



September 22, 2026

Mr. Roger Bellas
Program Manager
Pennsylvania Department of
Environmental Protection
Waste Management Program
2 Public Square
Wilkes Barre, PA 18701-1915

Re: Permit Renewal Application – Third Review Letter
Response from Keystone Sanitary Landfill, Inc.
Permit Application # 101247-A241
APS ID # 1111148, Auth. ID # 1479927
Throop and Dunmore Boroughs, Lackawanna County

Dear Mr. Bellas:

Keystone Sanitary Landfill has evaluated the Department's third review letter of September 15, 2026, and are providing the following responses to each of the items contained within the letter. Keystone has provided our responses immediately following each of the Department's comments, with Keystone's response in **bold** text.

Deficiencies

Condition 25 Requirement of Major Modification Phase III and RO Efficiency

- In the years 2030, 2033-2039, 2044, 2045, 2050, and 2051, the projected maximum leachate generation rates exceed 270,000-gallons per day.
 - Please provide a description of the steps that will be taken to ensure adequate treatment capacity is on hand given the anticipated leachate generation rates.

Keystone currently operates four (4) R.O. units at the treatment plant. With the availability of these four units being able to operate the treatment plant capacity would be 360,000 gal/day. Keystone typically only runs three units if needed and performs regular maintenance on the unit not running which still provides a treatment plant capacity of 300,000 gal/day. Attached is a spreadsheet (Attachment 1) which provides the excess capacity of the treatment plant for the years noted above.

- Please provide a description of how KSL intends on managing the treatment of leachate in those years.

Keystone will continue to monitor leachate flows and perform regular maintenance of the R.O. units to ensure that treatment capacity is available. Keystone would also note that the projected "Total Leachate Generation Gal/Year" was based on historical data prior to rain tarp being utilized on newly constructed cells. A commitment has been made that prior to opening any new cells that rain tarp will be installed to divert rainfall from entering the active portion of the cell, therefore reducing leachate generation, during those years. Keystone is confident that adequate treatment capacity is available for existing and future leachate generations at the site.

Pennsylvania Adopt-a-Highway

- Please provide documentation from PennDOT demonstrating that KSL has adopted the portions of Marshwood Road included in the March 5, 2026, submission.

Attached (Attachement 2) is Keystone's Adopt-A-Highway letter dated April 16, 2026. Our agreement number is 04200001. The Agreement is for a portion of Marshwood Road SR2008 (from segment 0050 offset 0000 to segment 0070 offset 2453).

Nuisance Minimization and Control Plan

- Please provide a revised NMCP that incorporates:
 - Open Area limits as conveyed to the Department on August 24, 2026, pertaining to contiguous and non-contiguous active fill areas.

The NMCP has been updated to include the open area limits pertaining to contiguous and non-contiguous areas in active fill areas, see page 17.

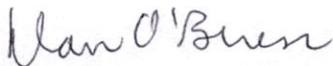
- This revision should also include language regarding the installation and operation of horizontal gas collection devices in active fill areas prior to moving to a non-contiguous active pad configuration.

Additional language regarding the installation and operation of horizontal gas collection devices in active fill areas prior to moving to a non-contiguous active pad configuration has been incorporated into the NMCP. See Exhibit G item 15.

A complete updated copy of the NMCP dated September 2026 is attached to this submission (Attachment 3) which includes the above noted revisions and revisions noted in Keystone's response to the Department's second review letter, all revisions are shown in red.

If there are any questions regarding the information provided or if additional information is required, please feel free to contact me directly.

Sincerely,



Dan O'Brien
Business Manager

Attachment 1

Keystone Landfill
Leachate Generation

Year	Total Leachate Generation Gal/Year	Leachate Generation Gal/Day	Excess Capacity with 3 RO Units running per day	Excess Capacity with 4 RO Units running per day
2030	105,863,941	290038	9962	69962
2033	108,264,524	296615	3385	63385
2034	102,963,584	282092	17908	77908
2035	105,381,247	288716	11284	71284
2036	107,881,512	295566	4434	64434
2037	102,581,632	281046	18954	78954
2038	105,770,622	289783	10217	70217
2039	100,344,033	274915	25085	85085
2044	106,870,582	292796	7204	67204
2045	99,268,165	271968	28032	88032
2050	107,397,164	294239	5761	65761
2051	101,907,099	279198	20802	80802
Treatment Plant Capacity				
Three(3) RO Units working =300,000gal/day				
Four (4) RO Units working =360,000gal/day				

Attachment 2



April 16, 2026

David Osborne
Employees Of Keystone Sanitary Landfill (Agreement #04200001)
249 Dunham Drive
Dunmore, PA 18512

Dear David Osborne,

Welcome to the Adopt-A-Highway program! You are joining many of your fellow citizens across the Commonwealth in helping to keep our roads clean and enjoyable for everyone, and for your efforts you'll get your group's name on a sign!

Recent improvements to the program have made it easier to participate! A new website has been created to provide groups on-line access to the AAH program, which can be found here: <https://adoptahighway.penndot.pa.gov/>.

These improvements enable groups to:

- Apply on-line,
- Use an interactive map to 'point and click' to select a roadway when applying,
- Request supplies for an event,
- Enter Trash Collections,
- Notify PennDOT after the event that bags are ready for pick-up,
- Update group information (contact, phone number, email address),
- Renew or Cancel their agreement, and
- Communicate via email (contact your AAH coordinator to provide an email address)

These improvements will make volunteer participation less time intensive and much easier!

Finally, as indicated in your application, you have adopted SR 2008 (from segment 0050 offset 0000 to segment 0070 offset 2453).

Please contact me with any questions you may have, at jquijano@pa.gov or +1 (570) 586-2211, and I will be happy to get you started in the program!

Sincerely,

Jessica Quijano
Adopt-A-Highway
County Coordinator, Lackawanna County

Attachment 3

Keystone Sanitary Landfill, Inc.

249 Dunham Drive

Dunmore Pa. 18512

Nuisance Minimization

Control Plan

Permit No. 101247

Updated September 2026

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Introduction

Keystone Sanitary Landfill, Inc. (KSL) has established a Nuisance Minimization and Control Plan (NMCP) in accordance with 25 PA Code 273.136 and 273.218 to address known and potential nuisances that may arise from normal operations.

The purpose of the NMCP is to prevent, mitigate and control any conditions that may adversely impact its employees, visitors, and the public in general.

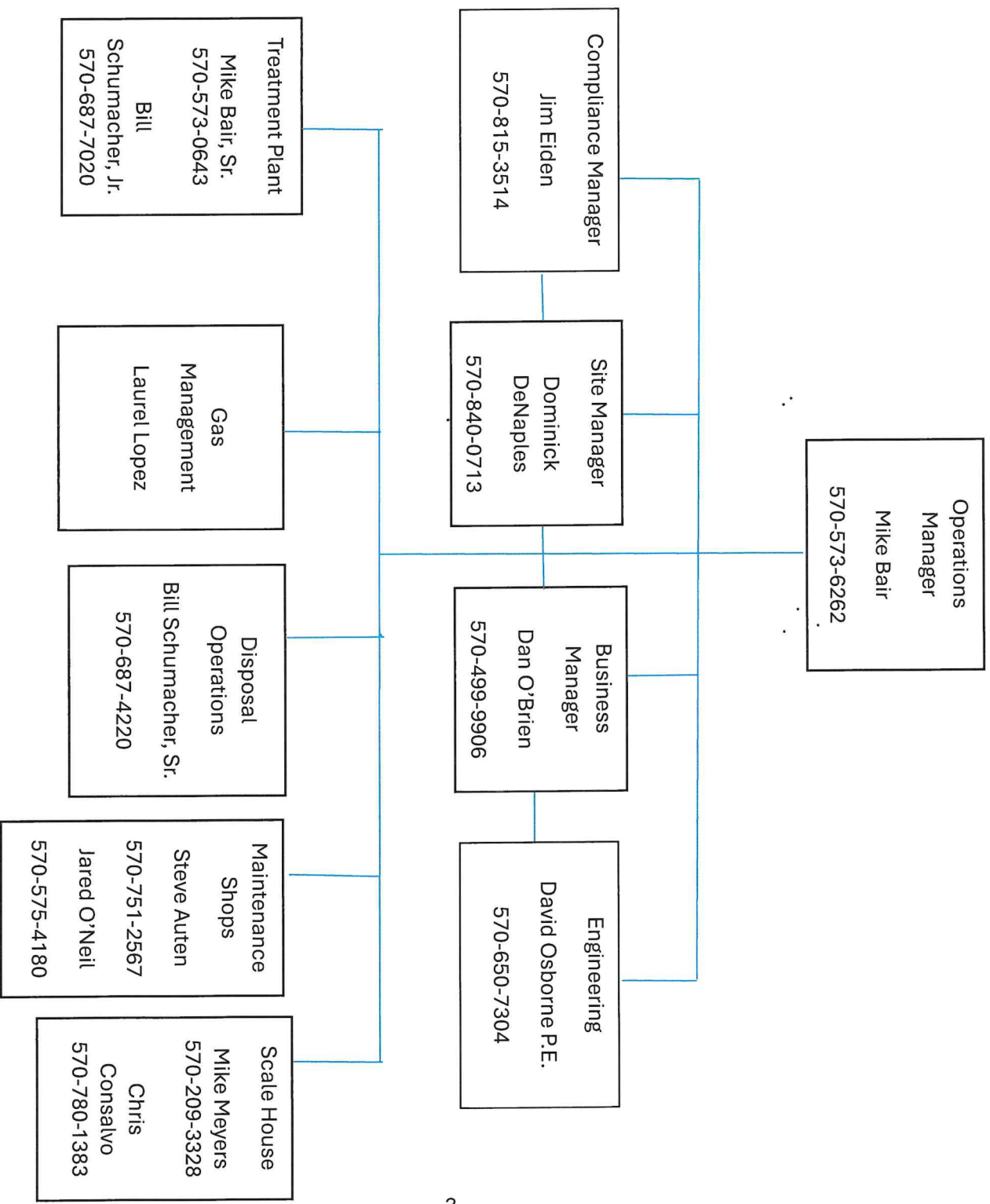
KSL is fully aware that such a Plan, to be effective, needs to be continually monitored and adjusted to stay in tune with designed operational changes, unplanned events, and technological advances. Consequently, the Plan will undergo, at minimum, an annual comprehensive review and be amended accordingly. Updated enhancements to the Plan will be available on site and provided to the Department as part of the annual Operational Report.

Contact/Notification List

<u>Contact Name</u>	<u>Office Number</u>	<u>Cell Number</u>
Mike Bair	570-343-5782	570-751-2137
Dominick DeNaples	570-343-5782	570-840-0713
Dan O'Brien	570-343-5782	570-499-9906

External notifications will be sent to the following based on the specific circumstances:

Pennsylvania Department of Environmental Protection (Wilkes Barre)	570-826-2511
Lackawanna County Emergency Management Agency	570-961-5511
PA State Police Dunmore	570-963-3156
PA Department of Transportation District 4-0 Dunmore	570-963-4061
Dunmore Police Department	570-343-0851
Dunmore Fire Department	570-343-0851
Throop Police Department	570-489-0211
Throop Fire Department	570-489-4767
Dunmore Borough Borough Manager	570-344-4590
Throop Borough Borough Manager	570-489-8311



NMCP Flow Chart

Daily Log

KSL maintains an on-site **daily check** which is made available to PADEP upon request. Keystone's personnel inspect the site perimeter public roads primarily to check for fugitive odors but also monitor the surroundings for birds, dust, mud on Dunham Drive, and off-site litter. In addition, the daily check will document any potential fugitive odors at the Lagoons, Treatment Plant and the Leachate Storage Tanks. **In addition, a nuisance log is maintained for both on-site and off-site potential nuisances.**

The information logged includes date, time, specific locations checked, wind speed and direction, employee conducting the patrol, strength and type of odor, if any, and suggested mitigation measures if applicable, **a copy of the daily check and the nuisance log is included in Exhibit E.**

Routinely checked areas include I-81 entrance onto Casey Highway, the Casey Highway, Marshwood Road, Reeves Street and Swinick Development. Frequently checked areas include Dunmore, Throop, Underwood Road, Mid Valley School campus and School Side Estates.

Relative to on-site odors, Keystone supervisors are instructed to report all on-site odors encountered during their shift. This reporting mechanism allows Keystone's staff to address such issues quickly and prevent odors from traveling off-site.

Waste Transportation Compliance and Vehicle Safety Plan

Keystone is located at the junction of Interstates 81 and 380 in Dunmore PA, off exit #1 of Interstate 380. The facility is on the southern edge of the Keystone Industrial Park at 249 Dunham Drive. This location grants Keystone's customers easy access to the facility by way of highways limiting the amount of residential exposure. The entrance is located on Dunham Drive, which is used by other industrial and commercial industries in the Keystone Industrial Park.

Truck traffic is directed into the facility through the main gate and staged in a parking area on site. The site parking area has the capacity to stage fifty (50) to sixty (60) tractor trailers and the disposal area will accept and manage waste hauling vehicles in a safe and timely manner resulting in a steady and controlled flow of traffic to the disposal area.

If Keystone personnel witness any customer vehicles parked along the public roads adjacent to or leading to the facility, the driver is instructed to move or return to the facility to perform any maintenance needed.

Keystone conducts annual on-site waste hauler inspections that include safety items as well as driver conduct. Included in this safety check are the following:

- Act 90 Waste Hauler Authorization Stickers
- Tarps
- Fire Extinguishers
- Manifests (if required)
- Leaking loads
- Lights/Blinkers
- Signage
- Owner's Card
- Driver's License
- Contingency Plans for Residual Waste

Overweight Trucks

All overweight trucks are tracked as required and this information is forwarded monthly to PADEP. All trucks that are excessively overweight (more than 2,500 pounds) are sent to the office and then held in the staging area for one hour. Repeat offenders will be held for two hours and subject to disposal suspension.

All customers with overweight loads are provided an overweight truck report monthly. All customers with excessively overweight loads are provided with a notification the next business day. All monthly notifications include a letter of explanation (Exhibit B).

Vectors and Bird Control

Keystone's waste acceptance procedures and working face operations help to deter the attraction of vectors. Keystone monitors the acceptance of processed wastewater sludge closely to ensure it meets the acceptance criteria established in 25 PA Code 271.933 for Vector Attraction Reduction. Keystone believes that by ensuring the material is treated properly through monitoring and review of analytical results the attraction for vectors at the facility is reduced. Keystone routinely stops accepting this waste stream at least two (2) hours before the end of the day. The reason for this is to ensure that this odorous type of waste is not placed close to the final daily cover and there is enough material to sufficiently cover the waste.

All waste is compacted and covered at the end of each day with either soil, approved foam, or alternative daily cover. Soils are rolled into place sealing the waste underneath and preventing odors from escaping that would attract birds, rodents, and other vectors.

Keystone has contracted with United States Department of the Interior-Fish and Wildlife Services to conduct on-site, and off-site surveys designed to humanely reduce the bird population in and around the facility. The Department assists and instructs Keystone personnel in the implementation of action plans to discourage birds from nesting in and around the facility. USDA Wildlife Services also assists with vector control. The USDA provides KSL with quarterly progress reports, copies of which are included in Keystone's Quarterly Informational Report submitted to PADEP.

Noise Control

Keystone Sanitary Landfill and Keystone Quarry are located in an area with a significant buffer between site operations and its surrounding neighbors. Noise from equipment, back up alarms, and other routine site activities cannot be heard in the surrounding residential areas. Noise levels on-site are periodically checked and are maintained at levels that comply with all regulatory requirements. Keystone utilizes the services of a third-party consultant to periodically prepare a “Noise Study” which is submitted to PADEP. The report’s conclusions are evaluated and compared to applicable regulatory requirements to ensure compliance, **to date all “Noise Studies” have concluded that “It is apparent that operations at the landfill will not directly result in a violation of the Dunmore noise ordinance and should not impact the Borough of Throop in a negative manner”**. MSHA will also perform noise level checks during some of their routine inspections to ensure compliance with federal regulations.

Keystone discourages the use of Jake brakes by its customers on perimeter public roadways and prohibits their use on interior site access roads unless necessary. Keystone monitors this daily and drivers who do not comply may lose disposal privileges at Keystone.

Mud Control

KSL understands the responsibilities associated with ensuring the public access roads are kept clean and mud free.

Keystone has miles of unpaved, dirt roads on site used by waste hauling vehicles. As a result, there is the potential that trucks leaving the site will carry dirt and mud out to the public access roads. In order to prevent this public nuisance, Keystone does the following:

- Temperature permitting, Keystone will operate an industrial truck undercarriage wash system. When operational, every truck leaving the site is required to pass through this wash station.
- Once the truck exits the cleaning station, it remains on paved surfaces until the truck reaches the public access road.
- The pavement between the truck wash and the public access road as well as the truck staging area are generally cleaned with a small 5,000-gallon water truck equipped with nozzles designed to wash away the dirt. Additionally, a street sweeper is put in service for several hours each day to clean these surfaces as well as a section of Dunham Drive.

These mitigating measures have been very effective in controlling the impact of mud on public roads in the past. Nonetheless, KSL is mindful of this potential nuisance and monitors the situation daily and will adjust and enhance these preventive measures as necessary.

Litter Control

Once a waste hauling vehicle enters the site there is certainly a potential for litter. If an untarped load pulls on the inbound scale the driver is instructed to pull over and tarp the waste. This will minimize the potential for litter on the access road up to the **working** face. The driver is instructed by Keystone personnel not to remove the tarp until he is ready to discharge the load.

Litter in and around the disposal area is a common nuisance for all landfills and KSL is certainly no exception. Disposal area employees are instructed to monitor wind direction continuously during the workday. They can generally obtain this information from their cell phones, monitoring windsocks strategically located on site, or by calling the office to get current information from the weather station located on site.

KSL has available forty to sixty portable litter fences. These fences are approximately ten feet high and are moved downwind from the disposal area. Keystone also has a fifty-foot-high stationary litter fence that borders the east side of Phase II preventing most litter from reaching the Casey Highway. During unusually high wind events Keystone will water down the **working** face to reduce the amount of wind-blown litter. Keystone will also reduce the size of the working face and initiate cover activities as early as possible to further reduce litter.

Keystone provides daily employment to approximately fifteen laborers who are dedicated to picking litter as needed. These individuals also regularly pick litter on both Dunham Drive and the Casey Highway. **In addition, "Staff and Friends of Keystone Landfill" have adopted a portion of Marshwood road as part of PennDOT's Adopt a Highway Program.**

Thermal Events

Generally, there are two types of thermal events which can occur at a landfill. The first is a condition at the working face where two or more incompatible materials ignite upon direct contact. And the second is elevated temperatures within the landfill waste mass.

- When incompatible reactive materials ignite, Keystone responds by excavating the material out of the working face onto a lined, dirt surface and utilizing the water truck cannon or smothering the material with dirt extinguishing the event. The waste is not placed back in the working face until the thermal event is completely extinguished.
- The generation of heat in a landfill is normal as microorganisms break down waste. If temperatures elevate to above 131°F, a thermal event could arise within the landfill. This can be indicated at the gas well head by: Gas temperatures above 131°F, a decreased methane level (<40%) along with an increase in the CO₂ (>50%) and an increase in carbon monoxide, hydrogen and ammonia gases. When these conditions occur, the immediate response is to discontinue the vacuum to the gas well and lower the vacuum to the surrounding gas wells to isolate the area from potential sources of oxygen.

There are two other less frequent events that can result in a thermal situation. The first is an already smoldering load arriving at Keystone. The second is equipment with leaking hoses resulting in flammable fluids contacting hot surfaces. The preventive and corrective measures can be found in the Nuisance Prevention and Action Plan Summary (Exhibit C).

Dust Control

Access Roads

There are several miles of unpaved roads on the landfill's 714-acre site. Roads that are not used during normal daily activities are generally closed, reducing water usage, and eliminating unnecessary and unwanted dust emissions.

Keystone maintains and operates a total of four water trucks. The two trucks primarily used for dust control each hold 10,000 gallons. These trucks can be filled in less than seven minutes when utilizing a water fill station constructed by Keystone. This ensures that these trucks spend more time suppressing dust and less time at the filling station.

The third water truck has a 5,000-gallon capacity and is primarily used on the paved roads and parking lots. This truck has nozzles attached and is effective in keeping these roads clean. KSL also utilizes the services of a street sweeper daily. Consequently, there are virtually no dust emissions originating from paved surfaces on site.

The fourth water truck, equipped with a cannon, is on standby in the vicinity of disposal operation to address potential thermal events. This truck is garaged during the winter months.

Quarry Dust Control

Keystone uses water from tank trucks to wet down the excavation site during dry conditions.

Rock is loaded into haul trucks and dumped into the crusher hoppers or at a pre-designated stockpile. The water trucks are assigned specific haul roads, and the haul drivers are informed which haul roads to use for the day. In extremely dry conditions the number of water trucks used to wet haul roads is increased.

The crusher is equipped with spray nozzles on all hoppers and transfer points to reduce or eliminate emissions. If the main stockpiles become dusty the water trucks will hose them down prior to processing. Keystone maintains additional nozzles on site for replacement should they become inoperable or damaged. Keystone also inspects the crushing system on a daily basis for opacity and fugitive emission. Should the emissions become excessive, or opacity reach 10%, the source will be wetted using the water truck and the spray bar pressure and GPM increased.

A trained visible emissions and opacity technician documents findings in a daily opacity log.

Landfill Dust Control

Generally waste loads do not contain a great deal of dust; however, some demolition materials and residual wastes can generate dust when discharged from a waste-hauling vehicles. If a load is known to be dusty or may cause dust, the load is disposed and immediately covered with municipal waste to prevent dispersion. If a demolition load is observed to contain materials that will create an emission the load will be wet down with water from the water truck. All residual wastes that contain dust or fine materials are communicated to the disposal area personnel to ensure proper handling. If a waste stream is too dusty to handle in the manner described above, the generator will be notified, and additional corrective measures will be implemented. If improvement is not acceptable, Keystone will no longer accept the waste.

Water trucks are available on site and used as necessary, based on weather conditions, to control dust along all site roads. The water truck travels the waste and construction vehicle traffic haul routes to wet the surface for dust suppression.

Odors/Emissions

Note: Please refer to attached Nuisance Prevention and Action Plan (Exhibit C) for detailed information.

Typical on-site odor sources that are common to landfills include:

Vehicle Emissions
Vehicle Waste
Working Face Operations
Landfill Gas Collection
Exposed Anchor Trenches
Drilling New Gas Wells
Leachate Outbreaks
Leachate Storage Lagoons
Leachate Storage Tanks
RO Concentrate Disposal
Ineffective Cover Material
Leachate Treatment Plant
Wet Wells

Vehicle Emissions

The PA Act 124 of 2008 idling requirements are posted throughout the staging areas which, when followed, significantly reduce emissions.

Vehicle Waste

Occasionally, vehicles that enter the facility each day will contain a particularly odorous load. Employees are instructed to identify, dump and cover these loads quickly and safely.

Working Face Operations

Localized working face odors are an operational reality at any landfill. Keystone takes the management of potential working face odors very seriously. That management begins by Keystone requiring all customers to maintain a secure tarp over waste loads while being transported to the working face. When waste loads arrive at the working face, Keystone personnel guide the vehicles to a designated staging area that is in close proximity to the disposal area contained within the lined cell. Keystone personnel inspect each vehicle's manifest and make a determination of the waste characteristic and its potential for generating localized odor. When waste loads are identified that contain a high potential for generating localized odor, such as local community sludge loads, rotting organic food waste from local restaurants, etc., such loads are immediately identified and quickly disposed of in the working face, regardless of the staging order in which they arrived. Keystone's

waste handling machine operators are trained to establish a hole-like impression within the working face to place potentially odorous loads into and cover immediately. These practices reduce potential working face odors. Additionally, Keystone's working face management commences in the early morning by establishing a designated area of the active face to open. This area is predetermined by the landfill Operations Manager and is based on several factors, including:

- review of onsite weather station data to determine wind speed and direction.
- review of forecasted weather to determine and schedule the timely implementation of the daily cover and application type.
- monitoring the rate of incoming waste loads to the disposal site through communication between the landfill supervisor and scale master; and
- ensuring that adequate machinery is in place for proper waste disposal management and compaction.

Beginning in the morning, and as the working day expires, Keystone consistently applies daily cover, thus reducing the size of the working face. There is a tight coordination of machinery and equipment in operation on the working face. At the beginning of the workday, the machine operators are instructed to place the morning waste to one side of the working face to establish the intended grade elevation for that day. When this area reaches the predetermined grade, the "spotters" are instructed to direct the incoming waste loads to the area adjacent to the completed portion. Daily cover operations begin in the designated area that has been graded and received the proper level of compaction. The cover operations, once initiated, are always in progress, thus reducing the size of the working face throughout the day. This controlled sequence of events ensures that Keystone's working face is only active for the timeframe required to adequately manage the daily waste in accordance with Department regulations.

Emissions – Landfill Gas Collection

Detailed information including preventative measures and corrective actions are listed in (Exhibit C). In addition, Gas Management System Construction Notes that are followed are listed in (Exhibit G)

Exposed Anchor Trenches

Constructing anchor trenches generally requires KSL to dig up aged waste creating a potential off-site odor. Keystone will continue the practice of only trenching what is expected to be completed that day and filling it in at the end of the shift so no anchor trench will remain open overnight. Keystone will also be installing Horizontal Gas collectors in the area of the anchor trenches.

Drilling New Gas Wells

Drilling new gas wells through aged waste will cause odors. Keystone will have odor misters down wind of the well hole and will not leave holes open overnight to minimize off-site odors. All waste

collected as part of the Gas Well drilling operation will immediately be placed back into the working face that day.

Leachate Outbreaks

Supervisors travel the entire site frequently each day and report leachate outbreaks. If an outbreak is identified the construction crew is dispatched with material and equipment sufficient to make the necessary repairs.

Leachate Storage Lagoons

Keystone is aware the open lagoons storing raw leachate can potentially generate an off-site odor. The East Lagoon is utilized as an emergency overflow for the wet well that conveys leachate to the above ground storage tanks. The West lagoon can only be used in emergency situations with prior approval from the Department. To minimize the potential of off-site odors Keystone will be applying foam and dosing the East lagoon with a neutralizing agent, in addition to using misters as appropriate. A daily log is kept regarding coverage in the East Lagoon, when and if Leachate is being stored in the Lagoon.

Leachate Storage Tanks

Keystone utilizes two 2.5 million gallon above ground storage tanks for raw leachate. To control potential VOC emissions and odors from each AST, Keystone installed a BIOREM system in conjunction with the construction of the two Leachate storage Tanks. The BIOREM biological treatment system features a biotrickling filter followed by a biofilter. The biotrickling filter and biofilter systems are both designed in a forced draft, up flow configuration. In each treatment stage the collected air enters the base of the packed biofilter bed and then passes up through the specially selected media.

Each high porosity media provides an ideal environment for the establishment of bacterial colonies. As the air comes in contact with the biofilm, odorous compounds are solubilized into the moisture layer and subsequently oxidized by the microbes; hydrogen sulfide is primarily removed by the biotrickling filter stage and other odorous compounds are primarily removed by the biofilter stage. The biotrickling filter stage is kept adequately moistened by way of continuous recirculation water while the biofilter stage is kept moistened by way of intermittent irrigation with client supplied water. According to the system manufacturer, the biofiltration system will achieve 99 percent removal of hydrogen sulfide and 90 percent removal of odor. In addition, Keystone is dosing the exhaust of the BIOREM system with Chemtron OC 8400 in case of a breakthrough from the BIOREM treatment. Along with dosing the BIOREM system with sulfuric acid to help reduce any ammonia.

RO Concentrate Disposal

To control odor emissions from the RO Concentrate generated from the RO units, Sulfa loc 200 is dosed into the RO concentrate prior to going into storage to reduce odor in the storage tanks, during the truck loading process and the disposal process on the working

face. The use of this product has shown 50% reduction in H₂S in the landfill gas stream since Keystone started dosing it into the recycled RO concentrate. In addition Keystone will load all trucks utilizing KSL's pumping system rather than individual truck "blower" system to eliminate potential odor emissions.

Ineffective Cover Material

Keystone adheres to the requirements for daily and Intermediate cover materials indicated in the QA/QC Plan Specifications & Details. Testing of the cover materials is completed at the frequency indicated in the tables on sheet GSE 7 of the Permit Drawings. (copy of the QA/QC plan and Specifications are contained in Exhibit J)

Leachate Treatment Plant

To help minimize any potential off-site odors Keystone has installed a blower system for the treatment plant that uses a stainless-steel vacuum header that pulls gases from all pH adjustment tanks within the plant as well as the cleaning tanks on each unit as they are prone to off gassing during cleaning cycles. This blower then pushes the gases through a scrubber vessel (DS-1000) loaded with absorption media, (Pure Air - Sulfasorb XL). The inlet and discharge of the scrubber is sampled on all business days including Saturday with a 4-gas meter, h₂s sample meter or drager tubes depending on location and concentrations. Media is changed when breakthrough of h₂s in the exhaust reaches 1 part per million. This process is completed utilizing a Vactor, typically change outs are completed the day after breakthrough is found. Systems are shut down for approximately 2 hours to vac out the media and reload the vessel. The above noted equipment has been added as a permanent emission equipment tool.

Wet wells

Keystone has identified potential for odor emissions at two wet wells on site, so at both the wet well for conveyance of leachate to the storage tanks and at the influent wet well to the treatment plant smaller scrubber vessels are utilized. These vessels loaded with absorption media, (Pure Air - Sulfasorb XL). The inlet and discharge of both scrubbers are sampled on all business days including Saturday with a 4-gas meter, h₂s sample meter or drager tubes depending on location and concentrations. Media is changed when breakthrough of h₂s in the exhaust reaches 1 part per million. This process is completed utilizing a Vactor, typically change outs are completed the day after breakthrough is found. Systems are shut down for approximately 2 hours to vac out the media and reload the vessel. The above noted equipment has been added as a permanent emission equipment tool.

Emissions

Keystone maintains a comprehensive list of guidelines and procedures to follow relative to prevention, early detection, identification, and mitigation of emissions. Please refer to Exhibit D (Enhanced Surface Monitoring Evaluation Process) and Exhibit C (Nuisance Prevention and Action Plan Summary) for detailed information.

Capping Guidelines/Requirements

Keystone implements the use of High Density Polyethylene (hdpe), Medium Density Polyethylene (mdpe), Low Density Polyethylene (ldpe), Lower Linear Polyethylene (lldpe), Reinforced Polyethylene (rpe) geomembrane liner systems and rain tarp in combination with Posi-Shell, a spray-applied mortar made from clay, reinforcing fibers, polymer and Portland cement to reduce potentials for fugitive emissions, minimize storm water infiltration, stop windblown dust and litter as well as erosion control.

Keystone has established specific guidelines as to the implementation of the listed capping measures. Any area of intermediate cover that will be inactive for more than 120 days shall receive one of or a combination of the approved materials indicated above. Installation of the aforementioned temporary capping procedures shall commence on areas of intermediate cover prior to the 120-day timeframe when operational activities will not return to these areas within the 120-day time frame.

On intermediate slopes that will become active within 120 days intermediate soil cover will be placed on these areas. This soil cover material will meet the requirements shown on GSE-7 of the permit drawings. These requirements are also contained in Exhibit J of this NMCP.

Areas of waste placement that have reached final elevation shall receive 40mil or equivalent hdpe liner starting within 180 days of reaching final elevation followed by 4oz geocomposite, 24 inches of lab certified soil cover and a predetermined seed/mulch mixture depending on the season.

To control odor emissions and minimize Leachate generation, Keystone is committed to not exceeding 42.5 total acres that are not covered by a combination of permanent and temporary capping when there is an active disposal area that is non-contiguous with the next pad that will become an active disposal area. When pad construction sequencing provides contiguous active disposal areas, Keystone is committed to not exceeding 32.5 total acres of open area. Exhibit H provides definitions of all acceptable temporary capping measures.

Examples of active disposal areas that are non-contiguous would be pads 6 and 7. Once pad 7 is constructed and ready to accept waste, pad 6 will need to remain active until the select lift of waste is placed in pad 7. In accordance with phase 3 approved pad construction sequencing similar conditions will also occur during pad 12a construction and pad 11 filling, pad 13 construction and pads 12a,12b,4,5,6 filling. It is also noted that Pad 11 is in a sump configuration and will be non-contiguous only until an elevation is reached to make it contiguous with pads 8 & 9.

To also help control odor emissions horizontal gas collectors will be installed as indicated in Exhibit G items 9 & 15.

In addition to waste capping activities KSL will deploy rain tarp (rpe) or Polyethylene geomembrane on all protective cover in any newly constructed cells prior to waste placement to divert or collect as much storm water as possible prior to entering the leachate collection systems. These storm water management measures will only be removed incrementally, on a day-to-day basis, only allowing enough open area for waste placement on that given day.

Weather Monitoring Program

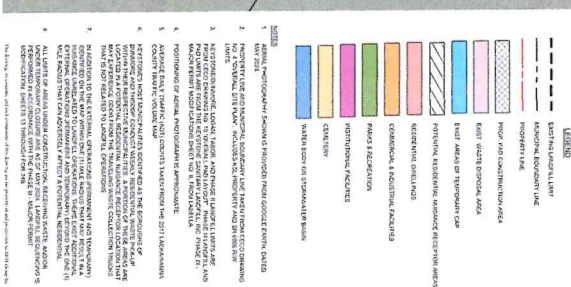
To ensure Keystone is aware of and prepared for changing weather conditions that can influence site operations or potentially cause a public nuisance, a weather-monitoring program has been developed and implemented.

Keystone maintains and operates both a primary and a backup weather station (see Exhibit F). The primary unit is the MWS-C400 from Intellisense. The unit combines 20 environmental parameters with cloud-based data logging. This unit is **portable and located on the site which provides unobstructed** weather information for the following: wind speed and direction, peak direction and speed, and lightning. The backup unit, the Davis Vantage Pro2, located on the Administration Building provides rainfall information as well as other weather parameters.

Information is downloaded daily and utilized to react to changing weather conditions. During perimeter nuisance inspections Keystone personnel will observe weather patterns for that time and location. Wind direction will be conveyed to the appropriate managers and supervisors, so actions can be taken to prevent nuisances such as dust, odors, and litter.

Local wind direction is typically from the southwest, however, there is some seasonal variation. When wind speeds are elevated, site personnel will deploy portable litter fences and/or wet the active disposal area to prevent offsite litter migration.

Exhibit A



SHEET A	INVENTORY OF POTENTIAL NUISANCES		DATE 12-1-2007										
			DATE 10/01/2010										
			DATE 11/11/11										
SITE DEVELOPMENT KEYSTONE SANITARY LANDFILL, INC.		BOROUGH OF DUNSMORE & THROOP LACKAWANNA COUNTY, PENNSYLVANIA											
												 ARM Group LLC Engineers and Scientists www.armgrp.net	

Exhibit B



Overweight Truck Notification

KSL Scales Tested/Calibrated 12/15/2025

Customer:

Date: 12/1/2025 To: 12/31/2025

Keystone is required to send a copy of the attached overweight truck log to PADEP's central office located in Harrisburg, PA. The report is sent in the first week of each month detailing the overweight information for the previous month.

You should know that PADEP reviews your compliance history prior to issuing your ACT 90 Waste Hauler Authorization License. Consequently, excessively overweight vehicles as well as habitual offenders run the risk of not having thier license reviewed.

And Finally, customers that use independent haulers or have thier trucks loaded off-site need to pass this information on appropriately, so we can all work together to minimize overweight truck traffic.

If you have any questions, please contact our office at (570) 343-5782.

Exhibit C

Nuisance Prevention and Action Plan Summary		
Nuisance	Prevention	Corrective Action Plan
Dust	Use street sweeper daily	Increase street sweeper daily hours
	Use water trucks for dust suppression as necessary	Increase number of water trucks used
	Close all unnecessary unpaved haul roads	Slow down all traffic
	Enforce site speed limit	Check crusher water nozzle effectiveness
	Continue with MSHA Dust Evaluation	Temporarily shut down crusher
	Use crusher spray system	
Emissions/Odors		
Vehicle	Signs posted instructing drivers:	Increase Security and Safety Patrols
	"No idling-Diesel Powered vehicles over 5 tons"	Suspend disposal privileges for repeat offenders
	Security and Safety Patrols monitor compliance.	
Surface	Bi-Monthly Protocol: (Refer to Exhibit D)	Increase capping schedule
	Well reads in active area	Increase frequency of drone flights and mapping
		Utilize 3rd party contractors to assist gas crew and technicians
	Monthly Protocol:	Drill additional gas wells as necessary
	Update and Follow Capping (Temporary/Final) Schedule	Install additional shallow collectors
	Drone Technology and Mapping	Refer to Enhanced Surface Monitoring Evaluation Process-Exhibit D.
	Surface monitoring of active area including inhouse Isopach mapping	
	Surface penetration monitoring of active area	
	Monitor decommissioned wells	
	Reads for site wide gas wells	
	Stay on schedule with new gas wells	
	Follow capping guidelines	

	Quarterly Protocol:		
	Site surface scans		
	Perimeter surface scans		
	Refer to Exhibit D for detailed information		
Working Face	Daily Cover		Commence cover earlier than normal
			Utilize Portable Misters
Leachate Storage Lagoons	Foaming of Lagoons		Odor controlling agents refer to exhibit I
	Misting System along fence line		Decrease surface area of leachate
Leachate storage Tanks	Closed system		Odor controlling agents refer to exhibit I
	Bioreactor System		
Leachate Treatment Plant	Installation of blower system		Odor controlling agents refer to exhibit I
	H2S scrubber vessel		
	Rooftop Misting System		
	Maintain covers on RO concentrate tanks		
RO Concentrate Truck Loading	Loading of trucks via pumping system, do not utilize truck's "blower" conveyance system		Misting system
Wet wells	H2S scrubber vessel		Odor controlling agents refer to exhibit I

Litter	Labor crew designated to pick litter	Increase number of "pickers" when needed.
	Utilize portable litter fences	Utilize more portable litter fences and verify downwind location.
	Monitor Dunham Drive	Decrease size of working face.
	Monitor Casey Highway	Apply water to working face.
		Consider suspending operations temporarily.
Mud		
	Operate undercarriage truck wash weather permitting	Use grader to get mud off unpaved roads.
	Utilize sweeper truck daily	Wash Dunham Drive temperature permitting.
	Wash off all paved areas daily.	Extend street sweeper hours to clean Dunham Drive and more
	Apply stone to truck wash entrance area.	frequent washing of on-site paved areas temperature permitting.
Noise		Apply more stone to truck wash entrance.
	Third party contractor conducts noise study on a regular basis and provides KSL the results and recommendations which are forwarded to PADEP.	Evaluate the issue and correct it.
	KSL and MSHA also conduct periodic noise studies.	Require ear protection in the affected area.
		Limit access to the affected area.
Thermal Event		Contact consultant who conducts Noise Study.
	Instruct guards, weighmasters and spotters to identify any smoldering loads that may enter facility.	Dispose smoldering load on lined area away from disposal area.
	Monitor trends of increasing gas well temperatures.	Activate parked water truck with cannon.
	Keep equipment clean to identify leaking fluids that could result in a thermal event.	Have foam vehicles ready to assist if needed.
	Pressure wash equipment regularly to more easily detect defective hoses.	Notify gas management supervisor regardless of well involvement.
	Temperature permitting, keep filled water truck with cannon parked in vicinity of high risk areas.	Office to call for outside assistance if required.
		If gas well involvement, discontinue vacuum and lower vacuum to the surrounding gas wells (Gas Management Crew).

Vectors/Birds	Continue annual Agreement with U.S. Dept. of Interior- U.S. Fish and Wildlife Service	Seek additional assistance from Fish and Wildlife Service	
	Continue to follow all recommendations		
Waste Trans.	Annual truck inspections	Increase number of vehicle inspections.	
Compliance/	Overweight truck reports/customer notifications	Suspension of disposal privileges.	
Vehicle Safety	Monitor truck speed and flow	Notify local law enforcement.	
	Monthly reports to PADEP	More frequent on-site safety patrols.	
	Penalize excessively overweight trucks	Put customer on notice.	

Exhibit D

Enhanced Surface Monitoring Evaluation Process

Keystone will perform enhanced monthly surface monitoring, per the facility's NMCP, in those areas within a certified Phase III cell with waste in place where the intermediate grade surface elevation or final grade surface elevation does not include a cap synthetic liner, regardless of the presence of active gas collection devices. Areas with soil cover or Posi-shell will be included in the monthly surface monitoring. The boundaries of the areas meeting those criteria will be clearly marked in the field by Keystone and will be designated to receive the enhanced monitoring program every month. Keystone will implement the forgoing enhanced monthly surface monitoring criteria in the subject area(s) within the vicinity of the sequencing working face operations. Additionally, enhanced monthly surface monitoring practices will be implemented in any area(s) that also fall under NSPS regulations, if the area(s) satisfy the above describing terms for enhanced program activities.

Monthly active area surface and well monitoring has proven to be a valuable tool in identifying and troubleshooting potential odor sources in the uncapped areas of the Landfill. Keystone has wellfield technicians dedicated to wellfield operations and compliance monitoring staffed by Archaea as a third-party contractor. It is KSL'S normal operating procedure to have all well-field technicians in the active area of the landfill starting on the first business day of the month and staying until active area surface scans and well head monitoring is completed. In lieu of using a third-party contractor to provide an Isopach map detailing areas of elevated methane concentrations Keystone is utilizing in-house staff to survey and prepare the Isopach map on a monthly basis. In addition, Keystone also performs a drone flyover which is completed in the morning, and the map can usually be generated that same afternoon. This innovative procedure enables Keystone's gas crew to immediately commence corrective measures while waiting for the Isopach map to be generated.

It is Keystone's belief the wellhead monitoring data is equally important in comparison to the surface scan data due to the fact many exceedances or elevated surface scans can be identified prior to generation of the map through evaluation of the wellhead readings. Wells that are identified as having lost significant vacuum or displaying high methane concentrations are clear indicators of poor collection in a specific area that can lead to or has already led to elevated surface monitoring readings. These early indications assist Keystone with creating construction plans, ordering materials, and scheduling work crews even prior to map generation.

Upon completion of the map it will be compared to the previous three months maps looking for increases in specific areas from the previous month, trends up or down in specific areas over the past three months, movements of elevated grids in comparison to the working face/disposal operations/, movements of elevated areas in comparison to capping activities, movements or changes in elevated areas compared to construction activities (road construction, gas line installation, seeding and mulching and material stock pile areas).

Priority during any evaluation of monthly data is surface exceedances (readings greater than 500ppm) identified with the TVA. Any exceedance immediately triggers a further evaluation with a plan to reduce emissions. This evaluation starts with a review of any wells in that grid or close enough to influence this area. The well head readings are looked at for several things during this evaluation:

- What is the methane concentration in comparison to the oxygen and balance gas ratios?

- Can the well be turned up any further.
- Is the well showing low methane with little or no oxygen? Will increasing vacuum, application of more vacuum, potentially pull more lfg back to the well from surrounding areas?
- Is the well displaying an oxygen/balance gas ratio indicating a leak at the well head or in the casing near the surface?
- Is the well temperature nearing 131 degrees?
- Is the well displaying signs of being crushed, broken, or watered in?
- How tall is the well casing? Often wells that are raised for filling operations lose their ability to efficiently collect gas and pull atmosphere into the casing. Is the well raised currently and is the most current reading an anomaly compared to historical well data for this device?
- What activities are taking place in this specific area that is showing elevated readings?

Are there any specific construction activities taking place that could be generating the exceedance that will be remedied by the completion of the project (anchor trench excavation, gas line excavation, striping of cover for waste placement, concentrate disposal, road or ramp construction, leachate outbreak repairs, well maintenance)?

As this data is already available a very quick evaluation can be made and well field technicians can be redirected back to these areas to repair wells that could be leaking, check water levels and integrity of well casing to see if dewatering pumps are applicable, increase vacuum to a well or wells in the area or identify any other potential issues that could be affecting overall performance of the collection devices.

If all efforts have been exhausted regarding well optimization and well tuning, then the next step in the process would be to evaluate filling operations and cover integrity. Cover in the area will be evaluated for thickness, moisture, compaction, percentage of fines in comparison to stone and signs of erosion. If the evaluation of cover determines there is room for improvement additional material will be hauled into the area, spread and compacted. If additional cover material does not improve or eliminate the exceedance, wells within the area will be reevaluated/tuned to improve performance/collection if possible. Often cover around gas wells is coarse and poorly compacted as it is hard to get machines close to the wells without causing damage to the casing. If this is the case existing cover will be excavated and removed in a 10 x 10 grid down to waste. A new bentonite plug will be placed around the well and the grid will be back filled with good quality soil then compacted. The area will also be evaluated for well density, how close is the closest collection device, is the exceedance within the radius of influence, is additional collection required.

At this point it is typically approaching the twenty-day follow-up, if an exceedance fails the twenty day follow-up there are generally three more measures that can be implemented and evaluated.

- Is this exceedance a product of disposal activities and will waste placement remedy the issue within the next several days?
- Is synthetic capping taking place and nearing this area where it will be covered with liner in the next several days?
- Is additional collection required? Either new vacuum lines to increase available vacuum, shallow collector around an existing well, pot well if the elevated reading is a confined point source or horizontal collector if the elevated reading covers a bigger area?

All available historical data clearly indicates this evaluation/trouble shooting/remediation process is effective as evidenced by all exceedances being corrected prior to the 30 day follow up. The working face/disposal activities progress quickly due to the size of the active area and brisk disposal rates resulting in not many slowly up trending data points. Typically, our readings go from Green to Red and back to Green as they are a result of collection loss in the area. New vacuum lines may be required. Working face activities and traffic disturbing the cover integrity in the area or other construction activities such as capping or gas construction need to be continuously evaluated. We do not see many, if any, reading progress from green to yellow to orange to red over several months.

After all, 500ppm plus exceedances are repaired, elevated areas or any areas that are trending upwards are evaluated through the same process outlined above. During the process of reducing emissions any wells that have shown collection issues or vacuum loss are being addressed at the same time helping to eliminate future potential elevated readings due to poor collection and influence in any area. New vacuum lines are constantly being run, dewatering pumps are installed as necessary, and the cover is always being improved and compacted at some location in the active area.

Exhibit E

NMCP Daily Check

Date: _____

Weather Conditions

Significant Weather Events Forecasted:	Yes _____ No _____
If Yes _____	
Wind Forecast: Direction: _____ Speed _____ MPH	
Ok To Tip Trailers:	Yes _____ No _____
Liter Fences Properly Placed:	Yes _____ No _____

Dust Control

Water Truck(s) in Use:	Yes _____ No _____
Spray Nozzles in Use:	Yes _____ No _____

Odor Mitigation

Start Cover Early:	Yes _____ No _____
Check Integrity of Cover Material:	Yes _____ No _____
Portable Listers in Use:	Yes _____ No _____
Rooftop (T.Plant) Misters in Use:	Yes _____ No _____
Fence Misting System:	Yes _____ No _____
Tank Vapor Capture System Active:	Yes _____ No _____
Tank Mixing System Active:	Yes _____ No _____
Surface Emissions Today:	Yes _____ No _____
Well Readings Today:	Yes _____ No _____
Internal Nuisance Patrols :	Yes _____ No _____
External Nuisance Patrols:	Yes _____ No _____

Comments: _____

Revised Sept.2025

Vector Control

Wildlife Services on Site:	Yes _____ No _____
Proper Daily Cover:	Yes _____ No _____
Bird Control Devices Used:	Yes _____ No _____

Dunham Drive Maintenance

Mud on Dunham Drive:	Yes _____ No _____
Truck Wash Operational:	Yes _____ No _____
Truck Wash in Use:	Yes _____ No _____
Sweeper truck in Use:	Yes _____ No _____

Litter Control

Portable Fence in Place:	Yes _____ No _____
Pole Line Fence Effective:	Yes _____ No _____
Litter Crew Properly Placed:	Yes _____ No _____
Monitoring Customer Tarps:	Yes _____ No _____
Monitoring Wind Direction:	Yes _____ No _____

Customer Traffic

Speed limit Enforced:	Yes _____ No _____
Monitoring:	
Tarps:	Yes _____ No _____
Act 90 Compliance:	Yes _____ No _____
Jake Brake Usage:	Yes _____ No _____
Off-Site Staging:	Yes _____ No _____
Excessive Speed:	Yes _____ No _____
Overnight Trucks:	Yes _____ No _____
Leaking Loads Checked:	Yes _____ No _____

Signature: _____

Nuisance Report

Date	Time	Time Degree Notified Direction	Cardinal Directio	Wind Speed	Purpose	Complaint	Odor Origin
12/1/2025	5:05 AM	0	N	13 MPH	Routine Off Site	No Complaint	No Odor
12/1/2025	6:00 AM	354	N	10 MPH	Routine Off Site	No Complaint	No Odor
12/1/2025	11:00 AM	51	NE	18 MPH	Routine Off Site	No Complaint	No Odor
12/1/2025	4:00 PM	65	ENE	7 MPH	Routine Off Site	No Complaint	No Odor
12/1/2025	5:00 PM	81	E	4 MPH	Routine Off Site	No Complaint	No Odor
12/1/2025	5:50 PM		N/A	2 MPH	Routine Off Site	No Complaint	No Odor
12/1/2025	8:20 PM	172	S	10 MPH	Routine Off Site	No Complaint	No Odor
12/2/2025	5:00 AM	253	WSW	5 MPH	Routine Off Site	No Complaint	No Odor
12/2/2025	10:00 AM		N/A	2 MPH	Routine Off Site	No Complaint	No Complaint
12/2/2025	4:00 PM	77	ENE	4 MPH	Routine Off Site	No Complaint	No Odor

Friday, January 9, 2026

Exhibit F

MWS®-C400

Micro Weather Station

The Professional-Grade, All-In-One Weather Station

Key Features

- Wireless Weather Sensing in an Elegant, Compact Package
- No Extra Equipment Needed
- Easy 60-Second Installation
- Autonomous Operations
- Two Expansion Ports
- Portable and Rugged
- Three Communication Options Available

Weather Data Reported

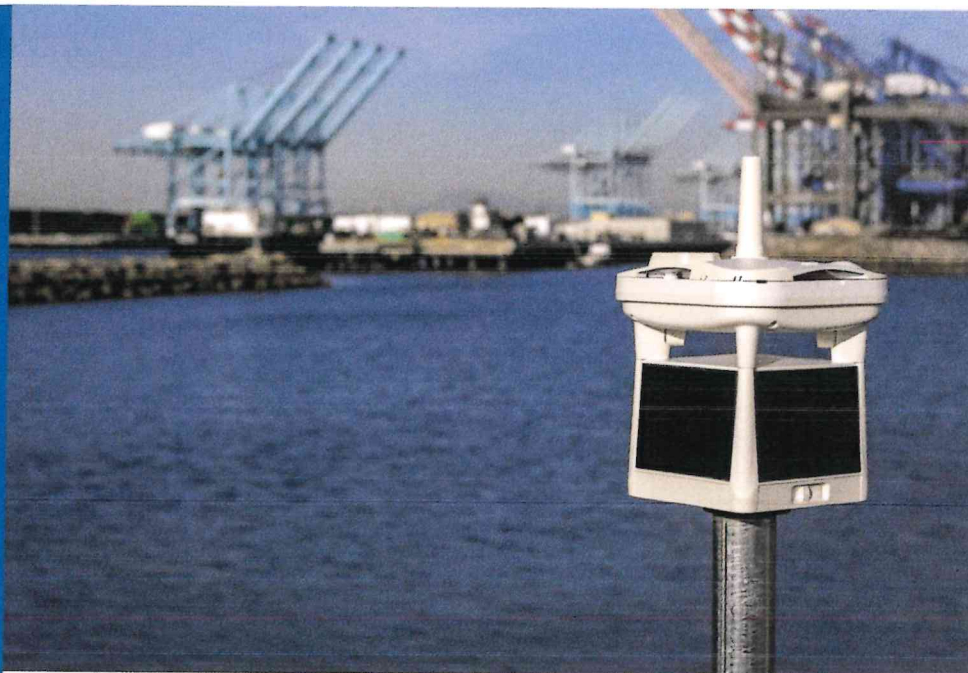
- Temperature
- Barometric Pressure
- Altimeter Setting
- Relative Humidity
- Wind Speed
- Peak Wind Speed
- Wind Direction
- Compass Reading
- Precipitation Amount
- Lightning Distance
- Lightning Frequency

Other Data Reported

- GPS Longitude and Latitude
- GPS Elevation
- Compass Orientation
- Angular Tilt

Patents

D734,182 | D796,353 | D796,972
9,784,887 | 10,429,546 | 3,013,934



The MWS®-C400 is a lightweight, wireless, all-in-one Micro Weather Station (MWS®) that precisely and reliably delivers meteorological data. As a completely wireless unattended ground sensor (UGS), this latest innovation in weather sensing technology from Intellisense Systems combines cloud-based data logging, communications, and a solar power system with a rechargeable battery pack to autonomously gather and report more than 20 environmental parameters. Small enough to fit inside a backpack, the C400 can be installed or placed in nearly any environment for weather reporting in real time.

The engineers at Intellisense set out to create a wireless, reliable, and cost-effective weather station for businesses and communities of any size, and they achieved that with the C400. With a built-in GPS and compass, the C400 offers more accurate measurements of wind speed and direction than any other all-in-one weather station on the market today. This all-in-one station also includes solar panels and an internal rechargeable battery pack for sustained operations, and customers can choose between cellular LTE-M or Iridium Satellite modems for reliable and fully remote data transmission and autonomous processing.

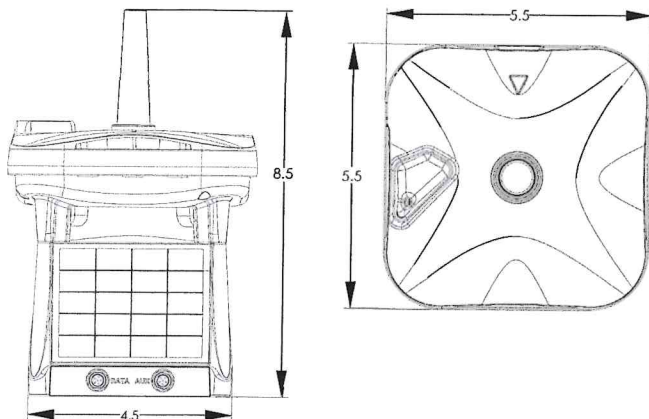


Compared to other off-the-shelf weather-sensing solutions for commercial applications, the C400 provides the most highly integrated, reliable, and easy-to-use weather-sensing system in one professional-grade, rugged, and wireless package.



DIMENSIONS

At just 8.5 inches tall and weighing only 3.2 pounds, the C400 can easily be carried to and set up in just about any location. With a built-in compass and GPS, it can be installed or placed in the most remote areas for accurate weather sensing and data collection.



COMMUNICATIONS

The C400 is available with three communication options to best fit the customers' needs. The standard C400 features a cellular LTE-M modem with data plans available from Verizon. But for areas where cellular coverage is limited, the station can also be equipped with Iridium Satellite modems for both commercial and U.S. Department of Defense (DoD) bands. A full breakdown of MWS Commercial Series models with these communication options are below:

- **MWS®-C400** – Cellular LTE-M
- **MWS®-C410** – Commercial Iridium Satellite
- **MWS®-C420** – DoD Iridium Satellite

ACCESSORIES

To serve a variety of needs, Intellisense offers many accessories for the C400, including mounting solutions, carrying cases, and extension cables up to 200 feet in length.

For a complete catalog of weather station accessories, please visit intellisenseinc.com.

CONTROLS & CONNECTIVITY

The controls on the C400 are simple, consisting of a single power switch. The station will automatically configure itself for operation within 60 seconds of start-up. The two expansion ports also enable connectivity to laptops, external power sources, and other field sensors.

STATION SPECIFICATIONS

Temperature	Range: -40 to 60°C (-40 to 140°F) Resolution: 0.1°C Accuracy: ± 0.1°C at 25°C (77°F)
Barometric Pressure	Range: 600 to 1100 mb Resolution: 0.01 mb Accuracy: ± 0.5 mb at 25°C (900–1100 mb)
Humidity	Range: 0 to 100% Resolution: 1% Accuracy: ± 1.5% (0 to 80%), ± 2.0% (> 80%)
Precipitation	Range: 0 to 152 mm/hr (0 to 6 in/hr) Resolution: 0.25 mm/hr (.01 in/hr) Accuracy: ± 2.5 mm/hr (0.1 in/hr) or 10% (whichever is greater)
Wind Speed	Range: 0 to 28 m/s (0 to 55 knots) Resolution: 0.5 m/s (1 knot) Accuracy: ± 3%
Wind Direction	Range: 0° to 359° Resolution: 1° Accuracy: ± 5°
Angular Tilt	Range: -90° to +90° Resolution: 0.1° Accuracy: ± 1°
Lightning Distance	Range: 0 to 40 km (0 to 25 mi) Resolution: 3.2 km (2 mi) Accuracy: Varies

UNIT PROPERTIES

Weight	1.45 kg (3.2 lb)
Dimensions	H: 21 cm (8.5 in) W: 14 cm (5.5 in) D: 14 cm (5.5 in)
Operating Temperature	Minimum: -40°C (-40°F) Maximum: +60°C (+140°F)
Mounting Hardware	1/4-20 threaded camera mount
Power Management	Solar Cell Array and Onboard Nickel-Cadmium Batteries Continuous operation and the ability to endure extended periods of harsh environmental conditions
Communications	Integrated LTE-M Cellular or Iridium Satellite Modem Transmits data to command and control elements via satellite
Expansion Port	Threaded M8 Serial Connector Rated to IP67 Waterproof Standards Allows new capabilities to be added and easy integration with other devices, including external power and laptop connectivity as well as easy integration of other field sensors
Compliance	Manufactured under ISO 9001 Quality Management System

Phone: 310-320-1827
Email: Info@intellisenseinc.com
www.intellisenseinc.com

intellisense
SYSTEMS

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DS-C400-03-2024

Exhibit G

GAS MANAGEMENT SYSTEM CONSTRUCTION NOTES/TYPICAL

1. TEMPORARY AND PERMANENT CAPPING WILL FOLLOW THE GUIDELINES NOTED IN THE NMCP IN CONJUNCTION WITH TEMPORARY AND PERMANENT GAS COLLECTION CONTROLS TO ENHANCE GAS COLLECTION SYSTEM EFFICIENCY AND MINIMIZE NUISANCE ODORS.
2. DURING CONSTRUCTION OF EACH NEW PAD, THE LANDFILL GAS PERIMETER HEADER WILL BE EXTENDED PRIOR TO WASTE PLACEMENT TO SERVICE FUTURE COLLECTION DEVICES.
3. PERIMETER AND OTHER GAS CONVEYANCE HEADERS SHALL BE INSTALLED ON A PREPARED SUBGRADE, IN ACCORDANCE WITH FORM K, FOR OPTIMAL CONDENSATE DRAINAGE.
4. CONSTRUCT CONDENSATE MANAGEMENT CONTROLS (DRAINS AND TRAPS) AT DESIGN LOW POINTS TO PREVENT CONDENSATE RESTRICTIONS.
5. TEMPORARY CONDENSATE DRAINAGE LINES ON THE PAD SIDE-SLOPES, ON TOP OF THE LINER SYSTEM, SHALL BE COVERED WITH PROTECTIVE MATERIAL OR WASTE AS NEEDED FOR FREEZE PROTECTION.
6. THE CONDENSATE TRAPS SHALL BE DESIGNED TO PREVENT EVACUATION OF THE LIQUID BY VACUUM APPLIED TO THE GAS MANAGEMENT SYSTEM. LIQUID SHALL BE MAINTAINED IN THE TRAPS TO PROVIDE A VACUUM BREAK AND PREVENT AIR INTRUSION.
7. TRAPS SHALL BE EQUIPPED WITH ACCESS RISERS FOR INITIAL LIQUID FILLING AND MAINTENANCE/CLEANING. THE DRAIN LEG SHALL BE EXTENDED TO THE LEACHATE COLLECTION SYSTEM OR TO THE WASTE AS APPROPRIATE TO MINIMIZE NUISANCE ODORS AND TO ALLOW FOR PROPER LIQUID MANAGEMENT.
8. LEACHATE COLLECTION CLEANOUTS WILL BE CONNECTED TO THE LANDFILL GAS PERIMETER HEADER OR OTHER VACUUM SOURCE FOR GAS COLLECTION. THE CONNECTIONS WILL BE MADE PRIOR TO THE PLACEMENT OF WASTE WITHIN THE NEW PAD TO PERMIT THE IMMEDIATE COLLECTION OF GAS AND TO CONTROL NUISANCE ODORS AS WASTE IS PLACED. TEMPORARY PIPE PLUGS WILL BE REMOVED FROM THE LEACHATE COLLECTION PIPING PER LANDFILL SEQUENCING PLANS AND LEACHATE COLLECTION PIPING DETAILS AS WASTE PLACEMENT PROCEEDS ACROSS THE PAD'S EIGHTEEN (18) INCHES OF PROTECTIVE COVER.
9. A HORIZONTAL COLLECTION DEVICE OR OTHER APPROVED VARIATION, SUCH AS STONE COLUMNS, SHALL BE CONSTRUCTED IN ACCORDANCE WITH DESIGN RECOMMENDATIONS IN EACH PAD ACROSS THE EXTENT OF THE EXISTING WASTE. THIS COLLECTION DEVICE WILL BE PLACED AT APPROXIMATELY 60 VERTICAL FEET ABOVE THE BOTTOM LINER SUBGRADE TO PROVIDE GAS COLLECTION FOR WASTE PLACED BELOW AND ABOVE THE DEVICE.

10. INTERIM GAS COLLECTION CONTROLS SUCH AS HORIZONTAL COLLECTORS AND TEMPORARY WELLS SHALL BE USED WHEN AN INTERMEDIATE SLOPE WILL REMAIN INACTIVE FOR MORE THAN 12 MONTHS. KEYSTONE LANDFILL SHALL CONSTRUCT TEMPORARY GAS WELLS ACROSS THE TOP OF THE INTERMEDIATE SLOPE AS WASTE PLACEMENT PROCEEDS IN THE ADJACENT PAD. TEMPORARY WELLS WILL WORK IN CONJUNCTION WITH TEMPORARY CAP ON THE INTERMEDIATE SLOPE. AS WASTE PLACEMENT PROCEEDS AGAINST THE INTERMEDIATE SLOPE IN THE ADJACENT PAD, A SECTION OF TEMPORARY CAP WILL BE REMOVED AND COVERED WITH NEW MSW BY THE END OF THAT WORKING DAY.
11. GAS CONVEYANCE SYSTEM PIPING SHALL BE EXTENDED TO PROPOSED GAS WELL LOCATIONS PRIOR TO OR CONCURRENT WITH TEMPORARY AND PERMANENT GAS WELL CONSTRUCTION ACTIVITIES SO THAT NEW WELLS CAN BE ACTIVATED UPON COMPLETION.
12. AS PORTIONS OF THE LANDFILL REACH FINAL GRADE, CONSTRUCT FINAL LANDFILL CAP SYSTEM. CONSTRUCT GAS COLLECTION SYSTEM WELLS AND PIPING IN ACCORDANCE WITH PERMIT DRAWINGS AND THE SITE GCCS PLAN IF NOT PREVIOUSLY CONSTRUCTED. GAS WELL LOCATIONS AS SHOWN ON PERMIT DRAWINGS ARE SUBJECT TO CHANGE BASED ON THE MOST CURRENT VERSION OF THE SITE GCCS PLAN, AND OTHER SITE-SPECIFIC REQUIREMENTS AS DETERMINED BY KSL'S CONSULTANT TO OPTIMIZE GAS COLLECTION EFFICIENCY.
13. INSTALL SHALLOW COLLECTORS ON SLOPES AT FINAL GRADE IN ACCORDANCE WITH THE CONSTRUCTION DETAILS AS NEEDED. SHALLOW COLLECTORS SHALL BE CONSTRUCTED IN CONJUNCTION WITH FINAL CAP AND SHALL BE LOCATED A MINIMUM OF 5' FROM THE LEADING EDGE OF THE CAP. SHALLOW COLLECTORS ASSOCIATED WITH THE FINAL CAP SHALL BE ADJUSTED USING FLOW CONTROL DEVICES AS NEEDED TO INTERCEPT GAS MIGRATING ALONG THE CAP EDGE. SHALLOW COLLECTORS MAY ALSO BE USED AS NEEDED TO PREVENT THE PILLOWING OF TEMPORARY AND FINAL CAP. PIPE SPACING AND VACUUM CONNECTIONS SHALL BE DETERMINED BASED UPON THE ENGINEER'S ANALYSIS OF EXISTING GAS COLLECTION DEVICES IN THE PROPOSED CAP AREA, SURFACE SCAN READINGS, AND OTHER AVAILABLE DATA.
14. KEYSTONE LANDFILL SHALL CONSTRUCT AND OPERATE THE LANDFILL GAS COLLECTION AND CONTROL SYSTEM IN ACCORDANCE WITH THIS TYPICAL SEQUENCE TO ENSURE THE NECESSARY CONTROL DEVICES ARE INSTALLED IN A TIMELY MANNER AND ARE AVAILABLE FOR USE AS THE NEED ARISES. ON-GOING ADJUSTMENTS WILL BE MADE TO THE GAS COLLECTION CONTROL DEVICES TO OPTIMIZE SYSTEM PERFORMANCE, AND IF NEEDED, KEYSTONE SHALL INSTALL ADDITIONAL DEVICES TO REMEDIATE NON-COMPLIANT AREAS AS IDENTIFIED DURING PERFORMANCE OF THE SURFACE EMISSION MONITORING.
15. HORIZONTAL COLLECTION DEVICES SHALL BE INSTALLED ALONG ALL ANCHOR TRENCHES BEING CONSTRUCTED. HORIZONTAL COLLECTION DEVICES WILL ALSO BE INSTALLED ALONG HAUL ROADS IN AREAS OF INTERMEDIATE COVER and in active fill areas prior to moving to non-contiguous active pad configurations.

Exhibit H

Intermediate Cover/Capping Definitions

Keystone utilizes various materials and construction practices during cell construction, waste placement and covering/capping of the same. For clarification purposes the following definitions will be used:

- Intermediate Soil Cover – areas outside of the working face that will become active within 120 days shall receive an intermediate soil cover. This soil cover will meet the requirements as outlined in Appendix H. These areas will be considered “Active Area for Leachate Generation and Potential Odors”.
- Rain Tarp, Reinforced Polyethylene (rpe) geomembrane (Protective Cover) – areas within cell construction that have 18” of protective cover in place may receive rain tarp. Stormwater is collected from the rain tarp and conveyed to stormwater ditches, preventing the same from getting into the leachate collection system. Leachate collection system clean-outs are monitored to ensure there are no gas emissions from areas with rain tarp. These areas will not be considered “Active Areas for Leachate Generation or Potential Odors”.
- Rain Tarp, Reinforced Polyethylene (rpe) geomembrane (Intermediate Slopes) – areas outside of the working face that will be inactive for more than 120 days may receive a rain tarp cap. Stormwater is collected from the rain tarp and conveyed to stormwater ditches, preventing the same from getting into the leachate collection system. Shallow horizontal gas collection will be installed along the anchor trench in these areas. If there are no vertical gas collections within the area capped with rain tarp, under cap collection will be installed up along the slopes to ensure no gas emissions from intermediate slopes capped with rain tarp. These areas will not be considered “Active Area for Leachate Generation or Potential Odors ”.
- 40 mil, 30 mil HDPE/LLDPE/LDPE (Intermediate Slopes) – areas outside of the working face that will be inactive for more than 120 days may receive one of these geomembrane materials as a temporary cap. In addition, a composite cushion and adequate soil will be placed on top of the geomembrane material to allow vegetation to be established. Stormwater will be conveyed from these areas to site stormwater ditches. Shallow horizontal gas collection will be installed along the anchor trench in these areas. If there is no vertical gas collection within the area capped with the geomembrane material, under cap collection will be installed up along the slopes to ensure no gas emissions from intermediate slopes capped with geomembrane materials. These areas will not be considered “Active Areas for Leachate Generation or Potential Odors ”.
- 30 mil, 20 mil, 12mil MDPE/LDPE/LLDPE (Protective Cover) – areas within cell construction that have 18” of protective cover in place may receive one of these geomembrane materials. Stormwater is collected from the geomembrane and conveyed to stormwater ditches, preventing the same from getting into the leachate collection system. Leachate collection system clean outs are monitored to ensure there are no gas emissions from areas with geomembrane covering. These areas will not be considered “Active Areas for Leachate Generation or Potential Odors ”.

- Posi-shell (Intermediate Slopes) – Keystone may use a product “Posi-shell” a spray-applied mortar made from clay , reinforcing fibers, polymer and Portland cement on intermediate slopes. These areas will receive Posi-shell at times if liner crews are not available to install one of the other alternative intermediate capping materials. Posi-shell is up to 90% effective in preventing stormwater from entering the leachate collection system and controlling gas emissions. Posi-shell covering is monitored, and additional spray applications are made to repair any deficiencies to maintain its integrity. These areas will not be considered “Active Areas for Leachate Generation based on the 90% effectiveness but will be considered an active area for potential odors,”. The Posi-shell material contains an ingredient that will change the color of the Posi-shell alerting KSL staff of a potential odor emission. This typically occurs at an imperfection in the cover or cracks in the Posi-shell, at which time KSL staff will repair these areas with a new coating of Posi-shell.

Exhibit I

Odor Control Mitigation Measures

Leachate Treatment Plant

Keystone has installed a blower system for the treatment plant that uses a stainless-steel vacuum header that pulls gases from all pH adjustment tanks within the plant as well as the cleaning tanks on each unit as they are prone to off gassing during cleaning cycles. This blower then pushes the gases through a scrubber vessel (DS-1000) loaded with absorption media, (Pure Air - Sulfasorb XL). The inlet and discharge of the scrubber is sampled on all business days including Saturday with a 4-gas meter, h₂s sample meter or drager tubes depending on location and concentrations. Media is changed when breakthrough of h₂s in the exhaust reaches 1 part per million. This process is completed utilizing a Vactor, typically change outs are completed the day after breakthrough is found. Systems are shut down for approximately 2 hours to vac out the media and reload the vessel.

Wet Wells

At both the wet well for conveyance of leachate to the storage tanks and at the influent wet well to the treatment plant smaller scrubber vessels are utilized. These vessels are loaded with absorption media, (Pure Air - Sulfasorb XL). The inlet and discharge of both scrubbers are sampled on all business days including Saturday with a 4-gas meter, h₂s sample meter or drager tubes depending on location and concentrations. Media is changed when breakthrough of h₂s in the exhaust reaches 1 part per million. This process is completed utilizing a Vactor, typically change outs are completed the day after breakthrough is found. Systems are shut down for approximately 2 hours to vac out the media and reload the vessel.

Lagoons

If there is any Leachate in the East Lagoon with overflow from the wet well or if the Lagoon is utilized for storage the foaming process will be activated and misting with neutralizing agents will be applied if needed.

Leachate Storage Tanks

To control potential VOC emissions and odors from each AST, Keystone installed a BIOREM system in conjunction with the construction of the two Leachate storage Tanks. The BIOREM biological treatment system features a biotrickling filter followed by a biofilter. The biotrickling filter and biofilter systems are both designed in a forced draft, up flow configuration. In each treatment stage the collected air enters the base of the packed biofilter bed and then passes up through the specially selected media.

Each high porosity media provides an ideal environment for the establishment of bacterial colonies. As the air comes in contact with the biofilm, odorous compounds are solubilized into the moisture layer and subsequently oxidized by the microbes; hydrogen sulfide is primarily removed by the biotrickling filter stage and other odorous compounds are primarily removed by the biofilter stage. The biotrickling filter stage is kept adequately moistened by way of continuous recirculation water while the biofilter stage is kept moistened by way of intermittent irrigation with client supplied water. According to the system manufacturer, the biofiltration system will achieve 99 percent removal of hydrogen sulfide and 90 percent removal of odor. In addition, Keystone is dosing the exhaust of the BIOREM system with Chemtron OC 8400 in case of a breakthrough from the BIOREM treatment. Along with dosing

the BIOREM system with sulfuric acid to help reduce any ammonia.

Lagoons, Treatment Plant, Wet Wells, Storage Tanks, RO Concentrate

In addition to the odor mitigation measures at the various locations noted above, Keystone is also utilizing an odor controlling product (Sulfa Loc 200). Sulfa loc 200 is dosed into the raw leachate at the new wet well prior to being pumped up to the tanks, so it has time to mix in the line (closed system). Sulfaloc 200 is also dosed at the discharge of each permeate polishing stage within the plant to remove any entrapped h₂s gas from the permeate prior to the degassifier where it would be separated and exhausted from the building. Sulfa loc 200 is dosed into the RO concentrate prior to going into storage to reduce odor in the storage tanks, during the truck loading process and the disposal process on the working face. The use of this product has shown 50% reduction in H₂S in the landfill gas stream since Keystone started dosing it into the recycled RO concentrate.

Copies of all Odor Controlling products noted are attached.



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Product Bulletin

OC 8400

Odor Control

GENERAL DESCRIPTION

Chemtron OC 8400 is an effective, concentrated blend of odor neutralizing and encapsulating compounds. It is specifically formulated to eliminate sulfur based nuisance odors. **OC 8400** effectively neutralizes odors in food processing, solid waste management, municipal waste systems, and most industrial applications when applied using atomizing technology.

ADVANTAGES

- Broad spectrum effectiveness, only one product required.
- Decreased overall odor intensity, no offensive masking.
- Easy to apply, saves time and labor.
- Low use rate, reduced cost for treatment.
- Low maintenance requirements, reduced capital costs.
- Non-toxic and biodegradable, replaces hazardous chemicals.
- Instantaneous odor reduction, reduces odor complaints.

TYPICAL PROPERTIES

Appearance	Slight opaque tan to white liquid
Odor	Clean Fragrance
pH	NA
Specific Gravity	1.00



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APPLICATION

OC 8400 can be used to control odors from sewage plants, landfills, poultry houses, waste collection facilities, paper mills, and rendering operations.

Dosages depend on a variety of factors and feed rates are specifically designed for each application and odor mitigation requirement. 400:1 is a typical dilution rate typically sufficient in most cases for odor control. The product should be atomized directly into the air stream.

SAFETY, STORAGE, & COMPATIBILITY

Keep container closed when not in use. Wear protective goggles and gloves when transferring or handling concentrated product. Keep from freezing. Do not store in areas of high temperature or direct sunlight. As efficacy is not lost if remixed, product can be remixed if separation or cloudiness occurs due to freezing or overheating. Product freezes at approx. 30 degrees F.

PACKAGING

Available in 55 or 275 gallon containers

Sulphasorb XL Media vs Virgin Activated Carbon

Virgin activated carbon is a physically adsorbent material, while Sulphasorb XL is a chemically reactive, high-capacity media designed specifically for hydrogen sulfide (H_2S) removal. Virgin activated carbon uses physical adsorption to trap contaminants, whereas Sulphasorb XL uses a chemisorption process with an oxidizing agent, such as potassium permanganate, to chemically convert H_2S into a stable, non-toxic compound, resulting in a significantly higher capacity and longer service life for H_2S removal.

Feature 	Virgin Activated Carbon	Sulphasorb XL
Primary Mechanism	Physical adsorption (trapping)	Chemisorption (chemical reaction)
Key Component	Carbon	Oxidizing agent (like potassium permanganate) infused material
Target Contaminant	Broad range of compounds, including VOCs	Primarily hydrogen sulfide (H_2S)
Capacity	Varies based on type and application	Two to three times higher than traditional activated carbon for H_2S
Lifespan for H_2S Removal	Shorter, as it becomes saturated	Longer, due to chemical reaction instead of physical saturation
Disposal of Contaminant	The trapped contaminants are physically held within the pores. These can sometimes be removed by heating in a process called desorption.	The H_2S is converted into a stable, non-toxic compound.



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H₂S Capacity Measurements: Sulphasorb XL vs. Virgin Activated Carbon

Measurement Parameter	Virgin Activated Carbon (approximate)	Sulphasorb XL Media
PureAir® Filtration +6		
Capacity by Volume (g H ₂ S/cc)	Approximately 0.15 g/cc or lower	Greater than 0.30 g/cc
Capacity by Weight (% w/w)	Typically has a much lower capacity, often only a few percent, or up to 10-20% of its weight in H ₂ S when optimal conditions (moisture/O ₂) are maintained for a weak catalytic reaction.	Can reach approximately 66% by weight .
Performance Multiplier	(Baseline for comparison)	Offers two to three times higher H ₂ S removal capabilities than traditional activated carbon.

Activated Carbon Adsorbent Media

PureAIR
FILTRATION

Basic Information:

- Activated carbons are one of the most cost-effective methods of gas removal.
- Many types of activated carbons are available.
- Activated carbon is used for purifying air and water because it acts as an adsorbent, and can effectively remove particles and organics from water and odors from the air.
- One of the best materials for reducing risks to human health, it is also aesthetically pleasing.
- Each activated carbon has its own specific benefit.
- Unless specified otherwise, PureAir provides AC-X type carbon as a standard.

CAUTION: WET ACTIVATED CARBON DEPLETES OXYGEN FROM AIR - Whenever workers enter a vessel containing carbon, all precautions must be taken since dangerously low levels of oxygen may be encountered. Atmosphere sampling and work procedures for potentially low oxygen areas should be followed.

Product Specifications:

- Density: 480 kg/m³
- Surface Area: 1100 m²/g
- Typical Moisture Content %: 5%
- Crush Test: 95 lbs
- Abrasion Loss %: 3% maximum
- Relative Pressure Drop: See Curve C/D*
- Ignition Temperature: 425 °C minimum
- CTC Value: 70%
- Iodine #: 1100 mg/g
- Ash Content: 5% maximum
- Butane Activity: 27% minimum

*See Curves Details at pureairfiltration.com/curves/

AC-X



AC-C



General Description and Capacities:

AC-X- Extruded Activated Carbon:

Because of its shape, performance and low cost, extruded carbon has become the standard over the past decade. PureAir carbon is a low dust, high-activity level, economical choice. Shape: 4 mm diameter cylinder

AC-C- Coconut Shell Carbon:

Produced from the shell of coconuts, this carbon is considered the finest in the world for air purification because the coconut shell forms pores that are just the right size to capture many gases and odors. Coconut shell carbon has a higher pressure drop (1.8" per foot at 70 fpm). Shape: 3 x 8 mesh

Removal Capability of Both Products:

- Nitric Dioxide Removal Capacity – 6.6% by weight
- Chlorine Removal Capacity – 10% by weight
- Dichloroethane Removal Capacity – 20% by weight



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Sulphasorb XL™ Adsorbent Media



Basic Information:

- Sulphasorb XL™ was developed to provide our customers with the highest extended life.
- Sulphasorb XL™ has a capacity for capturing hydrogen sulfide (H₂S), which is two to three times higher than other products in the market. PureAir does not impregnate this carbon.
- Sulphasorb XL™ performs exceptionally well not only in PureAir scrubbers, but also as replacement media in scrubbers manufactured by other companies.



General Description	Product Specifications	Removal Capability
Porous, 4 mm cylindrical pellets of high grade activated carbon. Sulphasorb XL™ is catalytic type engineered carbon that targets hydrogen sulfide.	• Particle Size: 4mm diameter cylinder • Density: 480 kg/m³ (30 lbs/ft³) • Surface Area: 1100 m²/g • Typical Moisture Content %: 5% • Crush Test: 97 lbs • Abrasion Loss %: 3% maximum • Relative Pressure Drop: See Curve C • Ignition Temperature: >400 C • CTC Value: 70% • Iodine #: 1100 mg/g • Ash Content: 5% maximum • Butane Activity: 27% minimum	• Approximately 66% by weight

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Product Bulletin

Sulfa Loc 200

Odor Control

GENERAL DESCRIPTION

Sulfa Loc 200 was developed specifically to provide a solution for the control of odors from hydrogen sulfide, mercaptans, and other malodorous compounds.

Sulfa Loc 200 is designed to be applied to the liquid phase to scavenge and inhibit the production and release of the odors causing compounds.

ADVANTAGES

- Eliminates the release of hydrogen sulfide and related corrosion producing compounds.
- Economical, cost effective, and easy to feed.
- Non-pollutant, non-corrosive solution.
- Will not contribute to or increase system solids.

TYPICAL PROPERTIES

Appearance	Clear, colorless liquid
Odor	Slight
pH	2.0 - 3.5
Specific Gravity	1.27



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APPLICATION

Sulfa Loc 200 can be used to control odors from sewage plants, landfills, poultry houses, waste collection facilities, paper mills, and rendering operations. In wastewater systems, it reacts with hydrogen sulfide, sulfur dioxide and most organic acids to permanently scavenge the chemical and its odor.

Dosages depend on a variety of factors and feed rates are specifically designed for each application and odor mitigation requirement. 3-5 parts per million per ppm of H₂S is typically sufficient in most cases for odor control. The product should be metered into the system of continuous flow streams ahead of the point of H₂S release. The product can be metered directly into waste lagoons, aeration basins, digesters, clarifiers, or SBR's. Longer retention improves performance.

SAFETY, STORAGE, & COMPATIBILITY

Keep container tightly closed in a dry and well-ventilated place. Observe label precautions. Electrical installations / working materials must comply with the technological safety standards. Do not store near acids. Recommended storage temperature: < 50 °C. Storage period: 6 Months

PACKAGING

Available in 55 or 250 gallon containers

Product Bulletin

Sulfa Loc

Odor Control

GENERAL DESCRIPTION

Sulfa Loc is a liquid blend extract from naturally occurring organic materials. It is a natural Carbon compound derived from highly humified organic material consisting of natural soil constituents. This novel formulation was developed specifically to provide an environmentally acceptable solution to odorous biological reactions. **Sulfa Loc** was developed after nearly 10 years of extensive research. This blend has been found to have remarkable properties in odor and corrosion control, stimulating indigenous microbial activity, and wastewater clarification.

Sulfa Loc is a natural Carbon composition that represents unsurpassed odor control for a wide range of odorous situations including, H₂S, Ammonia, Mercaptans and Biological compounds. It enhances and stimulates indigenous microbial populations in receiving waterways, dramatically improving waste degradation.

Sulfa Loc is a composition of naturally occurring biology, Carbon, humic acids, lignin, and trace nutrients. This unique blend of naturally occurring constituents represent essential acids and organic matter that bind with and eliminate odorous compounds.

ADVANTAGES

- Rapid odor reaction, results may be obtained on contact, or within 12 to 48 hours of application – eliminates 30,60, or even 90-day trial periods.
- Eliminates the release of hydrogen sulfide related corrosion.
- Economical and cost effective with low PPM rate requirements.
- Non-pollutant, non-corrosive, natural solution
- Stimulates and enhances microbial populations, beneficial to receiving water systems.

TYPICAL PROPERTIES

Appearance	Dark brown/black liquid
Odor	Earthy smell
pH	7.5 - 8.5
Specific Gravity	1.04

APPLICATION

Sulfa Loc performs within a pH range of 3.0 to 11.6 with the optimum near pH 7.0. Effective temperature range is 40 to 145 F.

Sulfa Loc can be used to control odors from sewage plants, landfills, poultry houses, waste collection facilities, paper mills, and rendering operations. In wastewater systems, it reacts with hydrogen sulfide, sulfur dioxide and most organic acids to permanently neutralize the chemical and its odor.

10-50 parts per million is sufficient in most cases for odor control. The product should be metered into the system of continuous flow streams at least 100 yards ahead of the point of H₂S release. The product can be metered directly into waste lagoons, aeration basins, digesters, clarifiers, or SBR's. Longer retention improves performance.

It has been found effective in removing hydrogen sulfide and TRS gases from paper mill scrubber systems. The **Sulfa Loc** should be added to the circulating or make-up at the gas inlet of the scrubber. Tests in the circulation water show neutralization of the sulfides.

SAFETY, STORAGE, & COMPATABILITY

No special handling precautions. Should be protected against long periods of frost or freezing, thaw out before using. The suggested maximum in plant storage is 24 months.

This is a non-toxic and non-hazardous product. Environmentally friendly.

PACKAGING

Available in 2.5, 30, 55, or 275 gallon containers

Exhibit J

1.9 PROGRAM DESCRIPTION
TO CLARIFY THAT THE DESIGN OBJECTIVES FOR THE FOUNDATIONS ARE MET, CONTIGUOUS THIRD-PARTY INSPECTION ORGANIZATIONS SHALL BE PRESENT DURING CONSTRUCTION OF LINER SYSTEMS, TOP CAPS, SUBURBASES AND SUBBASES. THE THIRD-PARTY ORGANIZATION SHALL HAVE BEEN INSPECTED BY A NATIONAL ACCREDITING AGENCY AND CONFORM TO THE REQUIREMENTS OF ASTM E320 FOR AT LEAST CONTINUOUS 5 YEARS. CONSTRUCTION QUALITY CONTROL (QC) WILL BE COMPLETED BY THE SITE CONTRACTOR. CONSTRUCTION QUALITY ASSURANCE (QA) WILL BE UNDERTAKEN BY THE QUALITY ASSURANCE ENGINEER AND INCLUDE CONSTRUCTION COMPONENTS AND TASKS AS OUTLINED BELOW.

- 1.1 OBSERVATIONS OF SOIL AND ROCK SURFACES FOR ADEQUATE FILLING OF ROCK JOINTS, FRACTURES, OR DISCONTINUITIES.
1.2 REVIEW SURVEY DATA OF THE APPROVED SUBGRADE ELEVATIONS TO ENSURE THAT ALL MEETS DESIGN REQUIREMENTS.
1.3 PERFORM TESTS AND OBSERVATIONS TO ENSURE THE QUALITY OF COMPACTED ENGINEERED FILL PLACED.
1.4 OBSERVATIONS OF STRIPPAID AND EXCAVATION TO ENSURE THAT THERE ARE NO MOISTURE SHEEPS AND THAT ALL SOIL, ORGANIC AND OTHER UNDESIRABLE MATERIALS ARE REMOVED.
1.5 OBSERVATIONS AND TESTS TO ENSURE THAT THE SURFACE IS PROPERLY COMPACTED, SMOOTH, UNIFORM, AND CONSISTENT WITH DESIGNED GRADES.
1.6 SUPPORT FOR SURVEYING ACTIVITIES AS OTHERWISE PROVIDED BY KEYSTONE AS REQUIRED TO VERIFY QUALITY DIMENSIONS, SIDE SLOPES, AND BOTTOM SLOPES PROVIDED IN THE DESIGN.
1.7 PLACEMENT OF GEOSYNTHETIC TO INHIBIT PROPER PLACEMENT PANEL OVERLAPS AND WELDING TECHNIQUES.
1.8 PLACEMENT OF COLLECTION SYSTEM FOR LINER AND GRADE, PROPER SIZE AND COVER MATERIALS.
1.9 PLACEMENT OF PROTECTIVE COVER FOR MATERIALS, COVER THICKNESS AND PLACEMENT PROCEDURES.
1.10 PLACEMENT OF FINAL COVER INCLUDING GEOSYNTHETIC CAP AND COVER MATERIALS.

2.8 ROCK STRUCTURAL FILL

- PRIOR TO THE PLACEMENT OF ANY FILL, THE CONTRACTOR SHALL PROOF ROLL ALL AREAS TO RECEIVE FILL. PROOF ROLLING WILL CONSIST OF A FULLY LOADED 20 TON TRUCK, MAKING AT LEAST TWO COMPLETE PASSES ACROSS THE ENTIRE FILL AREA. UNDESIRABLE SOILS FROM ANY AREAS SHALL BE REMOVED AND PROOF ROLLED AGAIN.
2.8 ROCK FILL WILL BE PLACED UP TO 2 FEET BELOW THE SURFACE OF THE SUBGRADE (I.E. THE LAYER DIRECTLY BELOW THE SUBBASE).
2.9 PRIOR TO PLACING ANY ROCK FILL, TOPSOIL, OR ANY UNDESIRABLE SOILS SHALL BE REMOVED COMPLETELY AND THE UNDERLYING SOIL, INCLUDING PREVIOUSLY PLACED LIFTS SHALL BE SCARIFIED WITH A BALLOONER. ROCK FILL CANNOT BE PLACED BETWEEN LAYERS OF SOIL STRUCTURAL FILL. ALTERNATING LAYERS OF SOIL WITH ROCK WILL NOT BE ALLOWED.
2.10 ROCK FILL MATERIAL SHALL CONSIST OF NATURAL, SOIL FREE, MATERIAL FROM ROCKS, GRANITE, MARBLE, CLAY SOILS, TRASH, DEBRIS AND OTHER UNDESIRABLE MATERIALS.
2.11 THE ROCK FILL MATERIAL SHALL BE OBTAINED FROM ON-SITE AREAS AND NON-CONTIGUOUS "OFF-SITE AREAS" OR OFF-SITE SUPPLIERS.
2.12 ROCK FILL SHALL HAVE MFG # 18 INCHES. MATERIAL MAY BE SCREENED TO MEET THE REQUIRED SPECIFICATIONS. LIFT SIZE SHALL NOT EXCEED 24 INCHES.
2.13 TO PREVENT WEAR, ROCK FRAGMENTS ENCOUNTERED SHALL BE EVENLY SPREAD THROUGHOUT THE LIFT. CARE SHALL BE TAKEN TO DISTRIBUTE FINEST FILL THROUGHOUT THE LIFT ESPECIALLY AROUND ROCK FRAGMENTS TO ELIMINATE VOID SPACES.
2.14 EACH LIFT OF ROCK FILL WILL BE COMPACTED FIRST BY TRACKING THE ROCK FILL WITH A CAT DRI OR EQUIVALENT DOZER WITH A MINIMUM 1-1/2" DROUGHER SIZE. ONE HUNDRED PERCENT COVERAGE SHALL BE PERFORMED AND A SECOND PASS AT 70 TO THE FIRST. SUBSEQUENTLY, THE ROCK FILL SHALL BE COMPACTED USING A VIBRATORY SHEET PILE ROLLER HAVING A MINIMUM DYNAMIC FORCE OF 60,000 LB-FT. A MINIMUM OF FOUR COMPLETE COVERS WITH EACH SUBSEQUENT COVERAGE AT RIGHT ANGLES TO THE PREVIOUS COVERAGE. FINALLY, EACH LIFT SHALL BE COMPACTED USING FOUR PASSES OF A SMOOTH DRUM SOIL COMPACTOR CAPABLE OF DELIVERING 60,000 LB-FT OF DYNAMIC FORCE. EACH PASS SHALL BE AT 90 TO THE PREVIOUS PASS.
2.15 THE ACCEPTANCE CRITERIA FOR ROCK FILL SHALL BE NO MOVEMENT BENEATH A 50 TON LOADED TRUCK WITH NOT LESS THAN 100 PSI WHEEL PRESSURE.
2.16 STRUCTURAL FILL BATHY

- PRIOR TO THE PLACEMENT OF ANY EARTH FILL, THE CONTRACTOR SHALL PROOF ROLL ALL AREAS TO RECEIVE FILL. PROOF ROLLING WILL CONSIST OF A FULLY LOADED 20 TON TRUCK, MAKING AT LEAST TWO COMPLETE PASSES ACROSS THE ENTIRE FILL AREA. UNDESIRABLE SOILS FROM ANY AREAS SHALL BE REMOVED AND PROOF ROLLED AGAIN.
2.17 FIRST BY TRACKING THE EARTH FILL WITH A CAT DRI OR EQUIVALENT DOZER WITH A MINIMUM 1-1/2" DROUGHER SIZE. ONE HUNDRED PERCENT COVERAGE SHALL BE PERFORMED AND A SECOND PASS AT 70 TO THE FIRST. SUBSEQUENTLY, THE EARTH FILL SHALL BE COMPACTED USING A VIBRATORY SMOOTH DRUM ROLLER HAVING A MINIMUM DYNAMIC FORCE OF 60,000 LB-FT. A MINIMUM OF FOUR COMPLETE COVERS WITH EACH SUBSEQUENT COVERAGE AT RIGHT ANGLES TO THE PREVIOUS COVERAGE.
2.18 THE ACCEPTANCE CRITERIA FOR STRUCTURAL FILL SHALL BE NO MOVEMENT BENEATH A 50 TON LOADED TRUCK WITH NOT LESS THAN 100 PSI WHEEL PRESSURE.
2.19 STRUCTURAL FILL SHALL BE USED ABOVE THE EXISTING GROUND OR ROCK FILL APPROVED BY THE QUALITY ASSURANCE ENGINEER OR THEIR DESIGNATED REPRESENTATIVE TO THE BOTTOM OF SUBBASE ELEVATION.
2.20 PRIOR TO PLACING ANY STRUCTURAL FILL, TOPSOIL, OR ANY UNDESIRABLE SOILS SHALL BE REMOVED COMPLETELY AND THE UNDERLYING LAYER SHALL BE SCARIFIED WITH A BALLOONER OR APPROVED EQUIVALENT. IF IN THE PRESENCE OF THE ENGINEER, A DROUGHER IS NECESSARY TO SCARIFY THE STRUCTURAL FILL FROM THE ROCK, A 16 DROUGHER NON-WOVEN NEEDLE PUNCHED GEOTEXTILE SHALL BE USED.
2.21 THE STRUCTURAL FILL MATERIAL SHALL BE OBTAINED FROM ON-SITE AREAS AND NON-CONTIGUOUS "OFF-SITE AREAS" OR OFF-SITE SUPPLIERS.
2.22 THE STRUCTURAL FILL SHALL HAVE A MFG # 18 INCHES AND NO GREATER THAN 4% PASSING NO. 40 SIEVE. MATERIAL MAY BE SCREENED TO MEET THE REQUIRED SPECIFICATIONS.
2.23 STRUCTURAL FILL SHALL BE PLACED IN A MINIMUM LOSS LIFT THICKNESS OF 18 INCHES, SPREAD IN CONSISTENT HORIZONTAL LAYERS. PRIOR TO PLACING A NEW LIFT, ALL PREVIOUSLY PLACED STRUCTURAL FILL LIFTS SHALL BE SCARIFIED WITH A BALLOONER OR APPROVED EQUIVALENT.
2.24 EACH LIFT SHALL BE COMPACTED USING A MINIMUM OF FOUR PASSES OF A SMOOTH DRUM COMPACTOR CAPABLE OF DELIVERING 60,000 LB-FT OF FORCE OR APPROVED EQUIVALENT.
2.25 STRUCTURAL FILL SHALL BE COMPACTED TO A MINIMUM OF 90% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR COMPACTION TESTS (ASTM D1557). THE COMPACTED MOISTURE CONTENT SHALL BE WITHIN +10% OF OPTIMUM MOISTURE CONTENT.
2.26 STRUCTURAL FILL QA TESTING SHALL BE CONDUCTED IN ACCORDANCE WITH ASTM METHODS AND TESTING FREQUENCIES LISTED IN THE STRUCTURAL FILL QA TESTING TABLE AND SHALL MEET OR EXCEED THE ACCEPTANCE CRITERIA OUTLINED IN THE TABLE.
2.27 TO COMPACT STRUCTURAL FILL, NOT MEETING THE REQUIRED SPECIFICATIONS SHALL BE RECOMPACTED OR MOISTURE CONDITIONED TO MEET SPECIFICATIONS, OR REMOVED AND REPLACED.

TABLE 3.1 STRUCTURAL FILL QA TESTING TABLE

TEST	TEST METHOD	TESTING FREQUENCY	ACCEPTANCE CRITERIA ON CRITERIA
GRAIN SIZE	ASTM D422	EVERY 5,000 CY IN-PLACE AND EVERY DISCRETE CHANGE IN MATERIAL	100% < 4.75 < 4.75 < 4.75
MOISTURE DENSITY RELATIONSHIPS	ASTM D1557	EVERY 5,000 CY IN-PLACE AND EVERY DISCRETE CHANGE IN MATERIAL	120 PCF
IN-PLACE DENSITY AND MOISTURE	ASTM D2922 AND ASTM D2922	EVERY 5,000 CY IN-PLACE AND EVERY DISCRETE CHANGE IN MATERIAL	90% OF MODIFIED MOD. < 4% TO +2% OF MODIFIED MOD.
REMOVAL OF UNSUITABLE MATERIAL	OBSERVATION	CONTINUOUS	REMOVE ANY TOPSOIL, OR UNDESIRABLE MATERIALS AS DIRECTED BY THE GEO-TECHNICAL ENGINEER
PROOF ROLLING	OBSERVATION	CONTINUOUS	PERFORMED UNDER THE SUPERVISION OF AND AS DIRECTED BY THE GEO-TECHNICAL ENGINEER
SURFACE FINISHING	OBSERVATION	CONTINUOUS	SMOOTH AND FREE OF SURFACE CHANGES
SLOPE	FIELD SURVEY	100 FT X 100 FT	+0.5% OF DESIGN GRADE

4.2 SUBBASE

1. THE 6-INCH THICK SUBBASE LAYER SHALL BE PLACED ABOVE THE STRUCTURAL FILL APPROVED BY THE QUALITY ASSURANCE ENGINEER OR THEIR DESIGNATED REPRESENTATIVE.
2. PRIOR TO PLACING ANY SUBBASE MATERIAL, ANY UNSUITABLE SOILS SHALL BE REMOVED COMPLETELY AND THE UNDERLYING SOIL LAYER SHALL BE SCARIFIED WITH A BALLOONER.
3. THE SUBBASE MATERIAL SHALL BE OBTAINED FROM ON-SITE AREAS AND NON-CONTIGUOUS "OFF-SITE AREAS" OR OFF-SITE SUPPLIERS.
4. THE SUBBASE MATERIAL SHALL HAVE A MAXIMUM PARTICLE SIZE < 3/8 INCHES AND NO MORE THAN 12% PASSING NO. 200 SIEVE. MATERIAL MAY BE SCREENED TO MEET THE REQUIRED SPECIFICATIONS.
5. THE DESCRIPTION (ASTM 2488), CLASSIFICATION (ASTM D422), GRAIN SIZE (ASTM D422), ATTERBURG LIMITS (ASTM D422) AND MOISTURE DENSITY RELATIONS (ASTM D1557) ON TESTS ON SUBBASE MATERIAL SHALL BE CONDUCTED AT FREQUENCIES SPECIFIED IN THE SUBBASE QA TESTING TABLE. IN ADDITION, IF APPROVED, THE MODIFIED PROCTOR COMPACTION TESTS (ASTM D1557) SHALL ALSO MEET OR EXCEED THE ACCEPTANCE CRITERIA OUTLINED IN THE SUBBASE QA TESTING TABLE.
6. THE SUBBASE MATERIAL SHALL BE PLACED IN LOSS LIFTS OF THICKNESS NOT GREATER THAN 6 INCHES. ALL LOSS LAYERS OF THE SUBBASE SHALL BE SPREAD IN CONSISTENT HORIZONTAL LAYERS.
7. LOADS OF SUBBASE MATERIAL DEPOSITED BY THE HAUL VEHICLES SHALL NOT EXCEED ONE ROW OF SOIL PILES BEYOND THE SPREADING FACE. EACH LOSS LIFT SHALL NOT BE PLACED IN EXCESS OF 100 LINEAL FEET WITHOUT BEING COMPACTED. ALSO, ALL SUBBASE MATERIALS MUST BE SEALD BY SMOOTH DRUM ROLLING AT THE END OF EACH WORKDAY TO PREVENT DAMAGE ASSOCIATED WITH PRECIPITATION EVENTS.
8. EACH LIFT SHALL BE COMPACTED USING A SMOOTH DRUM COMPACTOR OR APPROVED EQUIVALENT CAPABLE OF DELIVERING AT LEAST 60,000 LB-FT OF DYNAMIC FORCE. ALL FINAL SUBBASE MATERIALS MUST BE ROLLED WITH A SMOOTH DRUM COMPACTOR.
9. THE SUBBASE MATERIAL SHALL BE COMPACTED TO A MINIMUM OF 90% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR COMPACTION TESTS (ASTM D1557). THE COMPACTED MOISTURE CONTENT SHALL ALLOW AN IN-PLACE PERCENTAGE OF +1.5% DROUGHER.
10. COMPACTED SUBBASE FILL NOT MEETING THE REQUIRED SPECIFICATIONS SHALL BE RECOMPACTED OR MOISTURE CONDITIONED TO MEET SPECIFICATIONS, OR REMOVED AND REPLACED AND RETESTED.
11. DAMAGE TO ANY COMPACTED LIFT OBSERVED AT ANY TIME DURING THE CONSTRUCTION OF SUBBASE, SUCH AS FOLDING UNDER THE LOADS IMPARTED BY EARTH MOVING EQUIPMENT, SHALL BE FULLY REPAIRED BEFORE PLACEMENT OF ANY OVERLAY MATERIAL.
12. THE SUBBASE LAYER SHALL MEET THE DEPTH, BEARING CAPACITY (ASTM D1194) AND PERMEABILITY (ASTM D2922) REQUIREMENTS OUTLINED IN THE SUBBASE QA TESTING TABLE.
13. IN-PLACE MOISTURE DENSITY TESTING SHALL BE CONDUCTED IN ACCORDANCE WITH ASTM D2922 AND D2922 AT A MINIMUM FREQUENCY OF 1 TEST/ACROSS-INCH LIFT.
14. UPON COMPLETION OF SUBBASE LAYER INSTALLATION THE OWNER AT HIS EXPENSE WILL APPOINT A SURVEYOR TO PREPARE AN AS-BUILT RECORD DRAWING SHOWING THE LAYER AND GRADES OF THE SUBBASE LAYER.

TABLE 4.1 SUBBASE QA TESTING

TEST	TEST METHOD	TESTING FREQUENCY	ACCEPTANCE CRITERIA
DESCRIPTION	ASTM 2488	1/ACROSS-INCH LIFT	MATERIAL TO BE HARD, UNIFORM, FREE OF DEBRIS AND OTHER UNDESIRABLE MATTER
CLASSIFICATION	ASTM D422	1/ACROSS-INCH LIFT	AS DETERMINED BY THE QA ENGINEER
GRAIN SIZE (HYDROMETER)	ASTM D422	1/ACROSS-INCH LIFT	100% < 4.75 < 4.75
ATTERBURG LIMITS (LIQUID LIMIT AND PLASTICITY INDEX)	ASTM D422	1/ACROSS-INCH LIFT	AS DETERMINED BY THE QA ENGINEER
MOISTURE DENSITY RELATIONSHIPS	ASTM D1557	EVERY 5,000 CY IN-PLACE AND EVERY DISCRETE CHANGE IN MATERIAL	N/A
IN-PLACE DENSITY AND MOISTURE	ASTM D2922 AND ASTM D2922	EVERY 5,000 CY IN-PLACE AND EVERY DISCRETE CHANGE IN MATERIAL	90% OF MODIFIED MOD. < 4% TO +2% OF MODIFIED MOD.
BEARING CAPACITY	ASTM D1194	1 PER 200,000 SQ. YD.	4000 PSF @ 1.5' DEPTH ABOVE
DEPTH	FIELD SURVEY	2 PER DAY	8 INCHES ± 0.5 FEET
LABORATORY PERMEABILITY OF RECOMPACTED SAMPLE	ASTM D2922	EVERY 5,000 CY IN-PLACE AND EVERY DISCRETE CHANGE IN MATERIAL	1 X 10^-4 CM/SEC
REMOVAL OF UNSUITABLE MATERIAL	OBSERVATION	CONTINUOUS	REMOVE ANY TOPSOIL, OR UNDESIRABLE MATERIALS AS DIRECTED BY THE GEO-TECHNICAL ENGINEER
PROOF ROLLING	OBSERVATION	CONTINUOUS	PERFORMED UNDER THE SUPERVISION OF AND AS DIRECTED BY THE GEO-TECHNICAL ENGINEER
SURFACE FINISHING	OBSERVATION	CONTINUOUS	SMOOTH AND FREE OF SURFACE CHANGES
SLOPE	FIELD SURVEY	100 FT X 100 FT	±0.5% OF DESIGN GRADE

5.2 SECONDARY LINER

1. THE SECONDARY LINER HOPE GEOMEMBRANE SHALL BE INSTALLED AS PART OF THE LANDFILL SECONDARY LINER CONSTRUCTION.

5.1 POST-CONSTRUCTION

1. PRIOR TO DELIVERY OF LINING MATERIAL, THE LINER INSTALLER SHALL PROVIDE DOCUMENTATION TO THE QUALITY ASSURANCE ENGINEER SUPPORTING THE SUCCESSFUL INSTALLATION OF A MINIMUM OF 10 MILLION SQUARE FEET OF HOPE GEOMEMBRANE. THE FIELD CREW MUST BE SUCCESSFUL IN INSTALLING THE GEOMEMBRANE IN ACCORDANCE WITH THE DESIGN AND CONSTRUCTION REQUIREMENTS TO BE ASSIGNED TO THE PROJECT SHALL HAVE EXPERIENCE IN BEARING A MINIMUM OF 1 MILLION SQUARE FEET OF GEOMEMBRANE.
2. THE LINER INSTALLER SHALL PROVIDE SHOP DRAWINGS AND A WRITTEN DESCRIPTION DETAILING THE PROPOSED METHODS TO BE EMPLOYED FOR PERFORMING THE WORK. ALL MATERIALS, EQUIPMENT AND SUPPLIES TO BE INCORPORATED IN THE PROJECT SHALL BE IDENTIFIED AND APPROVED BY THE QUALITY ASSURANCE ENGINEER. THE FIELD CREW MUST BE SUCCESSFUL IN INSTALLING THE GEOMEMBRANE IN ACCORDANCE WITH THE DESIGN AND CONSTRUCTION REQUIREMENTS TO BE ASSIGNED TO THE PROJECT SHALL HAVE EXPERIENCE IN BEARING A MINIMUM OF 1 MILLION SQUARE FEET OF GEOMEMBRANE.
3. PRIOR TO LIVING MATERIAL DELIVERY TO THE PROJECT SITE THE REFIN AND LINER INSTALLER AND QUALITY ASSURANCE ENGINEER SHALL APPROVE THE SUBBASE. NO SECONDARY GEOMEMBRANE SHALL BE PLACED ON THE SUBBASE UNLESS THE SUBBASE IS APPROVED BY THE QUALITY ASSURANCE ENGINEER. ALL TEST RESULTS SHALL MEET OR EXCEED THE ACCEPTANCE CRITERIA SPECIFIED IN THE TABLE. THE QUALITY ASSURANCE ENGINEER, AT HIS DISCRETION, MAY OBTAIN ADDITIONAL, RANDOM SAMPLES OF THE GEOMEMBRANE SHEETS FOR FURTHER CONSTRUCTION.
4. THE 80 MIL HOPE COMPOSITE GEOMEMBRANE SHALL BE PLACED IN CONTACT WITH THE SUBBASE MATERIAL. THE GEOMEMBRANE SHALL BE TEXTURED WITH A MINIMUM ASPERITY HEIGHT OF 20 MILS. A NON-TEXTURED SURFACE WILL NOT BE ALLOWED. THE TOP SURFACE OF THE SECONDARY GEOMEMBRANE IN CONTACT WITH THE 100% NON-WOVEN GEOTEXTILE, WHICH IS NEXT ADJACENT TO THE GROUND, SHALL BE TEXTURED. THE GEOMEMBRANE LINER SYSTEM MUST HAVE PROPER APPROVAL BY THE QA ENGINEER.
5. THE LINER CONTRACTOR SHALL FURNISH ALL LINER PENETRATION DOOTS AND OTHER APPROPRIATE MATERIAL, REQUIRED TO COMPLETE THE INSTALLATION OF THE LINER. ALL LINER DOOTS SHALL BE OF THE SAME SHEET DENSITY AND THICKNESS AS THE LINER WHICH THEY WERE USED TO.
6. THE 80 MIL HOPE COMPOSITE GEOMEMBRANE SHALL BE PLACED IN CONTACT WITH THE SUBBASE MATERIAL. THE GEOMEMBRANE SHALL BE TEXTURED WITH A MINIMUM ASPERITY HEIGHT OF 20 MILS. A NON-TEXTURED SURFACE WILL NOT BE ALLOWED. THE TOP SURFACE OF THE SECONDARY GEOMEMBRANE IN CONTACT WITH THE 100% NON-WOVEN GEOTEXTILE, WHICH IS NEXT ADJACENT TO THE GROUND, SHALL BE TEXTURED. THE GEOMEMBRANE LINER SYSTEM MUST HAVE PROPER APPROVAL BY THE QA ENGINEER.
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41. THE LINER CONTRACTOR SHALL FURNISH ALL LINER PENETRATION DOOTS AND OTHER APPROPRIATE MATERIAL, REQUIRED TO COMPLETE THE INSTALLATION OF THE LINER. ALL LINER DOOTS SHALL BE OF THE SAME SHEET DENSITY AND THICKNESS AS THE LINER WHICH THEY WERE USED TO.
42. THE 80 MIL HOPE COMPOSITE GEOMEMBRANE SHALL BE PLACED IN CONTACT WITH THE SUBBASE MATERIAL. THE GEOMEMBRANE SHALL BE TEXTURED WITH A MINIMUM ASPERITY HEIGHT OF 20 MILS. A NON-TEXTURED SURFACE WILL NOT BE ALLOWED. THE TOP SURFACE OF THE SECONDARY GEOMEMBRANE IN CONTACT WITH THE 100% NON-WOVEN GEOTEXTILE, WHICH IS NEXT ADJACENT TO THE GROUND, SHALL BE TEXTURED. THE GEOMEMBRANE LINER SYSTEM MUST HAVE PROPER APPROVAL BY THE QA ENGINEER.
43. PRIOR TO INSTALLATION OF THE GEOMEMBRANE, THE LINER INSTALLER AND QUALITY ASSURANCE ENGINEER SHALL APPROVE THE SUBBASE. NO SECONDARY GEOMEMBRANE SHALL BE PLACED ON THE SUBBASE UNLESS THE SUBBASE IS APPROVED BY THE QUALITY ASSURANCE ENGINEER. ALL TEST RESULTS SHALL MEET OR EXCEED THE ACCEPTANCE CRITERIA SPECIFIED IN THE TABLE. THE QUALITY ASSURANCE ENGINEER, AT HIS DISCRETION, MAY OBTAIN ADDITIONAL, RANDOM SAMPLES OF THE GEOMEMBRANE SHEETS FOR FURTHER CONSTRUCTION.
44. THE 80 MIL HOPE COMPOSITE GEOMEMBRANE SHALL BE PLACED IN CONTACT WITH THE SUBBASE MATERIAL. THE GEOMEMBRANE SHALL BE TEXTURED WITH A MINIMUM ASPERITY HEIGHT OF 20 MILS. A NON-TEXTURED SURFACE WILL NOT BE ALLOWED. THE TOP SURFACE OF THE SECONDARY GEOMEMBRANE IN CONTACT WITH THE 100% NON-WOVEN GEOTEXTILE, WHICH IS NEXT ADJACENT TO THE GROUND, SHALL BE TEXTURED. THE GEOMEMBRANE LINER SYSTEM MUST HAVE PROPER APPROVAL BY THE QA ENGINEER.
45. THE LINER CONTRACTOR SHALL FURNISH ALL LINER PENETRATION DOOTS AND OTHER APPROPRIATE MATERIAL, REQUIRED TO COMPLETE THE INSTALLATION OF THE LINER. ALL LINER DOOTS SHALL BE OF THE SAME SHEET DENSITY AND THICKNESS AS THE LINER WHICH THEY WERE USED TO.
46. THE 80 MIL HOPE COMPOSITE GEOMEMBRANE SHALL BE PLACED IN CONTACT WITH THE SUBBASE MATERIAL. THE GEOMEMBRANE SHALL BE TEXTURED WITH A MINIMUM ASPERITY HEIGHT OF 20 MILS. A NON-TEXTURED SURFACE WILL NOT BE ALLOWED. THE TOP SURFACE OF THE SECONDARY GEOMEMBRANE IN CONTACT WITH THE 100% NON-WOVEN GEOTEXTILE, WHICH IS NEXT ADJACENT TO THE GROUND, SHALL BE TEXTURED. THE GEOMEMBRANE LINER SYSTEM MUST HAVE PROPER APPROVAL BY THE QA ENGINEER.
47. PRIOR TO INSTALLATION OF THE GEOMEMBRANE, THE LINER INSTALLER AND QUALITY ASSURANCE ENGINEER SHALL APPROVE THE SUBBASE. NO SECONDARY GEOMEMBRANE SHALL BE PLACED ON THE SUBBASE UNLESS THE SUBBASE IS APPROVED BY THE QUALITY ASSURANCE ENGINEER. ALL TEST RESULTS SHALL MEET OR EXCEED THE ACCEPTANCE CRITERIA SPECIFIED IN THE TABLE. THE QUALITY ASSURANCE ENGINEER, AT HIS DISCRETION, MAY OBTAIN ADDITIONAL, RANDOM SAMPLES OF THE GEOMEMBRANE SHEETS FOR FURTHER CONSTRUCTION.
48. THE 80 MIL HOPE COMPOSITE GEOMEMBRANE SHALL BE PLACED IN CONTACT WITH THE SUBBASE MATERIAL. THE GEOMEMBRANE SHALL BE TEXTURED WITH A MINIMUM ASPERITY HEIGHT OF 20 MILS. A NON-TEXTURED SURFACE WILL NOT BE ALLOWED. THE TOP SURFACE OF THE SECONDARY GEOMEMBRANE IN CONTACT WITH THE 100% NON-WOVEN GEOTEXTILE, WHICH IS NEXT ADJACENT TO THE GROUND, SHALL BE TEXTURED. THE GEOMEMBRANE LINER SYSTEM MUST HAVE PROPER APPROVAL BY THE QA ENGINEER.
49. THE LINER CONTRACTOR SHALL FURNISH ALL LINER PENETRATION DOOTS AND OTHER APPROPRIATE MATERIAL, REQUIRED TO COMPLETE THE INSTALLATION OF THE LINER. ALL LINER DOOTS SHALL BE OF THE SAME SHEET DENSITY AND THICKNESS AS THE LINER WHICH THEY WERE USED TO.
50. THE 80 MIL HOPE COMPOSITE GEOMEMBRANE SHALL BE PLACED IN CONTACT WITH THE SUBBASE MATERIAL. THE GEOMEMBRANE SHALL BE TEXTURED WITH A MINIMUM ASPERITY HEIGHT OF 20 MILS. A NON-TEXTURED SURFACE WILL NOT BE ALLOWED. THE TOP SURFACE OF THE SECONDARY GEOMEMBRANE IN CONTACT WITH THE 100% NON-WOVEN GEOTEXTILE, WHICH IS NEXT ADJACENT TO THE GROUND, SHALL BE TEXTURED. THE GEOMEMBRANE LINER SYSTEM MUST HAVE PROPER APPROVAL BY THE QA ENGINEER.
51. PRIOR TO INSTALLATION OF THE GEOMEMBRANE, THE LINER INSTALLER AND QUALITY ASSURANCE ENGINEER SHALL APPROVE THE SUBBASE. NO SECONDARY GEOMEMBRANE SHALL BE PLACED ON THE SUBBASE UNLESS THE SUBBASE IS APPROVED BY THE QUALITY ASSURANCE ENGINEER. ALL TEST RESULTS SHALL MEET OR EXCEED THE ACCEPTANCE CRITERIA SPECIFIED IN THE TABLE. THE QUALITY ASSURANCE ENGINEER, AT HIS DISCRETION, MAY OBTAIN ADDITIONAL, RANDOM SAMPLES OF THE GEOMEMBRANE SHEETS FOR FURTHER CONSTRUCTION.
52. THE 80 MIL HOPE COMPOSITE GEOMEMBRANE SHALL BE PLACED IN CONTACT WITH THE SUBBASE MATERIAL. THE GEOMEMBRANE SHALL BE TEXTURED WITH A MINIMUM ASPERITY HEIGHT OF 20 MILS. A NON-TEXTURED SURFACE WILL NOT BE ALLOWED. THE TOP SURFACE OF THE SECONDARY GEOMEMBRANE IN CONTACT WITH THE 100% NON-WOVEN GEOTEXTILE, WHICH IS NEXT ADJACENT TO THE GROUND, SHALL BE TEXTURED. THE GEOMEMBRANE LINER SYSTEM MUST HAVE PROPER APPROVAL BY THE QA ENGINEER.
53. THE LINER CONTRACTOR SHALL FURNISH ALL LINER PENETRATION DOOTS AND OTHER APPROPRIATE MATERIAL, REQUIRED TO COMPLETE THE INSTALLATION OF THE LINER. ALL LINER DOOTS SHALL BE OF THE SAME SHEET DENSITY AND THICKNESS AS THE LINER WHICH THEY WERE USED TO.
54. THE 80 MIL HOPE COMPOSITE GEOMEMBRANE SHALL BE PLACED IN CONTACT WITH THE SUBBASE MATERIAL. THE GEOMEMBRANE SHALL BE TEXTURED WITH A MINIMUM ASPERITY HEIGHT OF 20 MILS. A NON-TEXTURED SURFACE WILL NOT BE ALLOWED. THE TOP SURFACE OF THE SECONDARY GEOMEMBRANE IN CONTACT WITH THE 100% NON-WOVEN GEOTEXTILE, WHICH IS NEXT ADJACENT TO THE GROUND, SHALL BE TEXTURED. THE GEOMEMBRANE LINER SYSTEM MUST HAVE PROPER APPROVAL BY THE QA ENGINEER.
55. PRIOR TO INSTALLATION OF THE GEOMEMBRANE, THE LINER INSTALLER AND QUALITY ASSURANCE ENGINEER SHALL APPROVE THE SUBBASE. NO SECONDARY GEOMEMBRANE SHALL BE PLACED ON THE SUBBASE UNLESS THE SUBBASE IS APPROVED BY THE QUALITY ASSURANCE ENGINEER. ALL TEST RESULTS SHALL MEET OR EXCEED THE ACCEPTANCE CRITERIA SPECIFIED IN THE TABLE. THE QUALITY ASSURANCE ENGINEER, AT HIS DISCRETION, MAY OBTAIN ADDITIONAL, RANDOM SAMPLES OF THE GEOMEMBRANE SHEETS FOR FURTHER CONSTRUCTION.
56. THE 80 MIL HOPE COMPOSITE GEOMEMBRANE SHALL BE PLACED IN CONTACT WITH THE SUBBASE MATERIAL. THE GEOMEMBRANE SHALL BE TEXTURED WITH A MINIMUM ASPERITY HEIGHT OF 20 MILS. A NON-TEXTURED SURFACE WILL NOT BE ALLOWED. THE TOP SURFACE OF THE SECONDARY GEOMEMBRANE IN CONTACT WITH THE 100% NON-WOVEN GEOTEXTILE, WHICH IS NEXT ADJACENT TO THE GROUND, SHALL BE TEXTURED. THE GEOMEMBRANE LINER SYSTEM MUST HAVE PROPER APPROVAL BY THE QA ENGINEER.
57. THE LINER CONTRACTOR SHALL FURNISH ALL LINER PENETRATION DOOTS AND OTHER APPROPRIATE MATERIAL, REQUIRED TO COMPLETE THE INSTALLATION OF THE LINER. ALL LINER DOOTS SHALL BE OF THE SAME SHEET DENSITY AND THICKNESS AS THE LINER WHICH THEY WERE USED TO.
58. THE 80 MIL HOPE COMPOSITE GEOMEMBRANE SHALL BE PLACED IN CONTACT WITH THE SUBBASE MATERIAL. THE GEOMEMBRANE SHALL BE TEXTURED WITH A MINIMUM ASPERITY HEIGHT OF 20 MILS. A NON-TEXTURED SURFACE WILL NOT BE ALLOWED. THE TOP SURFACE OF THE SECONDARY GEOMEMBRANE IN CONTACT WITH THE 100% NON-WOVEN GEOTEXTILE, WHICH IS NEXT ADJACENT TO THE GROUND, SHALL BE TEXTURED. THE GEOMEMBRANE LINER SYSTEM MUST HAVE PROPER APPROVAL BY THE QA ENGINEER.
59. PRIOR TO INSTALLATION OF THE GEOMEMBRANE, THE LINER INSTALLER AND QUALITY ASSURANCE ENGINEER SHALL APPROVE THE SUBBASE. NO SECONDARY GEOMEMBRANE SHALL BE PLACED ON THE SUBBASE UNLESS THE SUBBASE IS APPROVED BY THE QUALITY ASSURANCE ENGINEER. ALL TEST RESULTS SHALL MEET OR EXCEED THE ACCEPTANCE CRITERIA SPECIFIED IN THE TABLE. THE QUALITY ASSURANCE ENGINEER, AT HIS DISCRETION, MAY OBTAIN ADDITIONAL, RANDOM SAMPLES OF THE GEOMEMBRANE SHEETS FOR FURTHER CONSTRUCTION.
60. THE 80 MIL HOPE COMPOSITE GEOMEMBRANE SHALL BE PLACED IN CONTACT WITH THE SUBBASE MATERIAL. THE GEOMEMBRANE SHALL BE TEXTURED WITH A MINIMUM ASPERITY HEIGHT OF 20 MILS. A NON-TEXTURED SURFACE WILL NOT BE ALLOWED. THE TOP SURFACE OF THE SECONDARY GEOMEMBRANE IN CONTACT WITH THE 100% NON-WOVEN GEOTEXTILE, WHICH IS NEXT ADJACENT TO THE GROUND, SHALL BE TEXTURED. THE GEOMEMBRANE LINER SYSTEM MUST HAVE PROPER APPROVAL BY THE QA ENGINEER.
61. THE LINER CONTRACTOR SHALL FURNISH ALL LINER PENETRATION DOOTS AND OTHER APPROPRIATE MATERIAL, REQUIRED TO COMPLETE THE INSTALLATION OF THE LINER. ALL LINER DOOTS SHALL BE OF THE SAME SHEET DENSITY AND THICKNESS AS THE LINER WHICH THEY WERE USED TO.
62. THE 80 MIL HOPE COMPOSITE GEOMEMBRANE SHALL BE PLACED IN CONTACT WITH THE SUBBASE MATERIAL. THE GEOMEMBRANE SHALL BE TEXTURED WITH A MINIMUM ASPERITY HEIGHT OF 20 MILS. A NON-TEXTURED SURFACE WILL NOT BE ALLOWED. THE TOP SURFACE OF THE SECONDARY GEOMEMBRANE IN CONTACT WITH THE 100% NON-WOVEN GEOTEXTILE, WHICH IS NEXT ADJACENT TO THE GROUND, SHALL BE TEXTURED. THE GEOMEMBRANE LINER SYSTEM MUST HAVE PROPER APPROVAL BY THE QA ENGINEER.
63. PRIOR TO INSTALLATION OF THE GEOMEMBRANE, THE LINER INSTALLER AND QUALITY ASSURANCE ENGINEER SHALL APPROVE THE SUBBASE. NO SECONDARY GEOMEMBRANE SHALL BE PLACED ON THE SUBBASE UNLESS THE SUBBASE IS APPROVED BY THE QUALITY ASSURANCE ENGINEER. ALL TEST RESULTS SHALL MEET OR EXCEED THE ACCEPTANCE CRITERIA

8.5. CUSHION GEOTEXTILE OR GEOCOMPOSITE

- 8.5.1 THE NON-WOVEN CUSHION GEOTEXTILE (OR GEOCOMPOSITE) IN THICKER WASTE PROFILE LOCATION AND AS OUTLINED WITH ATTACHMENT 2-4-8 SHALL BE INSTALLED ATOP THE PRIMARY COMPOSITE LINER. IN ADDITION CUSHION GEOTEXTILE WILL BE REQUIRED TO LINE THE SECONDARY GEOMEMBRANE IN LEACHATE DETECTION ZONE TRENCHES.
- 8.5.2 RANDOM SAMPLING OF THE CUSHION GEOTEXTILE SHALL BE PERFORMED BY THE MANUFACTURERS TO ASSURE PROPER QUALITY CONTROL. THE TEST METHOD, REQUIRED VALUES AND TEST FREQUENCIES SHALL BE IN ACCORDANCE WITH THE CUSHION GEOTEXTILE QA/QC TESTING TABLE. CERTIFIED COPIES OF THE MANUFACTURERS TEST RESULTS MUST BE PROVIDED TO THE QUALITY ASSURANCE ENGINEER. NO MATERIAL SHALL BE INSTALLED PRIOR TO FURNISHING THE REQUIRED TEST RESULTS. THE QUALITY ASSURANCE ENGINEER, AT HIS DISCRETION, MAY OBTAIN ADDITIONAL RANDOM SAMPLES OF THE CUSHION GEOTEXTILE FOR FURTHER CONFIRMATORY (I.E. QA) TESTING.
- 8.5.3 IN ADDITION TO OBTAINING THE QC RESULTS FROM THE CUSHION GEOTEXTILE MANUFACTURER, THE MANUFACTURER WILL ALSO BE REQUIRED TO PROVIDE WRITTEN CERTIFICATION TO THE QUALITY ASSURANCE ENGINEER THAT THE MATERIALS SUPPLIED CONFORM TO THE CUSHION GEOTEXTILE QA/QC TESTING TABLE.
- 8.5.4 PRIOR TO THE DELIVERY OF MATERIAL TO THE JOBSITE, THE LINER SYSTEM INSTALLER SHALL SUBMIT TO THE QUALITY ASSURANCE ENGINEER SHOP DRAWINGS INCLUDING ALL CUSHION GEOTEXTILE PANEL LAYOUT AND DETAILS OF ALL WORK INCLUDING DETAILS OF ALL OVERLAPPING ATTACHMENTS AND ANCHORING.
- 8.5.5 DURING ALL PERIODS OF SHIPMENT AND STORAGE, THE LINER SYSTEM INSTALLER SHALL PROTECT THE CUSHION GEOTEXTILE FROM DIRECT SUNLIGHT, ULTRAVIOLET RAYS, TEMPERATURES EXCEEDING 125°F, MUD, DIRT, DEBRIS, AND OTHER DETERIORATIVE SOURCES. THE CUSHION GEOTEXTILE SHALL BE MAINTAINED, WRAPPED IN HEAVY-DUTY PROTECTIVE COVERINGS UNTIL IT IS INSTALLED.
- 8.5.6 SECTIONS OF CUSHION GEOTEXTILE SHALL BE FIELD SEAM AS RECOMMENDED BY THE MANUFACTURER. ALTERNATE SEAMING METHODS CAN BE USED ONLY IF APPROVED BY THE QUALITY ASSURANCE ENGINEER. CUSHION GEOTEXTILE PLACED ON SLOPES SHALL BE PLACED SO THAT THE UPPER STRIP OF TEXTILE OVERLAPS THE NEXT LOWER STRIP. THE CUSHION GEOTEXTILE SHALL BE LAID SMOOTH AND FREE OF TENSION, STRESS, FOLDS, WRINKLES OR CREASES.
- 8.5.7 THE LINER SYSTEM INSTALLER SHALL BE RESPONSIBLE FOR THE PROTECTION OF THE PRIMARY COMPOSITE LINER, SECONDARY LINER, GEOCOMPOSITE DRAINAGE LAYER AND THE CUSHION GEOTEXTILE DURING THE INSTALLATION OF THE CUSHION GEOTEXTILE. NO EQUIPMENT SHALL BE PERMITTED TO OPERATE ON THE PRIMARY COMPOSITE LINER OR THE CUSHION GEOTEXTILE AT ANY TIME. ONLY LOW GROUND PRESSURE EQUIPMENT (I.E. CAT D4 LOU OR APPROVED EQUIVALENT) SHALL BE USED TO SPREAD PROTECTIVE COVER MATERIAL ATOP OF THE CUSHION GEOTEXTILE.
- 8.5.8 DURING SPREADING OF PROTECTIVE COVER MATERIAL OVER THE CUSHION GEOTEXTILE, A MINIMUM DEPTH OF 1 FT. OF PROTECTIVE COVER MATERIAL MUST SEPARATE THE BULLDOZER FROM THE CUSHION GEOTEXTILE AT ALL TIMES. IN HIGH TRAFFIC AREAS, A MINIMUM THICKNESS OF 3 FT. OF PROTECTIVE COVER MATERIAL SHOULD BE USED TO PROTECT THE CUSHION GEOTEXTILE FROM RUBBER TIRE HAULING VEHICLES. AGGREGATES SHALL BE SPREAD IN THE DIRECTION OF CUSHION GEOTEXTILE OVERLAP.
- 8.5.9 DURING PLACEMENT OF THE PROTECTIVE COVER MATERIALS, A REPRESENTATIVE OF THE QUALITY ASSURANCE ENGINEER MUST BE PRESENT AT ALL TIMES. THE QUALITY ASSURANCE ENGINEER'S REPRESENTATIVE MUST MONITOR PROTECTIVE COVER PLACEMENT ACTIVITIES TO ENSURE THE OUTLINED ACCEPTANCE CRITERIA. THE LINER SYSTEM COPIES, IN THE EVENT DAMAGE OCCURS TO THE LINER SYSTEM COMPOSITE, IMMEDIATELY STOP WORK WITHIN THE PROBLEM AREA AND MAINTAIN REPAIR PROCEDURES.
- 8.5.10 CUSHION GEOTEXTILE SHOULD BE DAMAGED DURING ANY STEP OF INSTALLATION, A PIECE OF GEOTEXTILE MATERIAL SHALL BE CUT AND PLACED OVER THE DAMAGED AREA AND OVERLAP THE UNMATERIALS MATERIAL A MINIMUM OF 3 FEET IN EACH DIRECTION. THE OVERLAPPED REPLACEMENT PANEL SHALL BE HEAT-BONDED TO THE EXISTING MATERIAL.
- 8.5.11 THE WORK SHALL BE SCHEDULED SO THAT THE COVERING OF THE CUSHION GEOTEXTILE WITH A LAYER OF THE COVER MATERIAL (I.E. AGGREGATES) BE ACCOMPLISHED WITHIN 5 DAYS AFTER PLACEMENT OF THE CUSHION GEOTEXTILE. FAILURE TO COMPLY WITH THIS REQUIREMENT SHALL REQUIRE REPLACEMENT OF THE FABRIC.
- 8.5.12 UPON COMPLETION, THE LINER SYSTEM INSTALLER SHALL SUBMIT A SUMMARY AND LOG OF ALL LABORATORY QUALITY CONTROL, COMPLETED AND CERTIFICATION THAT CUSHION GEOTEXTILE INSTALLATION IS COMPLETE AND IN ACCORDANCE WITH PROJECT SPECIFICATIONS AND A STATEMENT OF WARRANTY.

TABLE 8.1 CUSHION GEOTEXTILE QA/QC TESTING

PROPERTY	TEST METHOD	QC TESTING FREQUENCY	QA TESTING FREQUENCY
MASS PER UNIT AREA	ASTM D3075 OR ASTM D3079	1/100,000 SF	AS PER QA'S DISCRETION
TENSILE STRENGTH	ASTM D4832	1/100,000 SF	AS PER QA'S DISCRETION
ELONGATION	ASTM D4832	1/100,000 SF	AS PER QA'S DISCRETION
BURST STRENGTH	ASTM D3398	1/100,000 SF	AS PER QA'S DISCRETION
HANDLING & STORAGE	OBSERVATION	N/A	DELIVERY AND PLACEMENT
OVERLAP	OBSERVATION	N/A	CONTINUOUS
FOLDS & WRINKLES	OBSERVATION	N/A	CONTINUOUS

8.6. AGGREGATE

- 8.6.1 THE POLYCARBONATE SHALL CONSIST OF NATURAL OR PROCESSED NON-CARBONATE AGGREGATE THAT IS HARD, TOUGH, DURABLE, UNCOATED, INERT AND BE REASONABLY FREE FROM CLAY, SILT, VEGETATION OR OTHER DETERIORATIVE MATERIAL.
- 8.6.2 THE POLYCARBONATE SHALL HAVE A PERMEABILITY OF $< 1 \times 10^{-10}$ CM/SEC, A MPS OF < 1 INCH AND NO MORE THAN 2% PASSING NO. 200 SIEVE.
- 8.6.3 THE POLYCARBONATE SHALL BE TESTED FOR GRAIN SIZE (ASTM D422), BOUNDEDNESS (ASTM D88), PERMEABILITY (ASTM D422), CARBONATE CONTENT (ASTM D3042) AND DEPTH AT FREQUENCIES SPECIFIED IN THE PROTECTIVE COVER/LEACHATE COLLECTION ZONE AGGREGATE QA TESTING TABLE AND SHALL ALSO MEET OR EXCEED THE OUTLINED ACCEPTANCE CRITERIA.
- 8.6.4 THE POLYCARBONATE SHALL BE PLACED IN A SINGLE LIFT OF 18-INCHES UNDER LOW GROUND PRESSURE EQUIPMENT.
- 8.6.5 CARE SHALL BE EXERCISED TO PREVENT DAMAGE TO THE UNDERLYING GEOSYNTHETIC MATERIALS INCLUDING THE COMPOSITE PRIMARY LINER.
- 8.6.6 THE SURFACE OF POLYCARBONATE SHALL BE GRADED TO AD TO BE FREE OF IRREGULARITIES AND AIRPIT CHANGES IN DIRECTION.
- 8.6.7 POLYCARBONATE NOT MEETING THE REQUIRED SPECIFICATIONS SHALL BE REPLACED AND RETESTED.
- 8.6.8 A 12 GOSY NON-WOVEN CUSHION GEOTEXTILE SHALL BE INSTALLED ATOP THE PRIMARY COMPOSITE LINER.

TABLE 8.1 PROTECTIVE COVER/LEACHATE COLLECTION ZONE AGGREGATE QA TESTING

TEST	TEST METHOD	TESTING FREQUENCY	ACCEPTANCE CRITERIA
GRAIN SIZE	ASTM D422	1 RANDOM SAMPLE/ACRES	MP&S 1-INCHES AND NO. 200
BOUNDEDNESS	ASTM D88	1 RANDOM SAMPLE/ACRES	AS DETERMINED BY QA'S
LABORATORY PERMEABILITY OF RECOMPACTED SAMPLE	ASTM D3042	1 RANDOM SAMPLE/ACRES	$< 1 \times 10^{-10}$ CM/SEC
CARBONATE CONTENT	ASTM D3042	1 ACRES	$< 1\%$ (AVERAGE OF 3 REDUCATES)
DEPTH	FIELD SURVEY	ONCE DAILY	18-INCH $\pm$ 1 FOOT

8.7. FILTER GEOTEXTILE

- 8.7.1 RANDOM SAMPLING OF THE FILTER GEOTEXTILE SHALL BE PERFORMED BY THE MANUFACTURERS TO ASSURE PROPER QUALITY CONTROL. THE TEST METHOD, REQUIRED VALUES AND TEST FREQUENCIES SHALL BE IN ACCORDANCE WITH THE FILTER GEOTEXTILE QA/QC TESTING TABLE. CERTIFIED COPIES OF THE MANUFACTURERS TEST RESULTS MUST BE PROVIDED TO THE QUALITY ASSURANCE ENGINEER. NO MATERIAL SHALL BE INSTALLED PRIOR TO FURNISHING THE REQUIRED TEST RESULTS. THE QUALITY ASSURANCE ENGINEER, AT HIS DISCRETION, MAY OBTAIN ADDITIONAL RANDOM SAMPLES OF THE FILTER GEOTEXTILE FOR FURTHER CONFIRMATORY (I.E. QA) TESTING.
- 8.7.2 THE FILTER GEOTEXTILE MANUFACTURING/LINER SYSTEM INSTALLER SHALL BE SOLELY RESPONSIBLE FOR THE QUALITY OF THE MATERIAL PROVIDED. SHOULD ANY OF THE TESTS PERFORMED ON THE MATERIAL YIELD UNSATISFACTORY RESULTS, THE FILTER GEOTEXTILE MANUFACTURING SYSTEM INSTALLER SHALL BE RESPONSIBLE FOR REPLACING THE MATERIAL WITH SATISFACTORY MATERIALS.
- 8.7.3 IN ADDITION TO OBTAINING THE QC RESULTS FROM THE FILTER GEOTEXTILE MANUFACTURER, THE MANUFACTURER WILL ALSO BE REQUIRED TO PROVIDE WRITTEN CERTIFICATION TO THE QUALITY ASSURANCE ENGINEER THAT THE MATERIALS SUPPLIED CONFORM TO THE FILTER GEOTEXTILE QA/QC TESTING TABLE.
- 8.7.4 THE CONTRACTOR SHALL, DURING ALL PERIODS OF SHIPMENT AND STORAGE, PROTECT THE FILTER GEOTEXTILE FROM DIRECT SUNLIGHT, ULTRAVIOLET RAYS, TEMPERATURES EXCEEDING 125°F, MUD, DIRT, DEBRIS, AND OTHER DETERIORATIVE SOURCES. THE GEOTEXTILE SHALL BE MAINTAINED, WRAPPED IN HEAVY-DUTY PROTECTIVE COVERING UNTIL IT IS INSTALLED.

TABLE 8.2 FILTER GEOTEXTILE QA/QC TESTING

PROPERTY	TEST METHOD	QC TESTING FREQUENCY	QA TESTING FREQUENCY
MASS PER UNIT AREA	ASTM D3075 OR ASTM D3079	1/100,000 SF	AS PER QA'S DISCRETION
TENSILE STRENGTH	ASTM D4832	1/100,000 SF	AS PER QA'S DISCRETION
ELONGATION	ASTM D4832	1/100,000 SF	AS PER QA'S DISCRETION
PERMEABILITY	ASTM D3042	1/100,000 SF	AS PER QA'S DISCRETION
BURST STRENGTH	ASTM D3398	1/100,000 SF	AS PER QA'S DISCRETION
APPEARANCE	ASTM D4751	1/100,000 SF	AS PER QA'S DISCRETION
HANDLING & STORAGE	OBSERVATION	N/A	DELIVERY AND PLACEMENT
OVERLAP	OBSERVATION	N/A	CONTINUOUS
FOLDS & WRINKLES	OBSERVATION	N/A	CONTINUOUS

TABLE 8.2 FILTER GEOTEXTILE QA/QC TESTING

PROPERTY	TEST METHOD	QC TESTING FREQUENCY	QA TESTING FREQUENCY
MASS PER UNIT AREA	ASTM D3075 OR ASTM D3079	1/100,000 SF	AS PER QA'S DISCRETION
TENSILE STRENGTH	ASTM D4832	1/100,000 SF	AS PER QA'S DISCRETION
ELONGATION	ASTM D4832	1/100,000 SF	AS PER QA'S DISCRETION
PERMEABILITY	ASTM D3042	1/100,000 SF	AS PER QA'S DISCRETION
BURST STRENGTH	ASTM D3398	1/100,000 SF	AS PER QA'S DISCRETION
APPEARANCE	ASTM D4751	1/100,000 SF	AS PER QA'S DISCRETION
HANDLING & STORAGE	OBSERVATION	N/A	DELIVERY AND PLACEMENT
OVERLAP	OBSERVATION	N/A	CONTINUOUS
FOLDS & WRINKLES	OBSERVATION	N/A	CONTINUOUS

8.8. DRAINAGE NETWORK

- 8.8.1 THE L2C DRAINAGE NETWORK PIPING SHALL CONSIST OF 6-INCH DIAMETER SCHEDULE 120 PVC OR SDR 9 HDPE PERFORATED AND SLOTTED WALL PIPES AS SPECIFIED ON THE DESIGN DRAWINGS. THE SCHEDULE OF THE PIPE SHOULD BE APPROPRIATE FOR THE LIVING CONDITIONS.
- 8.8.2 PRIOR TO DELIVERY OF PIPES TO THE SITE THE CONTRACTOR SHALL SUBMIT A PROPERTY SHEET FOR THE PIPES AND PIPE FITTINGS. IN ADDITION, A CERTIFICATION, WHICH STATES THAT THE VALUES PROVIDED ON THE PROPERTY SHEET ARE MINIMUM VALUES THAT ARE GUARANTEED BY THE PIPE AND FITTING MANUFACTURER MUST ALSO BE PROVIDED TO THE QUALITY ASSURANCE ENGINEER.
- 8.8.3 THE QUALITY ASSURANCE ENGINEER MUST APPROVE THE PIPES AND PIPE FITTINGS PRIOR TO USE.
- 8.8.4 THE JOINTS OF THE PIPES AND PIPE FITTINGS SHALL BE COMPLETED IN A MANNER THAT IS APPROVED BY THE PIPE MANUFACTURER AND THE QUALITY ASSURANCE ENGINEER.
- 8.8.5 THE QA/QC TESTING OF THE L2C PIPING SHALL BE IN ACCORDANCE WITH THE L2C PIPE QA/QC TESTING TABLE INCLUDED IN THE LEACHATE DETECTION ZONE SECTION OF THIS DOCUMENT.
- 8.8.6 UPON COMPLETION OF DRAINAGE NETWORK INSTALLATION THE OWNER AT HIS EXPENSE WILL APPOINT A SURVEYOR TO PREPARE AN AS-BUILT RECORD DRAWING SHOWING THE LOCATION AND LAYOUT OF PIPING.
- 8.8.7 IF SAND OR A BLEND OF SAND/AGGREGATE IS USED FOR L2C THE L2C PIPING SHALL BE ENCASED IN AGGREGATES (I.E. PFC BONNET) AS SHOWN ON DESIGN DRAWINGS. A 6 GOSY NON-WOVEN FILTER GEOTEXTILE SHALL BE WAPPED AROUND THE PFC BONNET AGGREGATES.
- 8.8.8 THE FILTER GEOTEXTILE AND THE PFC BONNET AGGREGATES SHALL CONFORM TO SPECIFICATIONS OF FILTER GEOTEXTILE AND AGGREGATES OUTLINED IN THE EARLIER PARTS OF THIS SECTION.

8.9. DAILY COVER

- 8.9.1 DAILY COVER SHALL CONSIST OF NATURAL SOIL MATERIAL THAT IS GENERALLY FREE FROM ROOTS, ORGANIC MATTER, TRASH, DEBRIS, AND CONTAINING LESS THAN 12% COMBUSTIBLE MATERIAL. ALTERNATIVE MATERIALS MAY BE USED AS PREVIOUSLY APPROVED, OR AS MAY BE APPROVED IN THE FUTURE BY FDOT.
- 8.9.2 THE DAILY COVER SOILS WILL BE WITHIN THE UNITED STATES DEPARTMENT OF AGRICULTURE (USDA) TEXTURAL CLASS OF SANDY LOAM, LOAM, SANDY CLAY LOAM, SILTY CLAY LOAM, LOAMY SAND, OR SILT LOAM.
- 8.9.3 THE DAILY COVER SOILS SHALL BE OBTAINED FROM ON-SITE AREAS AND NON-CONTIGUOUS "OFF-SITE AREAS" OR OFF-SITE SUPPLIERS.
- 8.9.4 THE DAILY COVER SOILS SHALL HAVE A MPS OF $\pm$ 8-INCH AND MORE THAN 40% PASSING NO. 10 SIEVE. MATERIAL MAY BE SCREENED TO MEET THE REQUIRED SPECIFICATIONS.
- 8.9.5 THE DAILY COVER SOILS SHALL BE TESTED FOR GRAIN SIZE (ASTM D422), USDA SOIL CLASSIFICATION, AND COMBUSTIBILITY (ASTM D3174) AT FREQUENCIES SPECIFIED IN THE DAILY COVER SOIL QA TESTING TABLE AND SHALL ALSO MEET OR EXCEED THE OUTLINED ACCEPTANCE CRITERIA.
- 8.9.6 THE DAILY COVER SOILS SHALL BE PLACED OVER ALL EXPOSED REFUSE AT THE END OF EACH DAY, AT THE END OF 24-HOUR PERIOD, OR AT COMPLETION OF EACH LIFT, WHICHEVER OCCURS FIRST. DAILY COVER OPERATIONS SHALL CONFORM TO PROJECT PLANS AND SPECIFICATIONS.

TABLE 8.1 DAILY COVER SOIL QA TESTING

TEST	TEST METHOD	TESTING FREQUENCY	ACCEPTANCE CRITERIA
GRAIN SIZE	ASTM D422	1 PER DAY	MP&S 1-INCHES AND NO. 10
SOIL CLASSIFICATION	USDA SOIL TEXTURAL CLASSIFICATION	1 PER DAY	SANDY LOAM, LOAM, SANDY CLAY LOAM, SILTY CLAY LOAM, LOAMY SAND, OR SILTY LOAM
COMBUSTIBILITY	ASTM D3174	1 PER DAY	$\pm$ 7

8.10. INTERMEDIATE COVER

- 8.10.1 THE 12-INCH THICK INTERMEDIATE COVER SHALL CONSIST OF NATURAL SOIL MATERIAL THAT IS GENERALLY FREE FROM ROOTS, ORGANIC MATTER, TRASH, DEBRIS, AND CONTAINING LESS THAN 12% COMBUSTIBLE MATERIAL.
- 8.10.2 THE INTERMEDIATE COVER SOILS WILL BE WITHIN THE UNITED STATES DEPARTMENT OF AGRICULTURE (USDA) TEXTURAL CLASS OF SANDY LOAM, LOAM, SANDY CLAY LOAM, SILTY CLAY LOAM, LOAMY SAND AND SILT LOAM.
- 8.10.3 THE INTERMEDIATE COVER SOILS SHALL BE PLACED OVER EACH PARTIAL OR COMPLETED LIFT ON WHICH EITHER THE OWNER INTENDS TO PLACE NO ADDITIONAL WASTES FOR 60 DAYS OR THAT REPRESENTS THE FINAL PERMITTED ELEVATIONS OF THAT PART OF THE FACILITY.
- 8.10.4 THE INTERMEDIATE COVER SOILS SHALL BE OBTAINED FROM ON-SITE AREAS AND NON-CONTIGUOUS "OFF-SITE AREAS" OR OFF-SITE SUPPLIERS.
- 8.10.5 THE INTERMEDIATE COVER SOILS SHALL HAVE A MPS OF $\pm$ 8-INCH AND MORE THAN 40% PASSING NO. 10 SIEVE. MATERIAL MAY BE SCREENED TO MEET THE REQUIRED SPECIFICATIONS.
- 8.10.6 THE INTERMEDIATE COVER SOILS SHALL BE TESTED FOR GRAIN SIZE (ASTM D422), USDA SOIL CLASSIFICATION, AND COMBUSTIBILITY (ASTM D3174) AT FREQUENCIES SPECIFIED IN THE INTERMEDIATE COVER SOIL QA TESTING TABLE AND SHALL ALSO MEET OR EXCEED THE OUTLINED ACCEPTANCE CRITERIA.

TABLE 8.1 INTERMEDIATE COVER SOIL QA TESTING

TEST	TEST METHOD	TESTING FREQUENCY	ACCEPTANCE CRITERIA
GRAIN SIZE	ASTM D422	1 RANDOM SAMPLE/ACRES	MP&S 1-INCHES AND NO. 10
SOIL CLASSIFICATION	USDA SOIL TEXTURAL CLASSIFICATION	1 RANDOM SAMPLE/ACRES	SANDY LOAM, LOAM, SANDY CLAY LOAM, SILTY CLAY LOAM, LOAMY SAND, OR SILTY LOAM
COMBUSTIBILITY	ASTM D3174	1 RANDOM SAMPLE/ACRES	$\pm$ 7

8.11. CAP GEOMEMBRANE

- 8.11.1 THE HDPE OR LDPE GEOMEMBRANE SHALL BE INSTALLED AS PART OF THE LANDFILL CAP LINER CONSTRUCTION.

8.12. PRE CONSTRUCTION

- 8.12.1 PRIOR TO DELIVERY OF LIVING MATERIAL, THE LINER INSTALLER SHALL PROVIDE DOCUMENTATION TO THE QUALITY ASSURANCE ENGINEER SUPPORTING THE SUCCESSFUL INSTALLATION OF A MINIMUM OF 10 MILES SQUARE FEET OF GEOMEMBRANE. THE FIELD CREW MUST HAVE A MINIMUM OF 30 ACRES OF SUCCESSFUL INSTALLATION EXPERIENCE. IN ADDITION, AT LEAST ONE OF THE SEAMING TECHNIQUES TO BE ASSIGNED TO THE PROJECT SHALL HAVE EXPERIENCE IN SEAMING A MINIMUM OF 1 MILLION SQUARE FEET OF GEOMEMBRANE.
- 8.12.2 THE LINER INSTALLER SHALL PROVIDE SHOP DRAWINGS AND A WRITTEN DESCRIPTION OUTLINE THE PROPOSED METHODS TO BE EMPLOYED FOR PERFORMING THIS WORK. ALL MATERIALS, EQUIPMENT AND SUPPLIES TO BE INCORPORATED IN THE WORK SHALL BE DESCRIBED INCLUDING SEAMING TECHNIQUES, INSTALLATION PROCEDURES, QUALITY CONTROL PROCEDURES AND ANY OTHER INFORMATION NEEDED TO SHOW THE PROPOSED METHOD OF CONFORMING TO THE WORK OUTLINED IN THIS SECTION.
- 8.12.3 PRIOR TO LIVING MATERIAL DELIVERY TO THE PROJECT SITE THE RESIN AND LINER MANUFACTURERS SHALL SUBMIT QUALITY CONTROL TESTING OF MANUFACTURED RESIN AND SHEETS IN ACCORDANCE WITH PARAMETERS. TEST METHODS AND TESTING FREQUENCIES SPECIFIED IN CAP PRE-CONSTRUCTION TABLE TO THE QUALITY ASSURANCE ENGINEER. ALL TEST RESULTS SHALL MEET OR EXCEED THE ACCEPTANCE CRITERIA SPECIFIED IN THE TABLE. THE QUALITY ASSURANCE ENGINEER, AT HIS DISCRETION, MAY OBTAIN ADDITIONAL RANDOM SAMPLES OF THE GEOMEMBRANE SHEETS FOR FURTHER CONFIRMATORY TESTING.
- 8.12.4 THE LINER CONTRACTOR SHALL FURNISH ALL LINER PENETRATION ROOTS AND OTHER APPROPRIATE MATERIALS REQUIRED TO COMPLETE THE INSTALLATION OF THE LINER. ALL LINER ROOTS SHALL BE OF THE SAME SIZE DENSITY AND NON-DETERIORATIVE AS THE RESIN BEING USED TO THE LINER.
- 8.12.5 GEOMEMBRANE LINER PENETRATION ROOTS SHALL BE SHOP FABRICATED OF NON-TEXTURED MATERIAL. THE MANUFACTURER SHALL PROVIDE A STATEMENT OF HYDRAULIC OR PNEUMATIC TESTING OF THE FABRICATED ROOT PIPES TO THE QUALITY ASSURANCE ENGINEER. THE ROOT PIPES SHALL BE INSTALLED IN LINER PENETRATION ROOTS WILL BE ACCEPTED ONLY IF A PRE-FABRICATED FITTING IS NOT FEASIBLE DUE TO DRAIN COORDINATION AND IF THE LINER CONTRACTOR CAN PROVIDE AGGREGATE FIELD TESTING.
- 8.12.6 PRIOR TO INSTALLATION OF THE GEOMEMBRANE, THE LINER INSTALLER AND QUALITY ASSURANCE ENGINEER SHALL APPROVE THE BUDGET (I.E. INTERMEDIATE COVER), NO CAP GEOMEMBRANE SHALL BE PLACED ON UNSTABLE SURFACES. THE LINER CONTRACTOR SHALL ACCEPT THE BUDGET IN WRITING PRIOR TO THE INSTALLATION OF EACH GEOMEMBRANE PANEL. THE FOLLOWING CONDITIONS SHALL BE MINIMUM FOR THE BUDGET:

TABLE 8.1 CAP GEOMEMBRANE QA/QC TESTING

PROPERTY	TEST METHOD	QC TESTING FREQUENCY	QA TESTING FREQUENCY
RAW RESIN SPECIFIC GRAVITY (MINIMUM)	ASTM D1505	1 RESIN BATCH	AS PER QA'S DISCRETION
SHEET DENSITY (MINIMUM)	ASTM D2994	EVERY ROLL	AS PER QA'S DISCRETION
THICKNESS (MINIMUM)	ASTM D3174	EVERY ROLL	AS PER QA'S DISCRETION
THICKNESS (LOWEST INDIVIDUAL)	ASTM D3174	EVERY ROLL	AS PER QA'S DISCRETION
TENSILE STRENGTH (EACH DIRECTION) - STITCH AT BREAK - ELONGATION AT BREAK	ASTM D4832 TYPE IV D4832 TYPE IV	EVERY ROLL	AS PER QA'S DISCRETION
TEAR RESISTANCE (MINIMUM)	ASTM D1504	EVERY ROLL	AS PER QA'S DISCRETION
PUNCTURE RESISTANCE	ASTM D4832 OR F1555-01	EVERY ROLL	AS PER QA'S DISCRETION
ENVIRONMENTAL STRESS CRACK	ASTM D1683	100,000 FT2	AS PER QA'S DISCRETION
CARBON BLACK CONTENT ALLOWABLE RANGE	ASTM D1683	EVERY 5TH ROLL	AS PER QA'S DISCRETION
CARBON BLACK DISPERSION ACCEPTANCE	ASTM D3215	EVERY 5TH ROLL	AS PER QA'S DISCRETION
EXTRUSION ROL SPECIFIC GRAVITY	ASTM D1505	1 RESIN BATCH	AS PER QA'S DISCRETION
SEAM STRENGTH (SEAM WIDTH)	ASTM D4832	1000 FT FIELD SEAM	1000 FT FIELD SEAM
HANDLING & STORAGE	OBSERVATION	N/A	DELIVERY AND PLACEMENT
SEALANT ANCHOR PENETRATIONS	OBSERVATION	N/A	PERMEATION
ANCHORING	OBSERVATION	N/A	CONTINUOUS

NOTES: MICROMETERS WITH 1/8" TO 1/32" DIAMETER ANVIL AND SPINDLE OR PRESSURE FOOT

8.13. CAP DRAINAGE SYSTEM

- 8.13.1 THE CAP DRAINAGE LAYER SHALL BE COMPOSED OF A LAYER OF GEOCOMPOSITE INSTALLED ATOP THE CAP GEOMEMBRANE.
- 8.13.2 THE GEOCOMPOSITE SHALL CONSIST OF AN HDPE GEOTEXTILE WITH A POLYESTER OR POLYPROPYLENE NONWOVEN 6 GOSY GEOTEXTILE HEAT BONDED TO BOTH SIDES OF THE GEOTEXTILE. GEOTEXTILE SHALL BE A MINIMUM 27-MIL THICKNESS, EXHIBITING A MINIMUM TRANSMISSIVITY OF 2.8×10^{-14} M/SEC.
- 8.13.3 RANDOM SAMPLING OF THE EXTRUDED GEOCOMPOSITE DRAIN AND FILTER GEOTEXTILE COMPONENTS SHALL BE PERFORMED BY THE MANUFACTURERS TO ASSURE PROPER QUALITY CONTROL. THE TEST METHODS, REQUIRED VALUES AND TEST FREQUENCIES SHALL BE IN ACCORDANCE WITH THE GEOCOMPOSITE QA/QC TESTING TABLE. CERTIFIED COPIES OF THE MANUFACTURERS TEST RESULTS MUST BE PROVIDED TO THE QUALITY ASSURANCE ENGINEER. NO MATERIAL SHALL BE INSTALLED PRIOR TO FURNISHING THE REQUIRED TEST RESULTS. THE QUALITY ASSURANCE ENGINEER, AT HIS DISCRETION, MAY OBTAIN ADDITIONAL RANDOM SAMPLES OF THE GEOTEXTILE COMPOSITE FOR FURTHER CONFIRMATORY (I.E. QA) TESTING.
- 8.13.4 IN ADDITION TO OBTAINING THE QC RESULTS FROM THE RESPECTIVE GEOCOMPOSITE MANUFACTURERS, THE MANUFACTURER WILL ALSO BE REQUIRED TO PROVIDE WRITTEN CERTIFICATION TO THE QUALITY ASSURANCE ENGINEER THAT THE MATERIALS SUPPLIED CONFORM TO THE GEOCOMPOSITE QA/QC TESTING TABLE INCLUDED IN THE LEACHATE DETECTION ZONE SECTION OF THIS QA/QC PLAN.
- 8.13.5 PRIOR TO THE DELIVERY OF MATERIAL TO THE JOBSITE, THE LINER SYSTEM INSTALLER SHALL SUBMIT TO THE QUALITY ASSURANCE ENGINEER SHOP DRAWINGS INCLUDING ALL GEOCOMPOSITE DRAIN PANEL LAYOUT AND DETAILS OF ALL WORK INCLUDING DETAILS OF ALL OVERLAPPING ATTACHMENTS AND ANCHORING.
- 8.13.6 THE ROLLS OF GEOCOMPOSITE SHALL BE LAID SMOOTH AND FREE OF TENSION, STRESSES, FOLDS, WRINKLES OR CREASES.
- 8.13.7 THE GEOCOMPOSITE ROLLS SHALL BE JOINED BY OVERLAPPING THE PANELS TO ALLOW THE HDPE PORTION OF THE GEOTEXTILE TO BE SECURED WITH NON-METALLIC FASTENERS. IN ADDITION, SUFFICIENT OVERLAP MUST BE MAINTAINED BETWEEN THE PANELS TO ALLOW THE EXPOSED FILTER GEOTEXTILE COMPONENT TO BE JOINED BY SEWING. THERMAL BONDING TECHNIQUES TO JOIN THE EXPOSED EDGES OF THE NON-WOVEN GEOTEXTILE ARE NOT PERMITTED. THE QUALITY ASSURANCE ENGINEER, AT HIS DISCRETION, MAY OBTAIN ADDITIONAL RANDOM SAMPLES OF THE GEOTEXTILE COMPOSITE FOR FURTHER CONFIRMATORY (I.E. QA) TESTING.

TABLE 8.2 MINIMUM INTERFACE SHEAR STRENGTH DOUBLE-SIDED GEOCOMPOSITE VS. 60 MIL HDPE TEXTURED GEOMEMBRANE

METHOD	NORMAL STRESS (PSF)	PEAK SHEAR STRESS (PSF)	LD SHEAR STRESS (PSF)	TEST METHOD
PEAK	0	0	0	ASTM D 5211
	2,500	965	862	
	7,500	2,737	1,721	
	15,000	3,878	1,163	
	20,000	5,494	2,535	

PERFORM TESTING USING NORMAL STRESSES OF 2,500, 7,500, 15,000, AND 20,000 LBS/FT². LARGE DISPLACEMENT RESULTS SHALL BE RECORDED AT DISPLACEMENTS OF 3 INCHES. WET THE GEOCOMPOSITE/GEOMEMBRANE INTERFACE AND APPLY LOADING FOR 1 HOUR PRIOR TO TESTING. PERFORM TEST USING (1) NORMAL STRESSES INDICATED ABOVE, AND (2) A STRAIN RATE NOT TO EXCEED 0.5 IN/MIN. (0.2 IN/SEC).

TABLE 8.3 MINIMUM INTERFACE SHEAR STRENGTH SCL VS. DOUBLE-SIDED GEOCOMPOSITE

METHOD	NORMAL STRESS (PSF)	PEAK SHEAR STRESS (PSF)	LD SHEAR STRESS (PSF)	TEST METHOD
PEAK	0	0	0	ASTM D 5211
	2,500	965	862	
	7,500	2,737	1,721	
	15,000	3,878	1,163	
	20,000	5,494	2,535	

PERFORM TESTING USING NORMAL STRESSES OF 2,500, 7,500, 15,000, AND 20,000 LBS/FT². LARGE DISPLACEMENT RESULTS SHALL BE RECORDED AT DISPLACEMENTS OF 3 INCHES. WET THE GEOCOMPOSITE/GEOMEMBRANE INTERFACE AND APPLY LOADING FOR 1 HOUR PRIOR TO TESTING. PERFORM TEST USING (1) NORMAL STRESSES INDICATED ABOVE, AND (2) A STRAIN RATE NOT TO EXCEED 0.5 IN/MIN. (0.2 IN/SEC).

TABLE 8.4 MINIMUM INTERFACE SHEAR STRENGTH 60 MIL HDPE TEXTURED GEOMEMBRANE VS. SCL

METHOD	NORMAL STRESS (PSF)	PEAK SHEAR STRESS (PSF)	LD SHEAR STRESS (PSF)	TEST METHOD
PEAK	0	0	0	ASTM D 5211
	2,500	965	862	
	7,500	2,737	1,721	
	15,000	3,878	1,163	
	20,000	5,494	2,535	

PERFORM TESTING USING NORMAL STRESSES OF 2,500, 7,500, 15,000, AND 20,000 LBS/FT². LARGE DISPLACEMENT RESULTS SHALL BE RECORDED AT DISPLACEMENTS OF 3 INCHES. WET THE GEOCOMPOSITE/GEOMEMBRANE INTERFACE AND APPLY LOADING FOR 1 HOUR PRIOR TO TESTING. PERFORM TEST USING (1) NORMAL STRESSES INDICATED ABOVE, AND (2) A STRAIN RATE NOT TO EXCEED 0.5 IN/MIN. (0.2 IN/SEC).

TABLE 8.5 MINIMUM INTERFACE SHEAR STRENGTH 60 MIL HDPE TEXTURED GEOMEMBRANE VS. NON-WOVEN GEOTEXTILE

METHOD	NORMAL STRESS (PSF)	PEAK SHEAR STRESS (PSF)	LD SHEAR STRESS (PSF)	TEST METHOD
PEAK	0	0	0	ASTM D 5211
	2,500	965	862	
	7,500	2,737	1,721	
	15,000	3,878	1,163	
	20,000	5,494	2,535	

PERFORM TESTING USING NORMAL STRESSES OF 2,500, 7,500, 15,000, AND 20,000 LBS/FT². LARGE DISPLACEMENT RESULTS SHALL BE RECORDED AT DISPLACEMENTS OF 3 INCHES. WET THE GEOTEXTILE/GEOMEMBRANE INTERFACE AND APPLY LOADING FOR 1 HOUR PRIOR TO TESTING. PERFORM TEST USING (1) NORMAL STRESSES INDICATED ABOVE, AND (2) A STRAIN RATE NOT TO EXCEED 0.5 IN/MIN. (0.2 IN/SEC).

TABLE 8.6 MINIMUM INTERFACE SHEAR STRENGTH NON-WOVEN GEOTEXTILE VS. PROTECTIVE COVER

METHOD	NORMAL STRESS (PSF)	PEAK SHEAR STRESS (PSF)	LD SHEAR STRESS (PSF)	TEST METHOD
PEAK	0	0	0	ASTM D 5211
	2,500	965	862	
	7,500	2,737	1,721	
	15,000	3,878	1,163	
	20,000	5,494	2,535	

PERFORM TESTING USING NORMAL STRESSES OF 2,500, 7,500, 15,000, AND 20,000 LBS/FT². LARGE DISPLACEMENT RESULTS SHALL BE RECORDED AT DISPLACEMENTS OF 3 IN

Exhibit K

Typical Intermediate Capping Construction Procedures

- Excavate Anchor Trench and install horizontal gas collector as shown on Anchor Trench detail capping the end of the horizontal each day.. The length of Anchor Trench to be excavated will be based on the estimated number of panels the liner crew will install the following day plus 50' to allow anchor trench crew to work without interruption of liner crew activities.
- As Cap liner is completed place rolls of geocomposite in the Anchor Trench to temporarily secure liner material, and to temporarily assist with gas management by directing gas flows to the horizontal collectors until backfilling is complete.
- Upon receiving testing results of cap liner material and completion of any repairs that may be required, install the geocomposite material.
- Extend gas laterals up the slope and tie-in the horizontal gas collectors.
- Complete the final backfilling of the Anchor Trench.
- The progression of the Anchor Trench excavation and cap installation will follow the above-described procedure.
- Horizontal gas collectors will be connected to the Landfill Gas collection system or candlestick flares depending on the most efficient method to collect any potential gas emissions.

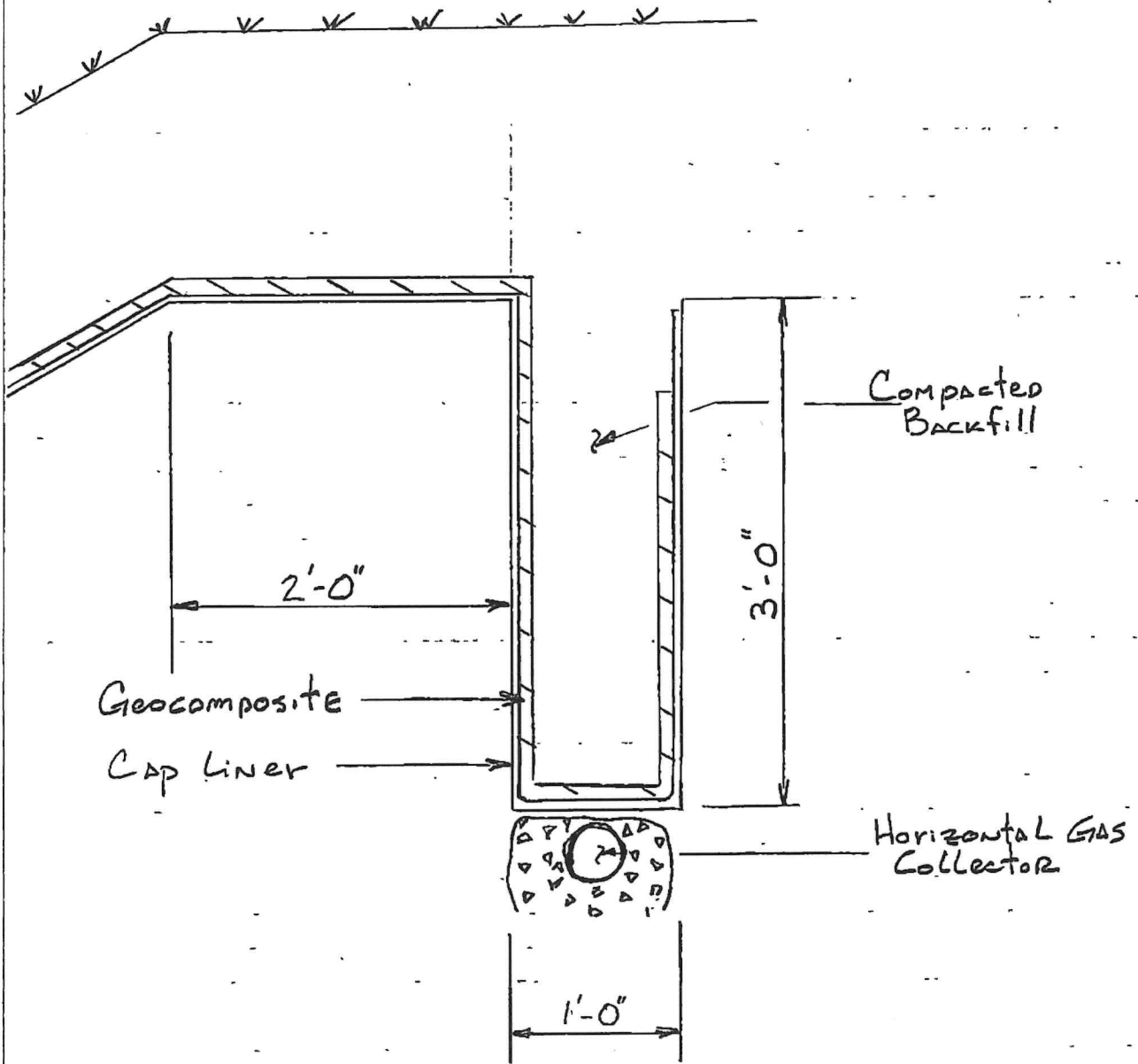
4/8/26

Keystone Landfill

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22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS

ENRPAO



Typical Anchor Trench Detail
for Intermediate Capping