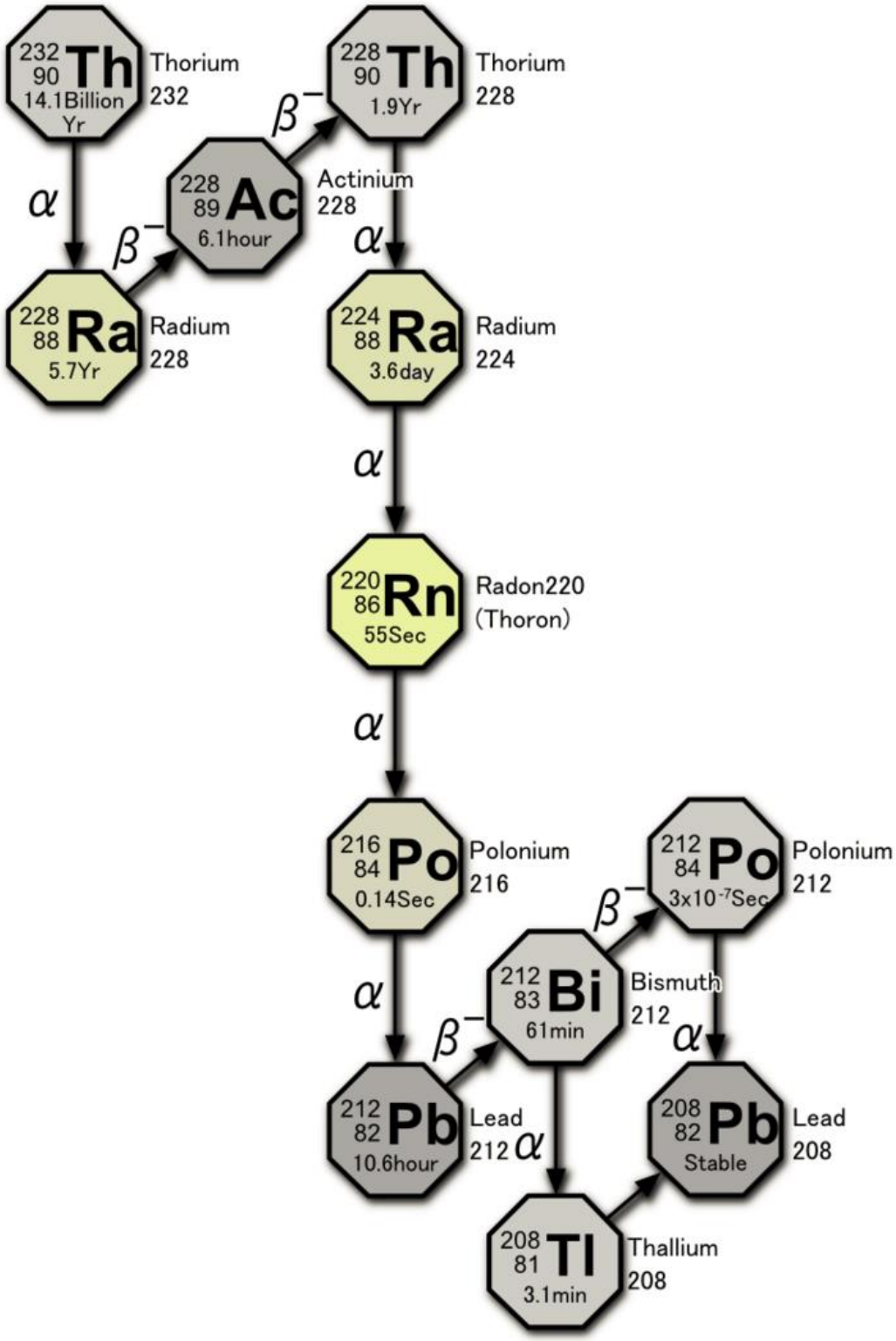
The following image summarizes the decay chain for Uranium 238:

Figure 1:



The following image summarizes the decay chain for Thorium 232:

Figure 2:



7. Exposure Concerns

Everyone is exposed to radiation every day and everywhere. We are surrounded by natural radiation. However it is possible for certain individuals to receive higher than normal doses of radiation as the result of their lifestyle, the foods they eat, their medical condition and the materials and products they surround themselves with. This document is intended to address only those potential occupational exposures of the company employees and any potential additional exposure to the general public as the result of facility operations.

We have completed a prospective evaluation and determined that unmonitored occupational and public individuals are not likely to receive, in one year, a radiation dose in excess of 10% of the allowable limits in 10 CFR Part 20 (Figure 4). The Argonne National Laboratory study commissioned by the North Dakota Department of Health also indicated that the regulatory dose limits of part 20 would not be exceeded. We are however providing the following information for future reference.

7.1.Ionizing Radiation

The following paragraphs provide information related to the exposure of an individual to the radiation of concern described in this document. There a two primary ways that radiation affects us: either through external doses or internal exposures. Radiation can damage biological entities because the energy of the radiation can dislodge an ion from the nucleus of a cell, which causes the cell to die or change. Imagine removing a piston from the engine of your car: it may run poorly for some period of time, but eventually it will irreparably come apart. Normally the body will repair/replace those damaged cells, but if one is exposed to sufficient levels of radiation above that considered healthy, the exposure can cause cancer or in very high doses, cause irreparable harm and death.

There are three forms of this invisible radioactive energy that can be given off by radioactive materials. They include:

- Gamma Rays (γ) or energy waves that are the same as what we know as x-rays. They penetrate the body very easily, which is why they are used for diagnostic purposes in medical facilities. As you are aware, you can be subject to gamma rays in high concentrations for short bursts without ill effects. Long exposures at these concentrations however can cause harm, which is why x-ray technicians retreat to lead lined rooms and may wear lead lined garments to protect themselves from repeated long term exposure. As demonstrated by the decay chain charts above, in the oil and gas industry, gamma rays are not present in the uranium and thorium primordial ores found in the formations oil and gas wells are placed in.
- Beta Particles (β) can travel several feet through the air and can penetrate the skin if close enough to the source. Beta particles are possible in the decay of uranium found in minerals drilled through for an oil well. The decay of lead 210 results in both alpha and beta particle emissions.
- Alpha Particles (α) will travel through the air only a few inches and can be blocked by skin or even paper. This however is the primary radiation of concern in the oil and gas industry. This is because once inside the body sufficient quantities can do damage to the cells of the body over a long period of time.

7.1.1. Occupational External Exposure

Because gamma rays are not prevalent in the wastes dealt with in the oil and gas industry, Beta particles do not travel far from the source, and alpha particles are blocked by skin, the potential for harmful human exposure to any of these three forms from external exposures are negligible.

General radiation regulations require; if the prospective evaluation shows that an individual's dose is not likely to exceed 10% of any applicable regulatory limit, the individual is not required to be monitored for radiation exposure and there are no recordkeeping or reporting requirements for doses received by that individual. If the prospective dose evaluation shows that the individual is likely to exceed 10% of an applicable limit, monitoring is required.

Licensees shall monitor worker exposures when adults are likely to receive an annual dose in excess of any of the following:

- -0.5 rem deep-dose equivalent;
- -1.5 rems eye dose equivalent;
- -5 rems shallow-dose equivalent to the skin;
- -5 rems shallow-dose equivalent to any extremity.

Declared pregnant women who are likely to receive an annual dose from occupational exposures in excess of 0.1 rem deep-dose equivalent, although the dose limit applies to the entire gestation period.

HOWEVER, IN ACCORDANCE WITH THE REQUIREMENTS OF THE NDDH, FOR A MINIMUM OF ONE YEAR AND UNTIL THE NDDH AGREES TO WAIVE THE REQUIREMENT, ALL OCCUPATIONAL INDIVIDUALS WHO WORK WITH THE WASTE SHALL BE MONITORED IN ACCORDANCE WITH SECTION 10.11 Personnel Dosimeter Program.

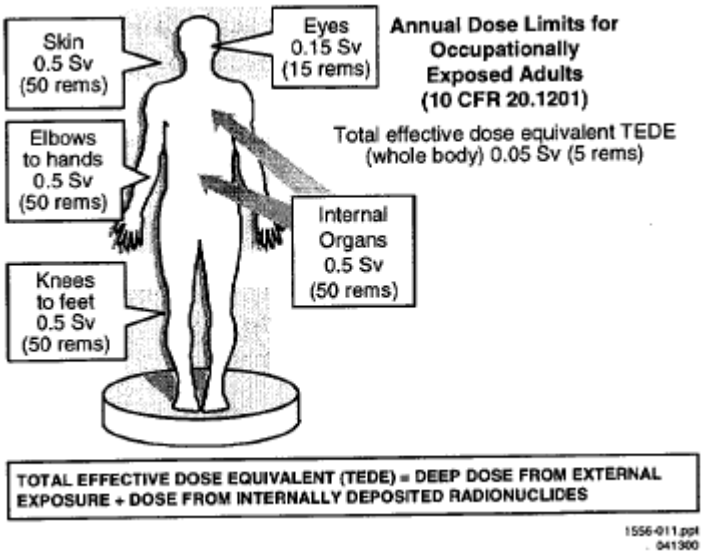
7.1.2. Occupational Internal Exposure

On the other hand, the potential for harmful human exposure from the wastes handled and transported in the oil a gas industry as the result of alpha or beta emitting radioactive particles is possible. As discussed above, once sufficient doses of a radioactive source is inside the body, the limitations to exposure from time, distance and shielding described above are no longer there. You are now in close contact with the source of radiation that can damage your biological functions and may be evaluated for a committed effective dose using a bio-assay. Alpha particles that are stopped by skin are not stopped by mucus membranes, porous bone and other internal structures of the body. Some of the source material leaves the body through some form of excrement: sweat, urine and feces To avoid these problems, it is important to follow company procedures and policies when completing tasks described in this document.

Internal exposure monitoring is required for:

- " Adults likely to receive in 1 year an intake in excess of 10% of the applicable Annual Limit of Intake (ALI) for ingestion and inhalation;
- " Minors and declared pregnant women likely to receive in 1 year a committed effective dose equivalent in excess of 1.0 mSv (0.1 rem).

Figure 3



7.1.3. Public Exposure

Exposure to the public is limited to 0.1 REM per year by the NDDH. This is less than Nuclear Regulatory Commission limitations in Federal Law. Public exposure to the waste is very limited as the result of operational procedures by the company. During transportation the waste is wrapped in plastic and tarped to avoid leaks or airborne material. Any individual near the truck during transportation has limited exposure as the result of the short period of time the two are near each other. North Dakota disposal requirements require daily cover to keep the waste contained within the disposal facility. These precautions are described in further detail in Section 11.

7.2.Routes of Exposure

Radioactive sources can enter the body in several different ways. The most common pathways of exposure are inhalation and ingestion; however one can also be exposed by injection, and absorption through open wounds. As mentioned above, beta particles can penetrate the skin if close enough, so waste materials containing beta emitters deposited on clothing or the skin can affect an individual until removed and distanced from the individual.

The route of exposure begins with the individual coming in contact with a TENORM waste stream. This contact can be as the result of physically handling, touching, or being splashed with the material. One could also pass through a plume of material entrained in the air or atmosphere. Contaminated clothing, gloves, hands and shoes can all contribute to the potential for transfer of material to food, drink, mouth and nose for ingestion or inhalation. Air entrainment of radioactive particles may not always be visible. The longer the exposure or the repeated the exposure, the higher the level of potential radioactive material received. Adherence to the company policies and procedures will prevent these potential occupational and public exposures.

7.2.1. Exposure Limits

The ALARA Principle states that one should keep your exposure to radiation as low as you possibly can. However, it is well known that all individuals are exposed to radiation every day from natural sources. These natural exposures are from sun, food, products, rocks air and other NORM containing materials. These natural exposures include both external and internal exposures as described above. However, increasing exposure unnecessarily may cause adverse effects to health.

There are three common measurements that are used for detecting levels of radiation. They are the Roentgen, which is a measurement of exposure; the Rad which is a measurement of dosage and the REM which measures the amount of radiation that is absorbed into human tissue.

The Nuclear Regulatory Commission (NRC) limits for occupational whole body exposure, excluding special exposures, is 5 rems per year. The NDDH exposure rate for the general public is 0.1 rems per year (OSHA 0.17 rems per year). These same exposure limits are used by the Occupational Safety and Health Administration (OSHA) in 29 Code of Federal Regulations (CFR) 1910.1096 (b)(1). North Dakota Regulations also state that each person subject to a specific or general license … shall conduct operations so that protection of workers complies with radiation protection standards chapter 33-10-04.2 STANDARDS FOR PROTECTION AGAINST RADIATION and 33-10-10.1 NOTICES, INSTRUCTIONS AND REPORTS TO WORKERS - INSPECTIONS. Chapter 33-10-04.2 adopts by reference the following from the CFR which covers the NRC: 10 CFR part § 20.1201 OCCUPATIONAL DOSE LIMITS FOR ADULTS. All these various regulations use the same exposure limits.

However, OSHA and the NRC apply different values to different parts of the bodyThe following reference chart is provided from OSHA's lecture on ionizing radiation:

Figure 4

Maximum Permissible Dose Equivalent for Occupational Exposure

Combined whole body occupational exposure	
Prospective annual limit	5 rems in any 1 yr
Retrospective annual limit	10-15 rems in any 1 yr
Long-term accumulation	(N-18) x5 rems. where N is age in yr
Skin	15 rems in any 1 yr
Hands	75 rems in any 1 yr (25/qtr)
Forearms	30 rems in any 1 yr (10/qtr)
Other organs, tissues and organ systems	
Fertile women (with respect to fetus)	0.5 rem in gestation period
Population dose limits	0.17 rem average per yr
(Reprinted from NCRP Publication No. 43, Review of the Current State of Radiation Protection Philosophy, 1975)	

Note: North Dakota Administrative Code 33-10-23-05 limits the Population Dose Limit in the above Table to 0.1 rem/yr.

One additional requirement is included in **1910.1096(b)(3):** No employer shall permit any employee who is under 18 years of age to receive in any period of one calendar quarter a dose in excess of 10 percent of the limits…[same limits as above]. All IHDS employees conducting operations described in this document shall be over the age of 18 years.

8. Exposure Prevention

Exposure prevention is the key to the success of this radiation safety program. It is IHD's policy to meet the requirements of the regulations that apply to their work. Both OSHA and the NRC have stated there are three exposure-reducing tools available for workers to apply to the safe handling of radioactive material. These tools include Time, Distance and Shielding. Time suggests that if you can limit the amount of time you are exposed to Radiation then it is unlikely you will receive enough dosage for it to become dangerous to your health. Secondly,

if you are in the proximity of a known radiation source, keep your distance from the source and thereby reduce the dosage you will receive. Although, time and distance are the preferred approaches to dealing with radiated sources, it is also true that sometimes you simply cannot keep your distance or limit your time: especially if it is your job to be close to possible sources of radiation. This is where the third tool comes in to play: shielding.

Because the higher risk of potential harmful exposure in this industry results from ingestion or inhalation; other precautions with respect to operational procedures in Section 11 are also used to reduce TEDE. These risk avoidance measures are primarily related to dust control and avoidance of contamination transference of radioactive material by ingestion or inhalation.

9. Exposure Calculations

The calculations in this section, to determine exposures, are based on an individuals' exposure at the specified level for 12 hours per day, 6 days per week, 52 weeks per year. In the case of a 750 micro rem/h exposure, the calculation equates to 2.81 rem/yr. At 1300 micro rem/h the calculation is 4.87 rem/yr. These are below the TEDE, exclusive of background radiation, as required by regulations with adequate safety factor. Empirical results of monitoring in and around TENORM however, indicate the dosage is substantially lower than the hypothetical calculations presented here.

In addition, utilization of the measures found in Section 11 will prevent air borne dust. Furthermore the prevention of acceptance of TENORM above 50 pCi/g ^{226}Ra & ^{228}Ra at the site will limit inhalation exposure risk. Therefore only external gamma radiation is considered for examples of the TEDE calculation.

9.1.Public Exposures Calculations

The general population would only have a milli-fraction of the exposure time to the waste or a container: keeping their exposure well below the 0.1 rem/yr. Hypothetically, public exposure is limited to the waste and individual coming within proximity of each other for up to 5 minutes at a stop sign: this results in a 108.3 micro rem encounter based on a 1300 micro rem/hr output from the container. This is well below the public limit. The real world exposure has been tested to actually be much lower than the hypothetical equation listed here and is based on Geiger counter observations of a loaded truck with the waste in question.

Restricted zones and boundaries for public passage near or around the site are shown in Attachment C. These boundaries are set up based on potential exposures at the facility and are modified as the waste disposal areas move over time. The boundaries will be evaluated on a monthly basis to assure that public exposures shall remain within regulatory requirements.

9.1.1. Public Dust Exposure

If operational procedures described in this document are followed, the potential for public exposure to dust is extremely limited. Public exposure is intermittent at best. Their short exposure to a potential airborne incident precludes the possibility of exposures in excess of those identified in 10 CFR Appendix B of Part 20. These published ALI exposures are from 0.2 to 1 µCi for Radium 226, Radium 228 and Lead-210. This is akin to inhalation or ingestion of nearly 5,000 to 20,000 grams of 50 pCi/gram material per year. All of the company procedures described in this document are developed to prohibit such exposures.

10. Exposure Monitoring

IHDS has four activities it conducts where the potential for exposure to TENORM exists. They are transportation, load inspection, truck unloading and placement of waste in the landfill involving TENORM material above 5pCi/g. For load inspection, the scale operator does not have the same exposures as an individual operating equipment, driving the truck or placing the waste. Consequently, the monitoring and operational procedures for the two activities can be different.

10.1. Employee Monitoring

In addition to area surveys and dosimetry, employees shall be monitored for contamination each time they leave the restricted zone. Surveys must show that employee contamination is not carried of the site. The survey shall include hand, arm, body and shoe sole frisking. Results of the survey must find no more than background levels of radiation. If frisking reveals unacceptable levels, refer to Section 12.7 for decontamination procedures.

If a truck driver does not leave the closed cab of his truck while in the Restricted Zone and does not help cover, enclose or restrain the load: a survey for contamination of the driver is not required.

The NDDH requires a minimum of one year of dosimeter monitoring of employees. Based on the results of this monitoring the NDDH may allow the dosimeter monitoring to be discontinued. However thereafter, should it subsequently be discovered that the level anywhere on facility exceeds 1000 micro rem/hr: the employees' shall obtain a dosimeter to record their actual exposure. Based on the calculations in Section 9, 1000 micro rem/hr is 75 % of the 10 % occupational dose limitations of 10 CFR 835.202 requiring the use of Dosimeters. Dosimeter monitoring in accordance with Section 10.11 shall be continual for the employees if the limits described above are exceeded.

The equipment operators, drivers and laborers shall follow the procedures and protections described in Section 11 to avoid over or inadvertent exposure and obtain an accurate evaluation of the exposure. Exposure monitoring conducted shall not exceed 3,000 micro rem/h at any point as measured one inch from the waste to be handled or 1,500 micro rem/h 80 inches from the outside of the container (also referred to as package monitoring in this plan). If this level is exceeded, IHDS will not handle the material without a modification to this plan.

Should the company come to believe that an individual or employee has been exposed above the exposure threshold; the company shall have the individual or employee evaluated by a professional utilizing a bioassay. Bioassay is the determination of kinds, quantities or concentrations, and, in some cases, the locations of radioactive material in the human body. Bioassays may be conducted by direct measurement or by analysis and evaluations of materials excreted or removed from the human body. Any individual or employee who receives a Bioassay will go to the hospital, or a clinic for analysis. IHDS and the individual or employee will receive results of the test.

If a bioassay is ever done on an individual or employee at IHDS, a full report will be prepared including information regarding circumstances of the incident, test results and preventative action for the future.

10.2. Equipment Monitoring

In accordance with the following paragraphs, routine monitoring of the equipment cabs and landfill facilities shall be completed to look for contamination of operator's compartments, door handles, the office, walkways, storage area, yard vehicles and other frequented areas and determine if contamination has migrated from the landfill. In addition, equipment that is to be removed from the Restricted Area shall be surveyed for contamination of the undercarriage, ground engaging tools, engine compartments, exterior and other areas. If contamination is noted, the equipment must be decontaminated prior to removal from the Restricted Area.

10.3. Air Monitoring

Since the licensee has determined that the activities are unlikely to generate an ALI of 10% of any required regulatory limit, air monitoring is not required (see Section 9.1.1 for additional information).

10.4. Instruments/Detection Devices

IHDS will utilize instruments for the detection of radiation with sufficient sensitivity to read background radiation levels. The instruments will generally be equipped with analog meters with increments of radiation levels reading in Micro REM and shall be capable of the scale of activity expected to be encountered. Detectors shall also be equipped and designed to measure radiation types expected to be encountered. The current list of Ludlum instruments readily available to IHDS are:

- Model 19. Reads in Micro rem/Hr
- Model 2221 Scaler Rate Meter. Reads in Counts per Minute (CPM) With a 2 by 2 scintillation detector and alpha/beta/gamma pancake detector.
- Model 2401-P. Reads in Milli R/Hr and CPM
- Model 193-6 with survey wand, reads in Micro Rem/Hr. with a 6 by 1 scintillation detector.

Instruments shall be calibrated regularly in accordance with manufactures recommendations.

10.5. Transportation

Exposure monitoring for the truck drivers and their equipment when transporting wastes above the 5 pCi/g ^{226}Ra & ^{228}Ra limit shall be conducted using a Geiger counter and in accordance with this Section 10. The monitoring shall include package monitoring. The package in this situation is the tub, tank, box or bed of the truck transporting the contaminated material. In addition to package monitoring, the truck frame, wheels, tires and cab will be monitored for contamination as described below.

10.5.1. Monitoring Schedule

For trucks/containers (package) loaded individually, Geiger counter exposure monitoring by properly trained survey personnel will occur each time the package is loaded. If package loading is occurring as part of the decontamination of land, the first five trucks loaded in any contamination area shall be surveyed. Then every fifth truck shall be surveyed: if the results of the survey of the first 5 trucks/containers remained below 500 micro rem/hr for the package survey; the truck cab shows only background levels of radiation and no contamination of the equipment is observed or measured on the frames, surfaces, tires and wheels of the vehicle. Observation includes visual observation of spillage from loading activities or tracking of contaminated

material from the wheels and tires of the truck. If 500 micro rem/hr is exceeded for the package, each truck load shall be checked.

After unloading and cleanout, each truck shall be surveyed for contamination by the facility prior to leaving the restricted area. If contamination is detected, decontamination shall continue until background readings are reached. If background readings are not attained, refer to Section 12.7 for additional decontamination information.

10.6. Load Inspection

Any truck that arrives at the facility properly placarded as a Class 7 radioactive material shall be immediately turned away from the facility. These materials do not meet acceptance criteria for the facility and present an exposure hazard.

Exposure monitoring for the scale operators (surveyor) evaluating wastes above the 5 pCi/g and equal to or below the 50 pCi/g ^{226}Ra & ^{228}Ra limit shall be conducted in accordance with Section 10.1 or in absence of a dosimeter program, a Geiger counter. The scale operator shall follow the procedures in Section 11 to avoid over exposure and obtain an accurate evaluation of the exposure. In accordance with the NCAD 33-10-04.2, worker exposures shall not exceed the TEDE of 5 Rems annually.

If the exposure monitoring of a loaded truck indicates that the radiation level 10 feet from the truck being monitored is at or below background, no further monitoring will be requiredMonitoring Schedule

For trucks/containers arriving at the facility, exposure monitoring by scale operator will occur each time truck/container arrives. If truck/container loading is occurring as part of the decontamination of land, the first five trucks/containers loaded in any contamination area of the project shall be surveyed. Then every fifth truck/container shall be surveyed, if the results of the survey of the first 5 trucks/containers remained below 500 micro rem/hr. If 500 micro rem/hr is exceeded, each truck/container load shall be checked.

10.7. Unloading Trucks

Except as provided in Section 10.1, exposure monitoring for equipment operators and laborers, where the potential exists that wastes are above the5 pCi/g and equal to or below the 50 pCi/g ^{226}Ra & ^{228}Ra limit, shall be conducted using a Geiger counter. Except as provided in Section 10.1, if the exposure monitoring of a waste indicates that the radiation level exceeds 750 micro rem/h[1] the operator and his assistant(s) shall obtain a dosimeter(s) to record their actual exposure. This lower threshold for equipment operators is due to the more intimate relationship potential of the task.

[1] The calculations in this section, to determine this value, are based on the individuals' exposure at the specified level for 12 hours per day, 6 days per week, 52 weeks per year. In the case of the 750 micro rem/r exposure, this equates to 2.81 rem/yr. At 1300 micro rem/h the calculation is 4.87 rem/yr. These are below the TEDE, exclusive of background radiation, as required by regulations with adequate safety factor. Equipment operators are assumed to have a longer relationship with the waste than the shorter relationship of the scale operator. The general population would only have a deci-fraction of the exposure time to the waste as well as a considerable distance, therefore keeping their exposure well below 0.1 rem/yr.

10.7.1. Monitoring Schedule

Incoming trucks/containers are monitored at the scale in accordance with Section 0. Each truck/container shall be surveyed for contamination prior to leaving the restricted area.

10.8. Waste Placement

Except as provided in Section 10.1. exposure monitoring for the operators, where the potential exists that wastes are above the 5 pCi/g limit, shall be conducted using a Geiger counter. The operators shall follow the procedures and protections described in Section 11 to avoid over or inadvertent exposure and obtain an accurate evaluation of the exposure.

Except as provided in Section 10.1, if the exposure monitoring of a waste indicates that the radiation level exceeds 1300 micro rem/h, then the operator shall obtain a dosimeter(s) to record their actual exposure.

10.8.1. Monitoring Schedule

Except as provided in Section 10.1, in addition to monitoring described above for customer intake, monitoring for exposure levels shall take place a minimum of once per day for the equipment and operators in the restricted zone. When TENORM waste is exposed, operators shall survey themselves for contamination prior to leaving the restricted area for breaks or at the end of their shift. If contamination is found, the employee must be decontaminated in accordance with Section 12.7 prior to leaving the restricted area.

10.9. Equipment Repair

Equipment used to place waste shall be removed from the TENORM disposal area and decontaminated prior to maintenance and repair. If it is not possible to remove the equipment from the Restricted Area, the same exposure monitoring as listed in the previous paragraph shall apply, except that the technician completing the repair or maintenance shall be required to don PPE to protect from dust and contact exposure in accordance with Section 11.2, if monitoring indicates that radiation levels are in excess of background.

10.10. Area Surveys

IHD shall monitor areas of the facility with a Geiger counter on a weekly schedule during weeks that TENORM waste is accepted. Items to be checked include operator's compartments, door handles, the office, walkways, storage area, yard vehicles, the scale, the closest property line to the disposal area and the landfill working face. Scheduling shall be increased or decreased based on the results of the last several surveys. Surveys shall be documented.

10.11. Personnel Dosimeter Program

Each employee required to wear a dosimeter will be issued an Dosimeter badge that will be clipped to the outer clothing in the major trunk area (upper pocket on coveralls is a good spot). A thermoluminescent dosimeter (TLD) badge will be assigned to each employee personally and they will be responsible to retrieve it and return it each day from its assigned location. It is imperative that each employee only uses their own badge and never that of another employee. Badges will be sent in for testing once every three months and the employee will be issued a new badge at that time. Geiger counter monitoring/surveys described above, shall not be discontinued when dosimetry is used.

Dosimeter monitoring in accordance with this Section shall be continual for the employees while in the restricted zone and for the Scale Operator (surveyor), when dosimetry monitoring is required.

Landauer-located at Science Road, Glenwood, Illinois 60425; Telephone: (708)755-7000; Toll Free: (800)323-8830; Facsimile: (708) 755-7016 or other qualified company will be hired to supply personal dosimeters for workers at IHDS. Badges are returned to the company quarterly for testing and results for each worker will be provided in a report supplied to IHDS by Sierra Dosimetry or other qualified company. Any employee who comes close to 1.25 rem of exposure in a quarter will be removed from work in radiation exposure areas to ensure they remain under the 5 rem per year, level allowed by OSHA.

The RSO will review reports each quarter when they are received and will deal with any issues that may arise in the reports. Once a year the RSO will prepare a report summarizing the total yearly exposure to employees and will submit it to management for their information. This report will be filed and will be made available to monitoring agencies if they require the information.

11. Operational Procedures

IHDS shall conduct operations with TENORM so that individual members of the public will not exceed 0.1 rem in TEDE in a year, exclusive of the dose contributions from background radiation, from all licensed (inclusive of IHDS's operations) or registered sources of radiation, including TENORM. Doses from inhalation of indoor radon and its short half-life (less than one hour) progeny shall not be included in calculations of the TEDE, except when the dose is due to releases from licensed operations involving the handling or processing of TENORM.

Operations shall be conducted in accordance with the exposure and monitoring requirements identified in Section 10 of this document. This monitoring will confirm that operational procedures utilized will have met the regulatory exposure limits described above. Failures of the exposure limitations, if any, will result in modification to the operational procedures to obtain passing results.

The requirements of this Section apply to all of the tasks associated with transportation and disposal of wastes described in this document. Some but not all of these tasks include:

- Truck driving
- Equipment operation
- Shoveling
- Scale operations
- Administrative functions
- Traffic control
- Supervision
- And equipment repair

11.1. Administrative Controls

As previously discussed, the goal for companies is to utilize an ALARA Principle approach to these activities. ALARA is not intended to remove all exposure. The only way to do that would be to quarantine the materials forever. This just is not practical. However there are things that can be done to minimize the exposure up front.

First and foremost, do not spend idle time around the contaminated land, structures, or containerized loads. Do not hang around, sit or lean on equipment that has been used to handle the material. Gloves should be used to mount and dismount the equipment and not be worn to operate the equipment or handle tools or other items or complete other tasks. It is recommended that disposable gloves are kept in the cab to use to mount and dismount the equipment.

Breaks shall not be taken in the equipment or landfill. Food shall not be kept in the machine. Open top drinks such as cans, coffee cups and the like shall not be kept or used in the equipment or landfill. Employees shall survey themselves for contamination prior to leaving the Restricted Area. Immediately after leaving the landfill and prior to eating, employees must wash their hands and face to avoid ingestion of contaminated materials. Clean shoes and boots prior to leaving the Restricted Area: this may require use of overshoes.

Except for truck drivers that remain within their vehicle, employees working in the Restricted Area should be 40 hour HazWoper trained and familiar with the concepts of contamination, hot zones, safe zones and decontamination as described in Section 13. When moving from the Restricted Area, take time to set up for and decontaminate equipment and personnel prior to crossover from the Restricted Area to other areas of the landfill, as the job and conditions warrant.

Equipment operators and truck drivers should remain in their equipment while in the Restricted Area, with their doors and windows closed. The trucks should be decontaminated of spillage or dusts prior to leaving the landfill. Trucks and equipment at the site should have cab filters for the cabin air that are removed and disposed of on a regular basis.

Except where absolutely required, hand labor should not be used to handle contaminated materials. Use equipment wherever possible. When cleaning undercarriages or decontaminating equipment, the work should be completed while the waste is wet. If dust will be generated, wear appropriate PPE in accordance with Section 11.2.

As required, the Restricted Area should be treated with water, leachate or mixtures designed to eliminate dust as the waste is unloaded and covered.

Individuals that have had a medical treatment that results in the residual radioactive material to remain in the body after a procedure or treatment shall not be allowed to work in facility areas where the radiation levels are elevated. The RSO shall evaluate the individual's ability to return to elevated radiation areas by determining if the medical exposure combined with the work exposure presents an opportunity for the individual to exceed the OSHA exposure limits.

11.2. PPE

Tasks or activities shall be evaluated by the RSO for the need to utilize PPE. If it is determined that PPE should be utilized that is in excess of the standard requirements under company policy, for work on sites that are not contaminated, IHDS health and safety requirements shall be in accordance with OSHA requirements. OSHA Hazardous Waste Operations and Emergency Response (HazWoper) 1910.120 training is described in Section 13 of this document. PPE shall be utilized in accordance with these requirements should they apply.

PPE required, in addition to the standard safety toed boots, hard hat, gloves and safety glasses, could include: tyvek suits, disposable gloves, overshoes and respirators. This is particularly true for equipment repair and maintenance activities where the equipment cannot be decontaminated appropriately. The outer items of PPE shall not be taken home with an employee, unless first decontaminated in the decontamination area at the site in accordance with OSHA Regulations. Furthermore, employees should wash their hands and face or other exposed areas prior to leaving the site and be surveyed for contamination.

11.3. Truck Unloading

Where truck unloading operations are taking place, drivers shall not assist in the handling, unloading or un-packaging of the waste other than to operate the truck controls from inside the cab of the truck. Drivers shall inspect their truck for residual contamination prior to exiting the landfill and if found coordinate with the landfill operator to clean the contamination. Drivers shall not pull their trailers through or drive their truck through the deposited waste. Unloading should not take place where the operation of a truck would track contaminated material from the site.

Where bulk material exceeding 10 pCi/g is loaded into a truck for transport to the landfill it is suggested that a plastic liner be utilized to prevent contamination of the trailer/truck body and ease decontamination procedures.

The waste shall not be un-tarped until ready to be unloaded; or in the case of containerized waste, shall remain in the container when placed in the landfill.

Unloading should be arranged to keep equipment and truck cabs upwind from the loading operations. All reasonable options to minimize dust shall be taken. If the material appears to be dry and will result in formation of a dust cloud, water mist and watering of the load can be utilized to prevent air transport.

11.4. Weather

Unloading of TENORM waste shall not take place during adverse weather events. These events can include heavy rain, high winds and heavy snow. Unloading operations shall not take place where the wind would cause a dust plume from properly wetted wastes to leave the TENORM area. This in general would be any unprotected winds in excess of 20 miles per hour (MPH). Ground conditions shall be such that tracking of waste off the landfill will not occur as described above. TENORM wastes shall not be transported on excessively slippery or icy roads to avoid an incident that would trigger an emergency response as the result of load spillage.

11.5. Waste Reduction and Quality Assurance

Operating and emergency procedures, including procedures for waste reduction and quality assurance of items released for unrestricted use shall include:

- Minimization of waste spillage or tracking onto uncontaminated areas during unloading and load inspection.
- Immediate cleanup of inadvertent spills to reduce tracking of the waste.
- Protection of equipment from permanent contamination resulting in it being discarded.
- Equipment and personnel decontamination
- Monitoring and scanning equipment and personnel prior to leaving the site.

11.6. Shipping Papers and Placarding

Each container or shipment of TENORM waste shall be labeled or manifested with the following information prior to arriving at the landfill:

- Name and address of generator and physical address of the location the waste originated from, if different.
- IHDS's name, address, phone number and radioactive materials license number.
- If transported for disposal, the name, address, and phone number of the disposal facility.
- Type of material (e.g., sludge, scale, dirt, scrap metal, et cetera).
- The total quantity of all TENORM waste by units of weight in tons or cubic yards and the number and type of containers.
- Date stored if for storage.

11.6.1. Manifesting

The licensee shall:

- Sign and date the manifest upon initial acceptance of the waste material;
- Obtain the signature of the waste generator;
- Obtain the signature of the initial transporter and date of the acceptance of the manifest from the generator;
- Retain one copy of the manifest for a period of not less than 3 years;
- Provide the initial transporter the remaining copies of the manifest; and
- Provide a fully signed copy of the manifest to the generator and transporter within forty-five days from the delivery to the initial transporter.

11.6.2. Certification

The following certification must appear on the manifest and be signed and dated by the generator as follows (NDAC 33-10-23-08 (5)):

"I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport according to applicable international and national government regulations."

11.7. Transfer and storage of waste for disposal

IHDS shall manage, transport and dispose of wastes containing TENORM in accordance with NDAC 33-10-23.08 which in part requires:

- Transfer of the wastes for storage, treatment, or disposal to a facility authorized to accept wastes containing TENORM by the department or other applicable state or federal agency;
- Transfer for disposal in another state as otherwise approved by the applicable governmental authority; or
- Transfer in accordance with alternate methods authorized by the department or other applicable state or federal agency.
- TENORM waste shall be kept in a leak-proof container.
- The licensee shall use a container made of, or lined with, materials that will not react with, or be incompatible with the TENORM waste to be stored so that the ability of the container to contain the waste is not impaired or compromised.
- If TENORM waste is containerized and stored in an unrestricted zone beyond a one shift time period and is not in transit to a disposal facility. The container shall be marked TENORM and include the Geiger counter reading at the surface of the outside of the sealed container. The label shall also include the date, time and Generator of the waste.
- A container containing TENORM waste shall always be closed and sealed during storage or while in transport, except when it is necessary to add or remove waste.
- A container containing TENORM waste shall not be opened, handled, or stored in a manner that may rupture the container or cause it to leak.
- At least quarterly, the licensee shall inspect areas where containers of TENORM waste are stored, looking for leaking or deteriorating containers or containment systems.
- All containers of TENORM waste shall be stacked in such a manner that each container identification label can be read from the access aisle or area.

11.7.1. Disposal Facilities

In the unlikely event that IHDS receives and unloads TENORM waste, where the total ^{226}Radium and ^{228}Radium exceeds the acceptance level in North Dakota, the following disposal facilities can be utilized as appropriate:

- US Ecology in Great Falls, Idaho.
- Clean Harbors in Dear Trail, Colorado

12. Contingency Planning/Emergency Response

The radiation levels and relatively solid nature of the material that is expected to be handled under this program presents very low risk to the environment or people exposed should an incident occur. NDAC 33-10-03.1-01 adopts sections of the 10 Code of Federal Regulations (CFR) including: **10 CFR § 30.72 Schedule C--Quantities of radioactive materials requiring consideration of the need for an emergency plan for responding to a release.** This states that quantities of radiation less than 100 curies are exempt from such planning. However, Landfill disposal of TENORM wastes will eventually exceed this limit.

IHDS affiliated company JMAC Resources, Inc. maintains a spill response unit and trailer for the purposes of responding to a spill. JMAC is licensed for “decontamination of land” related to radioactive materials and could respond to a spill that occurs outside of the landfill property.

All incidents described or that otherwise occur in the course of the operations of the company under this program, will require thorough investigation and determination of the cause. The results of the investigation may warrant modification of this Program.

Should an incident occur related to TENORM materials accepted for disposal, the procedures in this section shall be coordinated with IHDS normal Contingency Action Plan as is currently on file at the facility.

12.1. Spill reporting

Spill reporting to the North Dakota Department of Health is required as soon as the situation permits and after all emergency actions have been put into motion. This includes spills:

- That threaten or affect Waters of the State;
- Occur off the property;
- Occur on portions of the property that are not within the landfill cells.

Spill reporting as soon as possible but no later than 12 hours after the incident, is required to the Federal Department of Transportation National Response Center for incidents that occur on DOT (includes pipelines and other) rights of way and result in:

- A person is killed;
- A person receives an injury requiring admittance to a hospital;
- The general public is evacuated for one hour or more;
- One or more major transportation arteries or facilities are closed for one hour or more;
- The operational flight plan or routine of an aircraft is altered;
- Fire, breakage, spillage or suspected radioactive contamination occurs involving a radioactive material;
- Fire, breakage, spillage or suspected contamination occurs involving an infectious substance other than a diagnostic specimen or regulated medical waste;
- There is a release of a marine pollutant in a quantity exceeding 450 liters (119) gallons for liquids or 400 kilograms (882 pounds) for solids; or
- A situation exists of such a nature that in the judgment of the person in possession of the hazardous material, it should be reported to DOT's National Response Center even though it does not meet the above criteria.

You may decide that the situation should be reported even though it does not meet any of the above criteria. Make sure that you request the National Response Center report number when you make your telephonic report.

12.2. Emergency Numbers

Emergency Services	**911**
IHDS Safety Manager Joe Busch	(701) 570-9303
IHDS RSO Chris Kreger	(612) 840-5597
Alternate RSO Scott Roberts	(701) 339-1983

IHDS Manager Mark Masterson	(701) 580-7098
North Dakota Spill Reporting	**(701) 328-5210 or 5166**
North Dakota Radiation Control Emergency Reporting	**Business Hours: (701) 328-5188** **Non-Business Hours: (800) 472-2121**
Federal DOT National Response Center	**(800) 424-8802**

12.3. Accident

If an accident occurs at the job site call 911, a IHDS representative and report the spill if there is one. Should an individual be injured in the Restricted Area, attempt emergency decontamination prior to removal of the individual from the area only if the process will not result in additional injury: spinal injuries are of particular concern. Inform and help protect paramedics and rescuers from contamination and inadvertent exposure.

If the incident is automobile related keep members of the general public and traffic away from the scene. Do not allow vehicles or the public to drive through or walk across the waste if spilled. Attempt to control the migration of any spilled liquids from the incident site.

12.4. Fire

All equipment, trucks and company vehicles are to have fire extinguishers available and in working order. If the fire can be fought safely using extinguishers then proceed, if not evacuate the area of individuals that could be harmed and call 911. Keep the public away from the scene and out of the smoke plume. Be available to inform responders of the materials involved in the fire.

If a spill occurs follow the spill reporting and response procedures. Call an IHDS representative.

12.5. Spillage

In the event of a spill call an IHDS representative, and then attempt to contain the spill if needed through the use of spill kits or berms. Site materials or wastes may allow you to berm or otherwise block or slow the flow of material from the incident site. Report the spill to the North Dakota Spill Reporting number listed above if outside of the landfill cells or is a material not normally accepted at the facility or is a hazardous material. If the spill occurs where the federal or state DOT has jurisdiction it must also be reported to the National Response Center Hotline listed in Section 12.1. All spills reported to the Department of Health and the Federal DOT require follow-up reporting and confirmation of cleanup to each agency. IHDS will ensure that someone is following up with those reports and document the incident and scene.

If the spill is of the radioactive material, all the same precautions and PPE identified in Sections 8, 10 and 11 shall be used to contain and clean up the spill.

Spill cleanup shall be considered complete when the residual radiation levels in the soils, structures or roadways have met the regulatory limits for the appropriate jurisdiction. In North Dakota this level is considered to be 5pCi/g combined ^{226}Ra and ^{228}Ra or less excluding backgroundor in the case of structure surface or equipment contamination, as described in Section 12.7.

12.6. Personnel Exposure

If there is reason to believe that an individual has been exposed in a manner not planned for or intended; or that is likely to exceed the exposure limits identified in this program, then that individual shall be evaluated for the exposure. This evaluation shall be in the form of a Bioassay to determine the exposure to the individual and mitigate any further risks to the individual. The mitigation may include the modification of the individual's duties or routines to lower their further exposure.

12.7. Equipment Decontamination

Decontamination of all equipment, materials and employees must be completed before leaving or being released from the facility. Decontamination in general will involve the use of shovels, to clean the solid waste from the equipment, while wearing appropriate PPE. PPE selection and usage shall be the same as that chose for the primary project unless elevated risks as the result of the task are identified. Radiation surveys shall be made of the equipment, tools and PPE to determine if decontamination is complete. Decontamination is considered complete when the survey readings are no more than twice background CPM levels.For equipment decontamination, should shovel removal be insufficient, pressure washing may be required. If the equipment and materials are unable to be adequately decontaminated, it shall be discarded in the same manner as the waste as long as it meets NDAC 33-20-11-01 (2):

> Equipment contaminated with TENORM which does not exceed a maximum exposure level of one hundred microroentgen per hour, including background radiation, at any accessible location may be disposed in a landfill which complies with chapter 33-20-07.1 or chapter 33-20-10.

Equipment decontamination is considered complete when in compliance with the requirements of NDAC 33-10-23-26 (3.a):

> For surface contamination by alpha emitting nuclides, the average contamination level shall not exceed five thousand disintegrations per minute per one hundred square centimeters of surface area.

For removable contamination NDAC 33-10-23-26 (5.a) shall apply:

> For surface contamination by alpha emitting nuclides, the removable contamination shall not exceed one thousand disintegrations per minute per one hundred square centimeters of surface area.
>
> NOTE: The need for the correction of the contamination in CPM (counts per minute) to DPM (disintegrations per minute) is as follows:
>
> 1000 CPM = (1000 x factor for instrument efficiency correction typically 5.

The instructions for sampling for removable contamination are found in NDAC33-10-23-26 (5.d) and are as follows:

> The amount of removable radioactive material per one hundred square centimeters of surface area shall be determined by wiping that area with dry filter or soft absorbent paper, applying moderate

pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of surface area A (where A is less than one hundred square centimeters) is determined, the entire surface shall be wiped and the contamination level multiplied by the quantity [one hundred divided by A] to convert to a "per one hundred square centimeter" basis.

12.8. Personnel Decontamination

For personnel, decontamination is considered complete if a contamination survey indicates < twice background readings in CPM. Decontamination methods include washing exposed skin with soap and water. Do not use scrub brushes or other abrasive cleansers or cloths. If clothes are contaminated they must be washed or disposed of at the facility. Wash water shall be disposed through evaporation at the facility or through disposal at IHD Liquids Managment. If it is likely that clothing will become contaminated, use Tyvek coveralls or other disposable clothing and dispose in the TENORM disposal area. Boots may be brushed or washed off provided they can be < twice the local background in CPM using aGeiger pancake detector. Survey reading shall be taken in areas where background radiation is representative and after decontamination of the individual. The survey shall pay particular attention to the individual's hands and feet or shoes.

13. Training

Employee training shall be completed to educate employees on the concepts, principles and requirements described in this Program and as may be required by the applicable regulations. The level of education and description of the content is described below:

13.1. RSO Non-Transportation

Except for licenses exclusive to the transport of TENORM waste, the Department's general license requires an individual fulfilling the responsibilities of the Radiation Safety Officer, as provided in NDAC 33-10-23-28, to be an individual who has completed a Department approved training program consisting of:

Forty hours of classroom training in the following areas:

- Characteristics of radiation;
- Units of radiation dose and quantity of radioactivity;
- Hazards of exposure to radiation;
- Radiation detection and measurement;
- Minimizing radiation exposure (time, distance, shielding, and respiratory precautions);
- Use and types of personnel-monitoring equipment;
- Proper use of protective equipment; and
- Transportation of licensed material.

13.2. RSO Transportation

For licenses exclusive to the transport of TENORM waste, IHDS shall require an individual fulfilling the responsibilities of the Radiation Safety Officer to be an individual who has completed a Department approved training program consisting of:

Eight hours of classroom training in the following areas:

- Characteristics of radiation;
- Units of radiation dose and quantity of radioactivity;
- Hazards of exposure to radiation;
- Radiation detection and measurement;
- Minimizing radiation exposure (time, distance, shielding, and respiratory precautions);
- Use and types of personnel-monitoring equipment;
- Proper use of protective equipment; and
- Transportation of licensed material.

13.3. Employee Training

All employees who work with TENORM wastes will receive a minimum of 4 hours of classroom and practical training in radiation safety from the company RSO. Items to be covered during this training include:

- Characteristics of radiation;
- Hazards of exposure to radiation;
- Radiation detection and measurement;
- Minimizing radiation exposure through administrative controls
- Use and types of personnel-monitoring equipment;
- Decontamination
- Proper use of PPE; and
- Transportation of licensed material.

In addition, NDAC 33-20-11-06 also requires that employees be trained in and receive the following information:

> (a) All individuals who in the course of employment are likely to receive in a year an occupational dose in excess of 100 mrem (1 mSv) shall be:
>
> (1) Kept informed of the storage, transfer, or use of radiation and/or radioactive material;
>
> (2) Instructed in the health protection problems associated with exposure to radiation and/or radioactive material, in precautions or procedures to minimize exposure, and in the purposes and functions of protective devices employed;
>
> (3) Instructed in, and required to observe, to the extent within the workers control, the applicable provisions of Commission regulations and licenses for the protection of personnel from exposure to radiation and/or radioactive material;
>
> (4) Instructed of their responsibility to report promptly to the licensee any condition which may lead to or cause a violation of Commission regulations and licenses or unnecessary exposure to radiation and/or radioactive material;

(5) Instructed in the appropriate response to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation and/or radioactive material; and

(6) Advised as to the radiation exposure reports which workers may request pursuant to § 19.13.

(b) In determining those individuals subject to the requirements of paragraph (a) of this section, licensees must take into consideration assigned activities during normal and abnormal situations involving exposure to radiation and/or radioactive material which can reasonably be expected to occur during the life of a licensed facility. The extent of these instructions must be commensurate with potential radiological health protection problems present in the work place.

[60 FR 36043, July 13, 1995]

13.3.1. Ancillary Personnel

Personnel who are employed by IHDS and who will have occasion to be on the facility or near the Restricted Area shall be provided with 1 hour awareness training from the Company RSO that includes:

- Characteristics of radiation;
- Hazards of exposure to radiation;
- Minimizing radiation exposure through administrative controls
- Use and types of personnel-monitoring equipment;

13.3.2. HazWoper

IHDS shall provide HazWoper training to employees involved in disposal operations. The Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) apply to five distinct groups of employers and their employees. This includes any employees who are exposed or potentially exposed to hazardous substances -- including hazardous waste -- and who are engaged in one of the following operations as specified by 29 CFR 1910.120(a)(1)(i-v) and 1926.65(a)(1)(i-v):

- clean-up operations -- required by a governmental body, whether federal, state, local, or other involving hazardous substances -- that are conducted at uncontrolled hazardous waste sites;
- corrective actions involving clean-up operations at sites covered by the **Resource Conservation and Recovery Act of 1976 (RCRA)** as amended (42 U.S.C. 6901 et seq.);
- voluntary clean-up operations at sites recognized by federal, state, local, or other governmental body as uncontrolled hazardous waste sites;
- operations involving hazardous wastes that are conducted at treatment, storage, and disposal facilities regulated by **Title 40 Code of Federal Regulations** Parts 264 and 265 pursuant to RCRA, or by agencies under agreement with U.S. Environmental Protection Agency to implement RCRA regulations; and
- emergency response operations for releases of, or substantial threats of releases of, hazardous substances regardless of the location of the hazard.

14. Radiation Safety Officer Authority, Duties and Responsibilities

14.1. Responsibility

IHDS shall appoint a Radiation Safety Officer, who agrees, in writing, to be responsible for implementing the radiation protection program. IHDS through the Radiation Safety Officer shall ensure that radiation safety activities are being performed in accordance with IHDS-approved procedures and regulatory requirements.

The Radiation Safety Officer is responsible for recommending or approving corrective actions, identifying radiation safety problems, initiating action, and ensuring compliance with regulations. The RSO shall be adequately trained by certification, experience or other educational qualification to carry out its duties and responsibilities for the anticipated level and volume of TENORM radiation containing material handled by the facility.

The responsibilities of the RSO may not be transferred to other individuals. Many tasks and duties associated with managing the program may be assigned or delegated to other qualified individuals; however, the responsibility for these tasks and duties remains with the RSO. NRC recognizes that a qualified individual will on occasion fill in for the RSO when the RSO is away for short periods of time, e.g. professional conferences, vacation, illness, etc. Absences that have a major impact on licensed activities should not occur for extended or indefinite periods of time. The information in this section is in general conformance with NEUREG 1556.

14.2. Authority

IHDS shall provide the Radiation Safety Officer sufficient authority, organizational freedom, time, resources, and management prerogative, to:

- Stop unsafe operations;
- Train employees and personnel working with the licensed materials.
- Identify radiation safety problems;
- Initiate, recommend, or provide corrective actions, and;
- Carry out the duties described below.

14.3. Duties

- Annual review of the radiation safety program for adherence to ALARA (as low as reasonably achievable) concepts.
- Quarterly review of occupational exposures. The RSO will review at least quarterly, external radiation exposures of authorized users and workers to determine that their exposures are ALARA.
- Quarterly review of records of radiation level surveys. The RSO will review radiation levels in unrestricted and restricted areas to determine that they were at ALARA levels during the previous quarter.
- Verify implementation of corrective actions.
- Development, distribution, implementation, and maintenance of up-to-date operating and emergency procedures;
- Control and direct disposal operations.
- Ensure proper records are maintained.

- Documentation is maintained to demonstrate, by measurement or calculation, that the total effective dose equivalent to the individual member of the public that is likely to receive the highest dose from the licensed operation does not exceed the annual limit for members of the public;
- Proper authorities are notified of incidents such as damage to loss of licensed material, accidents resulting in spills of licensed materials, fire, theft, etc.;
- Unusual occurrences are investigated, cause(s) and appropriate corrective action(s) are identified, and timely corrective action(s) are taken;
- Radiation safety program audits are performed and documented at least annually;
- When the licensee identifies violations of NDDH requirements or program weaknesses, the licensee develops, implements, and documents corrective actions;
- Licensed material is transported in accordance with all applicable DOT requirements;
- Up-to-date license is maintained and amendment and renewal requests are submitted in a timely manner;
- Monitoring and surveys of all areas in which radioactive material is used;
- Implementing personnel monitoring program, including determining the need for and evaluating bioassays, monitoring personnel exposure records, and developing corrective actions for those exposures approaching maximum permissible limits;
- Effluent monitoring;
- Overseeing decontamination activities;
- Investigating any incidents and responding to any emergencies;
- Serving as a point of contact for NDDH's and licensee's management during routine operations, emergencies, or incidents;

14.4. Educational Responsibility

- Training employee's in accordance with the RSP and NDDH regulations.
- The RSO will schedule briefings and educational sessions to inform workers of ALARA programs.
- The RSO will ensure that authorized users, workers, and ancillary personnel who may be exposed to radiation will be instructed in the ALARA philosophy and informed that the management and the RSO are committed to implementing the ALARA concept.

Records of actions taken relating to the activities and tasks described above must be kept for a minimum of five years. Records pertaining to individual employee health and exposures shall be maintained in accordance with IHD's Access to Medical Records policy.

15. Financial Assurance

Financial Assurance is governed by NDAC 33-10-03.1-01 and adopts **10 CFR § 30.35 Financial assurance and recordkeeping for decommissioning**. Paragraph D includes this table with a required calculation:

Greater than 10^4 but less than or equal to 10^5 times the applicable quantities of appendix B to part 30 in unsealed form. (For a combination of isotopes, if R, as defined in § 30.35(a)(1), divided by 10^4 is greater than 1 but R divided by 10^5 is less than or equal to 1.)	$1,125,000
Greater than 10^3 but less than or equal to 10^4 times the applicable quantities of appendix B to part 30 in unsealed form. (For a combination of isotopes, if R, as defined in § 30.35(a)(1), divided by 10^3 is greater than 1 but R divided by 10^4 is less than or equal to 1.)	225,000
Greater than 10^{10} but less than or equal to 10^{12} times the applicable quantities of appendix B to part 30 in sealed sources or plated foils. (For a combination of isotopes, if R, as defined in § 30.35(a)(1), divided by 10^{10} is greater than, 1, but R divided by 10^{12} is less than or equal to 1)	113,000

Based on input from the Department, IHDS believes the first scenario listed above is applicable to the IHDS. Appendix B shows Radium 226 at .01 micro curies. The calculation then is: 0.01 x 10^5 resulting in 1000 micro-curies. 30 net tons of waste (maximum potential load on a suitable truck) or one net truck load contains 60,000 pounds of material. There are 453.59237 grams in each imperial pound. The calculation of total curies in a load containing 50 pCi/g is 0.0013607771 curies. This equates to 1,360.7771 microcuries, which exceeds the limit and requires a decommissioning funding plan. Decommissioning of TENORM disposal facilities is limited to verification and possible cleanup of areas that may have become contaminated as the result of operations at the facility. However, the Department has specifically specified $1,125,000 as the financial assurance amount for IHDS.

A financial assurance amount of $1,125,000 is excessive compared to the actual potential cost to cleanup from the operations anticipated at the site. The cleanup scenario would include cleanup of access roads and assumes that TENORM waste had been scattered over a 16-acre area of the site. Waste would be placed in the landfill and the cost to cover the material is dealt with in the Financial Assurance under the solid waste rules. The following table depicts a highly overpriced version of this scenario:

Description	Unit	Number of Units	Cost	Extension
Mobilization	L.S.	1	$50,000	$50,000
Health and Safety items	L.S.	1	$50,000	$50,000
Soil Removal	C.Y.	5000	$10	$50,000
Soil replacement	C.Y.	6000	$25	$150,000
Seed and mulch	Acre	16	$3,000	$48,000
Silt Fence	L.F.	2000	$5	$10,000
Spill Supplies	L.S.	1	$4,000	$4,000
Pickup	Days	90	$500	$45,000
Materials and supplies	L.S.	1	$50,000	$50,000
EMS charges	L.S.	1	$20,000	$20,000
			Total	$477,000

The Department's requirements for financial assurance appear to be twice as high as required to properly take care of the decommissioning requirements.

IHDS shall establish a bond and standby trust fund to provide financial assurance should a specific License be issued. Copies of the example documents are in Attachment B.

16. Recordkeeping and Reporting

Records of inspections and RSO modifications to the protection requirements for the facility, shall be maintained by the IHDS for inspection by the Department for five years.

16.1. Facility Reporting

In addition to the facility reporting requirements under the solid waste rules and IHDS's permit, IHDS shall file with the Department a quarterly summary report stating the date, type and total quantity by weight in tons or cubic yards, generator and final disposal area of each TENORM load disposed of. Each report shall be filed within thirty days of the end of each quarter. If no transfers/disposal of TENORM occurred during the reporting period, the report must so indicate. Minimum requirements can be found in Attachment A.

16.2. Required Reporting to Employees

The North Dakota state form number 8414, "notice to employees", must be posted at the facility: it can be found at http://www.ndhealth.gov/AQ/RAD/forms/RCP1.pdf.

NDAC 33-20-11-06 requires certain information be properly reported to employees who work with TENORM. The regulation adopts 10 CFR Part 19 which states in part:

> (a) Radiation exposure data for an individual, and the results of any measurements, analyses, and calculations of radioactive material deposited or retained in the body of an individual, shall be reported to the individual as specified in this section. The information reported shall include data and results obtained pursuant to Commission regulations, orders or license conditions, as shown in records maintained by the licensee pursuant to Commission regulations. Each notification and report shall: be in writing; include appropriate identifying data such as the name of the licensee, the name of the individual, the individual's social security number; include the individual's exposure information; and contain the following statement:
>
> This report is furnished to you under the provisions of the Nuclear Regulatory Commission regulation 10 CFR part 19. You should preserve this report for further reference.
>
> (b) Each licensee shall make dose information available to workers as shown in records maintained by the licensee under the provisions of 10 CFR 20.2106. The licensee shall provide an annual report to each individual monitored under 10 CFR 20.1502 of the dose received in that monitoring year if:
>
> > (1) The individual's occupational dose exceeds 1 mSv (100 mrem) TEDE or 1 mSv (100 mrem) to any individual organ or tissue; or
> >
> > (2) The individual requests his or her annual dose report.

(c)(1) At the request of a worker formerly engaged in licensed activities controlled by the licensee, each licensee shall furnish to the worker a report of the worker's exposure to radiation and/or to radioactive material:

(i) As shown in records maintained by the licensee pursuant to § 20.2106 for each year the worker was required to be monitored under the provisions of § 20.1502; and

(ii) For each year the worker was required to be monitored under the monitoring requirements in effect prior to January 1, 1994.

(2) This report must be furnished within 30 days from the time the request is made or within 30 days after the exposure of the individual has been determined by the licensee, whichever is later. This report must cover the period of time that the worker's activities involved exposure to radiation from radioactive material licensed by the Commission and must include the dates and locations of licensed activities in which the worker participated during this period.

(d) When a licensee is required by §§ 20.2202, 20.2203 or 20.2204 of this chapter to report to the Commission any exposure of an individual to radiation or radioactive material, the licensee shall also provide the individual a report on his or her exposure data included in the report to the Commission. This report must be transmitted no later than the transmittal to the Commission.

(e) At the request of a worker who is terminating employment with the licensee that involved exposure to radiation or radioactive materials, during the current calendar quarter or the current year, each licensee shall provide at termination to each worker, or to the worker's designee, a written report regarding the radiation dose received by that worker from operations of the licensee during the current year or fraction thereof. If the most recent individual monitoring results are not available at that time, a written estimate of the dose must be provided together with a clear indication that this is an estimate.

References

wikipedia.com

whatis.com

osha.gov

nrc.gov

Lawrence Berkeley National Laboratory

Attachment A: TENORM Transportation Report

COMPANY NAME:	Type Name Here	License #		Year:	2016	Quarter:	1st Quarter Report	Version 1.3 - 4/28/2015

Manifest #	Collection Date	Pickup Location	Disposal Date	Disposal Location	Weight (lbs)	Physical Form	Concentration (pCi/gm)	Cubic Yards	Gallons

Attachment B: Financial Assurance Documents

STANDBY TRUST AGREEMENT

TRUST AGREEMENT, the Agreement entered into as of [*insert date*] by and between IHD Solids Management, LLC., a North Dakota Corporation, herein referred to as the "Grantor," and Heartland Trust Company, the "Trustee."

WHEREAS, the Department of Health ("Department"), an agency of the State of North Dakota, pursuant to the Century Code, Chapters 23-20 and 23-20.1, has promulgated rules in Article 33-10, Administrative Code, Chapter 33-10-03.1. These rules, applicable to the Grantor, require that a holder of, or an applicant for, a materials license issued pursuant to Chapter 33-10-03.1 provide assurance that funds will be available when needed for required decommissioning activities.

WHEREAS, the Grantor has elected to use a surety bond to provide all of such financial assurance for the facilities identified herein; and

WHEREAS, when payment is made under a surety bond, this standby trust shall be used for the receipt of such payment; and

WHEREAS, the Grantor, acting through its duly authorized officers, has selected the Trustee to be the trustee under this Agreement, and the Trustee is willing to act as trustee;

NOW, THEREFORE, the Grantor and the Trustee agree as follows:

Section 1. Definitions. As used in this Agreement:

(a) The term "Grantor" means the Department licensee who enters into this Agreement and any successors or assigns of the Grantor.

(b) The term "Trustee" means the trustee who enters into this Agreement and any successor trustee.

Section 2. Costs of Decommissioning. This Agreement pertains to the costs of decommissioning the materials and activities identified in License Number 33-51718-01 issued pursuant to 33-10-03.1, as shown in Schedule A.

Section 3. Establishment of Fund. The Grantor and the Trustee hereby establish a standby trust fund (the Fund) for the benefit of the Department. The Grantor and the Trustee intend that no third party shall have access to the Fund except as provided herein.

Section 4. Payments Constituting the Fund. Payments made to the Trustee for the Fund shall consist of cash, securities, or other liquid assets acceptable to the Trustee. The Fund is established initially as consisting of the property, which is acceptable to the Trustee, described in Schedule B attached hereto. Such property and any other property subsequently transferred to the Trustee are referred to as the "Fund," together with all earnings and profits thereon, less any payments or distributions made by the Trustee pursuant to this Agreement. The Fund shall be held by the Trustee, IN TRUST, as hereinafter provided. The Trustee shall not be responsible nor shall it undertake any responsibility for the amount of,

or adequacy of the Fund, nor any duty to collect from the Grantor, any payments necessary to discharge any liabilities of the Grantor established by the Department.

Section 5. Payment for Required Activities Specified in the Plan. The Trustee shall make payments from the Fund to the Grantor upon presentation to the Trustee of the following:

(a) A certificate duly executed by the Secretary of the Grantor attesting to the occurrence of the events, and in the form set forth in the attached Certificate of Events, and

(b) A certificate attesting to the following conditions:

(1) that decommissioning is proceeding pursuant to a Department-approved plan;

(2) that the funds withdrawn will be expended for activities undertaken pursuant to that plan; and

(3) that the Department has been given 30 days prior notice of Grantors's intent to withdraw funds from the trust fund.

No withdrawal from the Fund can be made unless the Department's written approval is attached.

In addition, the Trustee shall make payments from the Fund as the Department shall direct, in writing, to provide for the payment of the costs of required activities covered by this Agreement. The Trustee shall reimburse the Grantor or other persons as specified by the Department from the Fund for expenditures for required activities in such amounts as the Department shall direct in writing. In addition, the Trustee shall refund to the Grantor such amounts as the Department specifies in writing. Upon refund, such funds shall no longer constitute part of the Fund as defined herein.

Section 6. Trust Management. The Trustee shall invest and reinvest the principal and income of the Fund and keep the Fund invested as a single fund, without distinction between principal and income, in accordance with general investment policies and guidelines which the Grantor may communicate in writing to the Trustee from time to time, subject, however, to the provisions of this section. In investing, reinvesting, exchanging, selling, and managing the Fund, the Trustee shall discharge its duties with respect to the Fund solely in the interest of the beneficiary and with the care, skill, prudence and diligence under the circumstances then prevailing which persons of prudence, acting in a like capacity and familiar with such matters, would use in the conduct of an enterprise of a like character and with like aims, except that:

(a) Securities or other obligations of the Grantor, or any other owner or operator of the facilities, or any of their affiliates as defined in the Investment Company Act of 1940, as amended (15 U.S.C. 80a-2(a)), shall not be acquired or held, unless they are securities or other obligations of the Federal or a State government;

(b) The Trustee is authorized to invest the Fund in time or demand deposits of the Trustee, to

the extent insured by an agency of the Federal government, and in obligations of the Federal government such as GNMA, FNMA, and FHLM bonds and certificates or State and Municipal bonds rated BBB or higher by Standard & Poor's or Baa or higher by Moody's Investment Services; and

(c) For a reasonable time, not to exceed 60 days, the Trustee is authorized to hold uninvested cash, awaiting investment or distribution, without liability for the payment of interest thereon.

Section 7. Commingling and Investment. The Trustee is expressly authorized in its discretion:

(a) To transfer from time to time any or all of the assets of the Fund to any common, commingled, or collective trust fund created by the Trustee in which the Fund is eligible to participate, subject to all of the provisions thereof, to be commingled with the assets of other trusts participating therein; and

(b) To purchase shares in any investment company registered under the Investment Company Act of 1940 (15 U.S.C. 80a-1 et seq.), including one that may be created, managed, underwritten, or to which investment advice is rendered, or the shares of which are sold by the Trustee. The Trustee may vote such shares in its discretion.

Section 8. Express Powers of Trustee. Without in any way limiting the powers and discretion conferred upon the Trustee by the other provisions of this Agreement or by law, the Trustee is expressly authorized and empowered:

(a) To sell, exchange, convey, transfer, or otherwise dispose of any property held by it, by public or private sale, as necessary to allow duly authorized withdrawals at the joint request of the Grantor and the Department or to reinvest in securities at the direction of the Grantor;

(b) To make, execute, acknowledge, and deliver any and all documents of transfer and conveyance and any and all other instruments that may be necessary or appropriate to carry out the powers herein granted;

(c) To register any securities held in the Fund in its own name, or in the name of a nominee, and to hold any security in bearer form or in book entry, or to combine certificates representing such securities with certificates of the same issue held by the Trustee in other fiduciary capacities, to reinvest interest payments and funds from matured and redeemed instruments, to file proper forms concerning securities held in the Fund in a timely fashion with appropriate government agencies, or to deposit or arrange for the deposit of such securities in a qualified central depository even though, when so deposited, such securities may be merged and held in bulk in the name of the nominee or such depository with other securities deposited therein by another person, or to deposit or arrange for the deposit of any securities issued by the U.S. Government, or any agency or instrumentality thereof, with a Federal Reserve Bank, but the books and records of the Trustee shall at all times show that all such securities are part of the Fund;

(d) To deposit any cash in the Fund in interest-bearing accounts maintained or savings certificates issued by the Trustee, in its separate corporate capacity, or in any other banking institution affiliated with the Trustee, to the extent insured by an agency of the Federal government; and

(e) To compromise or otherwise adjust all claims in favor of or against the Fund.

Section 9. Taxes and Expenses. All taxes of any kind that may be assessed or levied against or

in respect of the Fund and all brokerage commissions incurred by the Fund shall be paid from the Fund. All other expenses incurred by the Trustee in connection with the administration of this Trust, including fees for legal services rendered to the Trustee, the compensation of the Trustee to the extent not paid directly by the Grantor, and all other proper charges and disbursements of the Trustee shall be paid from the Fund.

Section 10. Annual Valuation. After payment has been made into this standby trust fund, the Trustee shall annually, at least 30 days before the anniversary date of receipt of payment into the standby trust fund, furnish to the Grantor and to the Department a statement confirming the value of the Trust. Any securities in the Fund shall be valued at market value as of no more than 60 days before the anniversary date of the establishment of the Fund. The failure of the Grantor to object in writing to the Trustee within 90 days after the statement has been furnished to the Grantor and the Department shall constitute a conclusively binding assent by the Grantor, barring the Grantor from asserting any claim or liability against the Trustee with respect to the matters disclosed in the statement.

Section 11. Advice of Counsel. The Trustee may from time to time consult with counsel with respect to any question arising as to the construction of this Agreement or any action to be taken hereunder. The Trustee shall be fully protected, to the extent permitted by law, in acting on the advice of counsel.

Section 12. Trustee Compensation. The Trustee shall be entitled to reasonable compensation for its services as agreed upon in writing with the Grantor. (See Schedule C.)

Section 13. Successor Trustee. Upon 90 days notice to the Department and the Grantor, the Trustee may resign; upon 90 days notice to the Department and the Trustee, the Grantor may replace the Trustee, but such resignation or replacement shall not be effective until the Grantor has appointed a successor Trustee, the successor accepts the appointment, the successor is ready to assume its duties as trustee, and the Department has agreed, in writing, that the successor is an appropriate Federal or State government agency or an entity that has the authority to act as a trustee and whose trust operations are regulated and examined by a Federal or State agency. The successor Trustee shall have the same powers and duties as those conferred upon the Trustee hereunder. When the resignation or replacement is effective, the Trustee shall assign, transfer, and pay over to the successor Trustee the funds and properties then constituting the Fund. If for any reason the Grantor cannot or does not act in the event of the resignation of the Trustee, the Trustee may apply to a court of competent jurisdiction for the appointment of a successor Trustee or for instructions. The successor Trustee shall specify the date on which it assumes administration of the trust, in a writing sent to the Grantor, the Department, and the present Trustee, by certified mail 10 days before such change becomes effective. Any expenses incurred by the Trustee as a result of any of the acts contemplated by this section shall be paid as provided in Section 9.

Section 14. Instructions to the Trustee. All orders, requests, and instructions by the Grantor to the Trustee shall be in writing, signed by such persons as are signatories to this Agreement or such other designees as the Grantor may designate in writing. The Trustee shall be fully protected in acting without inquiry in accordance with the Grantor's orders, requests, and instructions. If the Department issues orders, requests, or instructions to the Trustee, these shall be in writing, signed by the Department or its designees, and the Trustee shall act and shall be fully protected in acting in accordance with such orders, requests, and instructions. The Trustee shall have the right to assume, in the absence of written notice to the contrary, that no event constituting a change or a termination of the authority of any person to act on behalf of the Grantor or the Department hereunder has occurred. The Trustee shall have no duty to act in the absence of such orders, requests, and instructions from the Grantor and/or the Department, except as provided for herein.

Section 15. Amendment of Agreement. This Agreement may be amended by an instrument in writing executed by the Grantor, the Trustee, and the Department, or by the Trustee and the Department if the

Grantor ceases to exist. All amendments shall meet the relevant regulatory requirements of the Department.

Section 16. Irrevocability and Termination. Subject to the right of the parties to amend this Agreement as provided in Section 15, this trust shall be irrevocable and shall continue until terminated at the written agreement of the Grantor, the Trustee, and the Department, or by the Trustee and the Department if the Grantor ceases to exist. Upon termination of the trust, all remaining trust property, less final trust administration expenses, shall be delivered to the Grantor or its successor.

Section 17. Immunity and Indemnification. The Trustee shall not incur personal liability of any nature in connection with any act or omission, made in good faith, in the administration of this trust, or in carrying out any directions by the Grantor or the Department issued in accordance with this Agreement. The Trustee shall be indemnified and saved harmless by the Grantor or from the trust fund, or both, from and against any personal liability to which the Trustee may be subjected by reason of any act or conduct in its official capacity, including all expenses reasonably incurred in its defense in the event the Grantor fails to provide such defense.

Section 18. This Agreement shall be administered, construed, and enforced according to the laws of the State of North Dakota.

Section 19. Interpretation and Severability. As used in this Agreement, words in the singular include the plural and words in the plural include the singular. The descriptive headings for each section of this Agreement shall not affect the interpretation or the legal efficacy of this Agreement. If any part of this Agreement is invalid, it shall not affect the remaining provisions which will remain valid and enforceable.

IN WITNESS WHEREOF the parties have caused this Agreement to be executed by the respective officers duly authorized and the incorporate seals to be hereunto affixed and attested as of the date first written above.

IHD Solids Management, LLC

_____

By: Joey Dale
Title: Secretary/Treasurer

[*Corporate Seal*]

Heartland Trust Company

_____

By: [*Insert name of representative of Trustee*]
Title:

[*Corporate Seal*]

ACKNOWLEDGEMENT OF GRANTOR (if an Individual)

STATE OF)
) ss.
COUNTY OF)

This instrument was acknowledged before me on _____ [date] by _____ [*name of individual*].

_____ (*Seal*)
Notary Public
My Commission Expires: _____

ACKNOWLEDGEMENT OF GRANTOR (if a Business Entity)

STATE OF)
) ss.
COUNTY OF)

This instrument was acknowledged before me on _____ [*date*] by _____ [*name of individual*], the _____ [*type of authority, such as officer*] of _____ [*name of party on behalf of whom record was executed*], on behalf of the [*type of business entity*].

_____ (*Seal*)
Notary Public
My Commission Expires: _____

ACKNOWLEDGMENT OF TRUSTEE

STATE OF)
) ss.
COUNTY OF)

The foregoing instrument was acknowledged before me on _____ [*date*] by _____ [*name of individual*], the _____ [*insert title*] of [*insert name of Trustee and ", national banking association" or ", State banking association"*] on behalf of the association.

_____ (*Seal*)
Notary Public
My Commission Expires: _____

Schedule A

This Agreement demonstrates financial assurance for the following cost estimates or prescribed amounts for the following licensed activities:

RADIATION CONTROL PROGRAM LICENSE NUMBER(S)	NAME AND ADDRESS OF LICENSEE	ADDRESS OF LICENSED ACTIVITY	COST ESTIMATES FOR REGULATORY ASSURANCES DEMONSTRATED BY THIS AGREEMENT
	IHD Solids Management, LLC 14070 43rd St. NW Alexander ND 58831	14070 43rd St. NW Alexander ND 58831	$1,125,000

The cost estimates listed here were last adjusted and approved by the Department on January 31th 2016.

Schedule B

DOLLAR AMOUNT $1,125,000 AS EVIDENCED BY Cashier's check or bank draft.

Schedule C

Heartland Trust Company, PO Box 9135, Fargo ND 58103 Trustee's fees shall be $2,000 per year.

Certificate of Events

Heartland Trust Company

PO Box 9135

Fargo, ND 58103

Attention: Trust Division

Gentlemen:

In accordance with the terms of the Agreement with you dated _____, I, _____, Secretary of IHDS Resources, Inc., hereby certify that the following events have occurred:

1. IHDS Resources, Inc. is required to commence the decommissioning of its facility located at 121 48th Avenue Southwest, Williston, ND 58801 (hereinafter called the decommissioning).

2. The plans and procedures for the commencement and conduct of the decommissioning have been approved by the North Dakota Department of Health, or its successor, on _____ (copy of approval attached).

3. The Board of Directors of IHDS Resources, Inc. has adopted the attached resolution authorizing the commencement of the decommissioning.

_____

Secretary of IHDS Resources, Inc.

_____

Date

Bond

PAYMENT SURETY BOND

Date bond executed: _____
Effective date: _____
Surety's bond number: _____

PRINCIPAL: IHDS Resources, Inc., 121 48th Ave. SW, Williston, ND 58801
Type of organization: corporation
State of incorporation: North Dakota

SURETY: [Insert legal name and business address]
Type of organization: [Insert "proprietorship," "partnership," or "corporation"]
State of incorporation: (if applicable)
[Insert Surety's qualification in ND.]

License number, name, and address of facility, and amount for decommissioning activities guaranteed by this bond: _____

Total penal sum of bond: $ _____

KNOW ALL PERSONS BY THESE PRESENTS, that we, the PRINCIPAL and SURETY hereto, are firmly bound to the North Dakota Department of Health on behalf of the State of North Dakota (hereinafter called the DEPARTMENT) in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally; provided that, where the Sureties are corporations acting as cosureties, we, the Sureties, bind ourselves in such sum "jointly and severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety; but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

WHEREAS, the DEPARTMENT, an agency of the State of North Dakota, pursuant to North Dakota Century Code, Chapters 23-20 and 23-20.1, has promulgated a rule, Section 33-10-03.1-01 of the North Dakota Administrative Code, adopting by reference 10 C.F.R. § 30.35. This rule, which is applicable to the PRINCIPAL, requires a license holder or an applicant for a materials license to (1) provide financial assurance that funds will be available when needed for facility decommissioning and (2) establish a standby trust fund when a surety bond is used to provide financial assurance;

NOW, THEREFORE, the conditions of this obligation are such that if the PRINCIPAL shall:

(1) faithfully, before the beginning of decommissioning of the facility identified above, fund the standby trust fund in the amount identified above for the facility; OR

(2) fund the standby trust fund in such amount after an order to begin facility

decommissioning is issued by the DEPARTMENT or a court of competent jurisdiction; OR

(3) provide alternative financial assurance, and obtain the DEPARTMENT's written approval of such assurance, within 30 days after the date a notice of cancellation from the SURETY is received by both the PRINCIPAL and DEPARTMENT

then this obligation shall be null and void; otherwise, it is to remain in full force and effect.

The SURETY shall become liable on this bond obligation only when the PRINCIPAL has failed to fulfill the conditions described above. Upon notification by the DEPARTMENT that the PRINCIPAL has failed to perform as guaranteed by this bond, the SURETY shall place funds in the amount guaranteed for the facility into the standby trust fund.

The PARTIES further agree that:

Termination: The PRINCIPAL may terminate this bond by sending written notice to the DEPARTMENT and to the SURETY 90 days prior to the proposed date of termination, provided, however, that no such notice shall become effective until the SURETY receives written authorization for termination of the bond from the DEPARTMENT.

Cancellation: The SURETY may cancel the bond by sending notice of cancellation by certified mail to the PRINCIPAL and to the DEPARTMENT provided, however, that cancellation shall not occur during the 90 days beginning on the date of receipt of the notice of cancellation by both the PRINCIPAL and the DEPARTMENT, as evidenced by the return receipts.
Aggregate Liability: The liability of the SURETY shall not be discharged by any payment or succession of payments hereunder, unless and until such payment or payments shall amount in the aggregate to the penal sum of the bond, but in no event shall the obligation of the SURETY hereunder exceed the amount of said penal sum.

Waiver: The SURETY hereby waives notification of amendments to closure plans, permits, applicable laws, statutes, rules, and regulations and agrees that no such amendment shall in any way alleviate its obligation on this bond.

Modification: The PRINCIPAL and SURETY agree that they shall not amend, modify or vary any term of this bond without prior written consent of the DEPARTMENT.

Warranties: The SURETY hereby represents and warrants that is in full compliance with the provisions of the State of North Dakota.

Penal Sum Adjustment: The PRINCIPAL and SURETY hereby agree to adjust the penal sum of the bond yearly so that it guarantees a new amount, provided that the penal sum does not increase by more than 20 percent in any one year, and no decrease in the penal sum takes place without the written permission of the DEPARTMENT.

Severability: If any part of this agreement is invalid, it shall not affect the remaining provisions

that will remain valid and enforceable.

Governing Law: North Dakota law governs this bond.

In Witness Whereof, the PRINCIPAL and SURETY have executed this financial guarantee bond and have affixed their seals on the date set forth above.

The persons whose signatures appear below hereby certify that they are authorized to execute this surety bond on behalf of the PRINCIPAL and SURETY.

PRINCIPAL

_____
By:
Title:

[Corporate seal]

CORPORATE SURETY

Liability limit: $ _____

_____
By:
Title:

[Corporate seal]

[*For every co-surety, provide signatures, names and titles, corporate seal, and other information in the same manner as for the Sureties above.*]

Bond Premium: $ ____

ACKNOWLEDGEMENT OF PRINCIPAL (if an Individual)

STATE OF)
) ss.
COUNTY OF)

The foregoing instrument was acknowledged before me on _____ [date] by _____ [name of individual].

_____ (Seal)
Notary Public
My Commission Expires: _____

ACKNOWLEDGEMENT OF PRINCIPAL (if a Business Entity)

STATE OF)
) ss.
COUNTY OF)

The foregoing instrument was acknowledged before me on _____ [date] by _____ [name of individual], the _____ [type of authority, such as officer] of _____ [name of party on behalf of whom record was executed], on behalf of the [type of business entity].

_____ (Seal)
Notary Public
My Commission Expires: _____

ACKNOWLEDGMENT OF SURETY

STATE OF)
) ss.
COUNTY OF)

The foregoing instrument was acknowledged before me on _____ [date] by _____ [name of individual], the _____ [type of authority, such as officer or attorney-in-fact] of _____ [name of party on behalf of whom record was executed], Surety, on behalf of the Surety.

_____ (Seal)
Notary Public
My Commission Expires: _____

Attachment C: Site Map