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1.0 EXECUTIVE SUMMARY
This Remedial Action Plan (RAP) has been prepared for the initial phase of the North Temple Landfill (NTL) clean-up effort identified as Phase I. The NTL is a closed municipal landfill that was operated by Salt Lake City Corporation between 1959 and 1979. During its operation waste was deposited in shallow trenches and when filled, covered with native soil. Since the time that the landfill operations ceased, the waste that was originally deposited within the cells has undergone decomposition and has, in certain cells, interacted with water that has infiltrated into the cells to form leachate. The decomposing waste and the corresponding leachate together create the “source” of potential contamination to the soil and groundwater within the site itself and the adjacent property’s groundwater.

The intent of this RAP is to effectuate the remedy to minimize these potential risks through; (1) the removal of the source material by excavating the waste from the cells and evacuating the standing leachate from the cell bottoms, (2) reconsolidating the waste within a new on-site repository that incorporates a modern engineered repository cap, (3) the evaporation, treatment and appropriate disposal of the collected leachate, (4) the establishment of a groundwater monitoring program for the area including and surrounding Phase I as well as the entire site and (5) the establishment of environmental covenants within a site management plan which will incorporate a post O&M plan to guide the future development of the property.

1.1 SITE HISTORY
As mentioned above, Phase I is part of the 770-acre North Temple Landfill site that was operated as a trench landfill. The landfill operation began in the eastern portion of the landfill and moved west as the landfilling operation extended across the site. During the life of the landfill, the site received the majority of Salt Lake City’s municipal waste stream. This waste stream consisted primarily of household municipal waste, commercial waste and construction debris.

In the late 1970’s the LDS Church received a grant of a large tract of land in Salt Lake City’s northwest quadrant which included the land that was then being utilized by Salt Lake City for the landfill. After Salt Lake City closed the landfill in 1979, the site lay fallow. Since the closing of the landfill, numerous studies were performed at the landfill to understand the nature of potential contamination and possible clean up alternatives to return the land back into productive use. One of the most extensive studies was performed by Suburban Land Reserve (SLR, an entity of the LDS Church). That study, in addition to supplementing environmental data for site, evaluated possible alternative approaches to remove the waste from the site and transport the waste to an offsite disposal location. The transportation road impacts, and safety considerations associated with transporting the waste off-site combined with the economic realities of such an undertaking eliminated offsite disposal as a viable option to reclaim the old landfill.

In 2017 Utah’s State Institutional Trust Land Administration (SITLA) obtained title from SLR to a 770-acre parcel (the Property) that encompasses the footprint of the old landfill. The plan has been to redevelop the Property and enhance the Trust Fund for its stated beneficiaries (Permanent School Fund). The proposed plan is to have SITLA clean-up the landfill under a brownfield development concept whereby the landfill would be remediated in a series of phases with waste being consolidated on-site to allow for
future development. These remediation efforts will be undertaken in close coordination with Utah Department of Environmental Quality (UDEQ) Division of Environmental Response & Remediation (DERR) under their Voluntary Cleanup Program (VCP), in a similar mode as the Site Characterization efforts have been performed to date. Information regarding the project can be found on DERR’s website under the names Airport West and North Temple Landfill.

1.2 REMEDIAL ACTION PLAN

This RAP sets forth the details of the means and methods to be utilized in this initial Phase of the landfill clean-up. As identified in recent site characterization reports, the waste within Phase I is relatively shallow with minimal leachate. To date, there have been over one hundred investigative sample locations established and utilized (wells, test pits, soil borings) across the landfill and adjacent properties in an effort to characterize the nature of the waste cells, groundwater and soil conditions. In addition, the most recent Phase I Area Site Investigation was developed with UDEQ to provide specific additional site condition information to be utilized to produce the remedial designs and approaches for this initial clean-up phase. Similarly, additional characterization studies will be performed to support the development of subsequent phases of the landfill remediation.

As stated above, the waste within the Phase I area is relatively shallow and contains minimal leachate within the cells. These factors support beginning the landfill clean-up efforts in this location as it permits the applicant as well as UDEQ an opportunity to refine the remediation means and methods in an area of the landfill that is less complicated. The in-field experiences can then be evaluated, critiqued and modified as appropriate for later phases of the clean-up in areas where the waste may be deeper and with the presence of more leachate. The “Phase I Area” also includes the repository for Phase I which will incorporate the area identified as the Bonneville Pile. The Bonneville Pile contains waste that was previously relocated from the former NTL East Landfill (waste was removed to allow for development within the Salt Lake International Center) under an approved plan with UDEQ which conforms with this current waste consolidation approach. The Bonneville Pile, which is a 50/50 mix of soil and dry waste will be screened (and soil reclaimed) prior to being incorporated into the new repository.

In addition to the means and methods to be utilized for the Phase I clean-up efforts, this RAP also identifies the environmental safeguards that will be implemented. While the landfill is located in a relatively remote location away from sensitive receptors, odor control measures have been incorporated into the plan to minimize effects from the active waste excavation as well as the waste placement within the repository. Odor monitoring stations across the balance of the Property have also been established to provide the required feedback and allow for any necessary modifications to the field activities. The groundwater in the area of the site is classified as a Class 4 groundwater, due to its high salinity content and limited beneficial use. However, the RAP incorporates multiple components that are specifically designed to minimize future impacts on the site and the surrounding area groundwater. Leachate currently existing in the bottom of the waste cells will be collected, evaporated and treated prior to offsite disposal. The development of a new repository for Phase I, incorporating a modern landfill impermeable cap, will eliminate the further generation of leachate from precipitation infiltration into the newly consolidated waste while addressing stormwater management requirements. As subsequent phases of the landfill remediation are advanced, additional groundwater impact mitigation methods will be evaluated including a physical barrier on the western boundary of the landfill to help
minimize off-site migration of impacted groundwater. Other means and procedures to control site access, impacts on wildlife, fugitive dust or other air quality impacts are detailed in the report sections to follow. In addition, each of the figures contained within the text of this report is presented in full format in Appendix A of this report and are identified in a consistent manner as the same figure number.

This Remedial Action Plan has been developed as part of the Voluntary Cleanup Program (VCP) administered by UDEQ’s Division of Environmental Response and Remediation (DERR). The Program was created to promote the voluntary cleanup of contaminated sites encouraging the redevelopment of Brownfield sites back into productive use. While SITLA had no involvement in the waste previously being disposed of in the landfill, upon obtaining title to the property, SITLA entered the VCP program and began to undertake the additional site characterization studies requested by DERR. Those studies, which helped formulate the remedial approaches set forth in the RAP, can be found on DERR’s website under the project’s name “Airport West VCP” and “North Temple Landfill”. Prior to initiating the proposed clean up under this RAP, public participation is encouraged through a 30-day public comment period. The public notice will be placed in a local paper and communicated directly with the adjacent landowners and various stakeholders that have shown an interest in this project and which SITLA has maintained communication with over the past few years. A copy of the proposed public notice can be found in Appendix D-3.
2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS

2.1 SITE LOCATION AND DESCRIPTION

2.1.1 North Temple Landfill

The North Temple Landfill is located between downtown Salt Lake City and the Great Salt Lake, along US Interstate 80 (I-80) on the North Temple Frontage Road approximately 6100 West and 7500 West, within the northwest portion of Salt Lake County, Utah (Figure 1/Appendix A-1). The Property is approximately 770 acres in area. The property encompasses the former landfill which occupies approximately 660 acres. NTL is a closed municipal landfill that was operated by Salt Lake City Corporation from 1959 until 1979. The topography of the landfill is relatively flat, with mounding and depressions due to trenching cell construction and varying landfill practices during operation.
2.1.2 Phase I Remediation Area

Phase I of the landfill remediation, and the subject of this RAP, is located in the southeast corner of the Property (Figure 2/Appendix A-2). The Phase I designation includes three distinct areas; (1) 130 acres of the former landfill operation containing buried Municipal Solid Waste (MSW), (2) 45 acres south of the Brighton Canal which does not contain MSW and (3) 41 acres upon which the new repository will be constructed and receive the waste excavated out of the 130 acres identified above. As discussed in more detail in the following sections of the report, the MSW within the waste cells in Phase I is relatively shallow, between three and six feet deep, with minor quantities of leachate in the cell bottoms. Portions of the area south of the Brighton Canal, while not containing MSW, does have some lead shot contamination from a former sporting clay operation which will also be addressed as part of this RAP.

Figure 2 – Phase I Location Boundary (See Also Appendix A-2)

2.2 SUMMARY OF REMEDIAL INVESTIGATIONS

2.2.1 Waste Composition and Depth of Waste

Waste depths across the Phase I area of the landfill as well as the period of time the waste was deposited there vary slightly. The depth of waste ranges from 3 to 6 feet with the cover material overlaying the waste averaging 1.5 feet. The original waste cell preparation in most areas within Phase I has the bottom of the cells corresponding slightly above the local elevation of the surrounding groundwater. Waste deposited in Phase I during the era of 1959-1963 was placed in relatively shallow trenches. These trenches were likely dug with a dozer or dragline leaving a native soil levee in-place between each successive trench functioning as a cell wall (Figure 3/Appendix A-3).
Actual records of waste accepted during the City’s operation of the NTL are limited and, as such, the available waste composition data has been developed through exploratory excavations undertaken by means of several studies throughout the years. Within the Phase I area, waste constituents have been identified mainly as typical household municipal waste products including tires, wood debris, soils, plastics, paper, glass, cardboard, rubble and other unrecognizable decomposed materials. While a significant number of tires have been identified during the test pitting efforts, other suspect/special waste has been minimal or non-existent.

Among the data recorded in the most recent field investigation activities as a part of the expanded subsurface investigation performed in September of 2021, the following table provides a detailed summary of test pit excavation data including the visual characteristics of the waste in each test pit, the measured cover material, waste profile, depth to water and overall depth of each test pit located within the Phase I area (Table 1). An aerial graphic depicting the location of each of the test pits labeled with each corresponding Test Pit ID number within this area of the landfill are identified on Figure 4/Appendix A-4.

<table>
<thead>
<tr>
<th>TEST PIT ID</th>
<th>VISUAL WASTE CHARACTERISTICS</th>
<th>MEASURED DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PLASTICS</td>
<td>TIRES</td>
</tr>
<tr>
<td>TP-RR10</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>TP-RR11</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>TP-RR12</td>
<td>25%</td>
<td>10%</td>
</tr>
<tr>
<td>TP-RR13</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>TP-RR14</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>TP-RR15</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>TP-RR16</td>
<td>10%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Table 1 – Test Pit Excavation Results – Phase I Area – September 2021
2.2.2 Site Groundwater Level and Gradients

Based on results from previous studies, the direction of localized shallow groundwater flow within the Phase I area of the landfill has been shown to have a northerly direction. The direction and gradients within this area are consistent with the surrounding regional areas. The shallow lower profile of waste cells in Phase I have less impact on the underlying groundwater direction than the western portion of the Site. Review of the previous data from groundwater wells surrounding the landfill indicates regional groundwater flow is to the North.

Based upon the most recent data collected, groundwater flow direction in the Phase I area of the Site is toward the North-Northwest with a gradient of approximately 0.0011 feet/foot measured between NTL-GW10 and NTL-GP69. The gradients along the western boundary of the NTL Site are four to six times higher than those on the eastern area of the Site, encompassing the Phase I area. The direction and gradients on the eastern area of the Site appear to be more indicative of the surrounding regional areas. Site groundwater gradient flows for the Phase I area can be seen in the following figure (Figure 4/Appendix A-4).

Table 1 – Test Pit Excavation Results – Phase I Area – September 2021 (cont.)

<table>
<thead>
<tr>
<th>TEST PIT ID</th>
<th>IN-FIELD COMMENTS/NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP-RR10</td>
<td>Black charcoal looking waste here. No plastics and very little municipal waste. Mostly C&amp;D debris with bricks and concrete. Very odorous waste. No water here even below the clay layer.</td>
</tr>
<tr>
<td>TP-RR11</td>
<td>Water was barely seeping in at the bottom. The waste is black and rusty brown in color. Odorous waste. Some oily sheen at the bottom. Mostly decomposed indiscernible waste but includes wood, paper, glass.</td>
</tr>
<tr>
<td>TP-RR12</td>
<td>Dark brown colored waste looking more like traditional MSW. Waste is wet at the bottom of the cell, but very little water. The waste is more damp than wet. Waste is somewhat odorous.</td>
</tr>
<tr>
<td>TP-RR13</td>
<td>Rusty brown colored waste and a lot of glass bottles here. Waste is significantly decomposed. Very little odor. No water encountered even below the clay bottom.</td>
</tr>
<tr>
<td>TP-RR14</td>
<td>Waste is rusty brown in color. Black clay on the bottom of the cell. The waste is mostly decomposed. Almost no water encountered only a small amount beyond the clay bottom.</td>
</tr>
<tr>
<td>TP-RR15</td>
<td>The waste is rusty brown in color, similar to other test pits in the area. The waste is mostly decomposed and somewhat damp at the bottom. No odor. No water at bottom or beyond the clay layer. Dark clay on bottom.</td>
</tr>
<tr>
<td>TP-RR16</td>
<td>Shallow cover material. The waste is rusty brown in color. Highly decomposed waste. Mostly glass bottles and paper. No odor. No water.</td>
</tr>
</tbody>
</table>
2.2.3 On-Site Groundwater Contamination

The western NTL Site is characterized by deeper, thicker and wetter MSW cells. The groundwater in the west area of the NTL is characterized as having more detections of constituents at the highest levels throughout the NTL Site. The east area of the NTL Site in particular the Phase I area is drier, shallow waste profiles with fewer constituents detected, and at the lowest levels throughout the NTL Site.

2.2.3.1 Investigation Well Groups

A total of 70 well locations have been sampled as part of the overall characterization of the Airport West VCP for the NTL site (2018-2019). These are grouped in the following areas and are briefly described below in proximity to the Phase I area.
**Phase I Southeast Wells (Upgradient) – 6 Wells**
The Southeast wells NTL-GW01; NTL-GW02; NTL-P8; NTL-GW09; NTL-GW10 and NTL-GW11 are hydrologically upgradient of the landfill waste cells. These wells are grouped together and are considered upgradient wells to the underlying groundwater at the Site.

**Phase I Northeast Boundary Wells (Perimeter and Off-site Downgradient) – 5 Wells**
The Northeast wells NTL-GW04; NTL-GW06; NTL-P7; NTL-GW13; and the 2019 Airport West VCP Expanded Subsurface Investigation (2019 ESI) well NTL-GP69 are hydrologically downgradient of the Phase I area and located along the north and east boundary of the former landfill. These wells are grouped together and are considered perimeter downgradient wells to the shallower older waste cells associated with the Phase I area and downgradient from the Phase I area wells. See Figure 4/Appendix A-4.

**Phase I Interior Wells (Phase I Development Area) – 9 Wells**
A group of six wells which were installed during the 2019 ESI are the wells in the area described as the Phase I area wells. These are NTL-GP63 through NTL-GP68 and are located in the north half of the Phase I area, within the eastern area of former waste cells. Also, three new GW monitoring wells were installed and sampled during the 2021 Airport West VCP Phase I Subsurface Investigation (2021 Phase I SI), (GW-RR13, RR18 and RR19). These were located in the general area being proposed for a new repository waste cell for the Phase I area. See Figure 4/Appendix A-4. Seven of these Phase I area interior wells were sampled in the 2021 Phase I SI (NTL63, 65-67) and the three new wells (GW-RR13, RR18 and RR19).

**Southwest NTL Boundary Wells (Perimeter, Interior and Off-Site Downgradient) – 31 Wells**
These wells are all located west and cross gradient from the Phase I area. See Figure 4/Appendix A-4.

**Northwest NTL Boundary Wells (Perimeter, Interior and Off-Site Downgradient) – 23 Wells**
These wells are all located west and cross gradient from the Phase I area. Northwest boundary NTL Site well NTL-GP48 from this group was sampled during the 2021 Phase I SI. This well was included within the area of a future proposed railroad alignment which was sampled for soil, leachate and vapor during the 2021 Phase I SI. See Figure 4/Appendix A-4.
2.2.3.2 Phase I Groundwater Analytical Results (2021 SI)

The 2021 Phase I SI focused on the Phase I area of the landfill. Of the eight major analyte groups analyzed including dissolved metals, TDS, VOCs, SVOCs, TPH-GRO, TPH-DRO, TRPH, and PFAS, three of the groups were reported in well locations above their PSL, including dissolved metals, TDS, and VOCs. Based on the hydrogeologic gradient and flow direction, the furthest downgradient Site well NTL-GP69 exhibited PSL exceedances of TDS, As, 1,4 dioxane, 1-1,DCA and VC while the Phase I area wells did not report any PSL exceedances of 1-1,DCA or VC. While the contaminants of TDS, As and 1-4,dioxane may exceed their respective PSLs in groundwater beneath the Phase I area, other regional environmental factors also exist that affect their presence, concentration, and distribution in both shallow and deeper regional water-bearing zones. A more in-depth discussion of the analytical testing/results can be found in the 2021 Phase I SI report.

2.2.4 Phase I Test Pit Investigation

As a part of the 2021 Phase I SI, nine test pits were excavated in the MSW located in the Phase I area (TP-RR6, TP-RR9 through TP-RR16). The test pits were excavated to observe and monitor the waste characteristics and moisture content of the waste cells. Ten samples were collected from the soil/waste matrix at the bottom of the waste profile. Samples of the leachate when present were collected for laboratory analysis. A leachate sample was collected and analyzed from the Phase I test pit where leachate was present. No TCLP analysis was performed based on the reported low total concentration ranges.

2.2.5 Test Pit Results – Air Monitoring

2.2.5.1 Soil/Waste Vapor Gas Monitoring

During excavation of the test pits located in the MSW cells, field monitoring of the soil/waste vapor gas was measured. A MultiRAE Five-Gas Monitor (multi-gas meter) with Advanced VOC Detection Capability, model PGM-6228 was used. Five gas parameters were monitoring during excavation and within the stockpiled soil/waste material. These parameters included hydrogen sulfide, methane, carbon monoxide, oxygen and volatile organic compounds. The test pits were continually monitored during the excavation and sampling process, with measurements recorded at spaced intervals. Test pit gas measurement readings were recorded between 2 to 5 times depending on the duration of the locations process time.

Two test pits (TP-RR10 and TP-RR11) were measured with average detections of H2S and VOCs above background. TP-RR10 was measured at 35.93 ppm for VOCs. TP-RR11 was measured at 1.1 ppm for H2S.

2.2.5.2 Field Olfactometer Measurement

Half of the test pits were recorded as very weak to weak for odor measurements with the Nasal Ranger Field Olfactometer. Test Pit TP-RR12 was recorded as moderate. Test Pit TP-RR3 was recorded as strong and Test Pits TP-RR(10 and 11) were recorded as very strong. Tabular field olfactometer data is included in the field measurement section of the 2021 Phase I SI.
2.2.6 Test Pit Results – Analytical Testing

2.2.6.1 Soil/Waste Solids Test Results
Arsenic was the only solids result in the soil/waste matrix to report exceeding the PSL (3 mg/kg).

2.2.6.2 Leachate Test Results – Metals
The arsenic PSL (0.01 mg/L) was exceeded in the test pits sampled. With very little leachate present in the Phase I test pits, the sole location with an exceedance for the arsenic PSL was TP-RR11L with a concentration of 0.0178 mg/L. The cadmium PSL (0.005 mg/L) was reported as exceeded in the sole location of TP-RR11L with a concentration of 0.00519 mg/L.

2.2.6.3 Leachate Test Results – VOCs
Benzene was not exceeded in any of the leachate samples within the Phase I test pits. The Phase I TP-RR11 was reported exceeding the methylene chloride PSL with a concentration of 6.4 µg/L. The sole Phase I TP reporting exceeding the 1,4-dioxane PSL was TPRR11 with a concentration of 3.7 µg/L.

2.2.6.4 Leachate Test Results – SVOCs
The PSL for the SVOC of benzo(a)pyrene (0.2 µg/L) was exceeded in TP-RR11, at a concentration of 0.23 µg/L. No other PSL for SVOCs was exceeded in the Phase I test pits.

2.2.6.5 Leachate Test Results – TDS
The PSL for the Phase I area TDS (2,200 mg/L) was established to characterize the shallow groundwater within the Phase I area TDS compared to the upgradient groundwater quality. The PSL for TDS in the leachate should only be applied as a reference. It is assumed MSW leachate will be elevated in TDS values. There is little movement of the leachate and high contact with the decomposing waste material. The leachate TDS values can be useful when developing leachate treatment designs for the handling and disposal of the leachate during excavation of the waste and remediation of the landfill. The concentration of TDS was 26,000 mg/L in NTL-TP11.

2.2.7 Site Geotechnical Conditions
This site has been investigated using a variety of field exploratory methods over the last few decades. The subsurface condition can be generalized as ancient deltaic deposits primarily fine sands, silts and clays which are underlain by Pleistocene age Lake Bonneville lacustrine deposits.

The trench excavations for waste burial in Phase I were shallow (3-6 ft) and were normally terminated in silty clays. It is inferred that the depths were limited in many cases by the intersection of the trench bottom by shallow groundwater. The shallow groundwater zone is underlain by a lower aquifer, generally separated in the Phase I area by a deeper confining clay layer.

The soils expected to be encountered during the remedial action work will be silty clays in the bottom and sides of trenches.
The cross-section view of the site (Figure 5/Appendix A-5) is located along the proposed rail alignment from west to east and represents eight (8) Cone Penetrometer Test locations. The CPT logs are included (for expanded detail) from CPT locations CPT2, CPT4, CPT6, and CPT8 (Figure 6/Appendix A-6). The generalized profile is shallow sand and silts, grading to deeper mixtures of clay to silty clay, interspersed with lenses of more permeable sands and silts occurring more frequently below 15 feet BGS.
Figure 6 – CPT Boring Logs (See Also Appendix A-6)
**Figure 6 – CPT Boring Logs (Cont.) (See Also Appendix A-6)**

<table>
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<tr>
<th>Depth (ft)</th>
<th>Tip CDR (sf)</th>
<th>Slope Stress (sf)</th>
<th>Pore Pressure (ps)</th>
<th>F-Ratio (%)</th>
<th>Class, FR (Rob. 1990)</th>
<th>REMARKS</th>
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</tr>
</tbody>
</table>

**NOTES:** Example of notes

1. Sensitive, fine grained
2. Organic soils - peats
3. Clays - clay to silt
4. Silty sands - clayey silt to silt
5. Sand mixtures - silty sand to sandy silt
6. Sands - clean sand to siltly sand
7. Gravels - sand to gravel
8. Very stiff sand to clayey sand
9. Very stiff, fine grained

*SBT: Robertson 1990; **Overconsolidated or Cemented; ***SBT/SPM CORRELATION, UBD-1993*
2.3 ENVIRONMENTAL AND PUBLIC HEALTH ASSESSMENTS

Soil and groundwater studies have been conducted since the mid-1970s at the NTL Site. Studies have been completed by Salt Lake County (SLCo) Health Department, Salt Lake City Corporation (SLC), Utah Department of Health, United States Environmental Protection Agency (USEPA), and a number of environmental and geotechnical engineering consulting firms as part of several agency oversight cleanup programs and private development studies. See the Summary of Previous Investigations table below for a list of the studies conducted between 1975 and 2021.

2.3.1 Site History and Previous Work

The earliest record of information on the NTL Site is a SLCo Health Department report in October 1975. The report summarizes an investigation conducted at the landfill by the SLCo and Utah State Division of Health on what at the time was referred to as the Salt Lake City Landfill. The report identified the landfill operations occurring for the previous 20 years. At the time of the inspection the trench method of landfilling was used with trenches being excavated approximately 8 feet deep. The report provides a map of the landfill showing the areas and during what periods the areas of the landfill had been developed. During the 1975 investigation, the area of the landfill being developed would have been the far west areas, west of the north-west trending Brighton Canal which bisects the site. The report identifies the presence of groundwater at the bottom of the trenches and states the waste is pushed from the top down to depths of 8 feet before the equipment can attempt to compact the waste due to the water in the bottom of the trench. The report records the existing method of landfilling does not prevent the direct contact with the groundwater. The Airport West VCP Phase I area is identified on the 1975 report map as being developed in the period from 1959 to 1963.

In 1977, Salt Lake City and EMCON Associates did an initial groundwater and geotechnical study at the NTL. The 5 wells were sampled for six water quality parameters. Apparent downgradient wells northwest of the landfill indicated impacts to the groundwater from the landfill operation. An USEPA potential hazardous waste site preliminary assessment (PA) was conducted in 1986 by the Utah Department of Health. The PA identified changes in the development of the landfill over the operational period between 1959 through 1979. From 1959 to 1963, trenches 2 to 4 feet deep were dug with a dozer and/or dragline and filled with refuse. The wastes were covered with 1-2 feet of native material (UDH 1986). This period coincides with the period of time that the waste cells were being developed in the Phase I area. In 1963, cells began to be excavated to a depth in excess of 10 feet. This is reflected in the waste cell profiles west of the Phase I area which were developed during the period following the Phase I area development. Around 1971, landfill operations continued to be excavated to those deeper depths. However, refuse began to be placed in the cells to a height of 3-5 feet above the former ground surface. The cells were covered with 1 to 2 feet of the surrounding native material. This is consistent with the waste cells located west of the Brighton Canal along the western area of the NTL Site, characterized as within the underlying groundwater and higher waste profiles compared to the earlier waste cells being above the groundwater and shallower, in the east side of the NTL Site. The PA recommended to combine the NTL and NTL-East due to their similarities in waste composition and hydrogeological settings. It was recommended that the combined sites be given a “medium-high” priority for conducting an USEPA Site Inspection. Waste types reported in previous CERCLA forms for the NTL Sites include: acids, bases, solvents, oily wastes, leather tanning wastes, plating/polishing...
wastes, oil refinery wastes, and sanitary refuse wastes. Septic tank and sump sludge were also disposed at the landfill.

From 1989 to 1995 the USEPA conducted Site Inspection Prioritization (SIP) Studies based on the UDH PA recommendations. The 1989 UDH initial Site Inspection (SI) study reported the presence of metals within both the downgradient wells and surface water. Chloride and sulfate were reported in higher concentrations in the downgradient surface water when compared to upgradient sample water. Metals concentrations in the North Point Drain and Brighton Canal did not appear to be impacted by the landfill (UDH 1989). The results of the SIP studies were a low priority for inclusion on the National Priority List (NPL). Following these initial USEPA CERCLA driven studies the Salt Lake City Landfill, now referred to in more recent studies as the North Temple Landfill (NTL), has gone through numerous studies for the last 20 years primarily the result of voluntary actions driven by development potential. The NTL East landfill (Bonneville Center Development) received a Certificate of Completion through the UDEQ VCP following cleanup of the buried MSW. The NTL-East underwent an approved waste removal and consolidation effort with UDEQ, where the waste from the NTL-East landfill was relocated to the NTL Site in an area located in the south-west area on the Phase I area referred to as the Bonneville Pile. This location is shown on the previous Figure 4/Appendix A-4.

The characterization studies performed at the NTL over the last 20 years continued to refine the extent and levels of contamination within the groundwater, waste, leachate, canals, soils and areas downgradient of the landfill. Additional wells were installed both in, around and downgradient of the landfill. Significant to these studies were investigations and pilot studies into the feasibility of remediation alternatives to clean up the landfill. Refinement of the waste profiles throughout the different areas of the landfill and the interaction the waste cells had on the underlying groundwater was performed. The studies between 2005 and 2006 by UTEX and others investigated the waste characteristics, leachate dewatering designs and groundwater contamination. Studies were conducted on the area used as a shotgun sporting shooting range following the closure of the landfill. This area was investigated for lead shot contamination. The lead shot impacted areas have been identified for cleanup as part of the overall remediation efforts of the re-development of the former landfill.

The characterization studies have in general identified the levels of contamination to be associated with the development of waste during the latter periods of operation from 1963 through 1979 when the waste cells were thicker and deeper. Some being placed near or in the shallow groundwater. These areas have been identified in the western half of the NTL. The focus of the characterization of the groundwater has traditionally been along the western and northwest boundaries. These areas are the downgradient areas to the areas developed after 1963. The extent of the groundwater contamination has been identified as continuing downgradient to the west and northwest off-site into the adjoining properties. The impacts, however, for most of the range of contamination has been limited to the landfill and the areas of MSW. Impacts within the Phase I area include VOC, PFAS and arsenic. Impacts along the downgradient western boundary include VOC, TPH DRO, PFAS and arsenic. There are less and lower detections of SVOCs and barium. The off-site impacts are the VOCs 1,4-dioxane and arsenic with a few detections of 1,1-DCA. Along the northern boundary, the impacts are fewer and lower, with arsenic, 1,4-dioxane, 1,1-DCA, vinyl chloride and the SVOC 1,1-biphenyl, being detected in various locations.
2.3.2 Summary of Previous Investigations

The following listing of reports below illustrate the extent of characterization studies that have been performed on the site.

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Report on the Salt Lake City Disposal Site – Old Salt Lake City Landfill</td>
<td>SLCo Health/Utah State Division of Health</td>
<td>1975</td>
<td>Investigation on landfilling operations</td>
</tr>
<tr>
<td>Geotechnical Investigation and Evaluation of the West North Temple Street Landfill (Old Salt Lake City Landfill)</td>
<td>Salt Lake City Corporation/EMCON Associates</td>
<td>1977</td>
<td>5 new groundwater monitoring wells for the North Temple Landfills</td>
</tr>
<tr>
<td>Site Investigation, Bonneville Center (North Temple East Landfill)</td>
<td>Bingham Engineering</td>
<td>1982</td>
<td>Geotechnical boring and test pit investigation for the NTL East</td>
</tr>
<tr>
<td>Preliminary Assessment (PA) – NTL</td>
<td>Utah Department of Health</td>
<td>1986</td>
<td>CERCLA Potential Hazardous Waste Site PA CERCLA SI; 7 new groundwater monitoring wells; 7 surface water; 7 sediment samples. Review existing 1989 SI ARR for CERCLA SIP ARR for 5 new sediment and 2 new surface water samples for CERCLA SIP Groundwater Sampling of 4 existing NTL GW wells</td>
</tr>
<tr>
<td>Analytical Results Report (ARR) - Site Inspection (SI) – NTL</td>
<td>Utah Department of Health</td>
<td>1989</td>
<td>CERCLA SI; 7 new groundwater monitoring wells; 7 surface water; 7 sediment samples. Review existing 1989 SI ARR for CERCLA SIP ARR for 5 new sediment and 2 new surface water samples for CERCLA SIP Groundwater Sampling of 4 existing NTL GW wells</td>
</tr>
<tr>
<td>Site Inspection Prioritization (SIP) - NTL</td>
<td>USEPA/URS, Inc.</td>
<td>1994</td>
<td>CERCLA SI; 7 new groundwater monitoring wells; 7 surface water; 7 sediment samples. Review existing 1989 SI ARR for CERCLA SIP ARR for 5 new sediment and 2 new surface water samples for CERCLA SIP Groundwater Sampling of 4 existing NTL GW wells</td>
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<tr>
<td>Analytical Results Report - Site Inspection Prioritization (SIP) - NTL</td>
<td>USEPA/URS, Inc.</td>
<td>1995</td>
<td>CERCLA SI; 7 new groundwater monitoring wells; 7 surface water; 7 sediment samples. Review existing 1989 SI ARR for CERCLA SIP ARR for 5 new sediment and 2 new surface water samples for CERCLA SIP Groundwater Sampling of 4 existing NTL GW wells</td>
</tr>
<tr>
<td>Groundwater Sampling Event - NTL</td>
<td>Salt Lake County Health Department/Maxim Technologies, Inc.</td>
<td>1998</td>
<td>CERCLA SI; 7 new groundwater monitoring wells; 7 surface water; 7 sediment samples. Review existing 1989 SI ARR for CERCLA SIP ARR for 5 new sediment and 2 new surface water samples for CERCLA SIP Groundwater Sampling of 4 existing NTL GW wells</td>
</tr>
<tr>
<td>Semi-Annual GW Monitoring Reporting – Voluntary Cleanup Program (VCP) – Bonneville Center</td>
<td>DERR/Bingham Environmental, Inc.</td>
<td>1998-2004</td>
<td>Periodic groundwater monitoring of NTL East and GW-03. Semi-annual groundwater levels for east half of NTL.</td>
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<tr>
<td>Site Investigation and Sampling Summary Report - NTL</td>
<td>Montgomery Watson</td>
<td>2000</td>
<td>Periodic groundwater monitoring of NTL East and GW-03. Semi-annual groundwater levels for east half of NTL.</td>
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<td>Semi-Annual GW Monitoring Reporting - Voluntary Cleanup Program (VCP) - Bonneville Center</td>
<td>DERR/Kennedy/Jenks Consultants</td>
<td>2005-2006</td>
<td>Periodic groundwater monitoring of NTL East and GW-03. Semi-annual groundwater levels for east half of NTL.</td>
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Airport West VCP – Phase I – 2022 RAP 17 NT DEVELOPMENT, LLC
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<th>Title</th>
<th>Author</th>
<th>Year</th>
<th>Description</th>
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<tr>
<td>Sporting Clay Shooting Area - NTL</td>
<td>HKC &amp; Associates, Inc./UTEX Environmental Services, LLC</td>
<td>2006</td>
<td>Preliminary lead soil investigation -32 surface and near surface soil sample</td>
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<tr>
<td>Phase II ESA, 712 Acre Parcel North of NTL</td>
<td>HI Environmental, Inc</td>
<td>2006</td>
<td>Five sediment, four soil and four groundwater samples collected.</td>
</tr>
<tr>
<td>Report of Water Analysis from Pilot Dewatering Area Planning Level Geotechnical Study - NW Quadrant Development Planning</td>
<td>UTEX Environmental Services, LLC</td>
<td>2006</td>
<td>Analytical results of dewatering pilot study</td>
</tr>
<tr>
<td>NTL Former Sporting Shotgun Shooting Range Remedial Investigation</td>
<td>CDM/SLR/DERR</td>
<td>2008</td>
<td>Planning level geotechnical study; 10 new groundwater monitoring wells</td>
</tr>
<tr>
<td>Subsurface Investigation Epperson Property</td>
<td>Cardno/SLR/DERR</td>
<td>2010</td>
<td>Assess lead contamination in surficial soil and canal sediments. 129 soil, 9 sediment locations Groundwater sampling off-site 200 ft. off west boundary downgradient of NTL Groundwater sampling off-site 500 ft. off west boundary downgradient of NTL. Soil vapor west perimeter New nested deep/shallow well sets installed, soil and groundwater sampling Site wide Groundwater sampling off-site 900 ft. off west boundary downgradient. Site wide perimeter wells, new Phase I wells. Soil vapor wells</td>
</tr>
<tr>
<td>Expanded Subsurface Investigation –Epperson Property</td>
<td>Cardno/SLR/DERR</td>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>Supplemental Site Characterization</td>
<td>Ninigret/DERR</td>
<td>2018</td>
<td></td>
</tr>
<tr>
<td>Expanded Subsurface Investigation</td>
<td>Cardno/SLR/DERR</td>
<td>2019</td>
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### 2.4 CONCEPTUAL SITE MODEL AND EXPOSURE PATHWAYS

A Conceptual Site Model (CSM) has been prepared to identify the following:

- **Historical Sources**
- **Primary Contamination**
- **Transport Pathways**
- **Contaminated Media**
- **Exposure Route**
- **Exposed Receptor Population**

See **Figure 7/Appendix A-7** below for a graphical representation of the following description of the CSM.

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**Figure 7 – CSM Model (See Also Appendix A-7)**
2.4.1 Historical Sources
The Phase I area is a portion of the larger NTL Site that received municipal waste during the initial phase of the landfill’s operation, a period of time from 1959 to 1963. The NTL Site continued expanding generally to the west of the Phase I area until Salt Lake City ceased operating the Landfill in 1979. As the landfill expanded beyond the Phase I area, the development of the landfill changed. As the waste cells continued to the west, they were placed in deeper and thicker profiles up until the landfill ceased operation.

Historically prior to the federally promulgated solid waste rules adopted and put into law in 1976, it was common for a range of waste, including liquid wastes to be placed into municipal waste landfills which today’s RCRA Subtitle D landfill requirements would limit.

The historical source of the Phase I waste is MSW. The Phase I waste has been characterized as shallower and dryer, and although there has been detection of regulated compounds within the underlying groundwater, there has been to date no sources of hazardous, liquid or other waste restricted in landfilling operation pre-dating the RCRA Subtitle D rules identified.

Visual waste characteristics were recorded for the waste composition in excavated stockpiles during investigations of the test pit waste. Seven primary categories of waste were recorded by percent composition (plastics, tires, wood, glass, paper, metal and other). Plastics ranged between 0 to 25 percent. Tires ranged between 0 to 10 percent. Wood ranged between 10 to 40 percent. Paper ranged between 0 to 25 percent. Metal was 0 percent in all test pits. Other was 5 to 55 percent.

Cover material ranged between 1 and 2 feet in thickness for the Test Pits (TP’s), located in Phase I. The waste profiles ranged between 3 to 6 feet in thickness, within the TPs located in Phase I. Depth to a saturation zone in the TPs ranged between 0 to 6.5 feet, with 7 of the 8 TPs in Phase I showing no water in the excavations.

2.4.2 Primary Contamination
Site Characterization Studies conducted on the buried MSW, leachate, soil, and groundwater for the Phase I area has identified the detection of elevated arsenic in the buried soil/waste matrix at the bottom of the cells. Lead has been identified in surface soil within portions of the southern area of Phase I used historically as a shotgun shooting range. The metals arsenic, cadmium and VOCs methylene chloride and 1,4-dioxane were elevated above their site investigation PSLs in the waste leachate. The metals (arsenic, cadmium, lead); VOCs (1,4-DCB, 1,4-dioxane); SVOCs (1,1-Biphenyl, bis(2-ethylhexyl)phthalate,1-methylnaphthalene); and TPH-DRO were detected above the investigation PSLs in 1 to 4 of the Phase I wells.

In addition to the buried MSW, waste leachate, shooting range soil, and groundwater as having detections of COCs as identified in site investigations, other areas of contamination will potentially be present during remedial activities. These areas include temporary waste stockpiles, haul roads and newly constructed leachate collection impoundments.
2.4.3 Transport Pathways
The transport pathways identified at the Phase I include the following:

- Leaching of the MSW by infiltration of precipitation; and drainage of pore water during excavation and or transport.
- Wind suspension of the MSW in opened trench cells, temporary stockpiles, spillage during transport of waste, and exposed consolidated waste in newly constructed repository cells.
- Water erosion from the run-on and run-off of contacted surface water or precipitation.
- Spills during transport of waste and or transport of leachate.
- Infiltration by leaks or run-off from leachate collection impoundments or containers.
- Volatilization and decomposition of organic compounds from the MSW or contaminated groundwater and soil.

2.4.4 Contaminated Media
The contaminated media identified at the Phase I included the following:

- Leachate due to infiltration of precipitation or shallow groundwater.
- Surface soil impacted by deposition of wind-blown suspended MSW or dried contaminated fine-grained soil or sediments from handling or treatment of leachate.
- Air impacted from the volatilization of MSW, leachate, contaminated groundwater, surface water or the suspension of dust particles from the dried MSW or impacted surface soil.
- Groundwater impacted through contact or infiltration through the MSW.
- Surface water or seeps receiving recharge from the underlying contaminated groundwater.
- Aviary and aquatic life impacted through the bio uptake from impacted surface water.

2.4.5 Exposure Route
The three routes of exposure are contact, ingestion and inhalation. These routes are identified by the following possible exposures:

- Ingestion of contamination by cross contamination of food sources or ingestion by contact to mouth due to the deposition of suspended wind-blown dust particles on hands, clothing or vehicles.
- Inhalation of volatile compounds suspended in air or other contaminates through wind-blown dust.
- Dermal contact with contaminated MSW, leachate, groundwater, surface water or soil.

2.4.6 Exposed Receptor Population
The following exposed receptor populations are identified with their particular stage during the remedial action phases.

- The Phase I area will be developed in accordance with its current zoning as a commercial/light industrial development and therefore does not include any complete pathway to a residential receptor and therefore does not require any further evaluation.
- During remedial activities of excavating, transporting and handling of the MSW, leachate and groundwater, one or more pathways of exposure exist for a short-term construction worker or visitor and a quantitative evaluation is required.
• Following remedial activities, there will remain in Phase I consolidated waste within engineered impoundments, and while greatly reduced, residual impacts may remain to groundwater which may include one or more pathways to a long term or site worker and a quantitative evaluation is required. The short-term worker or visitor during this period of post closure is not included in a quantitative evaluation due to the evaluation of the long term or site worker with the higher exposure.

• Local wildlife population that frequents the site and surrounding area have a pathway for exposure as a result of the Phase I remedial activities from the possible exposure to leachate, contaminated groundwater and exposed waste. Special operating procedures and design elements have been incorporated into the RAP to minimize such potential and are discussed in more detail in Section 3.0.

2.5 SUMMARY OF RISK ASSESSMENT

In 2018 a risk assessment report was prepared on the North Temple Landfill which at the time utilized sampling data that had been collected during previous site characterization studies. While the risk assessment provides good information relative to the protectiveness of the proposed remedy for Phase I, this risk assessment does not intend to be a final document for the entire North Temple Landfill site as additional characterization is still necessary for the areas outside of Phase I (See Appendix B).

2.5.1 Risk Calculation Results – Phase I Area

2.5.1.1 Municipal Use of Shallow Groundwater

Phase I Area groundwater concentrations are compared to PSLs in Table 4 of the 2021 Phase I SI. PSL values are based on MCL values. In the absence of MCL values, groundwater concentrations are compared to tap water RSLs. The PSLs are exceeded for several chemicals in the Phase I wells. These include 1,1-dichloroethane (DCA), 1,4-dioxane, vinyl chloride, arsenic, and cadmium. Additionally, the sample results from the Phase I area TPs collected from the leachate identified several chemicals exceeding the PSLs. These are presented in Table 5 of the 2021 Phase I SI. These included methylene chloride, 1,4-dioxane, benzo(a)pyrene, arsenic and cadmium.

An inspection of Tables 4 and 5 of the 2021 Phase I SI shows that the exceedances of the greatest magnitude were for 1,1-DCA, and 1,4-dioxane. These chemicals exceeded their PSLs by over one to two orders of magnitude, respectively. An inspection of these same tables show that arsenic and 1,4-dioxane exceeded their PSLs most frequently. The number of chemicals exceeding PSLs and the magnitude and/or frequency of some of these exceedances results in a conclusion that the shallow groundwater immediately downgradient of the Phase I area is not suitable for municipal purposes. The use of the local groundwater, independent of these exceedances, in negated by the high salinity of the groundwater in the area and its classification as Class IV groundwater.

2.5.1.2 Indoor Site Worker Exposure Via Vapor Intrusion

Groundwater concentrations of 1,1-DCA, and vinyl chloride were at least one-tenth of EPA’s VISLs. Further analysis has been performed regarding the potential of these compounds to create a health hazard to site workers via vapor intrusion. The Johnson and Ettinger model has been used to calculate risks for these compounds using site-specific geology. The output spreadsheets for the Johnson and Ettinger model are presented in the Risk Assessment Report attached as Appendix B.
The total cancer risk was $1 \times 10^{-8}$, while the hazard index was 0.0001 (Table 5-2 of the Risk Assessment Report). However, no compound had a cancer risk above $1 \times 10^{-6}$. The highest cancer risks were $2.9 \times 10^{-8}$ for 1,1-DCA, $1.8 \times 10^{-8}$ for vinyl chloride.

### 2.5.1.3 Construction Worker Contact with Groundwater

For a construction worker in contact with groundwater, the total cancer risk was $4 \times 10^{-8}$ and the total hazard index was 0.0017 (Table 5-3 of the Risk Assessment Report). The total cancer was derived from two chemicals with risks in the $10^{-8}$ range (1,4-dioxane, vinyl chloride). Dermal exposure accounted for over 50 percent of the total cancer risk estimate.

As with site worker exposure to vapor intrusion, the level of concern is diminished by the fact that there is no single chemical with a cancer risk above $1 \times 10^{-6}$. For the construction worker, this conclusion is emphasized by the fact that many of these chemicals have rarely been detected. The total risk from the chemicals that were detected with greater frequency (1,4-dioxane, vinyl chloride, and arsenic) is only $4 \times 10^{-8}$.

Blood-lead levels for the fetus of a pregnant construction worker are calculated in Table 5-4 of the Risk Assessment Report. The 95 percentile level is 2.4 µg/dl, which is well less than the benchmark of 10 µg/dl. No adverse effects are anticipated as a result of the presence of lead in groundwater.

### 2.5.2 Uncertainty Analysis

The primary uncertainty with the municipal use of shallow groundwater is that it is highly unlikely that the shallow groundwater in the vicinity of the Phase I area would ever be used for such a purpose. Groundwater concentrations exceed PSLs by a sufficient margin (by over a factor of 100 in a third of the instances and over 1,000 in one) that there is a high degree of certainty in the conclusion that there could be adverse health effects from such use if it were to occur.

When evaluating vapor intrusion risks that would be associated with an indoor site worker, it was assumed that the worker would be present for 25 years. This is the 95th percentile for how long workers stay at a job (EPA, 2014). Most workers change jobs more frequently. In 2016, the median time a person had been with their current employer was 4.2 years (U.S. Bureau of Labor Statistics (BLS), 2016).

Modeling was used to estimate indoor air exposure concentrations. The indoor air modeling made use of EPA’s implementation of the Johnson and Ettinger model (EPA, 2004a). Using this model requires assumptions regarding building size, soil-building pressure differential, the floor-wall seam crack width, the vapor flow rate into the building, and the indoor air exchange rate. EPA and model default values were used for these parameters.

EPA has designed these defaults to be conservative but within the range of possible values. Taken as a whole, these assumptions are likely to overestimate total risk. For example, the air exchange rate of one change per four hours is typical of winter conditions in areas of the country with a cold climate, and that will be more conservative than data averaged over an entire year (EPA, 2004a). It is also based on residential data and will overestimate indoor air concentrations for facilities such as warehouses. Also, a
small building of about 1,100 square feet is assumed; larger ones typical of office complexes and warehouses allow for greater mixing with outdoor air. When these uncertainties are juxtaposed with risk estimates that are below $1 \times 10^{-6}$, the conclusion is that there is no significant vapor intrusion risk.

Construction worker risk estimates required assumptions regarding the amount of contact workers will have with groundwater. Highly conservative assumptions were made, including that such contact would occur daily over the course of a year-long construction project (this assumption was made to match up with the EPA standard default assumption for construction worker exposure duration (EPA, 2002). Obviously, much of any construction project takes place above ground with no contact with groundwater. This assumption can only be at all plausible if it is assumed that several buildings are constructed in this area, and one group of workers goes from building site to building site, excavating and installing each of these foundations.

However, if a worker is at multiple construction sites, they will be in contact with groundwater over a much larger area. The assumption that a worker is in contact with maximum detected groundwater concentrations is no longer tenable. In other words, one can assume a construction worker is in contact with the highest concentrations in groundwater or have contact over the course of a year, but not both. Nonetheless, the assumption of maximum recent groundwater concentrations was made for simplicity. Even for chemicals detected frequently, the highest concentrations are one to two orders of magnitude higher than those found in any other wells. The only exception is 1,4-dioxane, and by itself it does not significantly contribute to site or construction worker risks. Thus, the use of the maximum detected concentration substantially overestimates site risks.

The highest concentration of a chemical detected during the 2021 Phase I SI was used in this risk assessment. Only when a chemical was detected by the 2019 ESI, but not in the 2021 Phase I SI, was the 2019 data utilized. There were chemicals which were detected at higher concentrations in the 2019 ESI. The lower concentrations in the 2021 Phase I SI could have resulted from degradation/dispersion over the years between the two investigations. However, it is also possible that the greater number of sampling rounds/locations encompassed by the 2019 ESI uncovered higher concentrations that are representative of current conditions.

The most significant discrepancy is for 1,1-biphenyl in three of the Phase I wells (NTL-GP65-67). In 2019 all three wells exceeded the PSL. In 2021 none of these wells exceeded the PSL. The results of the 2019 Risk Assessment did not result in a cancer risk greater than $1 \times 10^{-6}$ for 1,1-biphenyl.

Some of the chemicals detected in groundwater may not be solely related to the landfill operations. Some (and potentially all) of the metals detected will be naturally occurring. The maximum concentrations of 326 and 7 µg/l of these metals, respectively, are higher than the normal range that is present in Salt Lake Valley groundwater. It is unlikely that these levels are naturally occurring concentrations at this site. However, neither arsenic nor cadmium at these levels were associated with risks and/or above benchmarks for one or more receptors.
2.5.3 Summary and Conclusions

This section reviews the results of this risk assessment and draws conclusions that will be useful in determining what types of development are appropriate given the environmental conditions. The conclusions are based on the quantitative risk results, but also on qualitative information, including information in the Uncertainty Analysis.

Three receptors were evaluated in this risk assessment of groundwater at the NTL. These are a municipal user of tap water, an indoor site worker exposed via vapor intrusion, and a construction worker that comes in contact with groundwater during the course of site excavation. For the construction worker, potential exposure pathways are dermal contact with groundwater and incidental ingestion. The receptors were chosen based on potential commercial development of the property.

For a municipal user of tap water, groundwater concentrations were compared to MCLs and EPA residential RSLs, identified as PSLs. Several chemicals exceeded their PSLs by over two orders of magnitude at several locations within the Phase I groundwater and/or leachate. These included 1,1-DCA, 1,4-dioxane, methylene chloride, vinyl chloride, arsenic and cadmium. Using the groundwater as a source of tap water would be accompanied by significant risks.

However, the shallow groundwater is unlikely to be used for this purpose. The groundwater is classified as Class IV groundwater. The aquifer is tight, consisting of clay, silt, and fine sand, and would have a low yield. The nearest residence is over four miles distant, making even a private well an unlikely receptor. For an indoor site worker exposed to groundwater via vapor intrusion, the cancer risk was $5 \times 10^{-8}$ and the hazard index was 0.0001.

For a construction worker exposed to groundwater via dermal contact and incidental ingestion, the calculated cancer risk was $4 \times 10^{-8}$ and the hazard index was 0.0017.

In summary, calculated groundwater risks associated with the NTL for site and construction workers is less than the $1 \times 10^{-6}$ cancer risk benchmark.

While the groundwater inhalation pathway was evaluated for the site worker, the soil inhalation pathway was not evaluated since the remedy will include removal of soil and Municipal Solid Waste to an engineered Repository. However, to ensure protectiveness of the remedy, confirmation samples will also be collected and the results compared against current EPA Regional Screening Levels (for a commercial land use) or cleanup levels derived in a Risk Assessment. In addition, clean backfill will be placed across the site meeting commercial criteria and the phase I area will ultimately consist of hardscape and other cover features removing future risk via the soil pathway.

The Risk Assessment Report is attached in its entirety as Appendix B.
3.0 DESCRIPTION OF REMEDIAL ACTION PLAN

3.1 EVALUATION OF REMEDIAL ALTERNATIVES

Over the history of the landfill various cleanup alternatives have been considered. These remedial alternatives have included; (1) waste removal and disposal at an offsite landfill, (2) capping the landfill with the waste remaining in space and (3) adoption of a Brownfield approach where existing waste would be consolidated into a new on-site repository.

One of the more extensive remedial alternative evaluations was conducted by SLR, the previous property owner. SLR had envisioned a master-plan development that encompassed the landfill property in combination with surrounding land that was at that time under their ownership. This masterplan included a residential development component which necessitated the removal of the landfill waste off of the site to meet the appropriate risk management objectives. The costs associated with the waste excavation, loading and transport of the waste from the site and the associated disposal costs at an off-site landfill far exceeded the inherent value of the land and rendered the project uneconomical. The study also identified major safety environmental concerns with transporting the wet waste from the site and as well as the impacts on the local road system and the I-80 Interstate Highway.

Capping the landfill leaving the waste in place was also a remedial alternative considered. During the operation of the landfill when a particular waste cell was filled, the operator would cover the waste with native soil and move onto construct the next waste cell. There were no additional capping efforts prior to the landfill being closed, so over time, precipitation infiltrated into the landfill cells interacting with the waste and generating leachate. Applying a clay soil cap or application of a synthetic liner cap across the existing landfill would help minimize the infiltration of precipitation into the waste cells and the generation of leachate. However, just capping the landfill does not address the ongoing interaction of the existing leachate in the cell bottoms with the site’s groundwater or provide or provide a means to mitigate off-site migration. As such, capping the waste in place was considered to be only a partial fix and nonetheless very costly. Without the removal of the waste the value of the property and its functionality is greatly reduced and therefore does not provide a source of funds to help pay for the cost of applying a new cap which in turn has prevented this approach from being implemented.

The brownfield approach allows for waste from the old landfilling efforts to be excavated and consolidated in a new repository facilitating areas of the old landfill to be redeveloped. This removal and consolidation of waste approach was previously successfully implemented for waste from NTL East whereby historical portions of that landfill were preventing development with Salt Lake City’s International Commerce Center. Under an UDEQ approved plan waste from the NTL East was relocated and consolidated onto the NTL in what is now referred to as the Bonneville Pile. In a similar approach the waste within the Phase I waste cells would be excavated and transported for consolidation into the new repository. The new repository would include a modern engineered cap that would eliminate future infiltration into the repository waste cutting off the creation of additional leachate. The redevelopment of the areas of the landfill would unlock the inherent value of the land creating a source of funds that could assist in funding the landfill cleanup.
3.2 REMEDIAL ACTION OBJECTIVES

The remedial action objectives of this RAP are two-fold; (1) relocate the waste from the old landfill operation into a new properly engineered repository that incorporates modern environmental safeguards and (2) allow for areas of the old landfill to be brought back into productive use through the redevelopment of those areas. Excavating the waste from the existing cells and removing/processing the leachate will remove a source of contamination to the surrounding groundwater. Consolidating the excavated waste into a new repository with a proper cap will eliminate the future generation of leachate from that waste. Adopting a variety of environmental safeguards, discussed herein, during the waste repository construction will ensure that the process will be completed with minimal impacts on the surrounding area.

3.3 SUMMARY OF SELECTED REMEDIAL ACTIONS

Remedial actions that are incorporated into this RAP and discussed in more detail throughout this document include:

- Excavation of waste from existing waste cells
- Transportation of excavated waste to new repository
- Design and construction of new repository with proper engineering components
- Air monitoring and odor control at waste excavation locations, repository and Phase I perimeter
- Dewatering, leachate collection, evaporation, treatment and disposal
- Suspect/Special waste handling, testing and offsite disposal
- Stormwater Pollution Prevention
- Vector control
- Site security
- Wildlife security to ensure that site-indigenous animals (birds/mammals) are excluded from direct contact with waste or leachate
- Weekly meetings/reporting with UDEQ, Site Contractors and third-party observer

4.0 REMEDIAL ACTION PROGRAM

4.1 GOVERNING DOCUMENTS

The following is a list of governing documents intended to be developed and implemented in order to help shape the details concerning each segment of the remediation work effort. Sample copies of each of these documents can be found in Appendix C. As noted in our ongoing Stakeholder meetings, certain of these documents will require actual permits and/or approvals from other agencies prior to the initiation of site work. As such, these plans are presented here as a framework for additional review and comment prior to implementation.

- Site Specific Health & Safety Plan (HASP)
  - The planned Phase I remediation efforts will incorporate a Level D PPE based upon the results of the previous site characterization efforts. The HASP set forth in Appendix C-1 sets forth specific details to be followed on the Site inclusive of measure to be taken should special waste be identified during the excavation efforts.
• **Quality Assurance Project Plan (QAPP)**  
  o The QAPP set for in Appendix C-2 is consistent with the procedures that have been developed during the various site characterization investigations at the site and includes special provisions for the mass excavation, on-site transport and placement of the waste.

• **Soil/Waste Materials Management Plan (So MMP)**  
  o The SWMP identifies the movement and use of various material that will be incorporated into and made use of during the Phase I remediation efforts. Figure 14/Appendix A-14 presented later in the report illustrates the sources and disposition of soil, concrete aggregate, and waste movement on-site.

• **Storm-Water Pollution Prevention Plan (SWPPP)**  
  o The SWPPP identifies the existing site conditions and the means that will be implemented to minimize impacts to the surface water and drainage canals that are proximate to the Phase I area. The SWPPP plan when finalized will conform with the template from the Division of Water Quality and will be coordinated with Salt Lake City to ensure the UPDES permit requirements, if any, are met. The SWPP will be completed and approved prior to the start of construction.

• **Special Waste Handling and Off-Site Management**  
  o While the site characterization efforts have not uncovered any suspect/special waste, other than tires, that would require off-site disposal the RAP incorporates provisions and procedures that will be put in place prior to the initiation of waste excavation efforts to address such a contingency.

• **Community Air Monitoring Plan (CAMP)**  
  o Air monitoring will be an integral component of the site operations. As set forth in more detail in Appendix C-6, emissions monitoring and an active odor control system will be employed at the active waste excavation locations as well as at the repository. In addition, air and odor monitoring locations will be established at the perimeter of the site in proximity to sensitive receptors to monitor the ongoing work effort.

### 4.2 GENERAL REMEDIAL CONSTRUCTION SCHEDULE

The Phase I field operations are scheduled to occur over a twelve-month period starting with preconstruction activities and mobilization of support components. The waste excavation, hauling and placement efforts are anticipated to continue for a six-month period with ongoing Phase I site activities extending until the end of 2022. The schedule has been constructed to begin the waste excavation efforts in late spring/early summer in order to take advantage of the dry conditions typically experienced on the site during those months. Prior to onset of waste excavation activities, key support components will have been constructed (i.e., haul roads, leachate holding pond, leachate evaporator) to allow the waste excavation to proceed safely and efficiently. The following schedule (Figure 8/Appendix A-8) provides the framework for how these activities are anticipated to proceed.
4.3 SITE PREPARATION

4.3.1 Mobilization

4.3.1.1 Site Access Control

The Site will have three gated access points and one additional access point for the rail entrance to the property (Figure 9/Appendix A-9). The balance of potential vehicle entry points will be closed with temporary barriers. Appropriate signage will be posted at all entry points. Access to the working areas associated with the Phase I remediation will be limited to construction and field personnel that will be required to check in to the Operations Trailer prior to gaining access to the Site. The eastern property boundary is bordered by a rail spur that runs the distance of the Phase I area. The rail spur is secured by a four-foot wire fence limiting access to the rail from both sides of the spur. Should this fence need to be removed as part of the waste excavation efforts the area will be secured with a portable chain link fence.
4.3.1.2 Wildlife Access Control

A site perimeter cattle fence will be utilized to aid in minimizing local wildlife populations from accessing the Site. While the daily use of heavy equipment will likely discourage the wildlife population from frequenting the Phase I remediation area, additional safeguards have been incorporated into the design and operational plans. To reduce the potential exposure to waste, all excavated waste will be covered with tarps at the completion of each workday minimizing access to exposed waste. In addition, temporary construction fencing will be placed around any waste cell that has been excavated but not yet backfilled at the completion of the day (Figure 10/Appendix A-10).

To reduce the potential exposure to the leachate, bird wires have been incorporated into the design of the leachate collection pond (utilized to collect cell leachate prior to introduction to the evaporation system) (Figure 12/Appendix A-12). Other bird deterrents may be utilized based upon the infield experience once operations begin. The potential pathway to contaminated groundwater is remote. Other than contaminated groundwater that could be exposed during the excavation of the waste cells (and which will be treated and leachate and directed to the leachate collection and evaporation system), there is no pathway to groundwater as a result of the Phase I remediation efforts.
4.3.1.3 Site Office Compound

The Operations Trailer (Figure 11/Appendix A-11) will house supervisory personnel and will serve as check-in for any vendors, subcontractors, or visitors to the site. All visitors as well as site workers will be required to check in at the Operations Trailer. Visitors to the site will be required to attend a health and safety briefing and wear the appropriate safety gear commensurate with their activity on the site. There will be an equipment compound and lay down area located adjacent to the Operations Trailer that will be a secured fenced area. Certain deliveries of material or equipment will be directed to the Operations Trailer and compound to insure proper tracking and inventorying of materials and equipment.
4.3.2 Erosion and Sedimentation Controls

During the Phase I RAP, there will be no site wide elevation changes which will alter the existing surface water drainage patterns. There are three active water bodies on or adjacent to the site; Brighton Canal, Little Goggin Drain and North Point Drain. These areas will be protected with erosion control devices in cases where excavation operation approach 200 ft of the drains. These control devices may include silt fencing, hay bales or other appropriate control measures. A third-party stormwater engineer (i.e., Accena Group) will be retained to ensure proper Best Management Practices (BMP) and conduct periodic stormwater compliance inspections. The repository construction (where soil covers are installed), will be protected with hydroseeding soil slopes and other measures (refer to Section 5.2.7 and Figure 24/Appendix A-24 for repository cover design).

Stormwater sediment control will be provided primarily by the temporary and permanent stormwater detention features such as:

- Maintaining topographically higher ground where practical between the Frontage Drain and the disturbed areas in the southern portion of the project area to prevent direct stormwater and sediment discharge to the Frontage Drain, and to areas of the Brighton Canal that have not been decommissioned and filled.
- Where possible, retaining the existing vegetation barriers around peripheral areas of the site including along the frontage drain and southern portion of the property.
4.3.3 Stormwater Management
A Storm Water Pollution Prevention Plan (SWPPP) will be implemented for the Phase I remedial activities. This plan has been prepared in a draft format and attached in Appendix C-4. This plan will be revised, finalized and approved with Salt Lake City prior to the onset of the site remedial construction activities. This plan is not intended to address the Storm Water Pollution Prevention efforts for the subsequent development of this parcel as the development details are not known at this time. Those measures will be developed during the master planning of the development and in accordance with Salt Lake City’s regional stormwater masterplan. Instead, the stormwater management approaches set forth in this RAP are intended to identify the measures that will be implemented to ensure that the construction activities necessary to remediate the Phase I area do not negatively impact the existing stormwater infrastructure.

4.3.3.1 Existing Site Conditions
The site and surrounding areas are relatively level, with elevations typically ranging from approximately 4,224 to 4,234 feet msl. The slope across the site is generally flat and falls within the 0-7% range, which corresponds with a low erosion hazard. Surrounding areas to the east have already been permanently stabilized by new development, which incorporates City-approved stormwater detention systems. Local topographic lows occur along the frontage road canal to the south of the site. These features are protected from uncontrolled stormwater runoff and sedimentation by the existing vegetated buffer zones along the perimeter of the project area, and by the presence of topographically higher ground between the drainage canal and the southern portion of the project area. Because areas of the project site are not developed, stormwater accumulates in, and evaporates from, locations within the project area. Stormwater also accumulates in a series of sloughs throughout the site where most evaporates or infiltrates into the ground.

4.3.3.2 Management of Stormwater at Active Waste Excavations and Repository Fill Efforts
Any stormwater that collects within the active waste excavation areas, including stormwater that enters an open cell, will be collected and pumped to the leachate storage pond for introduction into the leachate treatment system.

Similarly, during the active repository fill efforts and prior to construction of the waste repository, a small stormwater containment berm (2 ft above existing elevations) will be constructed around the outside perimeter of the repository footprint. Any stormwater runoff collected prior to installation of the repository cap will be pumped to the leachate pond for evaporation and treatment.

4.3.4 Utility Marker and Easements Layout
Any active easements and utility locations will be located by survey when the site datum & benchmarks are established. An ALTA survey was performed for the North Temple Landfill site in 2018 by Dominion Engineering. Several utility, road and power easements are identified within the Phase I area of the landfill. The Utah Power & Light (UP&L) pole easement running south to north through this area will be vacated.

An underground utility locate request will be submitted through Blue Stakes of Utah to identify any potential underground utility conflicts within the work areas of Phase I. Since prior work efforts on the landfill have not identified any underground utilities, none are to be expected. However, if any conflicts
do arise, a concerted effort with each utility will be implemented to ensure the safety of the excavation crews and the underground utility itself.

4.3.5 Equipment and Material Staging
There will be an equipment compound and lay down area located adjacent to the Operations Trailer that will be a secured fenced area. Certain deliveries of material or equipment will be directed to the Operations Trailer and compound to insure proper tracking and inventoring of materials and equipment. Other materials and or equipment may be brought directly to the active working areas though one of the authorized access points. Equipment leaving the site will be inspected to ensure the equipment has been cleaned and free of potential contamination from its use on the site.

4.3.6 Decontamination Area
The site compound area will contain a decontamination pad for cleaning of equipment and vehicles prior to leaving site. The decontamination pad is shown on Figure 9/Appendix A-9.

4.3.7 Leachate Storage & Odor Control System
Prior to beginning waste excavation, the leachate storage pond will be excavated. The pond will have a capacity of 50,000 gallons and a depth of 4ft. The pond will be lined with a 20 mil PVC liner. Bird wires (for bird deterrence) will be mounted on poles around the pond (Figure 12/Appendix A-12). This pond will be situated to the west of the new repository (and not included in the Phase I legal description) but operate only through the Phase I RAP completion and thereafter will be decommissioned. Concurrently with leachate pond construction, we will mobilize an auger drill to place 12” diameter holes in the waste trenches in the area of the Bonneville Pile. The auger drill will advance to the estimated bottom of the trenches and upon withdrawal an 8” diameter slotted PVC pipe vise will be installed. Portable pumps will be used to extract the accessible leachate and discharge it to the leachate pond.

The leachate pond is intended to provide temporary storage for leachate which, when encountered during the waste cell excavations, will be pumped into the pond prior to being directed to the evaporation system. Upon completion of the Phase I activities the temporary pond will be decommissioned.

The pond is sized for 50,000 gallons of storage. The pond location is outside of the Phase I work area and will be constructed over MSW trenches. The construction will entail over-excavation of the pond footprint by three feet, removing existing cover and MSW. The three feet of over-excavation will be backfilled with compacted structural fill to the invert of the pond bottom. The excavated MSW will be placed in the repository. The pond liner, 20 mil PVC (or equivalent), will be placed and seams will be solvent welded. The perimeter liner will terminate into a perimeter anchor trench. Should leachate volume be greater than anticipated, or the treatment process (evaporation) prove slower than expected, a second pond (identical to initial pond) will be built. During operation, the pond liner and the liquid levels will be monitored and documented in the construction manager’s weekly report to make sure the liner integrity is maintained.

Given the temporary service life of the pond(s) and that they are built over area of future remediation, a double pond liner with a leak detection zone is not warranted. When the Phase I remediation is
completed, the leachate ponds and the evaporation pre-treatment system will be decommissioned. Thus, the pond location will not be included in the survey and legal description for the requested administrative letter for the Phase I remediation efforts.

At the conclusion of the Phase I activities the liquid fraction remaining in the pond will either be processed for off-site disposal, subject to meeting the pretreatment standard of the receiving Publicly Owned Treatment Works (POTW), or will be pumped back through the evaporator for further volume reduction. Any remaining precipitate solids or brines will be subject to analytical testing to meet the industrial pretreatment discharge requirements of the final disposal facility. A two-pass granulated activated carbon filtration system will treat the remaining liquid and will be handled by a Salt Lake County permitted waste hauler to the accepting POTW. Any solids (after testing/characterization) will be either placed in the repository, or if hazardous, be transported to an approved TSD facility. The liner material will be scavenged, cleaned, and disposed in an off-site MSW landfill.

![Figure 12 – Leachate Storage Detail (See Also Appendix A-12)](image)

The odor control system will be constructed prior to onset of excavation activities. The detailed description of the system is in Section 5.5.1.
4.4 REPORTING
4.4.1 Weekly Remediation Construction Meetings and Reports
Weekly on-site construction meetings will be held with representatives of UDEQ, SITLA, Salt Lake City, Salt Lake County Health Department (as appropriate) and selected remediation contractors and the third-party observer. Weekly progress reports will accompany the meetings identifying that week’s work progress, the following week’s work schedule, ongoing environmental management program and testing efforts, unexpected occurrences and identification of proposed modifications to the work effort.

4.4.2 Stakeholder Management Plan
SITLA will maintain communication of the cleanup process with stakeholders including Salt Lake City Public Works Department and Salt Lake County Health Department, and local community groups. These communications will occur regularly over the course of the projects twelve-month duration initially planned prior to the start of new field construction activity (i.e., mobilization of equipment, waste excavation).

4.4.3 Reported Deviations from the Remedial Action Work Plan
Given the nature of the field efforts and the scope of the project we would anticipate that certain modifications to the means and methods set forth in this RAP will need to be adjusted or modified. These adjustments will be discussed with UDEQ and documented in the weekly reports as well as the final remedial action report to be submitted to UDEQ at the conclusion of the Phase I field efforts.

5.0 REMEDIAL ACTION
5.1 REMEDIAL PERFORMANCE EVALUATION
5.1.1 Methodology, Reporting and QA/QC
The Phase I remediation efforts incorporate three distinct field operations; excavation of waste, construction of a new waste repository and the collection, evaporation, treatment and disposal of leachate which is discussed in detail within this section 5.0.

Prior to waste excavation, cover material will be removed from on top of the cells and segregated for subsequent use as cell backfill material or cover material in the repository. Waste material will be excavated from the trench (cell) along the cell wall and down to the underlying cell clay bottom. Photo documentation will be kept for each cell to confirm that the waste was removed before trench backfilling efforts with clean fill material begin.

Periodic inspections of the waste repository will be performed by UDEQ and Salt Lake County Health Department as waste is being placed and the repository features are being constructed. The final cap of the repository will be inspected by both UDEQ and Salt Lake County Health Department to ensure that the cap has been constructed in accordance with the design criteria set forth in this RAP.

Leachate extracted from the waste cells or collected as contact stormwater will be evaporated and treated as necessary per pretreatment standards at the local POTW prior to disposal. Utilization of activated carbon as a final treatment application (as established in the leachate pilot study) has been
demonstrated to be an effective approach to meet the industrial pretreatment standards. Specific volumes, timing and industrial pretreatment criteria will be discussed and negotiated with the individual POTW.

Weekly on-site construction meetings will be held with representatives of UDEQ, Project Sponsor, selected remediation contractors and the third-party observer. Weekly progress reports will accompany the meetings identifying that week’s work progress, the following week’s work schedule, critical action items, unexpected occurrences and identification of proposed modifications to the work effort.

A final report will be produced at the completion of the field activities documenting the work that has been performed and submitted in support of the request for the Administrative Letter for the Phase I remediation efforts to be issued by UDEQ.

The work will be completed in accordance with the governing documents set forth in Appendix C. The QA/QC for the project will be administered by the environmental professionals from Cardo Stantec, ET Environmental and Ninigret Construction all of which have had a 10 year plus history working on this landfill.

5.2 WASTE EXCAVATION

5.2.1 Repository Design and Operation

The fundamental concept in the Phase I waste excavation is to relocate the waste to an onsite repository instead of exporting the waste to offsite landfills. Plan view details of the repository are included in Figure 13/Appendix A-13. The operation of the repository will mimic that of all operating MSW landfills in as much as many of the operating and environmental controls will be very similar:

- Waste will be covered daily using alternate daily cover tarps.
- Soil cover will be used in intermediate lifts.
- Exposed soil cover will be protected from erosion with hydroseeding or other measures.
- Odor control devices will operate in the vicinity of the working areas.
- Air emission monitoring will take place during waste placement.
- The repository will be inside the compliance boundary of Phase I and within the proposed groundwater monitoring well network.
- A RCRA Subtitle-D compliant cap system will be completed when waste filling operations are complete (see Figure 24/Appendix A-24).
- The completed cap will be vegetated and maintained as greenspace.
Upon mobilization, the excavation operations will commence simultaneously in the Bonneville Pile area and the Northern section of Phase I. The Initial site operation will be to prepare the waste repository. This will consist of minor excavation and leveling of the footprint of the repository, and if needed, the placement of (previously) crushed concrete up to a depth of 12” to provide a stable foundation for waste placement. The clearing and grubbing materials will be stockpiled for future disposal and or composted. Any waste exhumed in the base preparation will be placed into the repository footprint (See Figure 14/Appendix A-14).
Once the MSW is removed and placed in the repository, the repository will be capped with an intermediate layer of soil (6” minimum). The intermediate soil layer may be hydrosedeed depending on climatic conditions, as we anticipated delaying final cap construction for 60 days following topping out to allow for settlement to occur.

When the final cap construction begins, the intermediate soil cover layers and any existing vegetation will be regraded to a minimum of 6” soil cover. The soil cover will comply with the specifications suggested in Appendix D. This layer will be subgrade for the placement of the geo-composite clay layer (GCL) (See product information in Appendix D) and it will be inspected for presence of any rocks or other sharp material prior to placement of the GCL. Only clean non-environmentally impacted material will be utilized in the soil layer supporting the final vegetative cover of the cap.

The final repository cover will have a geonet wet drainage layer which will terminate into a toe drain, consisting of a 4” PVC pipe. The pipe will be sloped for gravity drainage to HDPE manholes which will function as temporary storage. This liquid is percolate through the vegetative cap and should be stormwater. It will be tested and if clean, can be disposed in the future stormwater management system when the Phase I Development is complete. During the interim period of time, the HDPE manholes will be pumped when full and disposed off-site.
The repository also features perforated LFG collection piping to be installed in the highest portion of the repository crest (See Figure 15). These collector pipes will exit the final liner in vertical wellheads with sampling ports. LFG accumulation (if present) can be monitored and tested for methane and pressure periodically. If a significant amount of internal pressure builds up, then the well heads can be connected to a solar powered utility flare for combustion. Based on previous studies, very little LFG accumulation is expected.

5.2.2 Waste Excavation

Waste excavation efforts will begin with the removal of the soil cover material which will be placed and stockpiled adjacent to the trench to be utilized as backfill or cover material in the repository. Waste will then be removed from the cell exposing the side cell walls and the cell clay bottom.

The northern boundary of Phase I will be adjusted, if necessary, to allow for the complete excavation of the waste cells. The presence of MSW is suspected adjacent to the short line rail track along the eastern border but is not believed to exist under the rail. The excavation will progress to the east, approaching the rail and the determination will be made as to whether the rail bed is underlain with MSW or not. If waste is determined to exist under the rail spur, we will consult with the property owner (Patriot Rail) to determine the best course of action in consultation with UDEQ.
5.2.2.1 Dry Waste Operations

As the excavation of waste from the old landfill commences, the dry waste will be placed in off-road haul vehicles, covered and transported to the repository and placed. The dry waste will be compacted by a Caterpillar 836 LF compactor (or similar). Geosynthetic polyethylene tarps will be used to cover waste. The tarp covers will remain until a soil cover layer is placed. In this application, and in every other application of tarps used as daily cover, sandbags will be placed on the tarps at the end of the day to prevent dislocation by wind. This excavation operation will continue as described until the waste excavation encounters leachate (see below).

The second operation will be the excavation and relocation of the “Bonneville Pile”, waste which was previously relocated from the former NTL East Landfill and placed on the NTL site under a previously approved plan with UDEQ. The clean cover material will be removed from the Bonneville Pile and stockpiled and used in the backfilling operation of the waste cells as discussed in Section 5.2.8. Previous investigation of the material within the Bonneville Pile indicates the waste is both dry and mixed with approximately 50% soil fines. The intent will be to segregate the soil fraction and the waste fraction by processing the excavated material through a trommel screen. The soil fines will be stockpiled and either used as trench backfill or utilized within the repository construction as appropriate, with the waste being placed in the repository in a similar fashion as the waste being excavated from the cells. Soil recovered from the Bonneville Pile trommel process, Bonneville Pile cover material, and existing MSW trench cover material to be utilized as trench backfill will first be tested for RCRA 8 metals, VOCs, and SVOCs every 5,000 cubic yards following standard procedures to ensure the material is suitable for backfill. The stockpiled soil to be utilized as trench backfill will also be evaluated in accordance with Utah asbestos regulations.

5.2.2.2 Wet Waste Operations

As the excavation progresses to the north and west in Phase I, it is anticipated that leachate will be encountered in the excavation, thus a fraction of waste to be excavated will be wet. Wet waste removed from the trenches will be placed trench-side on geosynthetic tarps to drain free liquids back into the excavation. The trench side waste will be covered with tarps and left for 48-72 hours to drain before transportation to the repository.

The remnant leachate in the cell will be pumped to the leachate storage pond prior to being directed to the leachate evaporation system. The leachate pond is sized for 50,000 gallons of storage based on the estimation of leachate to be generated in Phase I.

The leachate, if any, contained within the waste cells beneath the repository will be dewatered using displacement pumps. Approximate locations of these displacement pumps are included in Figure 16/Appendix A-16. 12” diameter sumps will be drilled into each trench and insert slotted 8” diameter PVC casings. Pump intakes will be situated at the bottom of the casing and the pumpage will be collected in the leachate pond which will supply the evaporator. These details are included in Figure 17/Appendix A-17 below. This process will begin before the repository footprint is developed to ensure sump/trench access is maintained. The waste trenches will be dewatered along with the immediate area surrounding perimeter of the Bonneville Pile. Multiple pumping attempts will be made until a
measurable quantity of leachate can no longer be extracted. The well points will be decommissioned as the site excavation process proceeds.

Figure 16 – Leachate Dewatering Plan (See Also Appendix A-16)

Figure 17 – Leachate Dewatering Detail (See Also Appendix A-17)
Prior test pit excavation demonstrated that what we have referred to as “dry waste” (waste that was above the level of leachate saturation) is typically damp and does not generate dust upon the excavation from the waste cells. As such, we do not anticipate having to precondition the MSW with moisture for grading/hauling/depositing the repository.

The haul roads in Phase I will be decommissioned after end of the remediation process. Prior to the aggregate being removed and stockpiled, the X-Ray Fluorescent Scanner (XRF) utilizing EPA Method 6200 will used to scan the haul road surface for potential contamination. If clean, the aggregate will be removed and stockpiled. Where we find exceedances, the materials will be isolated and placed in the repository. Given that no waste will be hauled west of Phase I, the haul roads will not be scraped for lead removal.

5.2.3 Lead Shot Removal and Repository Placement

After the commencement of the waste excavation, the portion of the site south of the Brighton Canal (the site of a Sporting Clays Range) will be addressed. The remedy will be removal of the upper 6” of soil and vegetation for those areas identified as containing the lead shot. This material will be placed in the repository. Figure 18, which is a zoomed in version of Figure 11/Appendix A-11, illustrates the areas in green that have lead shot contamination that will require removal. Prior to this effort, representatives from the owner and UDEQ will conduct a visual reconnaissance of these areas, including the cover of the Bonneville Pile, and determine the estimated boundaries of scraping as needed.
5.2.4 Brighton Canal Decommissioning

SITLA, in cooperation with the Brighton Canal Company and Property Reserve, Inc. (PRI), will divert the transport of irrigation water across the NTL site prior to the onset of remediation activities. As such, the Brighton Canal will be decommissioned in its reach within the Phase I area (Figure 19/Appendix A-19). The canal will be dewatered, de-mucked, and backfilled to grade with on-site clean fill material. The goal is to remove sediment down to native soils which we anticipate being at depths between 6 and 12 inches. The de-mucked material will be stored in a stockpile and will subsequently be tested with an XRF utilizing EPA Method 6200. Any impacted soils will be placed in the repository.

Figure 19 – Brighton Canal Decommissioning (See Also Appendix A-19)

5.2.5 Leachate Management, Treatment and Disposal

The management leachate program for the Phase I remedial efforts has been designed to facilitate a substantial volume reduction in the leachate collected through enhanced evaporation which is to be followed by on-site treatment of the remaining leachate, as necessary, to meet the established industrial pretreatment standards of one or more local POTW’s. As part of the previous site characterization efforts, a leachate treatment pilot study was conducted where leachate from various locations (and disposal periods) was collected in a series of Baker tanks and subjected to a series of alternative treatment methods (see Supplemental Site Characterization Study August 2018). While a variety of methods were successful in treating the leachate to meet local POTW pretreatment standards, the use of carbon treatment after evaporation was selected as the preferred method for Phase I.
The leachate will be reduced in volume using a WAIV® Evaporator System (WAIV-Wind-Aided Intensified Evaporation). This system employs a series of draped fabric sails that are continuously saturated with leachate. This system is capable of evaporating 2000-5000 gallons/day depending on climatic conditions. This system will operate during the primary work shift during daylight hours (Figure 20/Appendix A-20).

Any leachate not evaporated by the WAIV system or collected in the containment berm (that will be installed around the WAIV system) will be pumped back to the leachate storage pond. The remaining fraction of the leachate that cannot be furthered by the WAIV system will be passed through a two-pass carbon filtration system (similar to that employed in the leachate pilot treatment system C.2019), and either passed back through the WAIV system for further evaporation (volume reduction) or after meeting the applicable pretreatment standards transported off-site by a Salt Lake County permitted waste hauler to a local POTW. Leachate that has passed through the WAIV system, and if necessary, the carbon filtration system, will be analyzed for compliance with the local POTW pretreatment standards and permit requirements and presented to that POTW for confirmation of acceptance. Once accepted, documentation will be presented to DERR. A diagram of the entire leachate management process can be seen in Figure 21/Appendix A-21.
5.2.6 On-Site Waste Transport

A series of haul roads will be constructed on-site to allow for the transport of waste and materials. The haul roads within the Phase I area will have their subgrade soils scraped and that material stockpiled for future disposal in the repository. The haul road surfaces will be crushed recycled aggregate from the western stockpiles, placed and compacted, to support the hauling efforts. Waste will be excavated from the existing trenches by large hydraulic excavators and placed in articulating, off-road dump trucks, where possible, given saturation conditions. If saturated, the waste will be windrowed adjacent to the trench to dry for 24-48 hours and covered with tarps. Because the free liquids will be drained back into
the trench and because of the solid body nature of the articulated trucks, the truck beds will not be lined.

Waste transported within off-road vehicles will traverse the site to the location of the new waste repository and be placed. Compaction will occur as landfill-style compactors (ex. Caterpillar 836) make multiple passes over the waste.

Concurrently, off-road dump trucks will transport processed concrete aggregate and structural fill materials from the existing stockpiles on the western edge of the site, to be placed as stabilization stone for soft subgrades, or trench backfill, respectively. A material hauling plan including haul routes is provided below as Figure 22/Appendix A-22.

Figure 22 – Material Hauling Plan (See Also Appendix A-22)

5.2.7 Waste Placement in Repository
The waste will be placed in the repository as the excavation proceeds. Concurrently, excavation and screening will begin in the Bonneville pile, located in the southern portion of repository footprint. The dry waste (as confirmed by previous exploration) will be hauled northward to be co-placed with freshly excavated waste, and the soil fraction will be temporarily stockpiled west of the repository and used as intermediate soil cover.
Figure 23/Appendix A-23 depicts the gradual cell/layer style of construction, sequentially raising the repository elevation as excavation proceeds. Temporary alternate daily cover tarps will be periodically replaced with soil covers and the entire repository will have a soil cover layer prior to final cap construction. The final cap structure will be constructed on the final repository fill excavations. The cap will consist of select granular fill overlain by a geo-composite clay layer (GCL) and a 40-mil low linear density polyethylene (LLDPE) membrane. The cover over the liner will consist of a drainage layer and three feet (3') of vegetative cover. No soil mined from the Bonneville Pile will be used in the vegetative cover layer.

The vegetative cover will be compiled of drought-tolerance grasses. Salt Lake County guidance on native plant cover suggests a mixture of India Rice grass, Mutton Grass, and Blue Bunch wheatgrass will succeed in this drought-prone environment. Permanent cover will be maintained as part of the O&M efforts maintaining at least an 80% coverage across the vegetative cap. Any deep-rooted vegetation that could occur in the future will be eradicated.

Figure 23 – Repository Fill Sequence (See Also Appendix A-23)

5.2.8 Cell Backfill from On-Site Sources
There is a large quantity of crushed concrete and granular borrow stockpiled on the western edge of the site which can be utilized as necessary as structural backfill in the trenches following waste removal when necessary. The granular borrow material is clean native material that was imported from the excavations associated with the construction of the parking structure for City Creek. The concrete was
generated by the demolition of those buildings to allow for the same development. The concrete was segregated at the site, environmental tested on-site to be clean and manifested for delivery to be stockpiled and later processed. The material was again checked at the point of entry confirming the delivery with the materials manifest. This material will again be tested using an XRF (EPA Method 6200) every 5,000 cubic yards prior to use as trench backfill or cover for the repository.

It is not anticipated that any off-site borrow material will be needed for these Phase I efforts. However, should additional fill be needed for future phases from off-site sources that material will be appropriately tested to ensure the material is acceptable for future commercial/industrial land use.

Removal of waste materials will include 6” of cut of the trench bottom/waste interface. In those instances where the exposed trench bottom requires additional stabilization prior to backfilling of the trench, the stockpiled material will be utilized to provide a sufficient material bridge to allow the trench filling operations to begin. Structural fill soil will then be placed up to the existing grade.

As discussed in Section 5.2.2.1 previously, soil recovered from the Bonneville Pile trommel process, Bonneville Pile cover material, and existing MSW trench cover material to be utilized as trench backfill will first be tested for RCRA 8 metals, VOCs, and SVOCs every 5,000 cubic yards following standard procedures to ensure the material is suitable for backfill. The stockpiled soil to be utilized as trench backfill will also be evaluated in accordance with Utah asbestos regulations.

5.3 WASTE EXCAVATION CONTROLS AND SUPPORT

5.3.1 Vapor/Air Monitoring

As referenced in several sections of the plan, various types of air and vapor monitoring will be used in the active remediation phase.

- The multi-gas meter will be deployed during all excavation operations. The device(s) will monitor the air emissions at the excavation trench side, the temporary stockpiles of the waste trench side, and in the repository at point of MSW deposition. These emission readings will be utilized to identify the appropriate level of PPE for potential exposure associated with the particular work zone in accordance with the Health and Safety Plan (HASP) found in Appendix C.
- Emission monitoring at point of excavation. Using a hand-held Photoionization Detector (PID) monitor, site personnel will be at trench-side monitoring for off gassing of vapor/LFG emissions.
- Concurrent air emission monitoring for fugitive ACM dust/fiber will be ongoing at point of excavation and processing (see Section 5.4.2).
- Emission monitoring at repository. The same procedure as above will take place at the point of waste placement.
- Leachate pond/evaporation. Periodically, emissions will be monitored at the pond and evaporator.
- Odor/emission monitoring at sensitive perimeter receptors. The PID and the field olfactometer will be used together (to objectively characterize odor reading with PID readings) at both trench excavation and along the sensitive receptors at the north, east, and south property boundaries.
- Aerial drone scans to measure LFG emissions will be performed at the onset of trench excavation, the mid-point of remediation, and at the end when the landfill cap is complete.
5.3.2 Confirmation Sampling

As discussed above, the waste excavation will extend to the side berms removing the layer of waste/soil interface. At the bottom of the trench cell, an additional six inches of the bottom waste/clay interface will be removed ensuring that all the waste is removed from the cell. Photographic logs will be included in the daily field reports, documenting the removal of the waste within each trench.

Analytical sampling of the soil beneath the waste in the previous site characterization studies has documented that the soil beneath the waste cells have experienced minimal impact. The soil tests within Test Pit soil samples within the Phase I area exceeded the PSL for arsenic in soil. No other analytes exceeded their PSL in soils. The PSL for arsenic in soil used was the EPA RSL (3.0 mg/kg) for an industrial land use soil with no engineering or institutional controls. The proposed Remedial Action Level (RAL) for arsenic in soil is 300 mg/kg for the industrial land use with engineering controls identified in the SMP.

To ensure the complete removal of waste and potentially impacted soil beneath the waste, confirmation sampling will be collected to demonstrate the remaining soil is below the established RALs. RALs have been proposed for the analyte groups for VOCs, SVOCs, PFAS and RCRA metals (See Table 2/Appendix A-29). Certain compounds within these analyte groups, while not identified in the soil, were identified in the groundwater samples within the characterization studies for the Phase I area (see 2021 Phase I SI). Including these groups, which were detected in the groundwater, as part of the soil confirmation sampling list will minimize the risk of leaving potential ongoing impacts to the groundwater. Including these analytes as part of the soil confirmation sampling will ensure that potentially hazardous concentrations, if any, not previously identified in the soil have been tested for.

In general, the RALs are based on the EPA RSL calculated values using the lifetime carcinogenic risk of $1 \times 10^{-4}$ and an HQ of 1.0. Testing for PAHs will be included in the SVOC method list. During the initial excavation process north and northwest of the proposed new repository (located in the northwest area of Phase I), confirmation soil samples will also include PFAS compounds. Approximate sample locations are shown on Figure 28/Appendix A-28. This area of the Phase I area has been identified as having the higher concentrations of the detected PFAS compounds in the groundwater. If the sample results are below the RALs, the PFAS testing will be suspended and considered not necessary for the remainder of the Phase I area. The PFAS RALs will also be based on the EPA RSL calculated values using the lifetime carcinogenic risk of $1 \times 10^{-4}$ and an HQ of 1.0.

The confirmation soil samples will be collected at a frequency of one sample per every 300 linear feet of trench. The samples will be discrete samples and will be collected by the bucket of the track excavator. The sample will be collected by removing two 4-ounce portions from the larger bulk sample in the bucket. Each of the 4-ounce samples will be placed in new clean glass sample jars identified by a unique sample ID. The ID will include the sequential sample number of the trench, the unique trench ID number and be identified as a soil confirmation sample. Care will be taken to not collect any portion of the bulk sample which may have been in contact with the bucket.
Soil gas sampling will be conducted to determine the potential for indoor air concentrations resulting from the post waste removal areas. The areas where MSW was removed and backfilled will be monitored for the TO-15 volatile compounds and compared to the EPA VISL target sub-slab and exterior soil gas concentrations. These levels will be based on their HQ of 1 and a carcinogenic risk at 1 in 10^-4. Soil confirmation sampling data will be used to identify areas of elevated potential for soil gas vapor intrusion for indoor air.

5.3.3 Stormwater Management at the Repository

Prior to construction of the waste repository, a small stormwater containment berm (2 ft above existing elevations) will be constructed around the outside perimeter of the repository footprint. Where stormwater impacts waste, any stormwater runoff collected prior to installation of the repository cap will be pumped to the leachate pond for evaporation and treatment.

The repository (when final elevations are achieved) will be capped with a multi-layer impervious cap structure to prevent infiltration. The repository will be shaped to drain water from the crown to a perimeter, side slope terrace which will shed rainfall and snow melt off the repository slope onto concrete revetment mattresses draining to original grades (Figure 24/Appendix A-24). Stormwater management on the completed repository will consist of side slope terrace berms around the perimeter to intercept and channel sheet flow drainage to specific let down structures. The floor of the drainage terraces will be sloped to drain the letdown structure. These structures will feature segmented concrete revetment blankets lining a down drain. Details of the repository revetment can be seen in Figure 25/Appendix A-25. The revetments will also be used in the terrace within 100 feet of the letdown structures. Since the infrastructure in Phase I will not yet be completed, the letdown structures will outfall to rip-rap lined energy dissipation basins. Details of these energy dissipation basins can be seen in Figure 26/Appendix-26.
Where precipitation events occur outside the repository boundary, detention of excess stormwater will temporarily be provided through a series of existing sloughs in the southern portion of the site. These sloughs function as temporary detention basins to catch excess stormwater runoff and allow infiltration, while preventing sediment-laden stormwater from leaving the site. Upon completion of the repository and the future development of Phase I, the storm drain system installed on the repository will be integrated into the development's stormwater system in coordination with Salt Lakes City's Department of Public Works.
Figure 25 – Repository Revetment (See Also Appendix A-25)
5.4 SPECIAL/SUSPECT WASTE

5.4.1 Contingency Plan

The numerous test pit explorations conducted on the site has confirmed that the majority of the waste deposited is MSW. A substantial fraction of the waste mass are scrap tires that will need to be separated from waste being relocated into the repository. We may encounter other less numerous non-MSW materials as the excavated proceeds.

The strategy for dealing with non-MSW materials will be to pre-position small lined, roll off containers at or near the area of waste excavation operation and to segregate those wastes in the following manner:

- Tires – for transport to Liberty Tire Recyclers
- White goods (or other large metallic items) for local scrap metal processor
- Unidentifiable or suspect materials for testing and evaluation
- Used drums and/or significant, non-leachate fluids (no free liquids will be deposited in the repository)
The Excavation will be overseen by Ninigret/ET/CARDNO professionals and a third-party observer. The third-party observer will be selected from local engineering firms with experience in solid waste and/or remediation projects. That person will be on-site during all excavation operations.

The observer’s duties will be to identify items which are not characteristic to MSW and to see that those items are segregated from the waste stream destined for redeposition. The proposed segregation system will be to separate tires, white goods, and any very large mass items (i.e., sofa, engine block, etc.) into roll-off containers for alternate disposal or recycling. The observer would also oversee environmentally suspect materials (also to be segregated and tested) that could be encountered in the excavation.

The field chain of command would have the observer reporting to the field engineer and/or field superintendent regarding any concerning observations. The observer will be given the authority to intercede with the site contractor and stop work if the field management team are not present.

In any case of suspect material (i.e., a 55-gallon drum), the item will be segregated into a roll-off container and covered. The work area will be flagged, and the excavation sequence will advance forward 100 feet and resume. Areas in the trench will be examined and samples taken of suspect soil or perched groundwater for laboratory analysis. Determination of outcomes will depend on test results this area will remain “as-is” until testing data is made available. However, any free liquid associated with the discovery of suspect materials (not typical leachate) encountered would not be placed in the repository but instead would be transported off-site to the appropriate licensed disposal facility. The analytical results will be shared with DERR and a determination of risk will be made. If the material proves hazardous, provisions will be made to send the material to a RCRA TSD facility. If non-hazardous, the material will be placed in the repository.

5.4.2 Asbestos Containing Material Removal and Relocation
The waste in the existing cells is believed to have been placed in the landfill between 1958 and 1978. It is possible that asbestos containing materials (ACM) were disposed of at this facility during that time. The types of ACM that could have been disposed of during the timeframe would generally be expected to be associated with demolition and construction debris such as pipe insulation, floor tiles, roofing shingles and other related construction materials. Prior to the initiation of the waste excavation efforts, a specific asbestos design document will be developed which will address federal, state and local asbestos rules and regulations. This design document will be developed by a state certified asbestos project designer, and subsequently approved by the UDEQ’s Division of Air Quality, establishing the means and methodologies that will be utilized to minimize potential impacts from the interaction with asbestos containing material should such material be identified during the remediation efforts.
5.5 MONITORING PLANS

5.5.1 Odor, Dust and Vector Control Plan

5.5.1.1 Odor Control Plan

The Intent of the Odor Control Plan is to control and counteract noxious odors from waste exhumation. We will employ a “Defense-in-depth” approach, using odor control components at sensitive property lines and at points of waste exposure. The methodology will be to provide perimeter control and point of excavation control.

The term “defense-in-depth” refers to a multi-layered strategy for combating odors from MSW exposure. We intend to abate odors in these ways:

1. Use odor surfactant (as needed) in the excavation and repository. This will be distributed by man-portable sprayers.
2. Area wide turbine sprayers will distribute odor masking agents at strategic locations near repository and excavation areas.
3. A perimeter odor control misting system, consisting of pole mounted misters distributing odor masking chemicals.

The field personnel will be equipped with handheld anemometers to gauge wind speed and direction so that the turbine sprayers can be properly positioned. If sustained wind speeds exceed 30 mph, work will be temporarily halted.

5.5.1.2 Perimeter Control

During the Phase I efforts, perimeter 10-foot-high misting nozzles will be utilized at appropriately spaced at locations that have been identified as possible sensitive site perimeters (Figure 27/Appendix A-27). There will be a stationary pumping system with flexible supply hoses which will distribute odor control surfactant during hours of operation to those areas requiring odor control.

5.5.1.3 Point of Excavation

Mobile fogging-style pump & fan combinations will be utilized at or near active excavations. The turbine fans atomize the odor control chemicals and will be directed accordingly with excavation areas and wind direction.

5.5.1.4 Wet Waste Staging

The wet waste will be excavated from the northern part of Phase I and windrowed to dry at the edge of the trench. The wet waste will be covered with tarps for 24-48 hours and then transported to the repository for reposition.

A topical odor suppressant will be applied on exposed waste after excavation (at trench site) and reapply at the point of deposition. The proposed system can be diesel or electric powered depending on mobility needs. The odor control agents will be specially formulated for MSW characteristics by Benzaco Scientific, an experienced odor control firm serving the solid waste industry. The system (perimeter and mobile) will be operated concurrently with all active excavation operations. A conceptual diagram of Odor Control locations is shown in Figure 27/Appendix A-27.
5.5.1.5 Dust Control Plan

The project will entail significant hauling of soil/aggregate and waste materials over unpaved haul routes across the site. The excavation contractor will employ water trucks to wet down haul roads to suppress dust. The proposed haul routes are depicted in the previous Figure 22/Appendix A-22. The raw water source will be non-decommissioned portion of the Brighton Canal (if available), or a culinary water line tap at the 7200 West property entrance.

The collective experience with North Temple Landfill test pit explorations suggests that there is very little risk of fugitive dust emissions from the removal of buried waste. The principal concern for dust emission is the extensive haul-road traffic between excavation sites, repository, and soil stockpile areas. Haul roads will be patrolled with a water truck (water source available on-site) continuously to keep roadway surfaces damp. As noted in the odor control section, if sustained winds exceed 30 mph, work will be temporarily halted. The goal is zero visible dust in contaminated areas.

5.5.1.6 Vector Control Plan

All exposed waste surfaces whether in the trench, stockpiled trench site or deposited in the repository will be covered with geosynthetic tarps to protect against vectors such as birds and scavenging animals.
5.5.2 Community Air Monitoring Plan

Despite the considerable degradation of the old MSW in the landfill, excavation of waste and extraction of leachate create opportunities for fugitive emissions, as compared to the current covered composition on-site.

As background, the site owner has performed a site emission scan using remote sensing technology where small, but detectable methane emissions were identified in certain locations of the landfill. The range of CH4 detected was 20 ppm to 80 ppm. The total site area where emissions were detected comprised 0.17% of the total site area, and 0.06% of the site area emitted over 60 ppm. As a point of reference, The New Source Performance Standards (NSPS) threshold for methane emissions is 500 ppm. Although the methane emissions identified in the Phase I area (in the above-mentioned site scan) were minimal, an additional aerial drone scan will be undertaken during waste removal operations as well as after the excavated trenches are backfilled.

5.5.3 Air/Odor/Emission Monitoring

As referenced in several sections of the plan, various types of air and vapor monitoring will be used in the active remediation phase.

- Emission monitoring at point of excavation. Using hand-held PID monitoring, site personnel will be at trench-side monitoring for off gassing of vapor/LFG emissions.
- Emission monitoring at repository. The same procedure as above will take place at the point of waste placement.
- Leachate pond/evaporation. Periodically, emissions will be monitored at the pond and evaporator.
- Odor/emission monitoring at sensitive perimeter receptors. The PID and the field olfactometer will be used together (to objectively characterize odor reading with PID readings) at both trench excavation and along the sensitive receptors at the north, east, and south property boundaries.
- Aerial drone scans to measure LFG emissions will be performed at the mid-point of the remediation and at the end when the landfill cap is complete.

The readings will be documented in the daily/weekly reports. The excavator operator and attending personnel will have PPE available if the PID readings support additional protective action.

During the site characterization phase, an aerial drone with remote sensing technology for methane detection was used to establish pre-RAP background emission data. The results were included in the 2021 Phase I SI and only one area in the SW corner of the site (beyond Phase I) has noticeable emission (80ppm). We intend to rescan the site during the excavation phase, and we will adjust the flight schedule to correspond to the excavation operation in the North part of Phase I and the reclamation of the Bonneville pile, which should approximately be at the 60-day milestone following contractor mobilization. The drone will also re-scan after the excavation efforts have been completed and the waste has been relocated in the repository.
The emission data collected in the Phase I RAP (PID, aerial drone, field olfactometry) will be analyzed to provide future vapor intrusion risk indication for the future phases of remediation. The vapor intrusion barriers would consist of gravel zones for vapor collection, overlain by HDPE membranes beneath foundation and floor slabs with active vapor collection, piping and filtration.

6.0 ENGINEERING CONTROLS

The remedial objectives are twofold. The first objective will be to remove the source material (MSW) from the poorly covered waste cells which trap infiltration in the waste as leachate and reconsolidate the excavated waste into a new onsite engineered waste repository. The reconsolidated waste will be placed above the underlying groundwater and will be covered with a low permeable cover system (cap) to restrict infiltration. The cover will include a gas collection layer to control potential air emissions. Details of a typical landfill gas collection wellhead and one that will be implemented in the proposed repository can be seen in the previous Figure 15/Appendix A-15. The second objective will be to eliminate the potential for vapor emissions entering future buildings through the potential for concentrations within the groundwater or underlying soil. This potential will be addressed by both the lowering of volatile concentration within the site groundwater through the removal of the source material and incorporating engineered barriers and collection system beneath the buildings where appropriate. These objectives will be demonstrated by the collection of groundwater monitoring data down gradient from the areas where waste is removed and from the downgradient areas of the new waste repository cell. The collection of confirmation samples from the soil remaining beneath the excavated waste cells will be collected and compared to the potential for ongoing air emissions to indoor air.

Sampling procedures for this RAP will follow prior project field work procedures and will be outlined in individual sampling and analysis plans (SAPs) with accompanying standard operating procedures (SOPs) to be submitted and reviewed prior to commencement of any field work.

6.1 GROUNDWATER SITEWIDE MONITORING SYSTEM

Monitoring of the groundwater will continue with the sampling of existing wells located in the Phase I area and new wells installed to assess the up and down gradient groundwater quality in relation to the new repository cell. A total of 13 groundwater monitoring wells are proposed for the Phase I area groundwater monitoring program at the Airport West VCP Site. Ongoing monitoring of the entire former NTL Site and impacted downgradient area will continue and be identified in a separate workplan to address the remedial designs for future remedial efforts on the site. Six of the wells are at existing locations within the Phase I area. An additional seven wells are to be located proximate to the repository. The wells are described as follows and are indicated on Figure 28/Appendix A-28.
### Table 1: Water Monitoring Locations

<table>
<thead>
<tr>
<th>AREA</th>
<th>LOCATION</th>
<th>NUMBERS</th>
<th>NEW/EXISTING</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I</td>
<td>Downgradient</td>
<td>2</td>
<td>2 existing</td>
<td>Along the north boundary of the Phase I area</td>
</tr>
<tr>
<td>Phase I Repository</td>
<td>Upgradient</td>
<td>4</td>
<td>3 new, 1 existing</td>
<td>Along the eastern boundary of the new repository</td>
</tr>
<tr>
<td>Phase I Repository</td>
<td>Downgradient</td>
<td>4</td>
<td>4 new</td>
<td>Along the NW and western boundary of the new Repository</td>
</tr>
<tr>
<td>Upgradient Site Wells – South</td>
<td>Upgradient</td>
<td>3</td>
<td>3 existing</td>
<td>Along the southern boundary</td>
</tr>
</tbody>
</table>

**Figure 28 – Groundwater Monitoring Program Location Map – Proposed (See Also Appendix A-28)**

**6.1.1 Monitoring Schedule**

The well network is proposed to be sampled on a 6-month schedule during the spring and fall during the Phase I Remedial Action (RA) efforts. Following the completion of the Phase I RA, a Site Management Plan (SMP) will be adopted for the Phase I area which will identify and include a program for future groundwater monitoring during the post closure period.
6.1.2 Analyte Testing

The parameters list for each well will include similar test method analyses for both upgradient and downgradient wells for the proposed Phase I area wells. The objectives of the Phase I groundwater monitoring are to establish a baseline concentration prior to the remedial actions to be undertaken in the Phase I area, characterize the concentrations following the waste removal from the existing waste cells, and characterize the concentrations up and downgradient of the new waste repository. Following the completion of the Phase I RA, groundwater monitoring concentrations will be evaluated for preparation of the post closure monitoring to be implemented during SMP activities.

The analytes will include the list of RCRA metals, VOCs, SVOCs, PAHs, TPHs and PFAS compounds as identified in Table 3/Appendix A-30, titled Groundwater Monitoring Screening Levels. The groundwater monitoring concentrations identified will be compared to the Table 3 Screening Levels (SL). The table 3 groundwater SLs are based on the most protective when comparing the risk associated with both the carcinogenic “composite” SL (dermal, inhalation and ingestion) and the non-carcinogenic “composite” SL (dermal, inhalation and ingestion) for an adult resident exposure. These levels will be based on their HQ of 1 and a carcinogenic risk at 1 in 10^-4. No screening levels will be less than the MCL. For groundwater concentrations exceeding the Table 3 screening levels, further assessments will be conducted to determine which pathway(s) are contributing to the elevated risk level. For each pathway and receptor identified, appropriate mitigation will be identified in the Site Management Plan. For the volatile compounds associated with the risk to indoor air intrusion, a groundwater concentration will be established based on the VISL model for a site worker. These levels will be based on their HQ of 1 and a carcinogenic risk at 1 in 10^-4.

The Groundwater Monitoring Action Levels are presented in Table 3/Appendix A-30, titled Groundwater Monitoring Screening Levels, which includes the list of analytes and their respective levels for concentrations to “demonstrate the remedial action objectives are being met”.

6.2 SOIL GAS SAMPLING

During the remedial actions involving the excavation of waste, the immediate areas of excavation and waste handling will be monitored for volatile concentrations emitting from the waste. These compounds and the monitoring procedures are included in the HASP. The concentration will be compared to identify the appropriate PPE and to compare to the established risk levels identified in the risk assessment for the construction worker.

Soil gas sampling will be conducted to determine the potential for indoor air concentrations resulting from the post waste removal areas. Per an approved SMP, areas where MSW was removed and backfilled, areas adjacent to the repository, and areas where special waste may have been encountered during the waste removal efforts will be monitored for the TO-15 volatile compounds, along with methane gas, and compared to the EPA VISL target sub-slab and exterior soil gas concentrations. These levels will be based on their HQ of 1 and a carcinogenic risk at 1 in 10^-4.

As the waste excavation and backfill efforts proceed across the Phase I Area, soil gas testing will be undertaken in those areas that have been completed to identify the potential for soil gas impacts on future planned building development. If testing results identify exceedances, mitigation procedures will
be identified and coordinated with DERR and incorporated into an SMP for that area, or alternatively, a separate sampling strategy will be implemented to allow building construction to proceed prior to site closure.

7.0 INSTITUTIONAL CONTROLS

7.1 ENVIRONMENTAL COVENANTS, EASEMENTS OR DEED RESTRICTIONS
Certain environmental easements and deed restrictions will be formulated at the conclusion of remediation efforts. Environmental easements may include provision to access monitoring wells and other site environmental improvements. Deed restrictions such as prohibitions on residential development and the use of site groundwater are expected.

7.2 SITE MANAGEMENT PLAN
A site management plan will be developed upon conclusion of remedial field efforts. The plan will include a description of the required controls to be implemented on the site, the intended role of each implemented control and a description of procedures to be followed for implementation of the controls (i.e., a site groundwater monitoring plan). The plan will also set forth procedures to minimize potential exposure to any remaining contamination during maintenance or redevelopment work and the reporting requirements for these controls. At the conclusion of all remedial efforts associated with Phase I, a final survey will be completed identifying the boundaries of Phase I and the final location of the completed repository.

8.0 FINAL ENGINEERING REPORT
A final engineering report will be produced at the conclusion of remediation field efforts reviewing the work that has been completed and any modification or deviations from the procedures set forth in the RAP.

8.1 CERTIFICATIONS
Upon the successful completion of the Phase I remediation efforts and the submittal and acceptance of the Final Engineering Report, Site Management Plan and Environmental Covenant, the project sponsor will request the issuance of an administrative letter from UDEQ.