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Washington State Department of Transportation
Local Programs
South Central Region
Attn: Randy Giles
2809 Rudkin Rd
Union Gap, WA 98903

April 18, 2022

Hazardous Materials Memorandum

East-West Corridor Project
Yakima, WA

Dear Randy Giles,

This memo has been prepared to provide the locations of potential hazardous material (hazmat) sites in the vicinity of the East-West Corridor Project and analyze the potential risk for such materials to cause contamination or be encountered during the construction of this project. This report includes a recent search of the Washington State Department of Ecology's (WSDOE) facility/site database and the results of previous hazmat studies for sites within the project vicinity that could potentially impact the proposed project.

Purpose of Project

The purpose of the proposed project is to reduce congestion and connect the growing neighborhood of Terrace Heights to the City of Yakima (Widener & Associates 2022):

- Provide an alternative Yakima River crossing for east-west travel between the City of Yakima and Terrace Heights.
- Increase mobility, by decreasing travel delay, and relieving traffic congestion at the I-82/Yakima Avenue Interchange and on Terrace Heights Drive and Yakima Avenue.
- Construct the local road corridor which would allow for the consideration of construction of the recommended alternative for an interchange with I-82 identified in the WSDOT I-82/Yakima Avenue/Terrace Heights Drive IJR.
- Provide bicycle and pedestrian facilities including a connection to the Yakima Greenway Trail.
- Serve the existing approved transportation and land use planning along the roadway corridor as documented in the Yakima Valley Conference of Governments (YVCOG) 2020-2045 Metropolitan and Regional Transportation Plan.

Needs for the Project

The needs for the project include the following (Widener & Associates 2022):

- *Congested Corridor* –The current road network cannot support the growth anticipated in the area under the current comprehensive plan. The Terrace Heights neighborhood lies just to the east of the City of Yakima. The neighborhood, an unincorporated part of Yakima County, has grown considerably over the last five decades, with its population increasing fivefold in the 30 years between 1970 and 2000, to a 2019 total of 8,507. Redevelopment of the Boise Cascade Mill Site consistent with the planned land use in the current City of Yakima Comprehensive Plan is also anticipated to increase traffic demand within the City of Yakima.

  The level of service (LOS) on the Yakima Avenue/Terrace Heights Drive corridor has been getting steadily worse and by 2035 it is expected to have multiple turning movements operating at LOS E or F. LOS is a letter grade corresponding to the amount of congestion a road has when completed to a standard. LOS A is the best or the least congested grade. LOS F indicates failure because the demand for a road is more than its capacity.

  The current LOS along the Yakima Avenue/Terrace Heights Drive corridor has triggered Yakima County's concurrency requirements, which limits new development permits along the corridor. In order to relax the restrictions, the County must either increase the capacity of the existing corridor or divert sufficient traffic volume onto another route. Right-of-way constraints along the existing Yakima Avenue/Terrace Heights Drive route prevent widening of the existing roadway. The future LOS at the Yakima Avenue interchange is also anticipated to cause back-ups onto the I-82 mainline.

- *Emergency Response* – The Yakima River poses a natural barrier to travel between Yakima and Terrace Heights. Historically, east-west traffic in the project vicinity has had only one option to travel between these two locations: the Yakima Avenue/Terrace Heights Drive corridor. A new corridor is needed to provide an alternative redundant route to Terrace Heights during any future closures of the Terrace Heights Bridge as well as an additional route for emergency services.

- *Lack of pedestrian and bicycle connectivity* – Access to the Greenway Trail is limited as it travels between I-82 and the Yakima River. The existing East H Street corridor does not include sidewalks or bike lanes and there is no access for pedestrians to the Greenway Trail from the surrounding residential neighborhood.

Project Description

Yakima County is proposing to construct an East-West Corridor in the City of Yakima and unincorporated Yakima County, Washington from North 1st Street and East H Street on the west side of Interstate 82 (I-82) in the City of Yakima to the eastern terminus on the east side of the Roza Canal Wasteway #2 in the community of Terrace Heights. This corridor will connect with Yakima County's Phase 1 of Cascade Mill Parkway (currently under construction) which will continue to Butterfield Road and North Keys Road. The project would include construction of three separate streets:

- **East H Street** –The existing road would be extended to the east from the current terminus at North 7th Street where it would connect to Bravo Company Boulevard as the road turns to the south. The existing portion from North 1st Street to North 7th Street would be widened. A new signal would be installed at the intersection with North 1st Street.
- **Bravo Company Boulevard** – An extension of Bravo Company Boulevard connecting to East H Street would be constructed which would turn south and connect to the current terminus near Fair Avenue. A roundabout intersection with Cascade Mill Parkway would be constructed along with one additional roundabout intersection to connect to an existing access road to the adjacent properties.
- **Cascade Mill Parkway** –Cascade Mill Parkway would connect to Bravo Company Boulevard at a roundabout intersection and then continue east beneath I-82 and across the Yakima River and Roza Canal Wasteway #2.

The East-West Corridor project will involve improvements to existing roadways, including transforming East H Street from a residential street to a free-flowing arterial between North 1st Street and North 7th Street; the building of new connections and roundabouts; non-motorized facilities including bike lanes, sidewalks, Americans with Disabilities Act (ADA) ramps, crosswalks, and a shared-use path that will connect to the Yakima Greenway Trail; and construction of four bridges: two to carry I-82 over the proposed roadway, one over the Yakima River, and one over the Roza Canal Wasteway #2. This project will also involve restoration and levee work along the Yakima River floodplain including removal and/or setback of levees and floodplain habitat restoration.

General roadway construction will require excavation to less than 10 feet below the ground surface (BGS). Channel excavation will be ~5 feet BGS. The deepest excavation will occur for bridge abutments and piers with the deepest of that being ~120 feet BGS for the drilled shafts for the piers and abutments of the Yakima River bridge. All construction excavation below 4 feet BGS (shallowest recorded groundwater depth within the project area) will occur between December and April when groundwater typically stays below 15 feet BGS. Drilled shafts will be the only construction activities to reach groundwater depths, however no groundwater will be handled or extracted. The corridor will be constructed in phases with construction of the earliest phases set to begin in 2023.

Site Description

The proposed project is located within Sections 17 and 18 of Township 13 North and Range 19 East as well as Section 13 of Township 13 North and Range 18 East. The project is located within Yakima, WA and the Terrace Heights neighborhood in unincorporated Yakima County (see attached Vicinity Map in Appendix A). Land use surrounding the project varies with industrial, commercial, residential, and vacant land. Zoning designations surrounding the project area include general commercial (GC), single family (R-1), multi-family (R-3), regional development (RD), suburban residential (SR), and light industrial (M-1) (City of Yakima 2021).

Topography/Hydrology

Topography within the project area is relatively flat but slopes at the banks of the Yakima River. The project area includes both the east and west bank of the Yakima River. It can be assumed that ground water will flow towards the Yakima River on either side. Groundwater was sampled at 4 observation wells adjacent to the project area by Shannon & Wilson Inc. between November 2017 and September 2018 (see attached Ground Water Observation Wells figure). Ground water elevation varied with Yakima River flow (Shannon & Wilson Inc. 2018b; c; d; e). Groundwater depths measured at well B-2-17, just west of the of the Yakima River along the project right-of way (ROW), were between 11.1 and 16.7 feet below ground surface (BGS) (Shannon & Wilson Inc. 2018a; b). Groundwater depths measured at well B-6-17, east of the of the Yakima River and south of the project ROW, were between 6.9 and 10.7 feet BGS (Shannon & Wilson 2018a; c). Groundwater depths measured at well B-7-17, west of the Roza Canal and south of the project ROW, were between 7.3 to 13.4 feet BGS (Shannon & Wilson Inc. 2018 a; d). Groundwater depths measured at well B-8-17, just east of the Yakima River and further south of the project ROW, were between 4.8 and 10.6 feet BGS (Shannon & Wilson Inc. 2018 a; e). Cleanup work for the Interstate 82 Exit 33A Yakima City Landfill site which occurred between December 2020 and April 2021 involved excavation down to 15 feet BGS. No groundwater was encountered during this work. In general, groundwater is the shallowest in August.

Regulatory Database Review Methodology

A search of the WSDOE’s facility/site database was conducted on August 19, 2021. Appendix B contains a table of the documented sites for the proposed project area. A facility/site map is also attached in Appendix A. Searched sites included those in the WSDOE’s toxics program within half a mile of the project limits. This included sites with reported underground storage tanks (UST), leaking underground storage tanks (LUST), state cleanup sites (SCS), voluntary cleanup program (VCP) sites, and state cleanup sites (SCS) (WSDOE 2021a; b; c).

Sites with active USTs that do not have documented contamination, and sites that are no longer on the Confirmed and Suspected Contaminated Sites List (CSCSL) or received a “No Further Action” (NFA) from WSDOE will not analyzed further. As such, these sites will not receive a low, moderate, or high-risk designation. A survey of the proposed project area was conducted, and no aboveground structures were identified within the project area that would indicate that any of the USTs on these sites are within the project area or within areas proposed for ROW acquisition.

The Interstate 82 Exit 33A Yakima City Landfill site (Facility/Site ID 1927) is partially located within the project limits and still on the CSCSL. Cleanup actions within the proposed project ROW limits have been completed for the Interstate 82 Exit 33A Yakima City Landfill site. Work included removing all soil to a depth of 20 feet BGS at a 2:1 incline starting between 20 and 60 feet outside of proposed roadway and sidewalk extents. A landfill gas barrier membrane was placed prior to utility installation and backfilling the excavation site with clean imported fill. Following backfill, the area was graded for the future roadway (Landau Associates 2019). See Appendix C for the interim action work plan (IAWP) for cleanup plan details. As this site has been fully remediated within the project footprint, it will not be addressed further as a risk site.

Of the sites of potential concern, sites were considered “high risk” if there is known concern due to historical activities, extensive contamination has been documented and has not been fully remediated, and the site is likely to impact the project. “High risk” sites often contain large volumes of contaminated soil and/or groundwater of different contaminants that can require special handling and disposal. Sites were determined to be “moderate risk” if there is known concern due to historical activities, contamination has been documented, the site could potentially impact the project, and there is insufficient evidence of the extent of potential contamination. “Moderate risk” sites can have a potential for migrating contaminants through groundwater flow. Sites were determined to be “low risk” if there is known concern due to historical activities, previous contamination has been remediated, the site is downgradient of the project, or the site is unlikely to impact the project.

Impacted Sites/Present Contaminants

Boise Cascade Mill, 450

The Boise Cascade Mill site is currently an abandoned mill that overlaps the project boundaries. The site operated as a sawmill and lumber manufacturer from the early 1900s until 2006. All logs were removed by 2009. Other operations on the site also included sash and door, and fruit box manufacturing between 1909 and 1967. The mill site operated two sawmills and a plywood plant. In 1990, following the removal of 4 USTs in December 1989, soil surrounding the removal sites was analyzed for total petroleum hydrocarbons (TPHs) and benzene, toluene, ethylbenzene, and xylene (BTEX). Groundwater was also sampled for TPHs. Soil samples indicated contamination above Model Toxics Control Act (MTCA) cleanup levels. ~2,000 cubic yards (CY) of contaminated soil was stockpiled and then removed from the site for disposal. WSDOE gave the site a NFA determination for the UST removal following the removal of contaminated soil. Another UST was removed in 1993 south of the small log sawmill. Soil samples for TPHs were taken but were all below MTCA cleanup levels. Also in 1993, it was discovered that between 300 and 400 gallons of antifreeze (ethylene glycol) had been released due corroded piping in a building that housed the heat exchanger to the small sawmill. Soil samples results were below the detection limit, but groundwater samples indicated antifreeze contamination above MTCA cleanup levels. The wood waste landfill to the north of the site (Interstate 82 Exit 33A Yakima City Landfill site) was closed between 2003 and 2005 (Barr 2019). As stated previously, the Interstate 82 Exit 33A Yakima City Landfill site has been fully remediated within the project limits. A Phase II Environmental Site Assessment (ESA) was conducted on the site in 2008 which included numerous contaminant investigations. It was believed that polychlorinated biphenyls (PCBs) could be present above MTCA cleanup levels because the detection level was slightly above the MTCA cleanup level. Hexavalent chromium and cadmium levels were found to be slightly above MTCA cleanup levels. Visual petroleum product contamination was present in a ~60-foot radius east of the large sawmill and in a ~25-foot radius west of the log shop fuel dispenser. When tested, 7 of the 31 soil samples had TPH levels above MTCA cleanup levels. One soil sample had benzene above MTCA cleanup levels. Polycyclic aromatic hydrocarbons (PAHs) only exceeded MTCA cleanup levels in surface soil samples, not subsurface samples. Groundwater samples were all found to be below MTCA Method A Cleanup levels; only vinyl chloride exceeded MTCA Method B cleanup levels. A Phase I ESA conducted in 2013 listed the following areas of concern on the site: poor chemical handling in the former natural gas boiler building, staining and odors at fueling area east of abovementioned building, staining and drums of chemicals at the VAT building, liquid with petroleum sheen and odor on the ground southeast of the plywood building and on the ground of the plywood building, deep structures with petroleum staining on the walls in the northeast corner of the plywood building, the landfill site, wood debris and potential methane production, metals in the groundwater, and unknown fill in the log deck/pond areas, and the irrigation ditch and former operational ponds. This was followed up with a Phase II ESA that included numerous tests. The scope of testing was narrowed for the proposed project corridor in a transportation corridor investigation in 2016. Samples identified TPH presence above MTCA Method A concentrations and a presence of methane. The 2019 Final Remedial Investigation Work Plan for this site summarized the areas of contamination and contaminants at the following areas of the site: petroleum contaminated soul east of large sawmill, petroleum in soul at fueling station west of log yard shop, petroleum, cadmium, and naphthalene in shallow soil at northern portion of site, TPH contamination in former operational ponds, petroleum contaminated soil and groundwater at plywood plant, metal contamination in groundwater, and elevated methane levels in soil gas (Barr 2019). Currently WSDOE lists the site as "awaiting cleanup" with confirmed soil contamination from benzene, halogenated solvents, metals, diesel, gasoline, other petroleum products, and polycyclic aromatic hydrocarbons; confirmed groundwater contamination from halogenated solvents and metals; and suspected soil contamination from PCBs (WSDOE 2021a). As the site is confirmed to have contamination within the proposed roadway corridor, the site is a high-risk site.

Yakima Railroad, 500

The Yakima Railroad site or Yakima Railroad Area (YRRA) is a ~6-square-mile site located along the railroad in the cities of Yakima and Union Gap (Marti 2018). The site is ~0.07 miles south at its closest location to the project area. Tetrachloroethene (PCE) contamination on the site was discovered in this area in the 1980s during routine industrial facility inspections. 13 commercial or industrial sites have been identified as potential contaminant sources including dry cleaners, machine shops, a carbon regeneration facility, and a former pesticide formulation plant. Cleanup activities occurred at many of the suspected source sites during the 1990s, and in 1998 a remedial investigation (RI) was completed for the YRRA. Beginning in 1999, 59 monitoring wells were sampled to characterize the extent of contamination within the groundwater. Data from this helped confirm the hypothesis of suspected contamination sites. In 2013, monitoring wells were reduced to a total of 36. In 2017, ten new wells were added with the intent to identify where remedial efforts were working. The latest published well data is from 2017, and as of 2017, ~39% of sampled wells contained PCE concentrations above MTCA cleanup levels. Samples confirmed that potential source site cleanup remediation efforts have successfully cleaned some areas of the YRRA. The majority of PCE contamination within the YRRA is located south of E Yakima Avenue which is ~0.5 miles south of the project area. Based on well surveys within the YRRA, groundwater at the most contaminated wells generally flows southeast towards the Yakima River (Marti 2018). As of now, WSDOE confirms halogenated organics contamination within the soil and groundwater (WSDOE 2021a). Identified contamination is located south of the project area, and observed groundwater indicates that the YRRA is likely downgradient of the project area. However, only the drilled shaft work will reach groundwater depths and for this work no groundwater will be handled or extracted. As such, the YRRA is considered a low-risk site will not impact this project.

Michelsen Packaging, 79375734

The Michelsen Packaging site is currently a gas station ~0.11 miles northwest of the project area. Two 10,000-gallon heating oil tanks were removed from the site in April of 1991, and upon removal, soil samples determined heating oil contamination. Further samples were conducted to confirm diesel contamination in the soil. Landfarming was chosen as the best remediation method. As soil was removed from the site, the contamination was identified as beneath the building to the south of the removed tanks, beneath a utility building to the west and possibly under N 1st Avenue to the east. A groundwater sampling well was drilled downgradient of the contamination source in the southeast corner of the shop building. Samples from this well showed no detectable amounts of contamination, so cleanup efforts were paused until it is feasible to remove the building and finish removing all the buildings (PLSA Engineering & Surveying 1991; WSDOE 2021a). The site still has confirmed diesel contamination within the soil and has a status of "cleanup started" (WSDOE 2021a). The project area is likely downgradient of the Michelsen Packaging site, but downgradient groundwater samples showed no signs of contamination. As such, this site is a low-risk site and is not anticipated to impact this project.

Barge Lincoln Elementary School, 5075703

The Barge Lincoln Elementary School site is a public school ~0.15 miles north of the project area. In 2005, Barge Lincoln Elementary School was one of over 100 public schools in Yakima County to have its soil tested for lead and arsenic. Many developments occur on former orchard land where use of the pesticide lead-arsenate was common between 1905 and 1947. 13 of the 20 samples taken from the site confirmed that lead and arsenic at levels above MTCA Method A cleanup levels were present in the soil. In 2007 a plan was put in place to cap the soil using geotextile fabric. Some soil was removed to maintain the existing grade. The cap has contained the contaminated soil so it will not migrate contaminants and can no longer be exposed to children at the school (WSDOE 2011). Currently WSDOE classifies the site as having confirmed soil contamination form arsenic and metals priority pollutants (WSDOE 2021a). The project area is likely downgradient of the site, however the constructed contamination cap limits the risk of contaminant exposure. As such, the site is a low-risk site and is not anticipated to impact this project.

Coleman Oil Yakima Bulk Plant, 4233

The Coleman Oil Yakima Bulk Plant site is a bulk oil distributor located ~0.18 miles northwest. A due diligence investigation was conducted in June of 2015 which discovered TPHs, PAHs, lead, and cadmium with concentrations above MTCA Method A cleanup levels. In March 2016, an investigation confirmed that an underground diesel line had ruptured and was releasing fuel. The leak was stopped and ~215 tons of petroleum contaminated soil (PCS) was removed from the site. During this remediation work a heating oil tank was also removed. Three groundwater monitoring wells were installed in April 2016 with monitoring beginning the following month. Sampling determined that diesel had reached the groundwater. From May 2016 to May 2017, groundwater cleanup methods including peristaltic pumping and vacuum extraction occurred. The contractor that conducted the vacuum extraction estimated that ~10% of the diesel was removed from the groundwater. During remediation, additional groundwater wells were installed and sampled. Samples continued to show diesel contamination. A vapor intrusion evaluation also occurred during the cleanup process (PBS 2018). Samples taken indoors and outside had similar concentration levels and were not above MTCA Method A cleanup levels. The latest data available from WSDOE indicates that groundwater samples from June 2017 still showed diesel levels above MTCA Method A cleanup levels. (PBS 2018; WSDOE 2021a). Another contamination release occurred in January of 2017, but the quantity and source are unknown. It is believed that the source is from an underground gasoline distribution line. As of now WSDOE lists this site as having confirmed diesel and gasoline contamination to both the soil and groundwater at the site. The site status remains as "cleanup started" (WSDOE 2021a). The project area is downgradient of the site, and it is possible that diesel and gasoline contaminated groundwater has migrated towards the project area. However, only the drilled shaft work will reach groundwater depths and for this work no groundwater will be handled or extracted. As such, this site is a low-risk site and is not anticipated to impact this project.

Alders Chevron, 511

The Alders Chevron site is currently a vehicle display building for an auto dealership. The site operated as a gas station from 1970 until 1992. It was redeveloped to its current configuration in 1993. An assessment of the site in 1989 indicated a potential of petroleum product contamination. Subsequent soil and groundwater samples were taken and they determined that soil and groundwater contamination from gasoline-range petroleum above MTCA Method A cleanup levels. Remedial actions conducted in 1992 and 1993 included UST removal and the removal of ~754 CY of contaminated soil. In March 2004, WSDOE determined that no further soil remediation was necessary for the site, but further remediation would be needed for the groundwater to receive a NFA determination. WSDOE suggested a location for a monitoring well close to one of the original monitoring wells before site redevelopment. A June 2013 supplemental site assessment work plan outlines the plans to install a monitoring well (SAIC 2013). As of now the site is listed by WSDOE as having contaminated soil from gasoline and diesel, as well as contaminated groundwater from base/neutral/acid organics, halogenated organics, diesel, and gasoline. WSDOE's status for the site is "cleanup started," and base/neutral/acid organics and halogenated organics have been remediated in the soil (WSDOE 2021a). The extent of groundwater contamination is not well documented, and contamination migration is possible at the site. However, the Yakima River provides a barrier for about half of the project area, and the entire project area is upgradient of the site. As such, this is a low-risk site and is not anticipated to impact this project.

Roche Fruit Co Warehouse 4, 75214769

The Roche Fruit Co Warehouse 4 site is part of a fruit processing and distribution facility ~0.26 miles southwest of the project area. In 1992, WSDOE was notified of a UST overfill causing a leaded gasoline spill. The initial LUST report proposed an independent cleanup. Soil samples were taken but never reported to WSDOE. No other supporting documents are available for this site in WSDOE's facility/site database, so contamination extent is unknown. As of now, WSDOE lists the site as having confirmed soil contamination from gasoline and has a status of "awaiting cleanup" (WSDOE 2021a). The project area is likely upgradient of the site and there is no confirmed groundwater contamination. As such, this site is a low-risk site and is not anticipated to impact this project.

Roza Powerplant Switchyard, 74381472

The Roza Powerplant Switchyard is a powerplant facility ~0.29 miles northeast of the project area. The site has served as a powerplant facility since 1958. WSDOE was notified of potential soil contamination in 2014 in the form of oil staining in the vicinity of a former aboveground storage tank (AST). Samples taken at the site concluded that mineral oil contamination above MTCA Method A cleanup levels and PCBs below MTCA Method A cleanup levels. The area of contamination is bounded so migration of contaminants is unlikely. WSDOE currently lists the site as having confirmed diesel contamination and suspected PCB contamination within the soil. The WSDOE status of the site is "awaiting cleanup" (WSDOE 2021a). The project area is potentially downgradient of the site, but contaminants are contained according to site surveys. As such, this site is a low-risk site and is not anticipated to impact this project.

Bissell Distributing, 92688321

The Bissell Distributing site is a fuel distributor ~0.31 miles northwest of the project area. In May 2000, ~4,000 gallons of unused motor oil from an AVT into a containment area. ~3,000 gallons of this spilled oil was recovered during the initial cleanup effort. ~120 CY of contaminated soil was removed. The remaining contaminated soil was not removed due to the cost of removing the tanks and concrete. The containment basin was sealed to isolate the contaminated soil from the rest of the facility. As of now the WSDOE lists the site as having confirmed soil contamination from unspecified petroleum products and a status of "cleanup started" (WSDOE 2021a). The project area is downgradient of the site, however there is no groundwater contamination, and the soil contamination has been contained. As such, this site is a low-risk site and is not anticipated to impact this project.

RH Bowles Company Bissell Distributing UST 9260, 94312127

The RH Bowles Company Bissell Distributing UST 9260 site is a petroleum product distributer ~0.33 miles northwest of the project area. During the 1970s the site was occupied by the Shell Petroleum Corporation and used as railroad transfer and storage depot. This involved refined petroleum product transfer from tanker cars to ASTs and USTs (Costello 2008; WSDOE 2021a). After Shell Petroleum went bankrupt, R.H. Bowles Distributing Co. acquired the property and transitioned it to its current use of bulk storage and wholesale of petroleum products. In 1998, two USTs were removed from the site. Soil samples taken from the removal locations indicated soil contamination from BTEX, and gasoline range total petroleum hydrocarbons (TPH-G) exceeding MTCA Method A cleanup levels. Inspections of the removed USTs suggested that the removed USTs were not the source of the contamination (Costello 2008). On July 2, 2003, ~1,300 gallons of lube oil was spilled at the site during an unload of lube oil from a tanker truck to an AST. Most of the oil was not recovered. ~146.36 tons of contaminated soil was removed from the site. Soil samples taken after the soil removal indicated that there no longer was a presence of contaminated soil, so the excavated area was backfilled, and a recommendation of a NFA status was sent to WSDOE (Trabusinar 2003). The site has yet to receive a NFA status from WSDOE and is currently listed as having confirmed gasoline soil contamination and a "cleanup started" status (WSDOE 2021a). The project area is downgradient of the site, however there is no confirmed groundwater contamination, and based on the 2003 spill, soil contamination from spills does not seem to migrate far if at all. As such, this is a low-risk site and is not anticipated to impact this project.

Yakima County Beverage, 38259534

The Yakima County Beverage site is currently a branch of a postharvest quality protection company ~0.36 miles northwest of the project area. WSDOE does not have supporting documents available to the public besides the Facility/Site and Cleanup Site Details sheets. The site status is currently "awaiting cleanup." The site has confirmed air contamination and suspected soil contamination from benzene and halogenated solvents (WSDOE 2021a). The project area is potentially downgradient of the site, however there is no confirmed soil or groundwater contamination. As such, this site is a low-risk site and is not anticipated to impact this project.

Allen & Ennis Clark Distributing, 29192228

The Allen & Ennis Clark Distributing site is currently a vacant lot ~0.38 miles northwest of the project area. The site used to be a service station. An investigation report published in 1994 documented the presence of PCS in the southeastern corner of the site, the presence of petroleum hydrocarbons in the groundwater, and the potential of oil from a previous spill seeping beneath the former service station concrete floor (PLSA Engineering & Surveying 2008; White Shield Inc. 1994). ~330 CY of PCS was removed from the site during the 1994 investigation and remedial investigation (White Shield Inc. 1994). Groundwater monitoring wells had to be replaced after the service station buildings and structures were demolished. New wells were installed and sampled in September 2005. Samples showed contaminated groundwater was still present at the site. Additional remediation work began in February 2006 with PCS soil removal. Up to 15 feet BGS, visual and olfactory observations indicated no presence of petroleum products. This clean solid was stockpiled for backfill. Below 15 feet BGS, visual and olfactory observations indicated petroleum contamination. ~800 CY of PCS was removed from the site; the majority of the PCS present on the site. A billboard and underground utilities prevented the complete removal of PCS from the site. The remaining PCS was remediated by monitored natural attenuation that was stimulated with a product called Oxygen Release Compound. Backfill was placed once ~1,200 pounds of Oxygen Release Compound was added to the remaining PCS. A groundwater monitoring well downgradient of the PCS was monitored for 23 months after the addition of Oxygen Release Compound to the site, and no contaminated groundwater was detected (PLSA Engineering & Surveying 2008). As of now the status of the site remains "cleanup started," and WSDOE has the site listed as having confirmed soil and groundwater contamination from benzene, diesel, and gasoline (WSDOE 2021a). The project area is downgradient from the site, and contaminated groundwater may have migrated from the site. However, only the drilled shaft work will reach groundwater depths and for this work no groundwater will be handled or extracted. As such, this site is a low-risk site and is not anticipated to impact this project.

Yakima Avenue Shell RH Bowles Inc, 15842241

The Yakima Avenue Shell RH Bowles Inc site is currently a fast-food restaurant ~0.40 miles south of the project area. Supporting documents for this site are limited to a single October 10, 1991, TPH analysis confirming the presence of TPH in the soil at the site (NHS Inc. 1991; WSDOE 2021a). WSDOE's status for the site is "cleanup started," and lists petroleum - other as confirmed in the soil at the site (WSDOE 2021a). The project area is upgradient from the site and the site has no confirmed groundwater contamination, so migration to the project area is unlikely. As such, this site is a low-risk site and is not anticipated to impact this project.

Smittys Conoco 190, 75697971

The Smittys Conoco 190 site is a gas station ~0.42 miles south of the project area. The site has operated as a gas station for ~38 years. Multiple petroleum product releases from USTs have occurred on this site. In November 1987, ~500 gallons of super unleaded gasoline was released to the subsurface of the site. A UST tightness test in July 2014 discovered another release. A crack on a UST was found in November 2014, which was repaired. In January 2016, during the remedial investigation for the previous release, a diesel fuel release of ~600 gallons was discovered from a diesel UST. Groundwater monitoring wells were installed prior to the 1987 gasoline release and have been monitored periodically ever since. On May 6, 2015, ~440 gallons of petroleum-contaminated groundwater was removed from the site. Vacuum pumping was used in February 2016 to remove ~2,500 gallons of contaminated groundwater. Another ~10,400 gallons were removed the following month. As of 2016, the extent of contamination, both in the soil and groundwater, was believed to extend from the southern end of the site out into E Lincoln Avenue ROW (Associated Environmental Group 2016). The site's status is currently "cleanup started," and the site has confirmed soil and groundwater contamination from benzene, diesel, and gasoline (WSDOE 2021a). The site's contamination extend is well documented and the project area is upgradient of the site. As such, this site is a low-risk site and is not anticipated to impact this project.

Garfield Elementary School, 1308202

The Garfield Elementary School site is a public 0.43 miles northwest of the project area. In 2005, Garfield Elementary School was one of over 100 public schools in Yakima County to have its soil tested for lead and arsenic. Many developments occur on former orchard land where use of the pesticide lead-arsenate was common between 1905 and 1947. Samples taken in 2005 confirmed the presence of lead and arsenic within the soil at the school and prompted WSDOE to prioritize the school for remedial activities. In the summer of 2010, the process started with additional soil samples. 5 of 24 samples taken had lead and arsenic levels above MTCA Method A cleanup levels. Contaminated soil was capped with geotextile fabric with some of the contaminated soil being hauled off-site to meet the existing grade. Contaminated soil was isolated to prevent migration and contact with contaminated from people at the school (Dunbar 2011). WSDOE continues to list the site as having confirmed arsenic and metal priority pollutants contamination (WSDOE 2021a). The project area is downgradient of the site, but the contaminated soil has been isolated and capped to prevent migration. As such, this is a low-risk site and is not anticipated to impact this project.

Unocal 76, 53365837

The Unocal 76 site is a fuel and lubricant wholesaler ~0.43 miles northwest of the project area. Site assessments began on this site in 1997 following a subsurface spill below the asphalt at the site. Groundwater and soil samples showed diesel, oil, gasoline, toluene, ethyl benzene, and xylenes above MTCA Method A cleanup levels (WSDOE 2021a). Soil and groundwater samples taken in 2010 helped identify the extent of contamination to guide future contamination monitoring efforts. Contamination is estimated to extend throughout the center and west end of the property as well as slightly north of the property (GHD 2017). The latest groundwater monitoring report documenting work done in 2020, despite periodic injections of a micro-carbon solution called Petrofix, the site still contained TPH-G, diesel range total petroleum hydrocarbons (TPH-D), and benzene exceeding MTCA Method A cleanup levels. Groundwater samples during 2020 indicated groundwater flow going southeast (GHD 2021). With the groundwater flow characterized, flow likely would miss the project area. The extent of contamination has also been well characterized. As such, this site is a low-risk site and is not anticipated to impact this project.

Yakima Old City Landfill, 463

The Yakima Old City Landfill site is currently a public park ~0.43 miles south of the project area. The site was a 28-acre dump and burn landfill until the 1960s with solid municipal waste buried to a maximum depth of 40 feet BGS. Groundwater was tested in 1997 for aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chloride, chromium, cobalt, copper, fluoride, iron, lead, magnesium, manganese, mercury, nickel, nitrate, potassium, selenium, silver, sodium, sulfate, TPH, thallium, total dissolved solids, total organic carbon, vanadium, zinc, and 36 volatile organics. Only lead concentrations were above MTCA Method A cleanup levels (Yakima Health District 1997). Despite the site remaining on the CSCSL, not having a NFA determination stated on the Cleanup Site Details sheet for the site, and having a status of "awaiting cleanup," the site received a NFA notice in 2019 (WSDOE 2019; 2021a; b). Current MTCA Method A Cleanup levels for lead are higher than what was recorded in 1997, and it is believed the higher concentrations of lead found were attributed to turbidity. WSDOE also states that lead in groundwater is generally not very mobile in the pH levels found in groundwater at the site (WSDOE 2019). WSDOE does state on the Cleanup Site Details sheet for the site that lead concentrations in the groundwater are below MTCA Method A Cleanup levels (WSDOE 2021a). Despite the fact that the site remains on the CSCSL; the project area is upgradient of the site, the site received an NFA letter, and lead is generally not a mobile contaminant in groundwater. As such, this site is a low-risk site and is not anticipated to impact this project.

Kelly Oil, 535

The Kelly Oil site is currently a retail business 0.44 miles north of the project area. The site was used as a gas station and bulk petroleum storage facility from 1946 to 1986. During operations of this gas station, an unidentified amount of diesel and gasoline were spilled into the soils at the site (The Lambert Group 1991; WSDOE 2021a). The site was surveyed in 1991 and found to have concentrations of petroleum hydrocarbons within the soil. Samples taken out of the station's containment area found no contaminants suggesting that the contamination is contained (The Lambert Group 1991). All USTs and ASTs were removed from the site in 1992 (WSDOE 2021a). As of now, WSDOE lists the site as having confirmed soil contamination and suspected groundwater contamination from unspecified petroleum products. The site's status is "awaiting cleanup." The project area is likely downgradient of the site, but there is no confirmed groundwater contamination and contamination is limited to the containment area on the site. As such, this site is a low-risk site and is not anticipated to impact this project.

Yakima Neighborhood Health Services Property, 266

The Yakima Neighborhood Health Services Property site is currently an office building ~0.44 miles south of the project area. The site previously operated as a gas station. 1992 soil and groundwater samples indicated a presence of diesel above MTCA Method A cleanup levels in the groundwater. The contaminant source is unknown, as research conducted on the site indicated that the gas station did not sell diesel on the site. A former bus station existed next to the site, but records indicate that no diesel was stored on the property either. Samples taken that the plume covers less than one city block. Bioremediation was the recommended cleanup method from the 1992 site assessment (PLSA Engineering & Surveying 1992). WSDOE has no additional documents available on this site, but the sites status remains as "awaiting cleanup." WSDOE lists the site as having confirmed groundwater contamination from diesel (WSDOE 2021a). The project area is upgradient of the site, so the site is considered a low-risk site and is not anticipated to impact this project.

Joes Grinding, 29708

The Joes Grinding site is a now closed automobile machine shop ~0.47 miles west of the project area. The site was in operation from 1948 until 2015. It is suspected PCE was used at the site as it was commonly used for degreasing from the 1940s to the 1980s in the manufacturing and automotive industries. Other suspected contamination included spoils from sandblasting, petroleum products particularly in areas of clear petroleum stains and the air compressor, and other toxins potentially washed out at the sump station. Soil samples were taken from areas of suspected contamination in and around the building in which is situated at the south end of the property. These areas include two petroleum stains in the soil west and south of the building, adjacent to the compressor with an oil release in the west end of the building, and the sandblasting discharging area south of the building. Soil samples found soil contamination from lead and chromium above MTCA Method A cleanup levels. Detectable petroleum samples were all below MTCA Method A cleanup levels, but vapor samples identified volatile organic compounds and petroleum range hydrocarbons which indicates the likely presence of petroleum and volatile organics below the concrete floor of the building (Fulcrum Environmental Consulting 2020). WSDOE lists the site as "awaiting cleanup" with confirmed soil and suspected groundwater contamination from lead, other metals, gasoline, and other petroleum products (WSDOE 2021a). The project area is potentially downgradient from the site, but there is no confirmed groundwater contamination. As such, the site is a low-risk site and is not anticipated to impact this project.

Property Acquisition

The project will require significant ROW acquisition in the form of temporary easements and permanent partial and full property acquisition. All ROW has already been purchased for this project with the exception of floodplain mitigation acquisitions. Property acquisitions are being worked out with the Department of Natural Resources (DNR) and Yakima County as acquisitions for floodplain mitigation will occur on undeveloped DNR and County land. Property acquisition and/or temporary easements will occur on the following parcels: 19131841001, 19131842001, 19131824001, 19131831539, 19131821003, 19131812001, 19131841002, 19131811002, 19131731009, 19131713005, 19131723405, 19131732404, 19131732421, 19131732408, 19131732409, 19131732420, 19131731008, 19131723012, 19131731408, 19131731407, 19131731409, 19131731410, 19131731411, 19131731412, 19131731413, 19131731405, 19131731415, 19131731416, 19131731414, 19131731417, 19131731418, 19131731419, 19131731420, 19131731013, 19131731012, 19131731011, 19131731004, 19131742017, 19131742009, 19131723404, 19131723007, and 19131723004. Parcels 19131821003, 19131812001, 19131842001, and 19131841001 are part of the Boise Cascade Mill and Interstate 82 Exit 33A Yakima City Landfill sites. The Interstate 82 Exit 33A Yakima City Landfill site has already been fully remediated within the extent of the construction area. Plans for safely containing, removing, and disposing of potentially contaminated material from the Boise Cascade Mill site are discussed below. None of the other parcels listed above are listed WSDOE sites of concern. See Appendix A for a ROW acquisition map.

Conclusion

All sites considered to have a risk the project site have been documented and discussed (See Appendix B for documented facilities/sites table). These sites included:

- Boise Cascade Mill (Facility/Site ID 450)
- Yakima Railroad (Facility/Site ID 500)
- Michelsen Packaging (Facility/Site ID 79375734)
- Barge Lincoln Elementary School (Facility/Site ID 5075703)
- Coleman Oil Yakima Bulk Plant (Facility/Site ID 4233)
- Alders Chevron (Facility/Site ID 511)
- Roche Fruit Co Warehouse 4 (Facility/Site ID 75214769)
- Roza Powerplant Switchyard (Facility/Site ID 74381472)
- Bissell Distributing (Facility/Site ID 92688321)
- RH Bowles Company Bissell Distributing UST 9260 (Facility/Site ID 94312127)
- Yakima County Beverage (Facility/Site ID 38259534)
- Allen & Ennis Clark Distributing (Facility/Site ID 29192228)
- Yakima Avenue Shell RH Bowles Inc (Facility/Site ID 15842241)
- Smittys Conoco 190 (Facility/Site ID 75697971)
- Garfield Elementary School (Facility/Site ID 1308202)
- Unocal 76 (Facility/Site ID 53365837)
- Yakima Old City Landfill (Facility/Site ID 463)
- Kelly Oil (Facility/Site ID 535)
- Yakima Neighborhood Health Services Property (Facility/Site ID 266)
- Joes Grinding (Facility/Site ID 29708)

All other listed sites are either do not have a reported release of contamination to the soil and/or groundwater, have been remedied for any releases and have a status of NFA from WSDOE, or have a plan in place for remediation prior to construction. They are therefore unlikely to contribute contamination to the project site.

The above-described facilities have reported contamination for petroleum products, petroleum byproducts, heavy metals, and fertilizer byproducts. The Boise Cascade Mill site is the only high-risk site as ROW will be acquired from this site. All other sites listed above are low-risk sites and should not have any impacts to the proposed project. Potential impacts can be avoided/minimized with proper measures.

Mitigation Measures

The proposed project may encounter groundwater for the proposed bridge abutments, but no groundwater will be extracted or handled. Groundwater contact will be avoided for all other construction activities by scheduling excavation deeper than 4 feet BGS between December and April when the groundwater is the deepest (recorded deeper than 15 feet BGS). Contaminated soil is likely to be encountered at the Boise Cascade Mill Site. Additional investigation for this site will be conducted that will include soil sampling to identify specific areas above MTCA

Method A cleanup levels within the limits of construction. This investigation will be used to determine the need for site specific mitigation measures. A Contaminated Soil Management Plan will be prepared prior to construction and will include the procedures for moving any suspected contaminated native soils to a staging area so that it can be tested and analyzed. A Spill Prevention Control and Countermeasures (SPCC) plan will also be prepared and implemented during construction to prevent the release of hazardous materials as a result of project actions. If contaminated soil is encountered during construction, the contract will require it to be contained, removed, and appropriately disposed of off-site in accordance with federal, state, and local regulations. Work within the limits of the Boise Cascade Mill site has been limited to the minimal extent necessary to complete the project.

Based on the professional judgement of Widener & Associates, this memorandum documents the appropriate level of investigation necessary to identify potentially contaminated sites that may affect the environment, create construction impacts, and/or incur potential cleanup liability. There are no significant adverse effects that cannot be reasonably mitigated for that are anticipated for this project. If you have any questions, feel free to contact me at (425) 332-3961 or at ross@widener-enviro.com.

Sincerely,

Ross Widener
Widener & Associates

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Appendix A. Figures

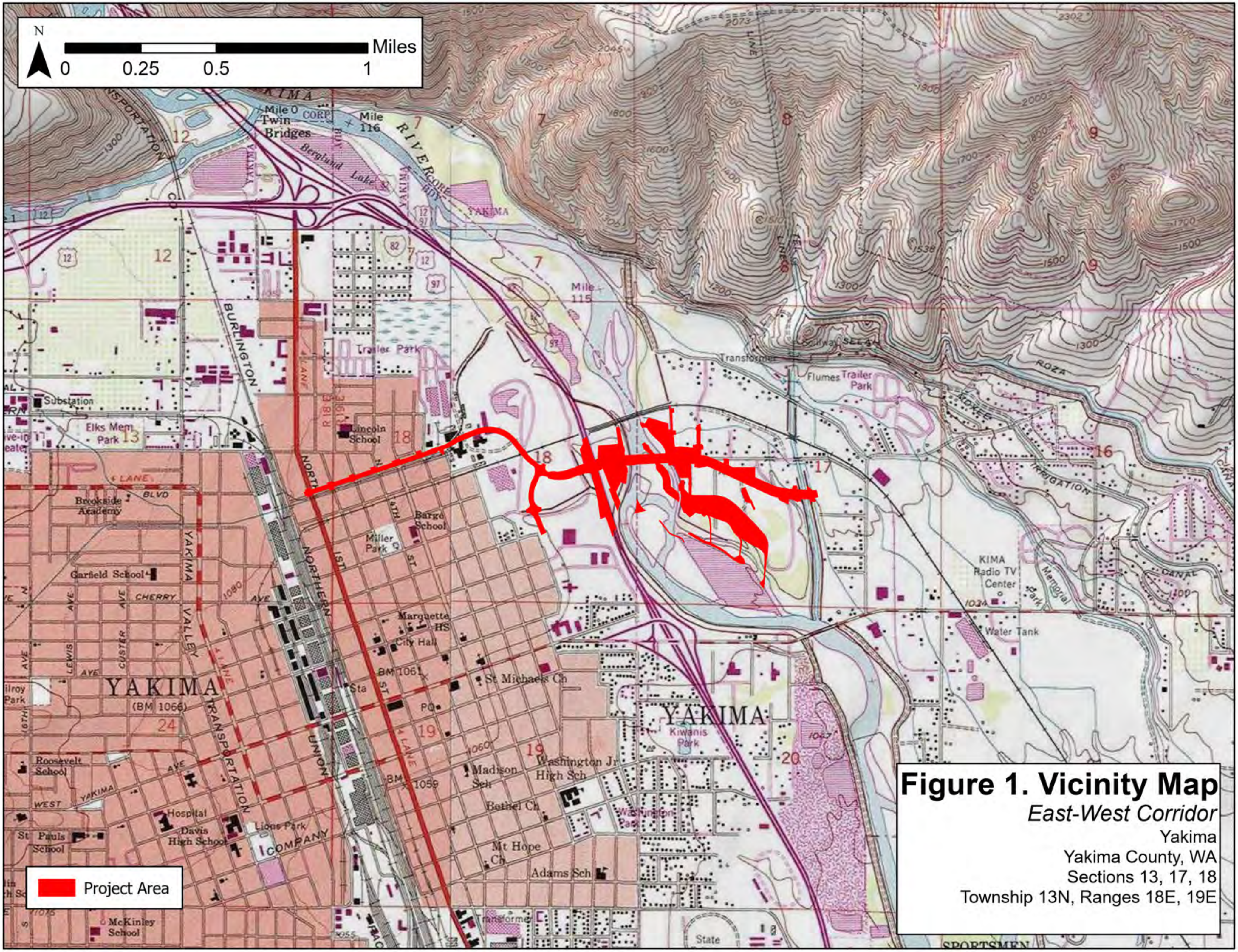
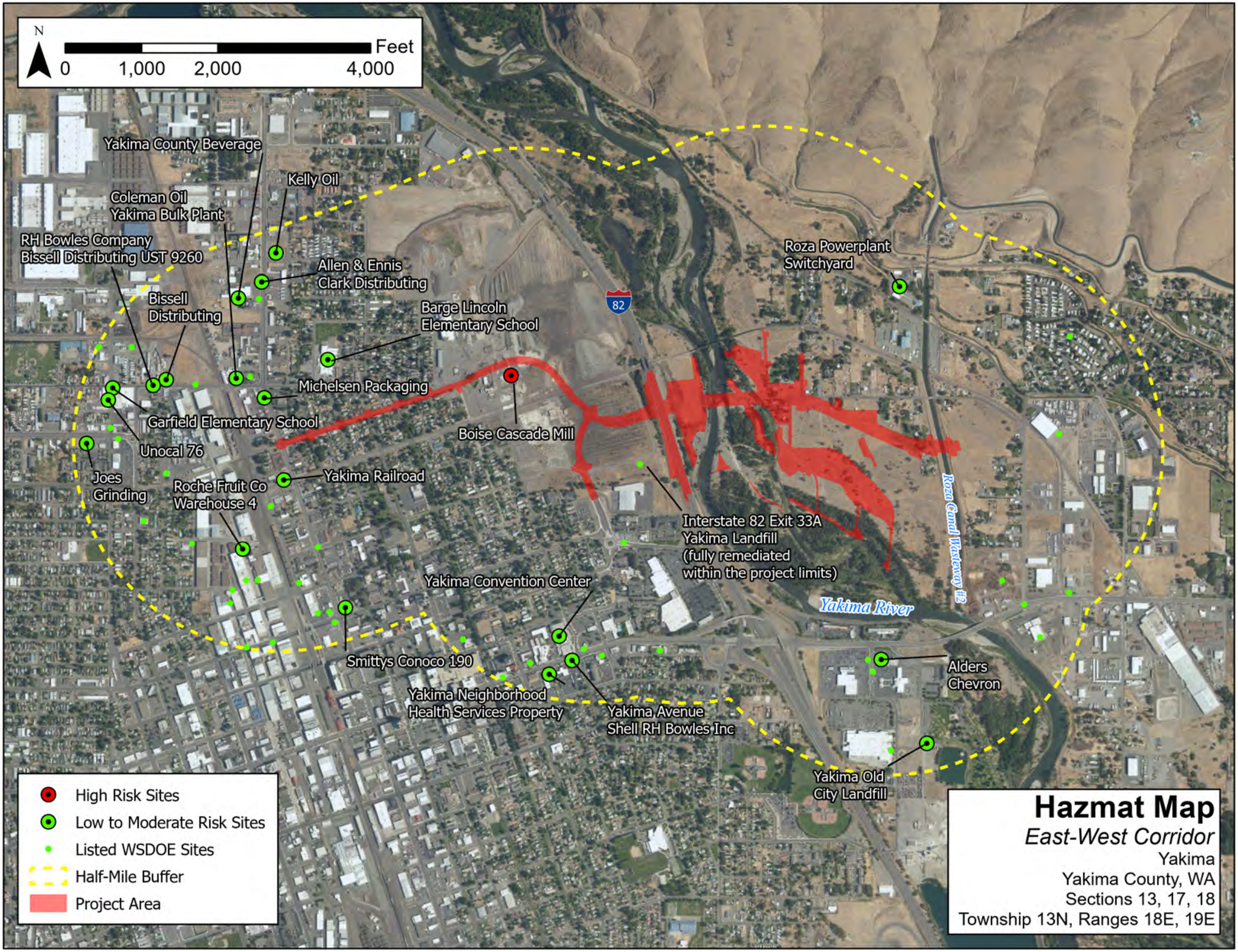
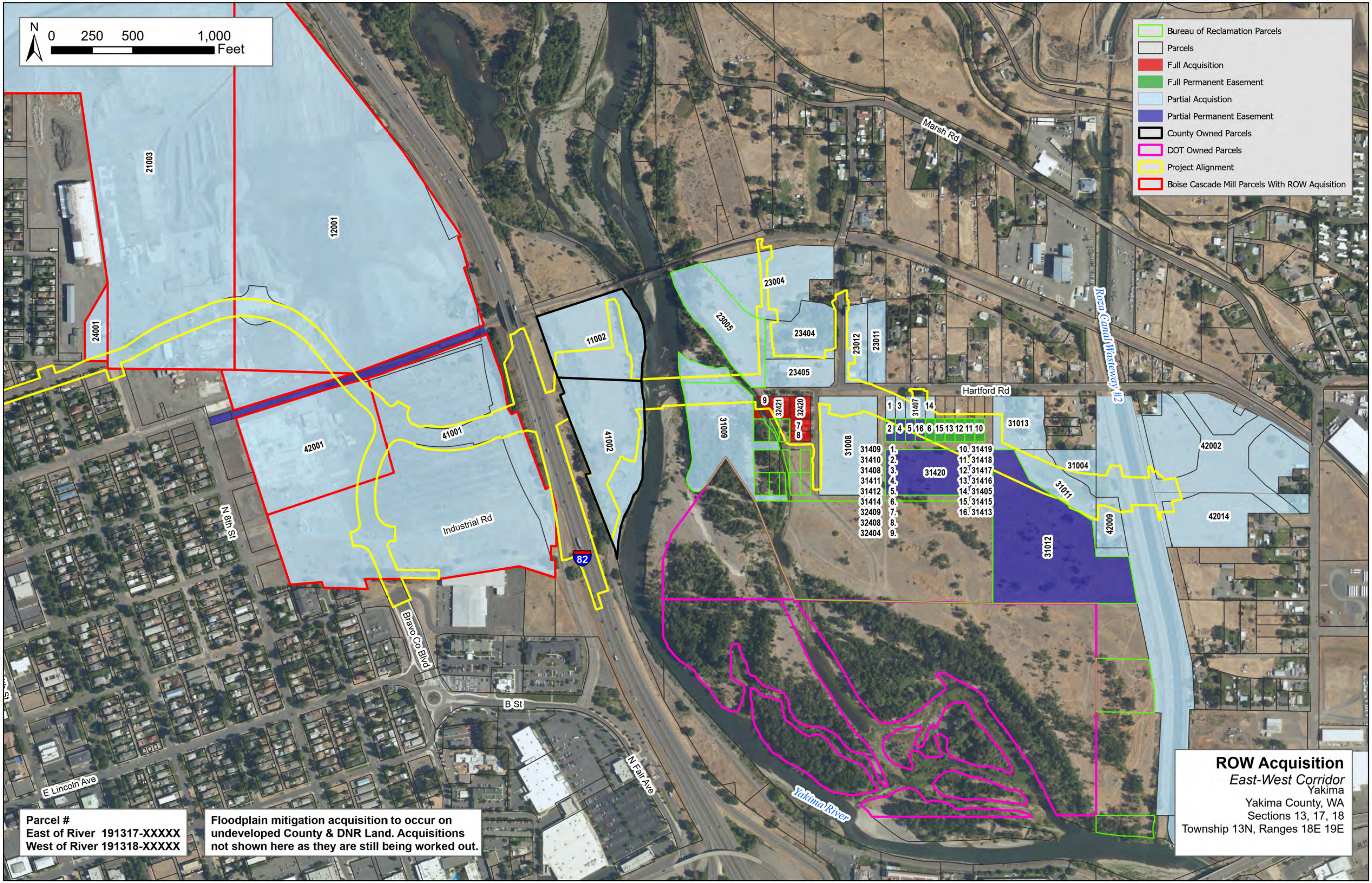


Figure 1. Vicinity Map

East-West Corridor

Yakima
Yakima County, WA
Sections 13, 17, 18
Township 13N, Ranges 18E, 19E


N
Feet
0
1,000
2,000
4,000
Yakima County Beverage
Kelly Oil
Coleman Oil
Yakima Bulk Plant
RH Bowles Company
Bissell Distributing UST 9260
Allen & Ennis
Clark Distributing
Bissell
Distributing
Barge Lincoln
Elementary School
82
Roza Powerplant
Switchyard
Michelsen Packaging
Garfield Elementary School
Boise Cascade Mill
Unocal 76
Joes
Grinding
Roche Fruit Co
Warehouse 4
Yakima Railroad
Interstate 82 Exit 33A
Yakima Landfill
(fully remediated
within the project limits)
Roza Canal Wasteway #2
Yakima Convention Center
Yakima River
Smittys Conoco 190
Yakima Neighborhood
Health Services Property
Yakima Avenue
Shell RH Bowles Inc
Alders
Chevron
Yakima Old
City Landfill
High Risk Sites
Low to Moderate Risk Sites
Listed WSDOE Sites
Half-Mile Buffer
Project Area
Hazmat Map
East-West Corridor
Yakima
Yakima County, WA
Sections 13, 17, 18
Township 13N, Ranges 18E, 19E



□ Bureau of Reclamation Parcels
□ Parcels
🟥 Full Acquisition
🟩 Full Permanent Easement
🟦 Partial Acquisition
🟪 Partial Permanent Easement
□ County Owned Parcels
□ DOT Owned Parcels
□ Project Alignment
□ Boise Cascade Mill Parcels With ROW Aquisition

Parcel #
East of River 191317-XXXXX
West of River 191318-XXXXX

Floodplain mitigation acquisition to occur on undeveloped County & DNR Land. Acquisitions not shown here as they are still being worked out.

ROW Acquisition

East-West Corridor
Yakima
Yakima County, WA
Sections 13, 17, 18
Township 13N, Ranges 18E 19E

Appendix B. Documented Facilities/Sites Table

Facility/Site	Name	Address	Distance to Project Area	Description	Date Closed
450*	Boise Cascade Mill	805 7th St Yakima, WA 98901	Overlapping	SCS UST LUST ICP SCS	4/16/1996 2/11/2004 3/1/2006 - -
500*	Yakima Railroad	1st St Corridor Yakima, WA 98901	0.07 miles S	SCS	-
79375734*	Michelsen Packaging	902 N 1st St Yakima, WA 98901	0.11 mi NW	UST LUST ICP	10/29/2003 - -
5075703*	Barge Lincoln Elementary School	219 E I St Yakima, WA 98901	0.15 mi N	SCS	-
4233*	Coleman Oil Yakima Bulk Plant	1 E I St Yakima, WA 98901	0.18 mi NW	SCS	-
511*	Alders Chevron	1702 E Yakima Ave Yakima, WA 98901	0.22 mi S	UST VCP VCP LUST SCS	9/29/2003 9/7/2005 2/14/2017 - -
75214769*	Roche Fruit Co Warehouse 4	610 N 1st Ave Yakima, WA 98907	0.26 mi SW	LUST ICP UST	- - -
74381472*	Roza Powerplant Switchyard	1917 Marsh Rd Yakima, WA 98901	0.29 mi NE	UST ICP	3/21/2000 -
92688321*	Bissell Distributing	311 W I St Yakima, WA 98902	0.31 mi NW	ICP	-
94312127*	RH Bowles Company Bissell Distributing UST 9260	401 W I St Yakima, WA 98902	0.33 mi NW	UST LUST ICP	10/20/2003 - -
38259534*	Yakima County Beverage	1208 N 1st St Yakima, WA 98901	0.36 mi NW	VCP UST SCS	12/12/2019 - -
29192228*	Allen & Ennis Clark Distributing	1216-1218 N 1st St Yakima, WA 98902	0.38 mi NW	UST VCP LUST SCS	9/16/2003 12/28/2009 - -
15842241*	Yakima Avenue Shell RH Bowles Inc	716 E Yakima Ave Yakima, WA 98901	0.40 mi S	UST ICP LUST	4/27/2000 - -
75697971*	Smittys Conoco 190	301 N 1st St Yakima, WA 98902	0.42 mi S	VCP VCP UST LUST	3/3/2016 1/2/2018 - -
1308202*	Garfield Elementary School	612 N 6th Ave Yakima, WA 98902	0.43 mi NW	SCS	-

Facility/Site	Name	Address	Distance to Project Area	Description	Date Closed
53365837*	Unocal 76	920 N 6th Ave Yakima, WA 98902	0.43 mi NW	SCS VCP	- -
463*	Yakima Old City Landfill	S 18th St & Yakima R Mile 112 Yakima, WA 98901	0.43 mi S	SCS	-
535*	Kelly Oil	1309 N 1st St Yakima, WA 98901	0.44 mi N	SCS UST	- -
266*	Yakima Neighborhood Health Services Property	610 E Yakima Ave Yakima, WA 98901	0.44 mi S	ICP	-
29708*	Joes Grinding	1114 Fruitvale Blvd Yakima, WA 98902	0.47 mi W	SCS	-
1927	Interstate 82 Exit 33A Yakima City Landfill	Interstate 82 Yakima, WA 98901	Overlapping	VCP SCS	4/26/2016 -
83129826	ARCO 4387 Z&M Enterprises Dispenser Island	912 N 1st St Yakima, WA 98901	0.11 mi NW	LUST VCP (NFA) LUST (NFA) ICP UST	4/6/1999 4/19/1999 9/13/2006 5/24/2007 -
38867675	Trail Wagons Inc	1100 E Lincoln Ave Yakima, WA 98901	0.13 miles S	LUST (NFA) UST	8/8/2000 11/28/2007
8325867	Davis Transport Inc	611 N Front St Yakima, WA 98901	0.14 miles SW	UST	5/30/1989
18526216	Jack in the Box	1002 N 1st St Yakima, WA 98901	0.17 mi NW	UST LUST (NFA) VCP (NFA)	9/25/2000 9/25/2000 9/25/2000
49569148	Sunfair Chevrolet Inc	1600 E Yakima Ave Yakima, WA 98901	0.22 mi S	UST ICP (NFA) LUST (NFA) VCP (NFA)	10/20/2003 2/10/2015 2/10/2015 2/10/2015
62969449	Nakano Foods	115 W I St Yakima, WA 98902	0.24 mi NW	VCP UST LUST VCP ICP (NFA)	4/8/2002 5/24/2006 1/25/2010 1/25/2010 3/4/2010
11396	National Can Corp	717 Butterfield Rd Yakima, WA 98901	0.25 mi E	ICP (NFA) VCP (NFA)	1/18/2018 1/18/2018
9971163	Lynch Motor Co	1700 E Yakima Ave Yakima, WA 98901	0.25 mi S	LUST (NFA) UST	3/2/2006 3/2/2006
4886372	Shell North First St RH Bowles Co Inc	501 N 1st St Yakima, WA 98901	0.26 mi S	UST	8/6/1996
58196198	HF Hauff Company	803 N 4th Ave Yakima, WA 98902	0.28 mi W	UST	1/25/1991
51566863	Judy Ranch	204 N Butterfield Rd Yakima, WA 98901	0.28 miles E	UST	8/6/1996
59993579	Roche Fruit Company Inc Warehouse Four	115 Poplar St Yakima, WA 98907	0.32 mi SW	UST	-
95735416	Washington Fruit & Produce Co	401 N 1st Ave Yakima, WA 98902	0.33 feet SW	UST	-

Facility/Site	Name	Address	Distance to Project Area	Description	Date Closed
54517643	Yakima City Fire Department	401 N Front St Yakima, WA 98901	0.33 mi S	UST LUST (NFA)	9/29/2003 9/30/2018
447	Woods Industries 1	709 N 1st Ave Yakima, WA 98901	0.33 mi SW	SCS (NFA) SCS	2/1/1992 4/16/1996
59566482	David Connel DBA S&C Investments	101 Butterfield Rd Yakima, WA 98901	0.34 mi SE	UST	8/6/1996
4073601	Yakima Convention Center	10 N 8th St Yakima, WA 98901	0.35 mi S	SCS (NFA) VCP (NFA)	9/9/2003 9/9/2003
9933241	Steves Chevron Service	1202 N 1st St Yakima, WA 98901	0.35 mi NW	LUST (NFA) UST	3/2/2006 3/2/2006
82883945	Yakima CA Snokist Growers	504 N 1st Ave Yakima, WA 98902	0.37 mi SW	UST	8/6/1996
66124279	Central Vending	900 E Yakima Ave Yakima, WA 98901	0.37 mi S	UST	10/12/1992
1658	Weaver Exterminating	926 E Terrace Heights Dr Yakima, WA 98901	0.37 mi S	UST	4/1/2010
62162267	5th Avenue One Stop	701 N 5th Ave Yakima, WA 98902	0.38 mi SW	LUST (NFA) UST	3/2/2006 -
46932413	Skyline Mobile Estates	2205 Butterfield Rd Yakima, WA 98901	0.38 mi NE	UST	-
28495772	7 Eleven Store 2307 27470H	810 E Yakima Ave Yakima, WA 98902	0.39 mi S	VCP LUST (NFA) ICP (NFA) VCP (NFA) UST	3/11/2003 6/4/2018 6/4/2018 6/4/2018 -
11186618	Stewart Subaru	506 Fruitvale Blvd Yakima, WA 98902	0.39 mi W	UST LUST (NFA) VCP (NFA)	10/14/2003 11/15/2004 11/15/2004
8995913	LL Buchanan	115 W D St Yakima, WA 98902	0.40 mi SW	UST	8/6/1996
542	NC Machinery Co Yakima	2100 Terrace Heights Dr Yakima, WA 98901	0.41 mi SE	SCS LUST (NFA) UST	4/16/1996 4/29/1997 5/4/2005
47521132	Valley International Inc	922 N 6th Ave Yakima, WA 98902	0.41 mi NW	UST	-
547	Elliott Tire Center	1 E Lincoln Ave Yakima, WA 98901	0.42 mi S	SCS (NFA)	10/15/2001
79271271	Lincoln Avenue Car Wash	302 N 1st St Yakima, WA 98901	0.42 mi S	VCP LUST (NFA) ICP (NFA) UST	5/11/2006 4/7/2016 4/7/2016 -
99836919	Freeth Distributing Company Inc	1025 N 6th Ave Yakima, WA 98902	0.43 mi NW	UST	8/6/1996
62627394	ARCO 4437 3D AM/PM	601 E Yakima Ave Yakima, WA 98901	0.43 mi S	VCP LUST (NFA) ICP (NFA) VCP (NFA) UST	3/7/2002 2/7/2012 2/7/2012 2/7/2012 -

Facility/Site	**Name**	**Address**	**Distance to Project Area**	**Description**	**Date Closed**
58256114	Case Power and Equipment	2209 Terrace Heights Dr Yakima, WA 98901	0.44 mi SE	LUST (NFA) UST	3/13/2006 3/13/2006
41222641	River Side Pit	River Side Rd Yakima, WA 98901	0.44 mi S	UST	8/6/1996
12808	Yakima County Parking Lot	230 N 1st Ave Yakima, WA 98902	0.45 mi S	UST ICP (NFA) LUST (NFA)	6/20/2012 7/29/2019 7/29/2019
538	Banks Property	102 N Naches Ave Yakima, WA 98901	0.47 mi S	UST LUST SCS (NFA)	10/8/2003 2/19/2004 3/31/2006
57468285	Hollingbery Warehouse Tanks	302 N 1st Ave Yakima, WA 98902	0.48 mi SW	UST ICP (NFA) LUST (NFA)	11/18/2015 2/25/2016 2/25/2016
73326241	Greyhound Lines Inc Yakima	602 E Yakima Ave Yakima, WA 98901	0.49 mi SW	UST	2/7/2013
27236123	Hops Extract Corporation of America	N 2nd Ave & W Lincoln Ave Yakima, WA 98902	0.50 mi SW	LUST (NFA) UST	2/2/2007 2/2/2007
4274375	V1 Oil Company	1024 N 6th Ave Yakima, WA 98902	0.50 feet NW	UST	8/6/1996

🟥 High-Risk Sites

🟨 Low Risk Sites

[*] Sites on the Confirmed and Suspected Contaminated Sites List (CSCSL) on 8/19/21 do not have an interim action work plan (IAWP) in place (potential risk sites) (WSDOE 2021b)

LUST = Leaking Underground Storage Tank
ICP = Independent Cleanup Program
SCS = State Cleanup Site
VCP = Voluntary Cleanup Program
UST = Underground Storage Tank
NFA = No Further Action

Appendix C: Final (Revision 1) Interim Action Work Plan – Roadway Project Closed City of Yakima Landfill Site Yakima, Washington

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Final (Revision 1)
Interim Action Work Plan – Roadway Project
Closed City of Yakima Landfill Site
Yakima, Washington

July 29, 2019

Prepared for

City of Yakima

LANDAU ASSOCIATES

130 2nd Avenue South
Edmonds, WA 98020
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Final (Revision 1)
Interim Action Work Plan – Roadway Project
Closed City of Yakima Landfill Site
Yakima, Washington

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LIST OF ABBREVIATIONS AND ACRONYMS

µg/m^3	micrograms per cubic meter
AO	agreed order
CFR	Code of Federal Regulations
City	City of Yakima
COCs	contaminants of concern
County	Yakima County
CQA	construction quality assurance
CY	cubic yards
DAHP	Department of Archaeology and Historic Preservation
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management
EMMP	excavated materials management plan
EPA	US Environmental Protection Agency
ft	feet, foot
GAC	granular activated carbon
HASP	health and safety plan
HLA	HLA Engineering & Land Surveying, Inc.
H:V	horizontal to vertical
I-82	Interstate 82
IA	interim action
IAWP	interim action work plan
LAI	Landau Associates, Inc.
Landfill Site	closed City of Yakima Landfill Site
LFG	landfill gas
LIFT	Local Infrastructure Financing Tool
Lochner	H.W. Lochner, Inc.
mg/kg	milligrams per kilogram
Mill Site	Boise Cascade Mill Site excluding Landfill Site
MSW	municipal solid waste
MTCA	Model Toxics Control Act
NHPA	National Historic Preservation Act of 1966
pbv	percent by volume
PID	photoionization detector
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
ROW	right-of-way

LIST OF ABBREVIATIONS AND ACRONYMS (con't)

SAP	sampling and analysis plan
SEPA	State Environmental Policy Act
TPH	total petroleum hydrocarbons
TPH D/O	TPH diesel range/oil range
VOC	volatile organic compound
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation
Yakima Resources	Yakima Resources, LLC

1.0 INTRODUCTION

This document is an interim action work plan (IAWP) for a roadway project at the closed City of Yakima Landfill Site (Landfill Site) located in Yakima, Washington. This interim action (IA) is being conducted (Figure 1) pursuant to Section VII of Agreed Order (AO) No. 15861. The Landfill Site is located at the southern end of the Boise Cascade Mill Site. The area of the Boise Cascade Mill Site excluding and generally north of the Landfill Site is referred to herein as the “Mill Site.” The purpose of this IAWP is to ensure the construction of roadways over the Landfill Site (and a portion of the Mill Site adjacent to the north) will not exacerbate existing site conditions and will not interfere with any potential cleanup alternatives at the Landfill Site (or Mill Site). To this end, this work plan presents:

- Existing site conditions for the roadway prism over which the City of Yakima (City) and Yakima County (County) plan to construct the roadway alignment (Section 3)
- Design and construction information for the roadway alignment construction project, including landfill gas (LFG) mitigation measures (Section 5)
- Contingency plans should unexpected contamination be encountered in the roadway prism during construction (Section 7).

1.1 Assumptions and Definitions

The City adopts the following assumptions for the purposes of this IAWP:

- The IA work described herein is being performed solely as a result of the roadway construction project. The AO authorizes, but does not require, the City to execute the elements of the IAWP.
- Materials excavated from the site as part of the roadway project will be managed in accordance with Model Toxics Control Act (MTCA; Washington Administrative Code [WAC] 173-340) and other applicable regulatory requirements.
- The term “wood debris” used in this report includes wood chips, bark, logs, saw dust, whole or scrap milled or unmilled wood and lumber, and other general log yard material that has not been chemically treated or preserved. Wood debris is not a solid waste, hazardous waste, or dangerous waste. So long as any wood debris excavated from the roadway project site is not impacted by other hazardous substances or petroleum products, wood debris may be disposed or beneficially recycled, composted, or reused without restriction, consistent with Washington State Department of Ecology (Ecology) disposal guidance.
- The term “municipal solid waste” or “MSW” used in this report includes typical household waste materials such as product packaging, grass clippings, furniture, clothing, bottles, cans, food scraps, newspapers, appliances, consumer electronics, and batteries; as well as non-hazardous building materials/construction debris such as bricks, concrete and mortar rubble, roofing and siding materials, flooring materials, painted wood/lumber scraps, glass, sheetrock and wall board, and scrap metal. So long as any MSW excavated from the Landfill Site is not impacted by other hazardous substances, petroleum products, or hazardous or dangerous wastes, MSW will be managed and disposed as a solid waste at an appropriately permitted Subtitle D landfill.

- The terms "hazardous waste" or "dangerous waste" used in this report are waste materials that are listed or characteristic wastes as defined under Resource Conservation and Recovery Act (RCRA; 40 Code of Federal Regulations [CFR] 260/261) or Washington State Dangerous Waste (WAC 173-303) regulations. There are no known hazardous or dangerous wastes present in the roadway prism; however, there is a possibility that hazardous or dangerous waste could be present and encountered during roadway construction. If encountered, hazardous/dangerous wastes will be managed in accordance with MTCA and characterized and disposed of at an appropriately permitted Subtitle C landfill.
- Landfill gas is a complex mixture of gases generated by the microbial biodegradation of organic material within a landfill. LFG typically consists of approximately 40–60 percent methane, with the majority of the remainder being mostly carbon dioxide. LFG also includes a range of other trace gasses including vinyl chloride and other volatile organic compounds (VOCs). Because it is impracticable to distinguish methane generated from decaying wood debris from methane generated by MSW, the term "landfill gas" or "LFG" used in this report includes both the methane (and any other gaseous decay products) generated by the MSW and the methane generated by biodegradation of wood debris.
- Any soil, wood debris, or MSW that is determined to contain petroleum or other contaminants at concentrations above applicable regulatory limits will be managed in accordance with MTCA and disposed of at an appropriately permitted Subtitle D or C landfill based on applicable waste characterization.

1.2 Mill Site and Landfill Site Description and Background

The IAWP is submitted as part of the City's roadway infrastructure project. The project includes construction of a new roadway that will cross portions of the Boise Cascade Mill Site. The facility has been divided into two cleanup areas, the "Landfill Site" and the "Mill Site":

- The Landfill Site is defined by the extent of the MSW, including the extent of contamination associated with potential releases from the former landfill. The former landfill covers an area of approximately 33 acres and is located across portions of three parcels, including most of the approximately 38-acre landfill parcel (19131841001; owned by the Boise Cascade Corporation),[1] the southeast corner of the approximately 15.5-acre plywood mill parcel (19131842001; owned by the LeeLynn, Inc. and Wiley Mt., Inc.), and an area adjacent to Interstate 82 (I-82) that is owned and maintained by the Washington State Department of Transportation. The IA described herein and other cleanup activities on the Landfill Site are currently being conducted under AO No. DE 15861, executed between Ecology and the City, and effective on July 9, 2018.
- The Mill Site consists of the remainder of the Boise Cascade Mill Site, primarily located north of the railroad tracks, but also includes most of the former plywood mill parcel to the south of the tracks (northwest of the Landfill Site). A remedial investigation (RI) and other cleanup activities on the Mill Site are currently being conducted under AO No. DE 13959, executed between Ecology; OfficeMax Corporation; Dunollie Enterprises, LLC; LeeLynn, Inc.; Wiley Mt., Inc.; and Yakima Resources, LLC (Yakima Resources), and effective on February 17, 2017.

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[1] The Yakima County Assessor's website lists Boise Cascade Corporation as the current property owner. The City understands that the Boise Cascade Corporation changed its name to OfficeMax Incorporated and is currently operating as OfficeMax, Inc.

The roadway project includes a segment that extends north from the Landfill Site then turns and continues along an east-west corridor that crosses a portion of the former Mill Site operations area to the north of the Landfill Site.

The Boise Cascade Mill Site (Figure 2) includes 21 parcels, totaling approximately 207 acres in size, adjacent to the west of I-82. BNSF Railway railroad tracks run east-west bisecting the Boise Cascade Mill Site. LeeLynn, Inc. and Wiley Mt., Inc. own 19 of the parcels. Two parcels are owned by OfficeMax Corporation (Office Depot)—the landfill parcel located south of the railroad tracks and a triangular-shaped parcel (known as the "Triangle Parcel") located immediately north of the railroad tracks. The former City Landfill Site is located to the south of the railroad tracks at the south end of the former Boise Cascade Mill Site.

The City operated a municipal landfill between approximately 1963 and 1970 within the footprint of the Boise Cascade Mill Site. As part of landfill operations, MSW was placed in a former log pond that originally occupied the sound end of the Boise Cascade Mill Site. (City of Yakima 1996). When landfill operations ceased, the MSW was covered and the area brought to grade with a mixture of fill soil and wood debris (bark, wood chips, discarded logs, and other log yard material). The landfill parcel area was then used until 2010 for log storage, including temporary log storage and log-chipping operations by the tenant of the landfill parcel, Yakima Resources.

1.3 Roadway Project Background

In 2008, the City received a Local Infrastructure Financing Tool (LIFT) award from Washington State for redevelopment of the area in the vicinity of the Boise Cascade Mill Site (City of Yakima 2018). The redevelopment project is known as the "Cascade Mill District Development Project" or the "Cascade Mill Site." The project objective is redevelopment of the Boise Cascade Mill Site with mixed use, commercial, and light industrial properties. The project includes access from I-82 to the properties as well as a new roadway corridor and bridge across the Yakima River that will connect Terrace Heights to Yakima (which is being designed in coordination with the County and Washington State Department of Transportation [WSDOT]), and east-west and north-south corridors through the Landfill Site and south end of the Mill Site. The proposed roadway alignment is shown on Figure 3.

The planned transportation corridors that will extend across the Landfill Site include the northern extension of Bravo Boulevard and the east-west corridor from East H Street to a new bridge crossing over I-82 and the Yakima River (Figure 3). The transportation planning, civil engineering, and design team (design team) of H.W. Lochner, Inc. (Lochner) and HLA Engineering & Land Surveying, Inc. (HLA) and their subconsultants, in consultation with the City and Yakima County, are designing the transportation corridor. Landau Associates, Inc. (LAI) is providing environmental engineering, design, support, and consultation to the City and the design team for supplemental elements of the roadway project associated with the IA.

1.4 Purpose/Reason for Interim Action

The IA is necessary because the proposed transportation corridor will require construction activities in many areas of the Landfill Site and a portion of the Mill Site known to contain wood debris and MSW.

The IAWP will:

- comply with the Landfill Site AO;
- prevent health and safety risks for roadway construction and maintenance workers or the general public from LFG;
- prevent potential exacerbation of contamination in groundwater;
- prevent unintentional or unauthorized release or disposal of dangerous or solid waste; and
- not foreclose the viable implementation of reasonable alternatives for a final cleanup action at the Landfill Site or Mill Site.

To fulfill these objectives, the transportation corridor plans will include designs, procedures, or allowances to:

- mitigate and manage potential accumulation of LFG beneath low-permeability surfaces that could inhibit natural ventilation and could result in uncontrolled lateral migration;
- collect, manage, and transport offsite precipitation that falls on the low-permeability roadway surface to prevent the concentration and/or infiltration of stormwater through wood debris and landfill material;
- properly observe and perform cutting and filling (excavation and grading) in areas of accumulated wood debris and MSW such that known solid waste or previously unidentified dangerous waste or other dangerous materials that may be encountered during construction (including potentially impacted groundwater) are property identified, characterized, managed, and disposed of in accordance with applicable, relevant, and appropriate requirements, including local, state, and federal health and safety, disposal, and cleanup laws and regulations; and
- complement or supplement the final cleanup work, should any be required, and will not foreclose the possibility of any reasonable alternative for final cleanup of the site pursuant to WAC 173-340-430(3)(b).

This IAWP complies with WAC 173-340-430 and the Landfill Site AO. It documents the features of the roadway design and construction procedures that address or account for the items listed above. While these design and construction requirements are not required by MTCA, they will provide Ecology with necessary information to ensure that the MTCA cleanup and contamination, to the extent any exists in the Landfill and Mill Sites, will not be exacerbated by the roadway construction.

2.0 DESCRIPTION OF INTERIM ACTION

The Landfill Site IA includes construction of a roadway extension and associated utilities for the Mill Site development between Martin Luther King, Jr. Boulevard to the existing street system at East H Street and 7th Avenue with a roundabout connection to the proposed east-west corridor. The street improvements consist of a boulevard-style four-lane arterial with roundabouts at the south and north intersections, as well as a midpoint roundabout and extensive landscaping elements. The project improvements include hot-mix asphalt pavement, curb and gutter, sidewalks, illumination, railroad crossing, pavement markings, storm drainage, sanitary and industrial sewer mains, potable water mains, and landscaping.

Based on current construction design drawings, the roadway construction will include removal of all wood debris and MSW within the roadway prism down to the underlying native soil and replacement with clean structural fill. The City and its design team determined that this construction method was required for geotechnical purposes. Complete removal will minimize the potential for roadway settlement due to natural biodegradation of the wood debris and MSW, and facilitate installation of utilities located beneath the roadway that may be installed as deep as 20 feet (ft) below the existing grounds surface.

The excavation of the MSW/wood debris will generally be sloped at a maximum 2:1 incline starting as much as 20 to 60 ft outside the roadway/sidewalk extents to allow for a maximum 20-ft excavation beneath the entire width of the roadway. The excavation will be backfilled with clean imported fill following utility installation and placement of an LFG barrier membrane along the sloped faces of the roadway fill prism. Following excavation backfill and surface grading, the paved infrastructure of the roadway alignment will be constructed as shown on Figures 4 and 5.

Because construction of the roadway corridor (low-permeability cap) will potentially affect LFG ventilation, migration, or exposure, a LFG migration barrier will be included in the roadway construction to protect public health and safety. The LFG control system will consist of:

- A low-permeability geosynthetic membrane which is a roll-out material placed over the roadway fill prism faces to reduce LFG migration below the roadway
- Sealed boots around utility laterals to prevent LFG migration along utility corridors/lines that intersect/penetrate the membrane
- Trench dams to reduce lateral LFG migration through the high-permeability utility corridor backfill.

Details of the LFG mitigation system are provided in Section 5.1 and on Figure 6. This LFG mitigation is required under worker health and safety requirements. Although LFG may be a MTCA-regulated media, this work is not being conducted pursuant to MTCA but is documented here as part of this IAWP.

The complete removal of wood debris and MSW is a geotechnical issue at the Landfill and Mill Sites. The removal shall not act as precedent for later feasibility study remediation options. Further, the LFG migration barrier shall not act as precedent for final cleanup options at the Landfill Site. Finally, the wood debris and MSW removal and LFG migration barrier will not exacerbate conditions and will not interfere with potential final remedies at the Landfill Site.

3.0 EXISTING SITE CONDITIONS

The following summarizes known existing conditions at the Landfill Site and the portion of the Mill Site within the roadway right-of-way (ROW).

3.1 Existing Conditions – Landfill Site

Based on prior investigations, including the interim RI (LAI 2015a) and supplemental RI investigations (LAI 2015b), the subsurface conditions at the Landfill Site are generally characterized by the presence of buried wood debris associated with the historical mill activities, and MSW deposited at the site during the landfill's active operational years. Extensive soil and groundwater investigations have been conducted to evaluate the presence (or absence), magnitude, and extent of a wide variety of contaminants of concern (COCs). After evaluation of the results of the RI activities, the indicator hazardous substances at the Landfill Site have been determined to be:

- Methane and vinyl chloride in LFG
- Dissolved metals in groundwater including:
    - Arsenic
    - Iron
    - Manganese.

It is assumed that these dissolved metals are present in groundwater due to reducing conditions associated with groundwater contact with and leaching of organic materials from the landfill and wood debris from both the Landfill and Mill Sites, and the high natural oxygen demand associated with the biologic degradation of these organic materials. The MSW and wood debris excavation that will be performed as part of roadway construction will likely mitigate or reduce these impacts to site groundwater through large-scale removal of organic and putrescible materials above or in contact with the groundwater in the roadway prism. Additionally, the road construction will aid in the control of stormwater that would otherwise infiltrate through the MSW and wood debris within the roadway prism.

LAI conducted additional investigations related to characterizing LFG and the volume of wood debris present on the Landfill Site in 2016 to aid in the design of the transportation corridor, attached as Appendix A (LAI 2018). This work included conducting test pit exploration to further evaluate and document the lateral and vertical extent, occurrence, and physical characteristics of the wood debris present along the proposed roadway alignments. LAI also installed and sampled additional LFG monitoring probes along the roadway alignment. LAI submitted all data from these activities to Ecology's Environmental Information Management (EIM) system pursuant to the Landfill Site AO.

The LFG and wood debris investigations included the following findings:

- Wood debris is present at various thicknesses below the majority of the proposed roadway alignment south of the railroad track.
- The volume of in-place wood debris within 10 ft of the ground surface under the proposed roadway prism (on both the Landfill Site and Mill Site) was estimated at 46,900 cubic yards (CY).
- It is estimated that approximately 117,500 in-place CY of MSW (and comingled wood debris) is present below the proposed roadway alignment.
- MSW and wood debris continue to generate LFG. The highest concentrations of methane, ranging from approximately 48 to 72 percent by volume (pbv), were detected in areas of buried MSW. Lower methane concentrations were detected outside the landfill boundaries where only buried wood debris is present, ranging from approximately 1 to 30 pbv. Methane was not detected at monitoring points where MSW or wood debris is not present, except at locations in close proximity to MSW or wood debris deposits.
- VOCs typically associated with LFG were detected in samples collected from sample points within the boundaries of the landfill. However, they are present at low concentrations when compared against landfills with more recent deposits. The highest observed total VOC concentration was approximately 76,500 micrograms per cubic meter ($\mu g/m^3$). This is less than 3 percent of the concentration typically present in LFG (US Environmental Protection Agency [EPA] 2008). Vinyl chloride was detected in LFG samples at concentrations that may exceed regulatory criteria at the point of discharge and trigger the need for treatment prior to discharge.

3.2 Existing Conditions – Mill Site (Roadway Alignment)

Numerous previous investigations have been conducted at the Mill Site, including in the southern end (within and proximate to the roadway alignment), much of which is summarized in the Supplemental RI investigation Report (LAI 2015b) or the Revised Final Remedial Investigation Work Plan for the Mill Site (Barr/Fulcrum 2019). LFG and wood debris evaluation conducted by LAI in 2006 (Appendix A) also included investigation activities in the southern end of the Mill Site. Based on these investigations, the subsurface conditions at the Mill Site are generally characterized by the presence of buried wood debris along the eastern end of the portion of the roadway alignment located on the Mill Site in the historical log pond areas. The western portion of the roadway alignment passes through areas of historical wood mill buildings, where some suspected areas of contamination exist related to historical site operations. Additionally, investigations have been performed and data collected at the former Plywood Mill area of the Mill Site located adjacent to the northwest of the Landfill Site (south of the railroad tracks), which have identified groundwater contamination that may have migrated beneath portions of the roadway alignment.

Known contaminants of concern for various site media that have been identified by these various investigations include:

- Based on two shallow test pit soil samples from an area of the roadway alignment proximate to the north of the railroad tracks, total petroleum hydrocarbons (TPH) were detected in the oil range at concentrations as high as 14,000 milligrams per kilogram (mg/kg) within approximately two feet of ground surface. Based on observations from these two test pits and other nearby test pits with no evidence of petroleum contamination, there may be as much as 2,800 CY of TPH-contaminated soil in this area of the proposed roadway alignment.

- Decomposing wood debris on the Mill Site is generating methane. Methane detected in soil gas monitoring wells where only buried wood debris is located (i.e. north of the railroad tracks and outside of the MSW landfill boundaries) has been measured at concentrations ranging from approximately 1 to 30 pbv.
- Dissolved metals are also present in groundwater at the Mill Site due to reducing conditions associated with groundwater contact with and leaching of organic materials from wood debris located at the Mill Site. Similar to the Landfill Site, the primary metals of concern are arsenic, iron, and manganese.

Based on the Mill Site Draft Remedial Investigation Work Plan (Barr/Fulcrum 2019), other suspected or potential contaminants of concern within the roadway alignment may include:

- Chromium (unspeciated) and polycyclic aromatic hydrocarbons (PAHs) have been identified in a limited number of soil samples in the area around the former “Boiler House”; however, the nature and extent have not been determined. Polychlorinated biphenyls (PCBs) and mineral oil may also be present in this area due to the former presence of an electrical capacitors in the Boiler House and other oil-filled transformers in this area.
- TPH in the diesel- and oil-range (TPH-D/O) have been detected in groundwater in the vicinity of the former plywood mill area. Based on groundwater data from monitoring wells, dissolved-phase TPH-D/O may have migrated beneath the roadway corridor in the area east of the former plywood mill of the south of the railroad tracks.

4.0 ALTERNATIVE INTERIM ACTIONS CONSIDERED

During planning and design of the transportation corridor, various alternatives were considered to address geotechnical conditions beneath the roadway prism. Of all of the geotechnical alternatives considered, only the full removal of MSW and wood debris resulted in meeting the roadway project geotechnical needs.

This design choice represents the most conservative action from an environmental perspective. As the most conservative potential approach for landfill cleanup, this alternative presents no issues with analysis of the range of likely final remedial alternatives that will be considered, nor will be likely to interfere with performance of the final selected MTCA cleanup. The ROW removal will result in an approximate 25 percent reduction in MSW and wood debris for the entire former Landfill Site, and reduction of wood debris from sections of the Mill Site. Therefore, this action will not foreclose any reasonable remedial technologies that may be evaluated or selected for the final cleanup action.

5.0 DESIGN AND CONSTRUCTION REQUIREMENTS

Construction of the roadway corridor will require excavating all wood debris and MSW from below the roadway to the underlying native material or to the final depth of utilities to be located beneath the roadway, whichever is deeper. Drawings showing the excavation are provided in the City's Bravo Company Boulevard roadway design package (not included with this report). The excavation faces will then be covered with a geocomposite LFG migration barrier. Following removal of MSW and wood debris, subsurface utilities will be installed, the excavation will be backfilled with clean fill imported from offsite, and the surface infrastructure of the roadway alignment will be constructed.

More specifically applicable to this IA, the transportation corridor plans will incorporate designs and plans to:

- Mitigate potential LFG migration toward the roadway prism;
- Collect and manage stormwater falling on the impermeable surfaces of the roadway; and
- Properly dispose of soil, wood debris, and MSW removed during excavation for roadway construction and characterize, manage, and dispose of previously unidentified hazardous or dangerous waste if encountered during construction.

Each of these components will be compatible with the final remedy selected for the site. Details for the design of each of these components are presented in the following sections. A summary of the design and specification preparation steps and the relationship/integration of such into the final roadway design package, and a summary of other pertinent construction and implementation requirements is also included below.

5.1 LFG Migration Mitigation

Because all wood debris and MSW will be removed from the roadway prism, LFG will not be generated below the roadway after completion of the interim action. The LFG migration barrier will therefore be designed to prevent potential migration of LFG from and generated by adjacent biodegradable materials into the roadway prism. This will minimize the potential for accumulation of LFG in the subsurface beneath low-permeability roadway surfaces that could inhibit natural ventilation and/or result in uncontrolled lateral migration, which could occur through higher permeability fill materials (e.g., gravel backfill in in utility corridors). The LFG migration barrier will consist of the following components:

- LFG barrier/membrane layer beneath the lateral limits of the roadway fill prism to prevent lateral migration of LFG from remaining MSW and wood debris proximate to the roadway corridor to beneath the roadway and along utility corridors associated with the roadway project
- Sealed boots around utility laterals to prevent LFG migration along utility corridors/lines that intersect/penetrate the membrane
- Trench dams to prevent off-site migration of LFG through utility corridors.

5.1.1 LFG Barrier Layer

The LFG barrier layer will be a geosynthetic membrane material, which is a flexible roll-out material. Installation will be accomplished by securing the lower end of the membrane in an anchor trench at the bottom of the fill prism slope and rolling out the membrane vertically over the fill prism at a minimum slope of 2 horizontal: 1 vertical (2H:1V) to a maximum slope of 1H:1V. The top of the membrane will be terminated at the inside edge of the sidewalks along the roadway corridor; the strip of landscaping between the sidewalks and roadway surface will thereby act as a natural ventilation point for any (unanticipated) LFG that migrates beyond the barrier and into the roadway prism. Membrane overlaps and seams will be completed and sealed as necessary in accordance with the manufacturer’s recommendations. Penetrations of the membrane by utility laterals and stubs will be sealed with boots in accordance with the manufacturer’s recommendations. LAI will conduct a quality control inspection before cover is placed to ensure proper construction and installation.

5.1.2 LFG Regulatory Compliance

The LFG migration barrier system described above would not trigger any requirements for an air permit; however, LFG production rates were evaluated for potential regulatory compliance requirements in the Landfill Gas Evaluation technical memorandum prepared for the site by LAI (Appendix B; LAI 2017)) in case the design were to be modified to include point source air discharges (e.g., supplemental LFG venting systems).

The LFG production rate for the Landfill Site developed in the technical memorandum are for the remaining landfill and wood debris at the site and can be used to estimate potential LFG discharge rates from any supplemental venting systems that may be installed. However, the LFG discharge rates at such vents would be significantly lower than the overall LFG production rates developed in the technical memorandum and are not anticipated to trigger air permitting requirements.

5.2 Stormwater Management

The roadway designs include a system to collect, manage, and transport offsite precipitation that falls on the low-permeability surfaces of the roadway is needed to prevent the concentration and/or infiltration of stormwater through wood debris and landfill material that could result in exacerbation of groundwater conditions. Stormwater controls are included in the roadway design to minimize the potential for this, including stormwater collection and sewer lines to direct and transport stormwater runoff offsite. The designs do not include any engineered features for onsite stormwater infiltration such as infiltration ponds, swales, or other types of infiltration galleries.

During construction, other stormwater related controls must be considered including obtaining and complying with the conditions of a Construction Stormwater General Permit, including preparing applicable stormwater management plans and providing temporary erosion and sediment controls for excavation and grading areas to prevent potential migration of stormwater runoff and sediment. Treatment of collected stormwater will be performed as indicated in Section 7.2.2.

5.3 Groundwater Management

If groundwater is encountered during construction, the contractor should be aware of general groundwater conditions in the roadway project area, which includes the presence of dissolved metals (primarily arsenic, iron, and manganese). Additionally, as indicated in Section 3.2, prior investigations have identified TPH-D/O in groundwater in the vicinity of the former plywood mill area which may have migrated east from the former plywood mill area and beneath the roadway corridor in the area immediately south of the railroad tracks. Treatment of collected groundwater will be performed as indicated in Section 7.2.2.

5.4 Excavated Materials Management

Soil, wood debris, and MSW excavated during construction must be properly handled and disposed of or appropriately recycled to prevent spreading contamination outside the project boundaries. Only appropriately certified facilities will be used for disposition or recycling of excavated material. Excavated MSW must be disposed of at a Subtitle D-permitted disposal facility. The nearest appropriate facilities to the site include, but are not limited to:

- Terrace Heights Landfill – 7151 Roza Hill Drive, Yakima, Washington
- Cheyne Landfill – 4970 Cheyne Road, Zillah, Washington
- Greater Wenatchee Landfill and Recycling Center – 191 Webb Road, East Wenatchee, Washington
- Roosevelt Regional Landfill – 500 Roosevelt Grade Road, Roosevelt, Washington
- Columbia Ridge Landfill – 18177 Cedar Springs Lane, Arlington, Oregon.

If appropriately characterized, wood debris may be hauled to a permitted wood material recycling or composting facility; or it may be sent to the same disposal facility as the MSW.

5.4.1 Disposal of MSW and Wood Debris

Excavated MSW and wood debris will be segregated for disposal if separate disposal and recycling facilities are used for each material. If required by the disposal facility (i.e. if existing sampling data is not sufficient for facility characterization, profiling, and acceptance criteria), soil, MSW, and wood debris may be stockpiled on-site and sampled for waste or recycling characterization analysis.

If necessary, additional excavated materials management details for MSW and wood debris are provided in the Excavated Materials Management Plan (EMMP) provided in Appendix C, and the Sampling and Analysis Plan (SAP) provided in Appendix D.

5.4.2 Management of Previously Unidentified Dangerous or Hazardous Waste

Because of the nature of older landfills, there is a potential for unexpected waste materials to be encountered during mass excavation activities. If potentially dangerous, hazardous, or otherwise regulated waste materials are encountered during construction, these materials will need to be properly characterized for protection of worker health and safety and in order to determine proper materials management and disposal requirements.

In the event that unidentified or unanticipated waste materials are encountered during construction activities, the EMMP provided in Appendix C and the SAP provided in Appendix D may be used by the City and its contractor(s) during the construction activities. These documents address recognition of known and unanticipated contamination and characterization of contamination, as well as issues related to excavated materials and associated stormwater handling and disposal.

5.5 Integration of Interim Action Design Elements into Roadway Project Designs

It is the City's intent to procure a single general contractor to coordinate and perform all elements of the roadway construction project, including each of the construction elements of the IA described in this work plan. As such, the City also intends to prepare and provide one comprehensive bid set of construction design drawings and specifications for bidding/contracting and a final construction set to the selected general contractor to inform and direct the construction work.

In order to accomplish this objective, LAI has been working and will continue to work closely with the City and its design team to integrate the requirements and conceptual designs presented in this work plan into the roadway design package. This includes working on the following elements for inclusion/integration into the roadway design package:

- Determine the final cut and fill profiles for the roadway needed to accommodate both the roadway and associated infrastructure (e.g., roads, sidewalks, utility corridors) and the necessary elements of the IA (e.g., LFG migration barrier and applicable extent of MSW and wood debris removal).[2]
- Preparation of bid and construction ready designs and specifications for the specific IA design elements described above, including identification of specific performance standards and inspection/documentation requirements for installation (and protection during subsequent construction activities) of the LFG migration barrier to confirm adequate completion of construction.
- Identification of stormwater permitting and management/treatment requirements, including erosion and sediment control measures.

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[2] Based on the cut and fill profiles, the dimensions and extent of the land needed for property acquisition, construction easements, and utility easements for the roadway project ROW will also be determined.

- Identification of groundwater management/treatment requirements if encountered during construction.
- Identification of specific applicable and appropriately permitted waste disposal facilities to be contracted for disposition of materials excavated from the roadway ROW, as necessary.
- Preparation of a cultural resources plan as required by DAHP, including an inadvertent discovery plan, and/or to provide needed information for the State Environmental Policy Act (SEPA) documentation and for the roadway project.

The City's design team has reviewed this IA Work Plan for feasibility and constructability. While conditions and project design may change, the likelihood of modifications at this point or in the future is minimal. Therefore, the design team has reviewed the pertinent sections of this report and agree that the applicable elements of the IA Work Plan related to the roadway are constructible, feasible, and conform to construction practices and norms. The requirements and design elements outlined in the IA Work Plan will be incorporated into construction plans, provided to contractors, and carried out (or modified as necessary) in consultation with appropriate parties, regulators, and stakeholders.

5.6 Monitoring Well Decommissioning

A number of existing groundwater and landfill/soil gas monitoring wells are located within the proposed roadway alignment. Consequently, the following wells may need to be decommissioned to accommodate the roadway construction activities:

Landfill gas monitoring probes

- GP-11
- GP-28
- GP-32
- GP-33
- GP-34
- GP-35
- GP-36
- GP-37
- GP-38
- GP-39
- GP-40
- GP-41
- GP-43
- GP-44

Groundwater monitoring wells

- MW-101
- MW-102
- MW-104
- MW-106
- MW-109.

As applicable, each of these wells will be decommissioned in accordance with Ecology's Minimum Standards for Construction and Maintenance of Wells (WAC 173-160-460). Other existing wells located proximate to the roadway alignment may also need to be removed to accommodate excavation or other construction activities, in which case they will be decommissioned in the same manner.

As required by Ecology, certain groundwater monitoring wells and landfill gas monitoring probes may need to be re-installed to monitoring site conditions after completion of roadway construction (see Section 7.2.3). Unless otherwise approved by adjacent land owners, these wells will be installed within the City-owned roadway ROW.

6.0 INTEGRATION WITH FINAL REMEDY

The IA will allow for the final selected remedy for the Landfill Site to be complementary or supplementary to the IA and the infrastructure installed as part of the roadway project and not foreclose reasonable alternatives for the final cleanup action at the site. The feasibility studies for the Landfill and Mill Sites have not been prepared, so the final remedy is currently unknown. However, based on the large volume of MSW and wood debris at the site, excavation and off-site removal would likely present a disproportionate cost relative to the benefit of performing such removal. Some form of capping and containment (with integrated LFG management, if needed) is, therefore, assumed to be the most likely option for the final remedy.

If a graded soil/vegetated cap is selected as the final remedy, this can easily be integrated with the IA with appropriate grading considerations.

If a low-permeability cap that extends over the Landfill Site is selected for the final remedy, the cap could be integrated with the roadway alignment by extending the cap to the edge of the alignment such that the cap and roadway form a continuous low-permeability surface. The cap's LFG management system would not be affected by the proposed LFG barrier for the roadway alignment.

Although very unlikely to be selected as a final remedy, the IA would also not preclude excavation and removal of the remaining MSW and wood debris. Because construction of the roadway will include removal of MSW and wood debris below the alignment, the full-site excavation would only need to extend to the limits of the roadway prism to remove the remaining waste.

7.0 COMPLIANCE MONITORING

Compliance monitoring will be conducted to confirm the effectiveness of the IA. Compliance monitoring consisting of protection, performance, and confirmation monitoring is required for the project. To the extent the project implicates any permitting or other relevant or applicable regulatory requirements including or beyond what is discussed below, the City will comply through its AO process with Ecology.

7.1 Protection Monitoring

Protection monitoring addresses worker health and safety for activities related to construction activities during the interim action, as well as protection of the general public, if conditions are encountered that indicate that workers or the general public could be exposed to hazardous substances or conditions.

Worker health and safety will be addressed through a project health and safety plan (HASP). The requirements for a project HASP will be included in the project construction documents, and the contractor will prepare the HASP to protect workers from exposure to hazardous materials during construction. The HASP will address potential physical and chemical hazards associated with Landfill Site activities and shall be prepared using requirements and guidance from, but not limited to:

- National Institute for Occupational Safety and Health/Occupational Safety and Health Administration/EPA: Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities
- 29 CFR 1910.120: Hazardous Waste Operations and Emergency Response
- 29 CFR 1926: Safety and Health Regulations for Construction
- 49.17 Revised Code of Washington: Washington Industrial Safety and Health Act
- WAC 173-340-810: Worker Safety and Health
- WAC 296-24: General Safety and Health Standards
- WAC 296-155: Safety Standards for Construction Work
- WAC 296-843: Hazardous Waste Operations.

The HASP shall provide for protection of the contractor’s personnel and the public and contain the following:

- Procedures to monitor worker safety (e.g., monitoring equipment, frequency of monitoring, required actions if monitoring indicates a dangerous situation)
- List of responsible individuals, including the site safety officer, and their respective duties
- Site organization; describing work zones (exclusion zone, contamination reduction zone, and support zone); access and mobility between zones
- List of physical and chemical hazards associated with the anticipated work tasks
- Routes to the nearest hospital or urgent care facility
- Description of personal safety equipment and the appropriate action levels
- Decontamination procedures for personnel and equipment.

Anticipated potential physical hazards include working in proximity to heavy equipment, heat stress or cold stress, working in shored and unshored excavations, vehicular traffic, and potentially combustive, flammable, explosive hazards related to wood debris, MSW, and LFG (e.g., methane). Anticipated potential chemical hazards include exposure to Landfill Site contaminants through various exposure pathways (i.e. direct contact, inhalation, and ingestion). Because the IA includes extensive excavation in areas known to contain MSW, wood debris, LFG, and contaminated groundwater, screening during construction for potential chemical exposure will need to be conducted. This will include use of a photoionization detector (PID) and an intrinsically safe multi-gas meter to screen for VOCs, methane, and hydrogen sulfide during construction. The HASP will address screening frequency and methods and include screening levels at which engineering controls and/or elevated personal protective equipment (PPE) will be required.

Oversight and protection monitoring performed during and after roadway construction by LAI will be performed under a site-specific HASP.

7.2 Performance Monitoring

Performance monitoring will consist of construction quality assurance (CQA) monitoring to confirm that the IA is constructed according to the IA design drawings and specifications, and proper excavated materials management is conducted to ensure that soil, wood debris, and MSW is properly handled and disposed. CQA monitoring will include physical testing and construction observations, as applicable. This will include a post-excavation survey to identify the limits of soil, MSW, and wood debris removal performed during roadway construction. Proper treatment and testing of stormwater and/or groundwater collected during construction will also be included as required by permit conditions and/or as necessary to discharge. Pre- and post-construction groundwater quality monitoring will also be performed to document any changes to groundwater quality as a result of IA and construction activities. Management procedures for excavated materials, including handling, storage, and disposal are addressed below.

7.2.1 Excavated Materials Management

As applicable, excavated material may be managed as suggested in the EMMP provided in Appendix C. In general, excavated material may be segregated based on physical/visual characteristics into soil, MSW, and wood debris stockpiles on-site until waste and or recycling characterization and profiling is complete. Existing data for chemical concentrations in soil, MSW, and wood debris from sampling locations nearest the roadway alignment will be used to provide information on potential COCs in the various excavated media that would require characterization analysis. Previously unidentified contaminated materials encountered during construction will be sampled and analyzed to characterize the type of contamination encountered. If needed, waste characterization and unidentified materials sampling and analysis procedures are included in the SAP provided in Appendix D.

All excavated material will be recycled or disposed of at an appropriate offsite recycling or disposal facility in accordance with Washington State regulations. Transportation manifests for waste materials will be signed and tracked for disposal recordkeeping purposes and to ensure that wastes are tracked from the time they are first created until they are properly treated, disposed, or recycled.

Potentially contaminated material encountered during construction that does not require removal for construction purposes will remain in place unless over-excavation is specified by the City. The location(s) and contamination characteristics of newly identified contaminated material (if any) shall be documented. The location and quantity of MSW, wood debris, and other contaminated material excavated or otherwise removed from the site will be documented through post-excavation survey(s) to provide applicable information for as-built drawings (see Section 8.0).

7.2.2 Stormwater and Groundwater Collection, Containment, and Disposal

Stormwater and groundwater accumulated or collected in trenches/excavations will be contained as necessary, sampled, and treated as needed prior to discharge to the City's sanitary or storm sewer system, depending on the permit conditions. It is assumed that treatment will consist of filtrations using granular activated carbon (GAC), with additional turbidity removal if discharge will be to the storm sewer. However, this treatment approach will be modified as necessary depending on the permit requirements and observed conditions. For example, if liquid-phase petroleum is observed in excavations or collected stormwater, adsorbent booms and pads may need to be deployed and/or an oil-water separator may need to be included in the treatment train. All discharges and monitoring/sampling thereof will comply with the provisions of the requisite permit obtained by the contractor. Groundwater Quality Monitoring

Pre- and post-construction groundwater sampling events will be performed and the results compared to assess and document groundwater quality and potential impacts to groundwater quality as a result of the IA and roadway construction activities. This monitoring will consist of one sampling event at the following monitoring wells prior to commencing IA/roadway construction activities:

- FPP-MW-1
- FPP-MW-2
- FPP-MW-3
- TP-MW-1
- TP-MW-2
- MW-5
- MW-6
- MW-7
- MW-8
- MW-9
- MW-11
- MW-14
- MW-15
- MW-16
- MW-17
- MW-18
- MW-100
- MW-101
- MW-102
- MW-103
- MW-104
- MW-105
- MW-106
- MW-107
- MW-108
- MW-109

As indicated in Section 5.6, monitoring wells MW-101, MW-102, MW-104, MW-106, and MW-109 may need to be decommissioned prior to commencing construction activities. Therefore, the post-construction groundwater quality monitoring event will be performed at all the same wells as during the pre-construction except for these wells. New monitoring wells will also be installed (in accordance with WAC 173-160) to replace monitoring wells MW-101 (because of its location with respect to the former plywood plant TPH groundwater plume) and MW-109 (which monitors groundwater downgradient of the western edge of the MSW). In addition to the list of wells above, these replacement wells (and any additional replacement wells required by Ecology[3]) will also be sampled during the post-construction monitoring event.

7.2.3 Cultural Resources

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires federal agencies to consider a project, activity, or program's effects on historic properties of projects. They carry out, assist, fund, permit, license, or approve throughout the country. If a federal or federally-assisted undertaking may affect historic properties, a Section 106 review will take place. Section 106 gives the state historic preservation office, in this cast the Department of Archaeology and Historic Preservation (DAHP), interested parties, and the public a chance to weigh in on activities before a final decision is made. This process is an important tool for citizens to lend their voice in protecting and maintaining historic properties in their communities.

The proposed work for removing MSW and wood debris from the roadway corridor will be included in the Section 106 process. Based on the scope of the ground disturbing activities planned for the roadway corridor, the East West Corridor *Project Area of Potential Effect* (approved by DAHP July 30, 2013) will be modified to include the proposed additional work within the Landfill Site and the Mill Site. Once this modification is completed, WSDOT will instruct Yakima County to supplement the Cultural Resources Report (dated July 14, 2014) to document the effects of the additional project activities for the additional areas. This supplemental report will be circulated to DAHP for concurrence and all interested tribes for comment. After this concurrence and comment period, the approved document will be provided to Ecology prior to any ground disturbing activities. The updated Section 106 document comments may trigger mitigation activities during construction, which may include the right to observe or inspect areas of active construction. The City and County will comply with any outcomes from the forthcoming Section 106 process, and will allow observation, inspection, or other elements as determined through completion of, and comments to, the cultural resources report.

If required by DAHP, ground disturbing activities near the interface of the MSW and wood debris with native soil may require monitoring by an archaeologist for evidence of cultural resources. Additionally, The City and county will work in good faith with the Yakama Nation to provide an opportunity for appropriate representatives[4] to observe the excavation interface with native soil during construction. Any cultural resource monitoring will be done in accordance with applicable regulations. Depending on DAHP's determination, a Cultural Resources Plan/Inadvertent Discovery may be developed for the roadway contractor to follow when performing subgrade excavation and construction activities. The

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[3] Depending on the final inventory of monitoring wells removed due to construction and/or the results of post-construction sample analysis, a final determination of which wells will be replaced will be identified in consultation with Ecology. Similarly, the final list of soil gas probes to be replaced and monitored will be determined in consultation with Ecology based on final roadway design considerations.

[4] All personnel entering the excavation must have appropriate health and safety training and certification to work within the exclusion zone of a cleanup site and in accordance with the Site-specific health and safety plan and applicable regulations.

City and County and its contractors and agents, will implement procedures in any Cultural Resources Plan/Inadvertent Discovery Plan.

Although not identified during previous Site investigation activities, if archaeological resources are discovered during construction, work will be stopped immediately and the City, the County, and their respective contractors and agents, Ecology, DAHP, the City, and the appropriate Tribes' Cultural Resources Department will be notified by the close of business on the day of discovery. A licensed archaeologist will inspect the Site and document the discovery, provide a professionally documented site form, and report to the above-listed parties. In the event of an inadvertent discovery of human remains, work will be immediately halted in the discovery area, the remains will be covered and secured against further disturbance, and the Yakima Police Department and Yakima County Medical Examiner will be immediately contacted, along with the DAHP Physical Anthropologist and authorized Tribal representatives. A treatment plan by a licensed archaeologist would then be developed in consultation with the above-listed parties consistent with Revised Code of Washington (RCW) 27.44 and RCW 27.53 and implemented according to Chapter 25-48 WAC.

7.3 Confirmation Monitoring

Confirmation monitoring will consist of sampling LFG monitoring probes, which will be installed within the roadway prism to monitor for potential migration through or past the geosynthetic LFG barrier layer. LFG monitoring may also be conducted in subsurface utility vaults along the alignment to evaluate the LFG barrier membrane's ability to prevent LFG migration beneath the roadway alignment. The LFG probes will also be monitored quarterly for the first year, and then as needed thereafter until a cleanup action plan is developed.

After completion of performance monitoring and sampling (Section 7.2.3), groundwater monitoring wells within the roadway right-of-way on the Mill Site will be monitored in accordance with the Mill Site AO and/or RI Work Plan (Barr/Fulcrum 2019). Additional groundwater monitoring at the Landfill Site will be performed, as required, in conjunction with the cleanup action plan for the final remedy.

Sampling procedures are detailed in the SAP provided in Appendix D.

8.0 REPORTING

As required under the AO, within 60 days of completion of IA activities, a draft Interim Action Report will be prepared for submission to Ecology. The Interim Action Report will include, as applicable:

- A written summary of IA construction activities.
- A summary of deviations from this IAWP.
- As-built survey results for IA related work.
- As-built drawings identifying the limits of excavation of MSW, wood debris, and removal of any other identified contaminated materials.
- As-built drawings of the location, layout, and details of the LFG migration barrier.
- Select pertinent photographs of IA construction activities and infrastructure installation.
- Copies of construction and performance monitoring and inspection results.
- Pre- and post-construction groundwater quality monitoring results.
- Copies of analytical laboratory reports (and tabulated data summaries) for any applicable performance or confirmation sampling results.
- Waste disposal documentation, including:
    - Bills of lading
    - Waste manifests
    - Weight tickets
    - Estimates of total MSW, wood debris, and contaminated soil volumes removed for offsite disposition
    - Estimates of groundwater volume treated and discharged during construction activities.

The report will be finalized after applicable review and approval by Ecology.

9.0 USE OF THIS REPORT

This IAWP has been prepared for the exclusive use of the City of Yakima and Washington State Department of Ecology for specific application to the transportation corridor project and interim action at the closed City of Yakima Landfill Site. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of LAI. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by LAI, shall be at the user's sole risk. LAI warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

10.0 REFERENCES

Barr/Fulcrum. 2019. Revised Final Remedial Investigation Work Plan, Yakima Mill Site (aka Boiese Cascade Mill Site). January.

City of Yakima. 1996. Letter: Interstate I-82 Gateway Project – January 11, 1996 Meeting Regarding Landfill and Wetland Issues. From to Washington State Department of Ecology. January 22.

City of Yakima. 2018. "Cascade Mill District Development Project." https://www.yakimawa.gov/services/strategic-projects/cascade-mill-district-development-project.

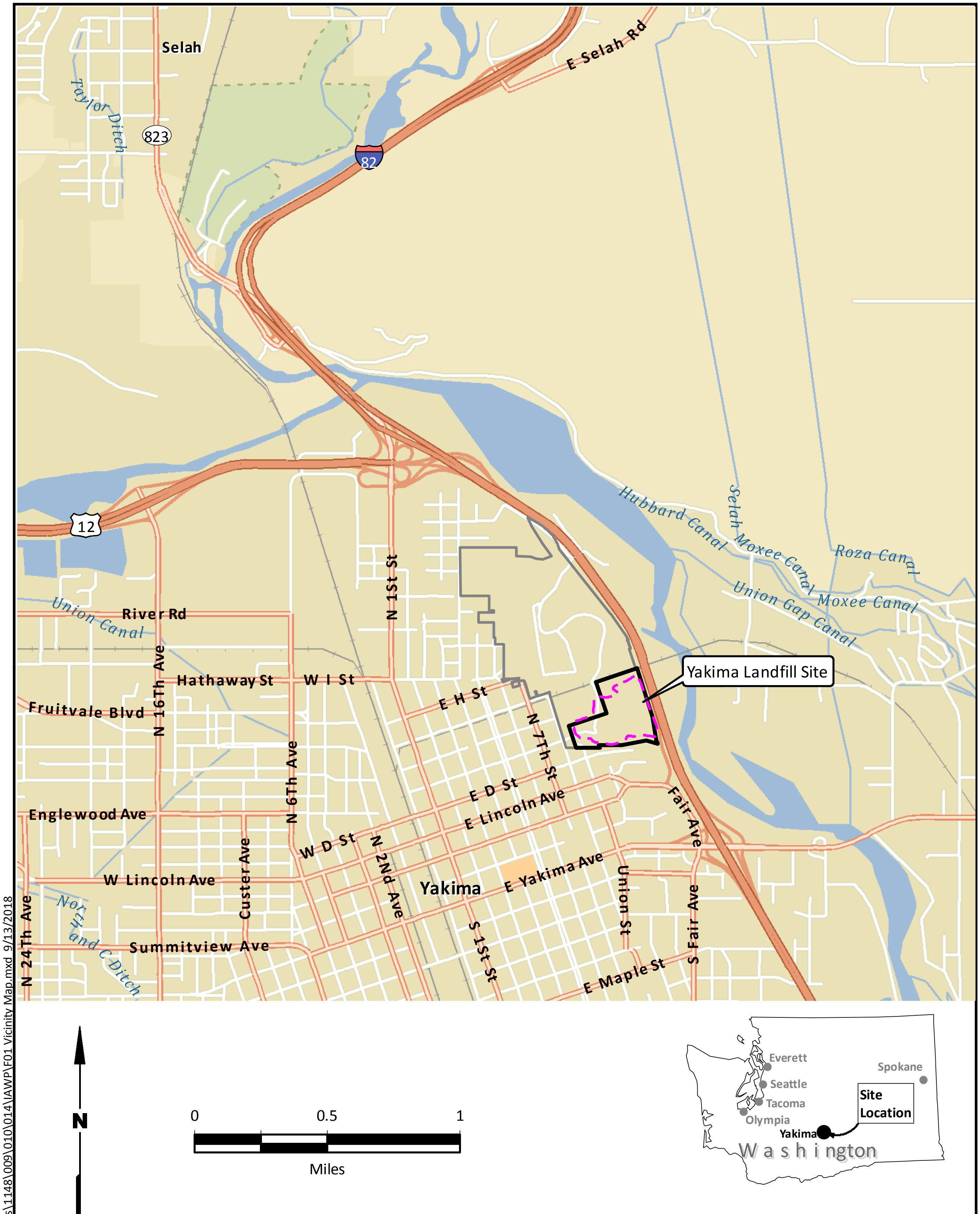
EPA. 2008. Background Information Document for Updating AP42 Section 2.4 for Estimating Emissions from Municipal Solid Waste Landfills. Publication No. EPA/600/R-08-116. US Environmental Protection Agency. September.

LAI. 2015a. Remedial Investigation Interim Data Report - September 2014 through January 2015, Closed City of Yakima Landfill Site, Yakima, Washington. Landau Associates, Inc. April 13.

LAI. 2015b. Agency Review Draft: Supplemental Remedial Investigation Report, Closed City of Yakima Landfill Site, Yakima, Washington. Landau Associates, Inc. September 29.

LAI. 2017. Technical Memorandum: Transportation Corridor Landfill Gas Evaluation, Former Boise Cascade Mill Site and Closed City of Yakima Landfill Site, Yakima, Washington, Facility/Site No. 1927. Landau Associates, Inc. March 24.

LAI. 2018. Technical Memorandum: Transportation Corridor Wood Debris and Landfill Gas Investigation, Former Boise Cascade Mill Site and Closed City of Yakima Landfill Site, Yakima, Washington, Facility/Site No. 1927. Landau Associates, Inc. September 12.



Data Source: Esri 2012

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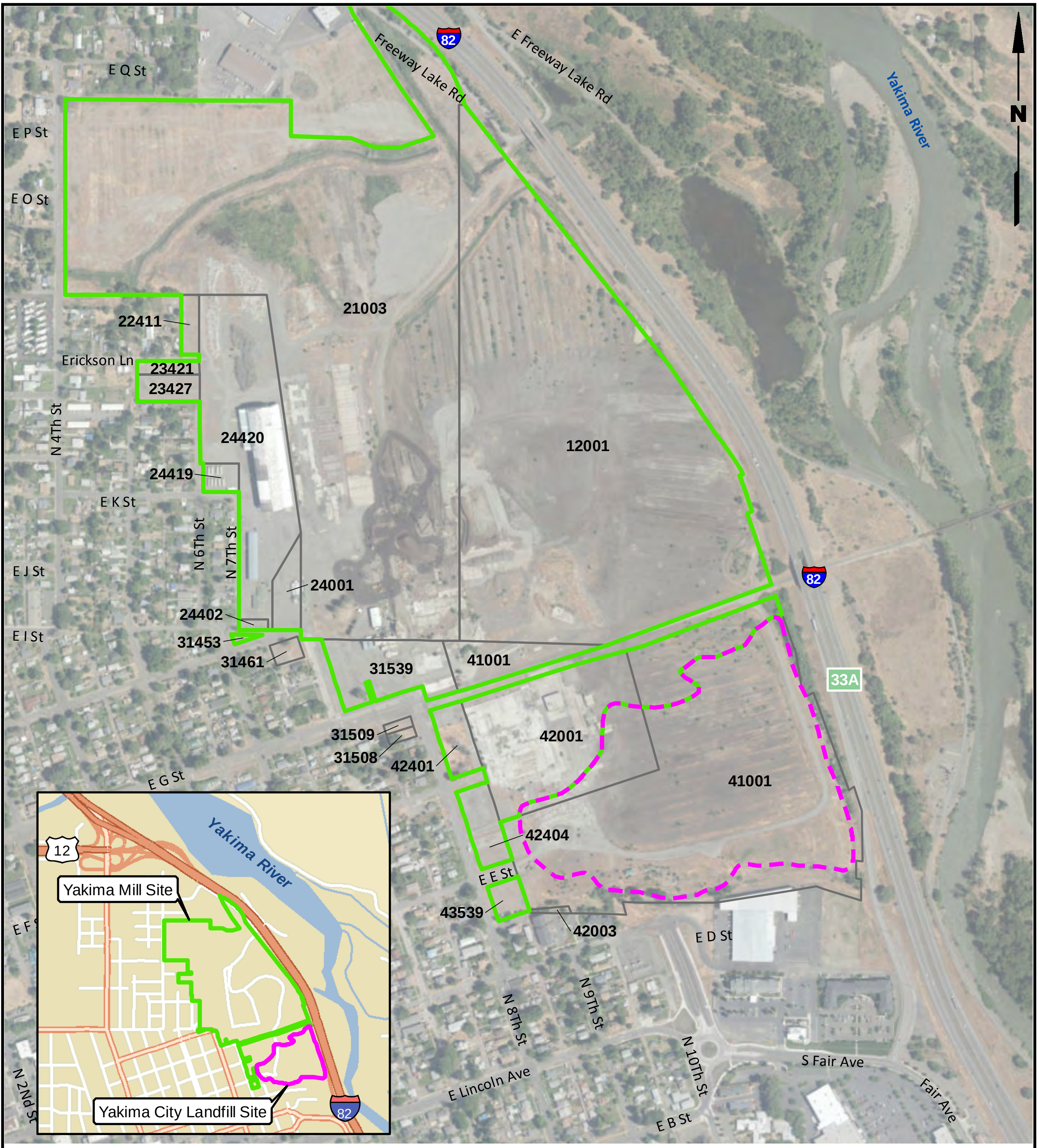
LANDAU ASSOCIATES

Closed City of Yakima
Landfill Site
Yakima, Washington

Vicinity Map

Figure
1

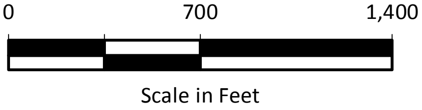


Legend

- 🟪 Yakima Landfill Site Boundary (AO No. DE 15862)
- 🟩 Yakima Mill Site Boundary (AO No. DE 13959)
- ☐ Tax Parcels and Parcel Site Number (191318-XXXXX)

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

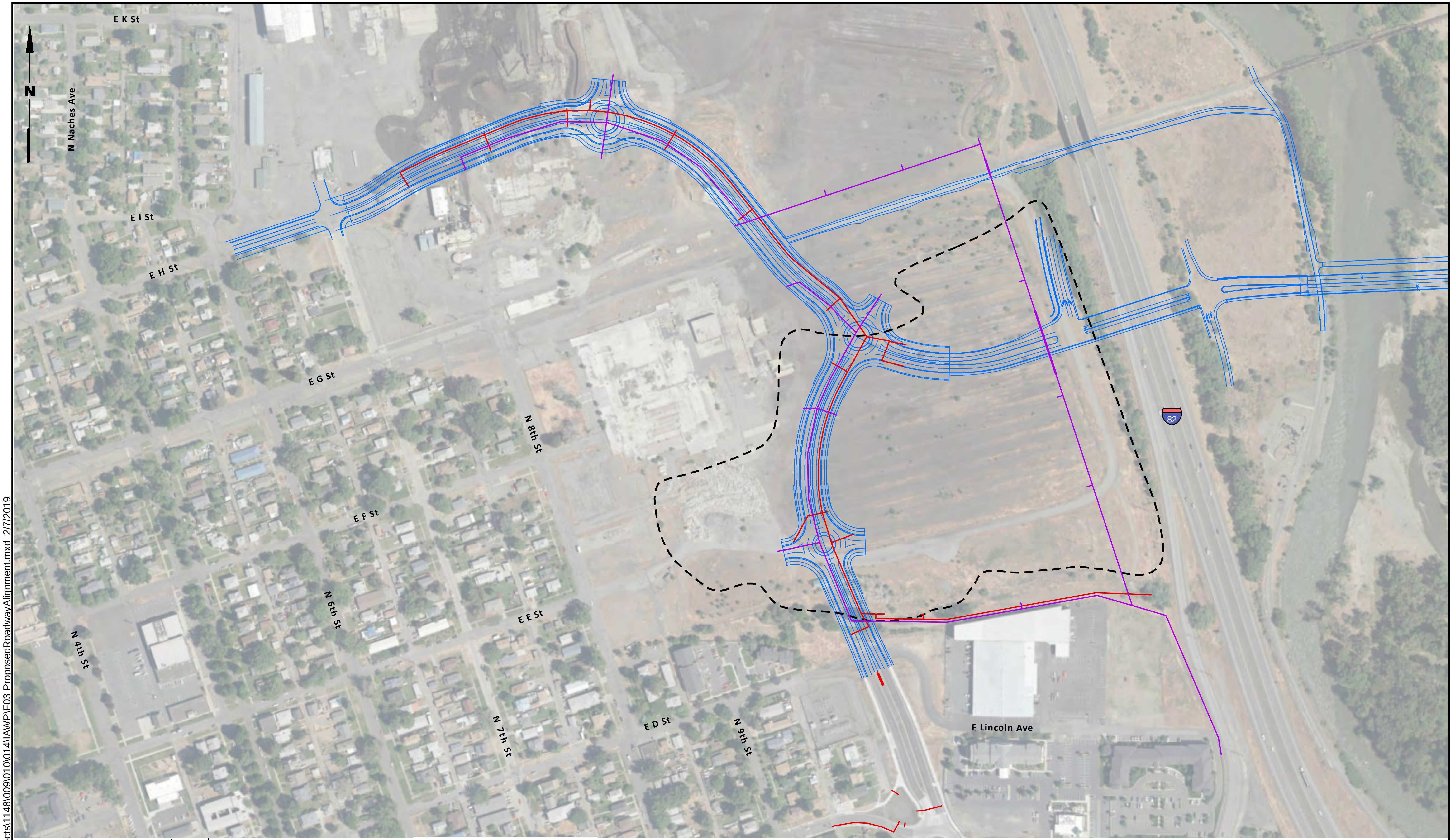


Data Source: Yakima County GIS, Esri World Imagery.

G:\Projects\1148\009\010\014\AWP\F02 SiteDiagram.mxd 9/13/2018

LANDAU ASSOCIATES

Yakima City Landfill Yakima, Washington	**Site Diagram** **Yakima Landfill Site and Mill Site**	Figure 2



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Legend

Sanitary Sewer Line

Storm Sewer Line

Municipal Landfill Extent

Notes

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 300 600

Scale in Feet

Data Source: HLA Engineering and Land Surveying, Inc; Lochner Engineering; Esri World Imagery.

LANDAU ASSOCIATES

Closed City of Yakima
Landfill Site
Yakima, Washington

Proposed Roadway Alignment
(As of 10/20/16)

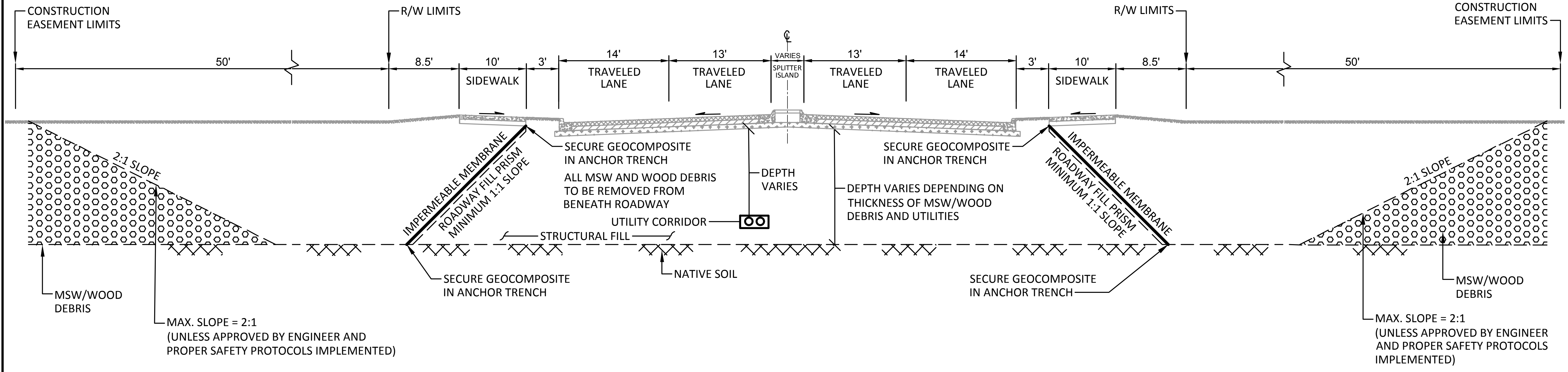
Figure
3

Picture 1

Picture 2

Landau Associates | G:\Projects\1148\009\010\014\AWP\F04-F06 Collection System.dwg | 4/15/2019 2:43 PM

LANDAU ASSOCIATES



TYPICAL ROADWAY SECTION
NTS

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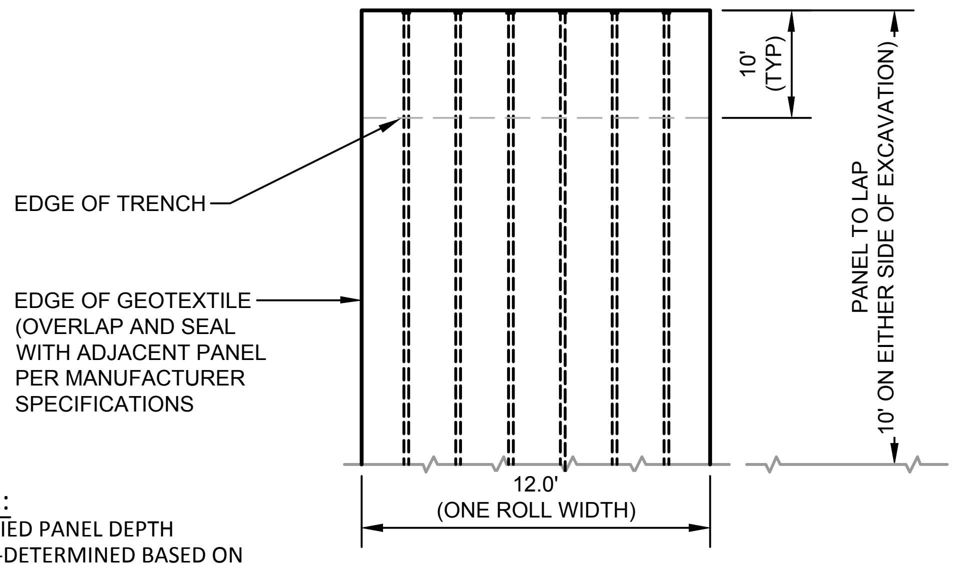
Landau Associates

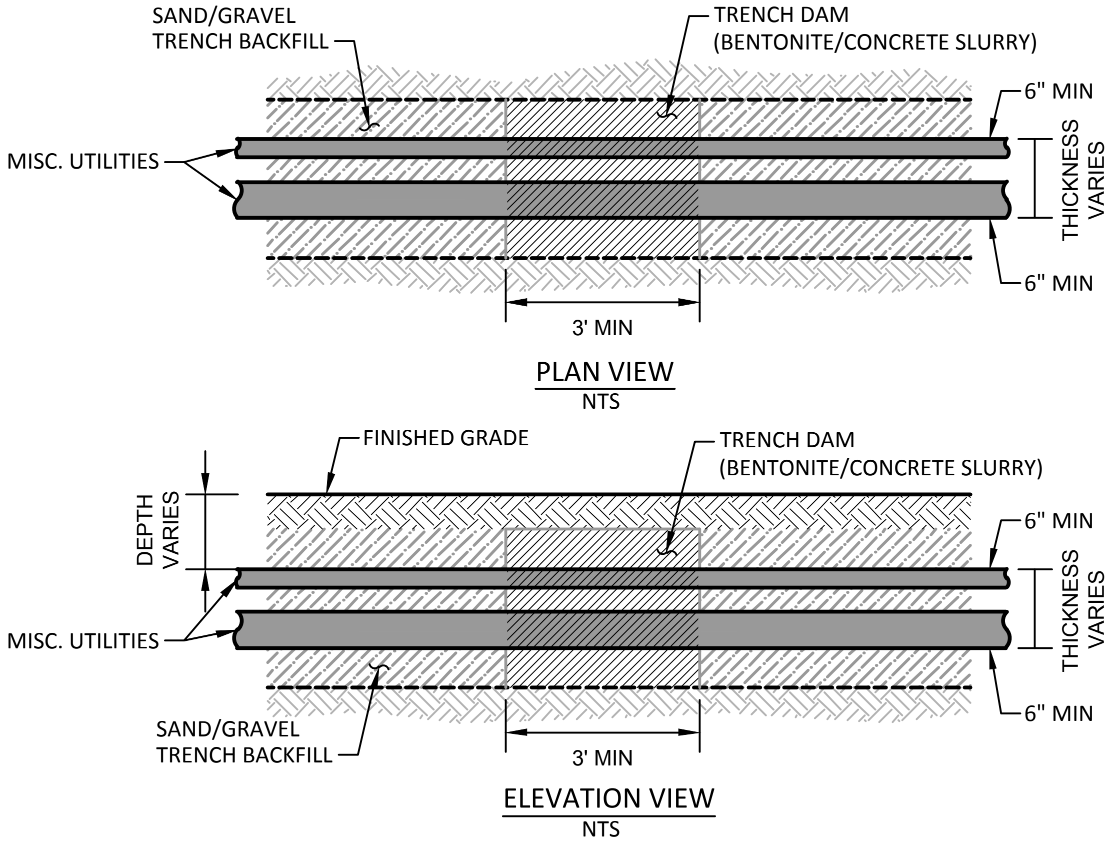
Interim Action Workplan Yakima, Washington	**Landfill Gas Migration Barrier Section**	Figure 5



NOTE:
SPECIFIED PANEL DEPTH TO-BE-DETERMINED BASED ON FINAL DESIGNED TRENCH DEPTH

1 GEOCOMPOSITE PANEL DETAIL

NTS



PLAN VIEW
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ELEVATION VIEW
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2 TRENCH DAM DETAIL

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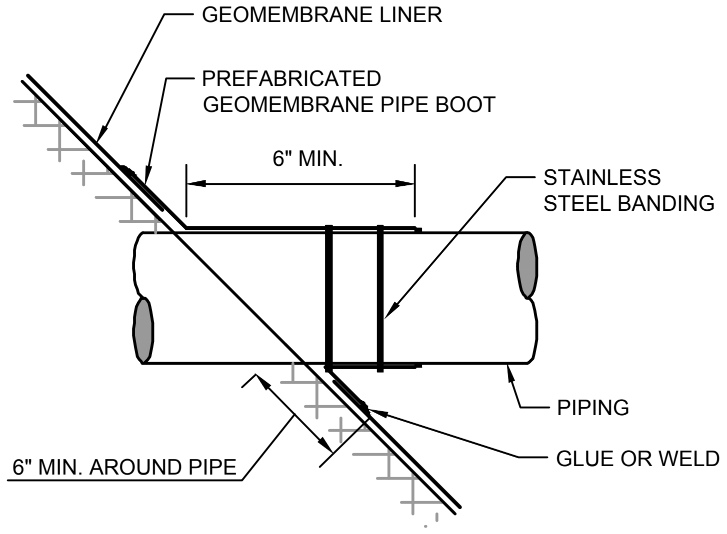

3 LINER PENETRATION BOOT DETAIL

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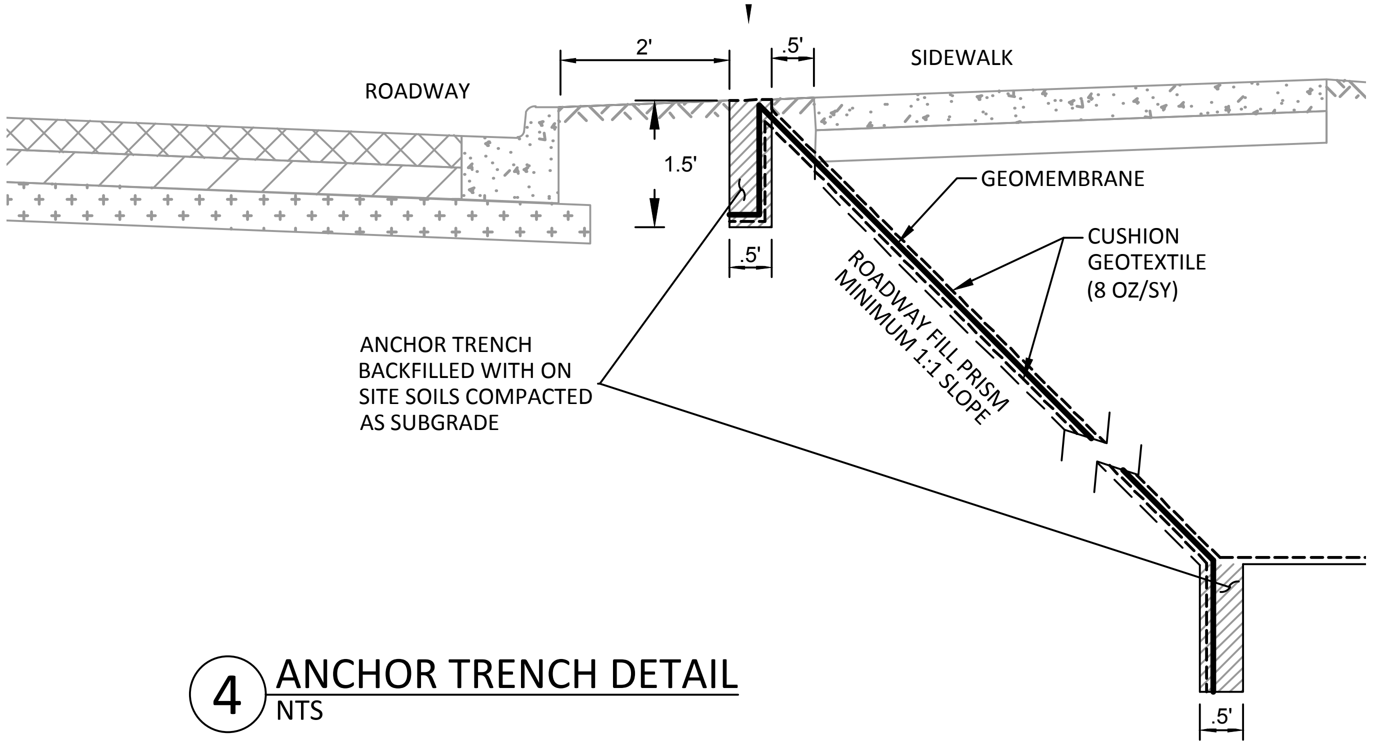

4 ANCHOR TRENCH DETAIL

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Landau Associates

Interim Action Workplan
Yakima, Washington

Landfill Gas
Migration Barrier Details

Figure
6

APPENDIX A

Transportation Corridor Wood Debris and Landfill Gas Evaluation

(September 2018)

Technical Memorandum

TO: Mr. Chris Wend, Washington State Department of Ecology

FROM: Cody Johnson, PE and Piper Roelen, PE, Landau Associates; Joan Davenport and Brett Sheffield, City of Yakima

DATE: September 12, 2018

RE: **Transportation Corridor Wood Debris and Landfill Gas Investigation**
Former Boise Cascade Mill Site and Closed City of Yakima Landfill Site
Yakima, Washington
Facility/Site No. 1927

Landau Associates, Inc. (LAI) has prepared the following technical memorandum on behalf of the City of Yakima (City) to summarize investigation activities conducted at the former Boise Cascade Mill Site (Mill Site) and the former City Municipal Solid Waste (MSW) Landfill Site (Landfill Site), collectively referred to as the Site. The focus of our investigations was to collect Site-specific information regarding subsurface conditions, including the presence or absence of wood debris, and the levels and composition of landfill gas (LFG), to support design of the planned transportation corridor that will be constructed across much of the Landfill Site and the southern end of the Mill Site. Because this work was conducted on an active Model Toxics Control Act (MTCA) cleanup site, this data is being provided to the Washington State Department of Ecology (Ecology) for its use and understanding of environmental conditions at the Site.

Site Background

The Site is located on the eastern edge of the City adjacent to Interstate 82 (I-82). The overall Site includes 20 parcels, comprising 19 parcels owned by LeeLynn, Inc. and Wiley Mt., Inc., and 1 parcel owned by OfficeMax Corporation (OfficeMax), totaling approximately 207 acres. A BNSF-owned right-of-way (ROW) with railroad tracks runs in an east-west orientation through the middle of the Site. The closed MSW landfill is located at the southern end of the Site and was operated by the City between 1963 and 1970. As part of landfill operations, MSW was placed in a former log pond that originally occupied the Site (City of Yakima 1996). When landfill operations ceased, the MSW was covered and the area brought to grade with a mixture of fill soil and wood debris. The Site was then used until 2010 for log storage, including temporary log storage and log chipping operations by the tenant of the landfill parcel, Yakima Resources, LLC (Yakima Resources).

The planned transportation corridor that will extend across the Site includes the northern extension of Bravo Boulevard and the East-West Corridor from East H Street to the bridge crossing over I-12 and the Yakima River (see Figure 1). The transportation corridor is being designed by the Lochner and HLA Engineering & Land Surveying, Inc. (HLA) team in consultation with the City and Yakima County (County). The proposed alignment for the transportation corridor will require construction activities, including subsurface disturbance, in many areas of the Site that are known to be underlain by varying amounts of wood debris and MSW resulting from historical operations. A better understanding of the locations and quantities of wood debris is necessary for roadway design purposes. Based on the significant quantities of MSW and wood debris present throughout the project area, it is also necessary to determine how much LFG may be produced during the degradation of these materials over time, and what constituents may be in the gas that may trigger health and safety or air emissions requirements.

The investigation activities summarized below obtained Site-specific information along the roadway alignments necessary for the development of the transportation corridor design package.

Transportation Corridor Investigation

As shown on Figure 1, several subsurface investigations have previously been conducted throughout the Site since 1988. LAI conducted additional investigations along the proposed transportation corridor alignment in the fall of 2016, including:

- Surveying and staking the planned transportation corridor alignment based on the information proved by the Lochner/HLA team in March 2016.
- Conducting test pit investigations to further evaluate and document the lateral and vertical extent, occurrence, and physical characteristics of the wood debris present along the proposed roadway alignments (Appendix A).
- Installing and sampling additional LFG monitoring probes (Appendix B).

Roadway Alignment and Exploration Point Survey

A roadway alignment survey was conducted by HLA to mark the locations of the roadway alignments to guide the field investigations. The planned roadway corridor consists of an area that is approximately 120 to 150 feet (ft) wide and approximately 5,300 ft long. The centerline and edges of the proposed roadway alignments within the corridor were staked in the field by HLA at 100-ft intervals to facilitate the subsurface exploration activities. HLA also surveyed the current ground surface elevation of each staked location and the final locations and elevations of the new test pits and LFG monitoring probes. The survey facilitated comparison of ground elevations associated with past explorations within and near the roadway corridor with the elevations of the 2016 exploration locations. The surveys used State Plane as the horizontal datum and North American Vertical Datum of 1988 (NAVD88) as the vertical datum.

Wood Debris Field Investigation

A test-pit investigation was conducted to further evaluate the lateral and vertical extent of wood debris present along the planned roadway alignment. The test-pit information was collected to estimate wood debris volumes and to obtain samples for testing. The final test pit locations were selected in the field based on the results of the public and private utility clearance surveys, access limitations, and the locations of previous subsurface explorations along or near the roadway alignments and remaining Site infrastructure (e.g., foundations, etc.).

Ken Leingang Excavating, Inc., under subcontract to LAI, provided an excavator and operator to advance 34 test pit explorations at a spacing of approximately 100 ft along the planned roadway alignment, and an additional 21 test pit explorations between some of those test pits to provide the higher data resolution necessary to map and document the depth and types of wood debris encountered. Test pit explorations were conducted September 26 through 30, 2016. Subsurface conditions exposed in the test pits were observed and documented by an LAI field geologist. The test pits were excavated to a typical maximum depth of approximately 15 ft below ground surface (bgs) or to the bottom of the wood debris (if shallower than 15 ft bgs), and were backfilled with the excavated materials. However, if groundwater or MSW was encountered prior to reaching 15 ft bgs, the depth of groundwater or MSW was noted and the test pit was terminated and backfilled.

The test-pit logs for each of the test pit explorations are provided in Appendix A. The locations of the test pits with respect to the roadway alignment plan are shown on Figure 1. Figures 2 through 5 provide cross sections (A-A’ through D-D’, respectively) which graphically depict the materials expected to be encountered under the proposed roadway based on observations from the current and previous investigations. In general, wood debris was encountered in most of the test pits in the area south of the railroad tracks, with some additional wood debris encountered in test pits within and northeast of the proposed roadway alignment north of the railroad tracks.

Within the exploration areas south of the railroad tracks, the wood debris is further characterized as follows:

- South of the proposed central roundabout (shown on Figures 2, 3, and 4b), the wood debris is present at the ground surface and ranges in thickness from approximately 1.0 to 6.5 ft, is generally loose, and consists of wood chips mixed with approximately 10 to 50 percent by volume of gravel and cobbles, with some interbedded dense gravel layers. MSW was encountered below the wood debris in this area and the test pit excavations were stopped once the MSW was encountered.
- Within and around the proposed central roundabout (shown on the right side of Figure 2 and left-central side of Figure 4b) the wood debris is at or within approximately 1 ft of the ground surface and extends below the completion depths of the test pit excavations (greater than 15 ft bgs). The wood debris varies in type and size with depth generally consisting of:
    - Wood chips mixed with gravel and sand from the ground surface to 1 to 3 ft bgs
    - Grading to bark chips and wood shavings extending 6 to 10 ft bgs
    - Grading to buried logs within saw dust and shavings extending below the completion depths of the test pits (greater than 15 ft bgs).

- North of the proposed central roundabout (shown on the left side of Figure 4b) the wood debris is encountered below a dense layer of silt, sand, gravel and/or cobbles that ranges in thickness from 1 to 11 ft. The wood debris below that dense soil layer generally consists of:
    - Wood chips with up to 50 percent gravel from 1 to 8 ft bgs
    - Grading to buried logs within saw dust and shavings from 8 ft bgs to beyond the termination depth of the test pit.

  In areas where the wood debris did not extend beyond the depth of the test pit, the wood debris was underlain by sandy gravel.

The test pit explorations in the areas of the proposed alignment north of the railroad tracks that will extend to the north and west indicate that this portion of the alignment will not generally be underlain by wood waste or MSW. Although subgrade pockets of wood debris were encountered around test pits TP15-16 (right side of Figure 4a) and TP14A-16 and TP13A-16 (left side of Figure 4b). Several test pits were also excavated northeast of the roadway alignment[1] (shown on Figure 5, Section D-D'); two of the test pits (TP24A-16 and TP25-16) also identified wood debris from approximately 6 ft bgs to below the groundwater table (approximately 14 ft bgs).

The quantity of the wood debris below the proposed roadway alignment was generally estimated by multiplying the proposed width of development (150 ft wide for the roadways and 200-ft diameter for roundabouts) with 1 horizontal to 1 vertical (1H:1V) cuts, by length of proposed roadway over the wood waste, by the depth of wood debris shown on the cross sections. It was estimated that there is approximately 46,900 in-place (bank) cubic yards (CY) of wood debris under the proposed roadway prism. Using elevation and wood debris thickness data from beneath the roadway and from the rest of the Landfill Site to create comparable top and bottom surfaces of the wood debris with computer-aided design (CAD), which calculated an estimated volume of approximately 182,000 in-place CY of wood debris within the horizontal boundaries of the MSW landfill.[2]

It is also noteworthy that, as shown on the right side of Figure 4a and on Figure 5, a layer of large-size concrete debris and boulders (designated as "BD" on the cross sections) exists under approximately 250 linear feet of the alignment, and extends from the ground surface to more than 13 ft deep in some places. For the alignment west of this large concrete and boulder debris pile, the proposed roadway alignment is generally underlain by dense silty sands and gravels.

---

[1] The roadway alignment was modified after the investigation was completed; these test pits were excavated in the former location of the northern extension of the northern roundabout.

[2] Using the updated elevation data from the roadway investigation, the volume of MSW was also calculated with CAD which estimated a total volume of MSW in the Landfill Site of approximately 319,500 in-place cubic yards.

Wood Debris Analytical Testing

Representative samples of the wood debris encountered were collected and analyzed at the ALS Environmental (ALS) analytical laboratory to help characterize the material for potential reuse and/or disposal. Wood debris sample analysis included the following:

- 20 wood debris samples were analyzed for Toxicity Characteristic Leaching Procedure (TCLP) Resource Conservation and Recovery Act (RCRA) 8 metals by US Environmental Protection Agency (EPA) Method 6010C/7470A
- The same 20 wood debris samples were also tested for High Heat British thermal unit (BTU) Value (BTU/pound [lb]) by Method ASTM International (ASTM) D2015
- Five wood debris samples with the highest BTU value results were also analyzed for total chlorine by EPA Method 5050/9056, which is required to interpret potential of reuse of wood debris as a fuel resource.

The results of the wood debris testing are provided in Table 1 and associated laboratory reports are included as Appendix C. The heating value of the wood debris samples tested range from 3,100 to 9,600 BTU/lb, with an average of 6,550 BTU/lb for the 20 samples tested. The distribution of heating values for each sample is shown on Figures 2, 4b, and 5. The TCLP analysis detected barium in all samples at concentrations ranging from 0.17 to 0.33 milligrams/liter (mg/L) with the exception of detection of 3.0 mg/L in one sample. Without the outlier, the barium concentration averaged 0.24 mg/L. Lead was detected in only two of the 20 samples at concentrations of 0.025 mg/L and 0.042 mg/L. All other TCLP metals were not detected in the 20 samples tested.

Two soil samples collected from the upper 2 ft of test pits TP-15-16 and TP-16B-16 were also analyzed by Northwest total petroleum hydrocarbon-diesel extended range (NWTPH-Dx) method with silica gel cleanup. These samples were collected because visual or odor evidence of potential petroleum hydrocarbons was identified in the shallow portion of the test pits during excavation. These areas were not identified as total petroleum hydrocarbon (TPH)-contaminated soils in the remedial investigation (LAI 2015). As summarized in Table 1 and included in Appendix C, the TPH detected was in the oil range and was 14,000 milligrams per kilogram (mg/kg) at TP-15-16 and 500 mg/kg at TP-16B-16. Based on observations from these two test pits and other nearby test pits with no evidence of petroleum contamination, there could be as much as 2,800 CY of petroleum-contaminated soil in this area of the proposed roadway that may require special management prior to or during construction.

Landfill Gas Probe Installation

To evaluate LFG in the project area, 13 new LFG monitoring probes (GP-32 through GP-44) were installed along the proposed roadway alignment. The spacing of LFG probes along the alignments is approximately 400 ft between probes north of the railroad tracks (where no MSW is located and wood debris is less abundant) and approximately 250 ft between probes within the area of the former landfill. Five existing LFG probes (GP-5, GP-11, GP-18, GP-19, and GP-28) were previously installed as part of remedial investigation activities. The five existing LFG probes are located within or proximal to the alignments, and were used to limit the number of new installations required. The locations of the new and previously-existing LFG monitoring probes are presented on Figure 1.

The new LFG probes were installed in October 2016 using hollow-stem auger drilling methods, consistent with procedures and materials of construction used for previous LFG probe installations at the Site. A 3.25–inch outside diameter Dames & Moore sampler was used with a 300-lb hammer and a 30-inch drop to retrieve split spoon samples of the materials encountered, and measure the blow counts required to penetrate into the underlying material. Each boring was advanced to 10 ft bgs. The LFG probes were completed with 0.5-inch-diameter Schedule 40 PVC pipe with a 5-ft screen from 5 to 10 ft bgs. The screens were constructed with 0.03-inch to 0.04-inch machine-slotted perforations. The filter pack surrounding the screens consisted of pea gravel to facilitate soil vapor/LFG movement into the probe during purging and monitoring. The probes were constructed by a licensed well driller and an LAI field scientist observed the drill cuttings and prepared a boring and installation log at each location. The boring logs for the LFG probes are provided in Appendix B.

Landfill Gas Monitoring

LFG monitoring was conducted at the 13 new probes and the five existing monitoring points during four monitoring events completed on October 13, November 16, December 21, and December 29, 2016. The LFG measurements were collected during conditions of falling barometric pressure to minimize potential atmospheric dilution effects. A Landtec GEM 5000 soil vapor/LFG analyzer was used to monitor *in situ* concentrations of methane, oxygen, carbon dioxide, and balance gases (the mixture of all other gases making up the balance of the air sample), to evaluate for potential soil-vapor impacts from degrading MSW or wood debris.

In addition to the data collected using the portable LFG analyzer, samples of LFG were collected during the second and fourth monitoring events at the four LFG monitoring probe locations with the highest concentrations of methane based on evaluation of the initial monitoring event result (GP-38, GP-39, GP41, and GP-43). The samples were collected into certified-clean stainless steel Summa canisters with Silonite linings for laboratory analysis of total reduced sulfur by ASTM standard D-5504, fixed gases (methane, carbon dioxide, carbon monoxide, oxygen, and nitrogen) by ASTM D-1945, non-methane organic compounds (NMOCs) by EPA Method 25C, and volatile organic compounds (VOCs) by EPA Compendium Method TO-15.

The field measurement results are presented in Table 2. A summary of the laboratory analytical results is presented in Table 3 and the analytical laboratory reports are included in Appendix C. A summary of pertinent data is provided below:

- The highest concentrations of methane, ranging from approximately 48 to 72 percent by volume (pbv), were detected in areas of buried MSW. Lower methane concentrations were detected outside the landfill boundaries where only buried wood debris is present, ranging from approximately 1 to 20 pbv. Methane was typically not detected at monitoring points where MSW or wood debris is not present, except at locations in close proximity to MSW or wood debris deposits. Figure 6 shows the limits of the MSW landfill and presents the methane results for all previous LFG monitoring events at the site, including the four 2016 monitoring events.
- The laboratory fixed-gas results are similar to the concentrations measured using the hand-held LFG analyzer, confirming the usability of the field-collected data for design.
- Elevated concentrations of hydrogen sulfide (H_2S) were detected in several samples. The most notable of these observations was a detection of 14,000 micrograms per cubic meter ($\mu g/m^3$) H_2S in GP-39 on November 11, 2016.
- Static pressure measurements across the landfill ranged generally from -0.55 to 0.11 inches of water (in. H_2O).
- The results of VOC testing indicate detectable concentrations of VOCs in the LFG coming from within the MSW landfill boundaries. The VOCs detected are those typically associated with LFG. The highest observed total VOC concentration (expressed as the sum of all detected VOCs) was at GP-39 in the sample collected on November 16 29, 2016, with a concentration of approximately 76,500 $\mu g/m^3$—less than 3 percent of the concentration typically present in LFG.

Limitations

This technical memorandum has been prepared for the exclusive use of the City of Yakima and the Washington State Department of Ecology for specific application to the Former Boise Cascade Mill Site and Closed City of Yakima Landfill Site Transportation Corridor. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of LAI. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by LAI, shall be at the user's sole risk. LAI warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

LANDAU ASSOCIATES, INC.

Cody Johnson, PE
Senior Engineer

Piper Roelen, PE
Principal

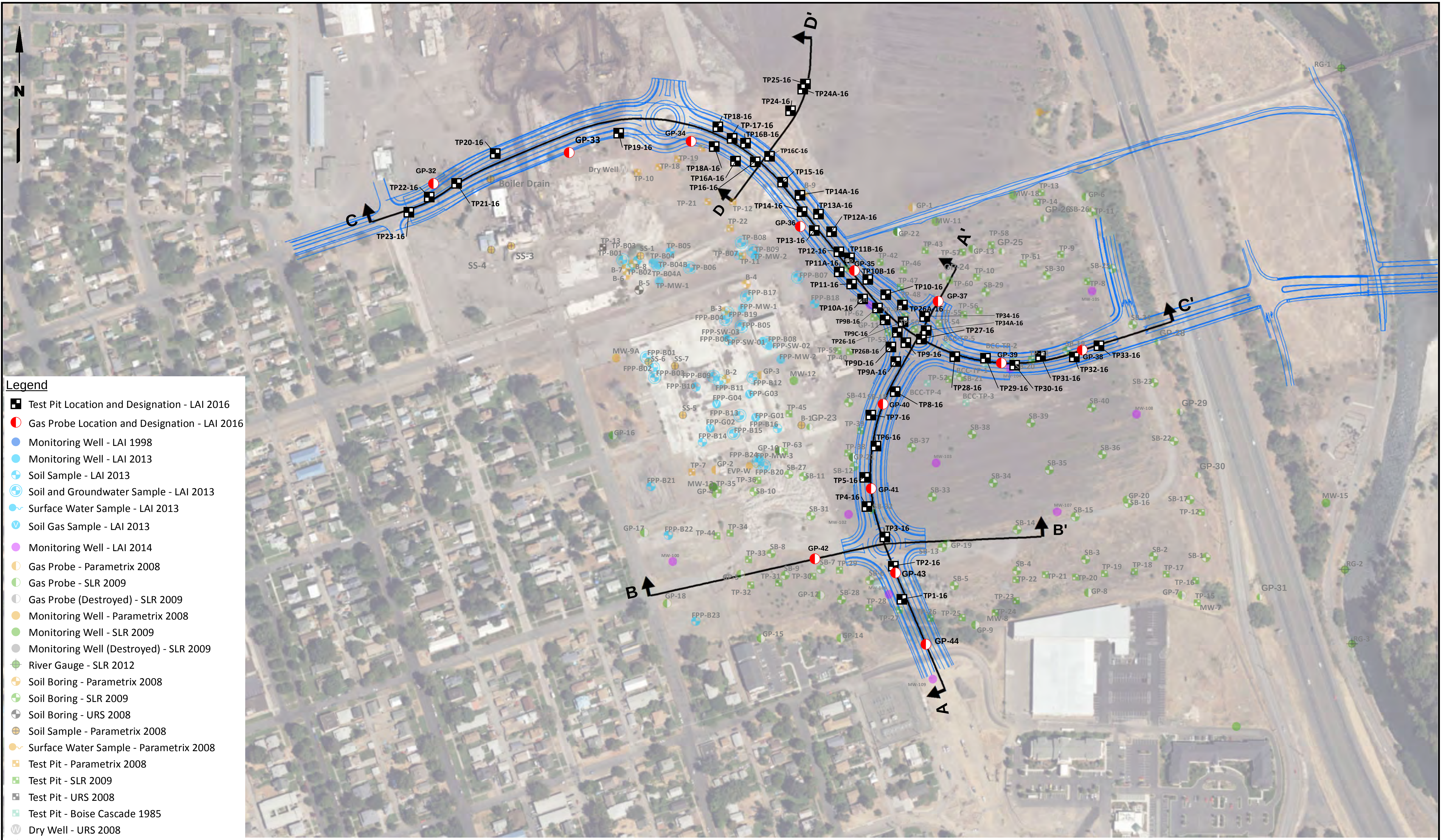
CMJ/PMR/ljl
[P:\1148\009\R\WOOD DEBRIS AND LFG INVESTIGATION TM\YAKIMA LANDFILL WOOD DEBRIS AND LFG DATA MEMO_091218.DOCX]

Attachments:
- Figure 1. Gas Probe and Test Pit Locations
- Figure 2. Geologic Cross Section A-A’
- Figure 3. Geologic Cross Section B-B’
- Figure 4a. Geologic Cross Section C-C’
- Figure 4b. Geologic Cross Section C-C’
- Figure 5. Geologic Cross Section D-D’
- Figure 6. Landfill Gas Monitoring Results
- Table 1. Test Pit Soil and Wood Debris – Analytical Results
- Table 2. Landfill Gas Monitoring Field Measurements
- Table 3. Landfill Gas Monitoring Data – Analytical Results
- Appendix A. Test Pit Boring Logs
- Appendix B. Landfill Gas Probes Logs
- Appendix C. Analytical Laboratory Reports

References

City of Yakima. 1996. Letter: Interstate I-82 Gateway Project – January 11, 1996 Meeting Regarding Landfill and Wetland Issues. From City of Yakima, to Washington State Department of Ecology. January 22.

LAI. 2015. Agency Review Draft: Supplemental Remedial Investigation Report, Closed City of Yakima Landfill Site, Yakima, Washington. Landau Associates, Inc. September 29.



Legend

- ■ Test Pit Location and Designation - LAI 2016
- ◐ Gas Probe Location and Designation - LAI 2016
- ● Monitoring Well - LAI 1998
- ● Monitoring Well - LAI 2013
- ● Soil Sample - LAI 2013
- ● Soil and Groundwater Sample - LAI 2013
- ● Surface Water Sample - LAI 2013
- ● Soil Gas Sample - LAI 2013
- ● Monitoring Well - LAI 2014
- ◐ Gas Probe - Parametrix 2008
- ◐ Gas Probe - SLR 2009
- ◐ Gas Probe (Destroyed) - SLR 2009
- ● Monitoring Well - Parametrix 2008
- ● Monitoring Well - SLR 2009
- ● Monitoring Well (Destroyed) - SLR 2009
- ⊕ River Gauge - SLR 2012
- ● Soil Boring - Parametrix 2008
- ● Soil Boring - SLR 2009
- ● Soil Boring - URS 2008
- ⊕ Soil Sample - Parametrix 2008
- ● Surface Water Sample - Parametrix 2008
- ■ Test Pit - Parametrix 2008
- ■ Test Pit - SLR 2009
- ■ Test Pit - URS 2008
- ■ Test Pit - Boise Cascade 1985
- ● Dry Well - URS 2008
- Section Alignment

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Data Source: HLA Engineering and Land Surveying, Inc; SLR; URS; Parametrix; Lochner Engineering; Boise Cascade; Esri World Imagery.

Notes
1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 300 600
Scale in Feet

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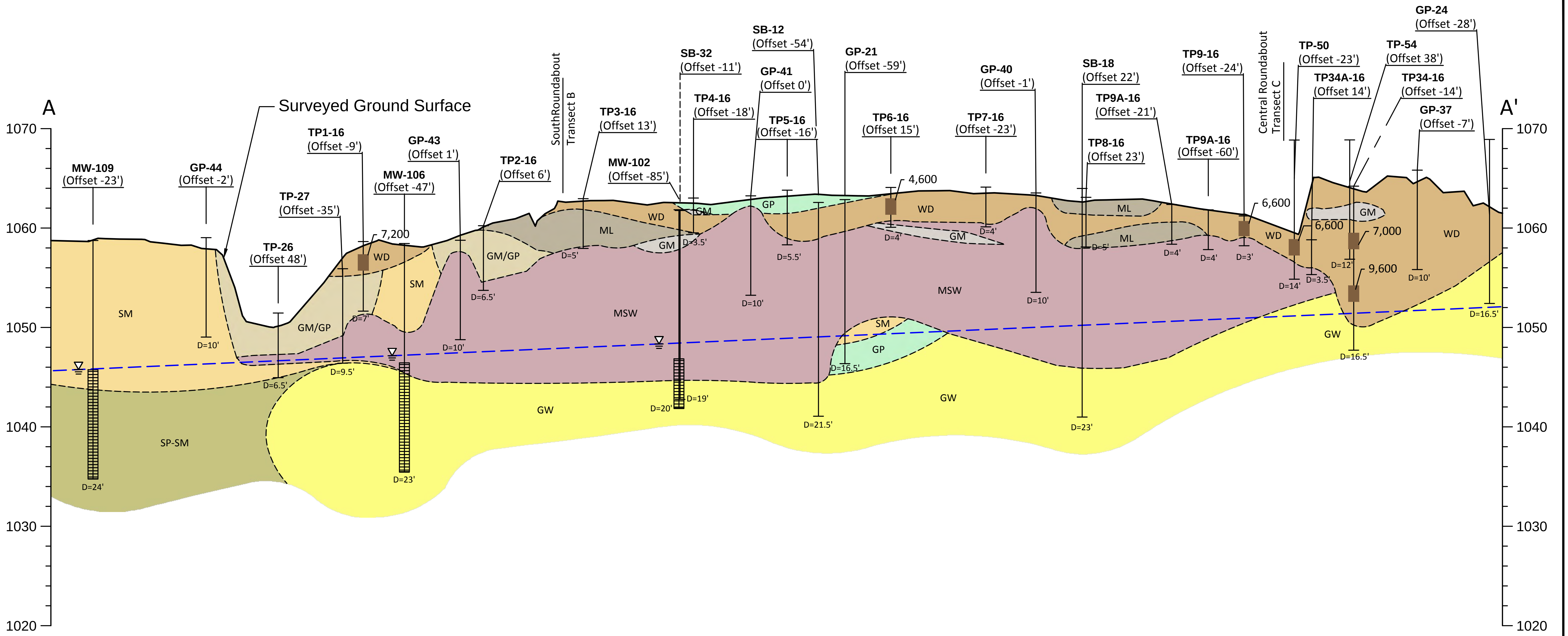
Closed City of Yakima
Landfill Site
Yakima, Washington

Transportation Corridor Project
Gas Probe and Test Pit Locations

Figure
1



▨ MSW (municipal solid waste)	▨ GP (clean gravel)
▨ WD (wood debris)	▨ GM (gravel with fines)
▨ SP (clean sand)	▨ GM-GP
▨ SM (sand with fines)	▨ GW (well graded gravel)
▨ SP-SM	▨ ML (silt and sand)
▨ BD (large concrete debris & boulders)	

Legend

7,200
■ Sample location of wood debris tested for heating value.
Heating value provided in BTU/LB

Groundwater well and screen interval

Approximate groundwater surface, seasonal high (September 2014)

ATD Approximate groundwater surface at time of exploration (September 2016)

Geologic Profile Transect A

Horizontal Scale in Feet: 1"=100'
Vertical Scale in Feet: 1"=10'

Source: Yakima County GIS; SLR, URS, Parametrix 2008, Boise 1985.

0 100 200
Scale in Feet
10x Vertical Exaggeration

LANDAU ASSOCIATES, INC. | G:\Projects\1148\009\010\014\Cross Sections A B C.dwg (A) "Figure 2" 9/12/2018

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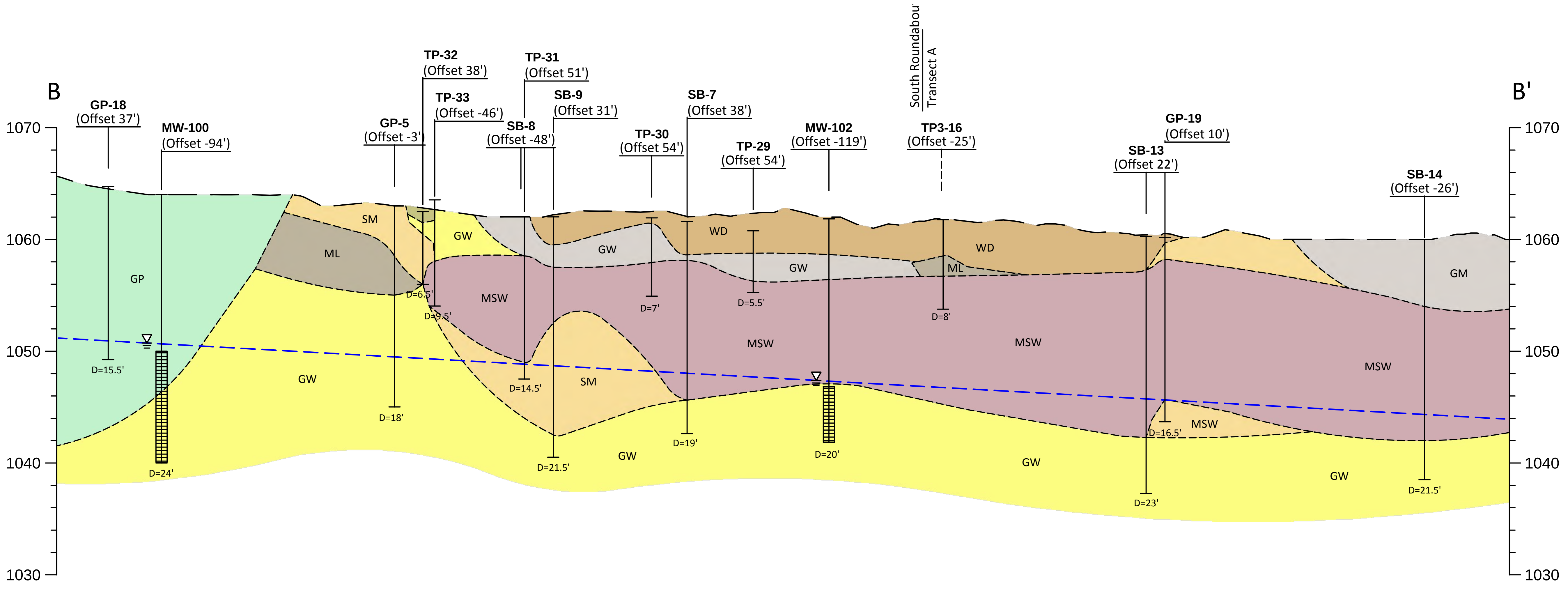
Closed City of Yakima
Landfill Site
Yakima, Washington

Geologic Cross Section A-A'

Figure
2



■ MSW (municipal solid waste)

■ WD (wood debris)

■ SP (clean sand)

■ SM (sand with fines)

■ SP-SM

■ BD (large concrete debris & boulders)

■ GP (clean gravel)

■ GM (gravel with fines)

■ GM-GP

■ GW (well graded gravel)

■ ML (silt and sand)

Geologic Profile Transect B

Horizontal Scale in Feet: 1"=100'
Vertical Scale in Feet: 1"=10'

Legend

7,200
Sample location of wood debris tested for heating value.
Heating value provided in BTU/LB

Groundwater well and screen interval

Approximate groundwater surface, seasonal high (September 2014)

ATD Approximate groundwater surface at time of exploration (September 2016)

Source: Yakima County GIS; SLR, URS, Parametrix 2008, Boise 1985.

0 100 200
Scale in Feet
10x Vertical Exaggeration

Closed City of Yakima
Landfill Site
Yakima, Washington

Geologic Cross Section B-B'

Figure
3

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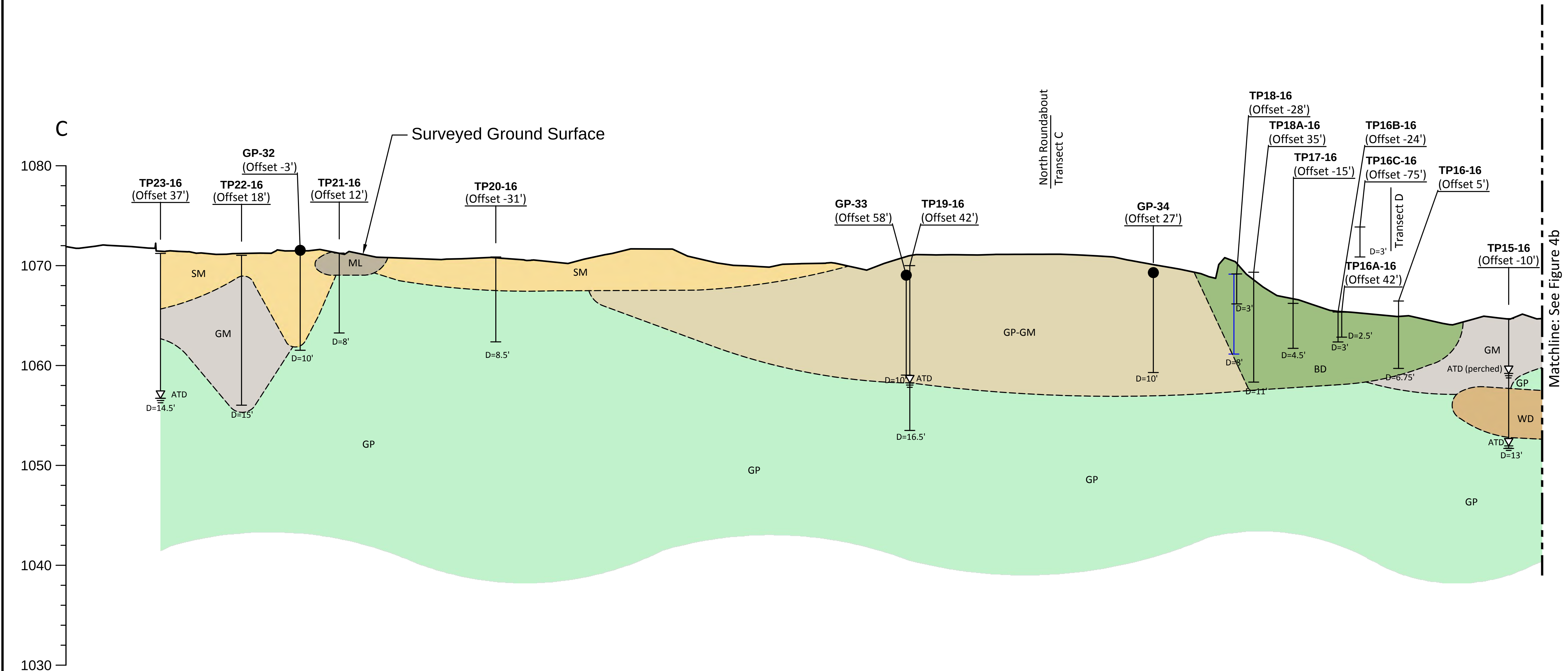
LANDAU ASSOCIATES, INC. | G:\Projects\1148\009\010\014\Cross Sections A B C\x cross sections A B C.dwg (A) "Figure 3" 9/12/2018



▨ MSW (municipal solid waste)

▨ WD (wood debris)

▨ SP (clean sand)

▨ SM (sand with fines)

▨ SP-SM

▨ BD (large concrete debris & boulders)

▨ GP (clean gravel)

▨ GM (gravel with fines)

▨ GM-GP

▨ GW (well graded gravel)

▨ ML (silt and sand)

Legend

7,200
Sample location of wood debris tested for heating value.
Heating value provided in BTU/LB

Groundwater well and screen interval

Approximate groundwater surface, seasonal high (September 2014)

ATD Approximate groundwater surface at time of exploration (September 2016)

Source: Yakima County GIS; SLR, URS, Parametrix 2008, Boise 1985.

0 100 200
Scale in Feet
10x Vertical Exaggeration

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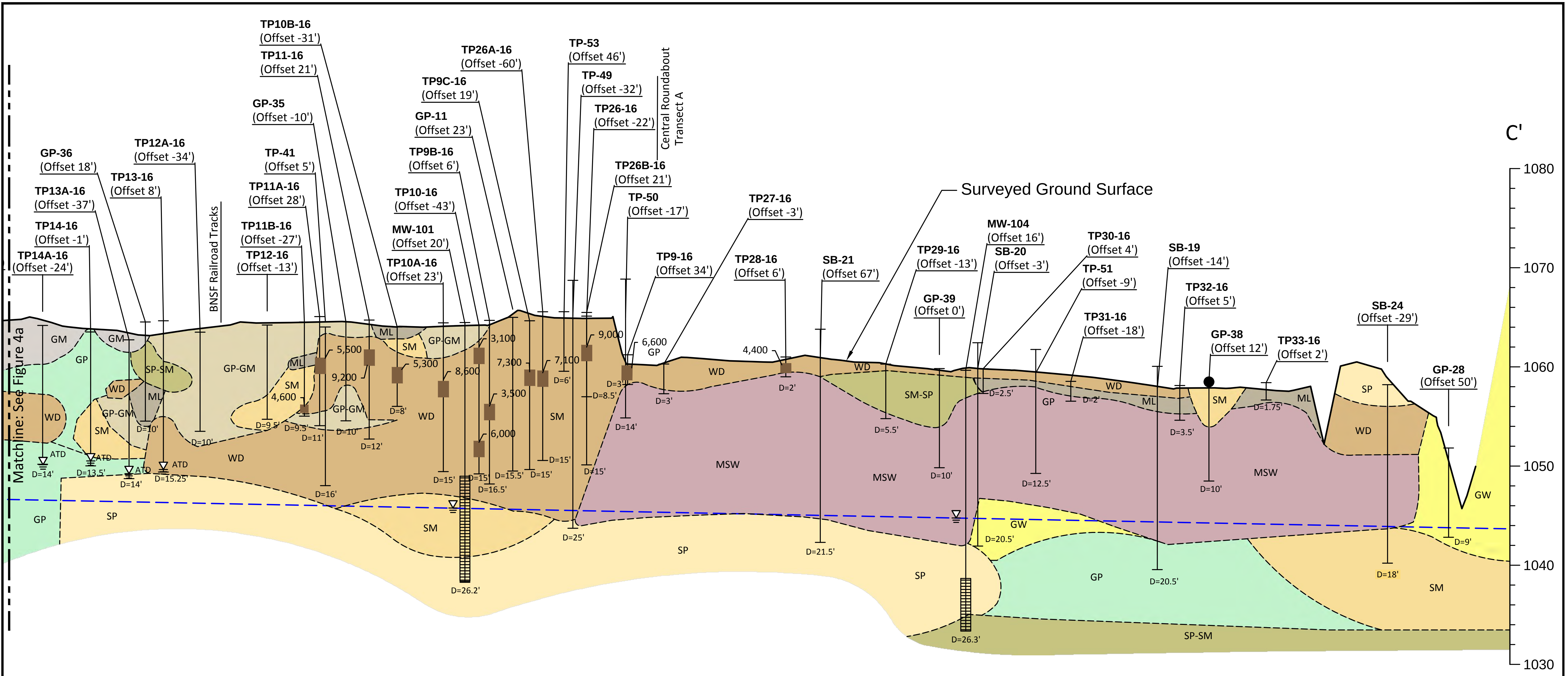
Closed City of Yakima
Landfill Site
Yakima, Washington

Geologic Cross Section C-C'

Figure
4a

LANDAU ASSOCIATES, INC. | G:\Projects\1148\009\010\014\Cross Sections A B C\x cross sections A B C.dwg (A) "Figure 4a" 9/12/2018



▨ MSW (municipal solid waste)

▨ WD (wood debris)

▨ SP (clean sand)

▨ SM (sand with fines)

▨ SP-SM

▨ BD (large concrete debris & boulders)

▨ GP (clean gravel)

▨ GM (gravel with fines)

▨ GM-GP

▨ GW (well graded gravel)

▨ ML (silt and sand)

Legend

7,200 Sample location of wood debris tested for heating value. Heating value provided in BTU/LB

Groundwater well and screen interval

Approximate groundwater surface, seasonal high (September 2014)

ATD Approximate groundwater surface at time of exploration (September 2016)

Source: Yakima County GIS; SLR, URS, Parametrix 2008, Boise 1985.

0 100 200
Scale in Feet
10x Vertical Exaggeration

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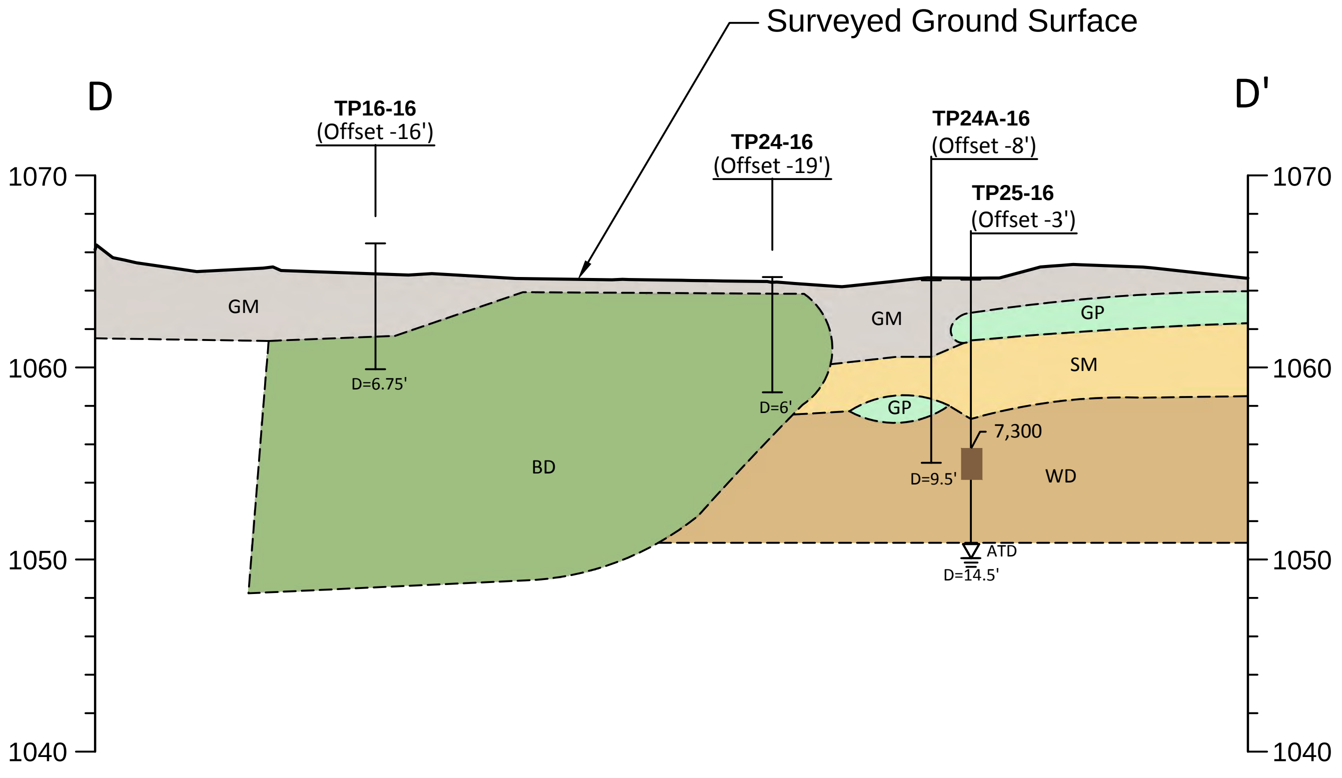
Closed City of Yakima
Landfill Site
Yakima, Washington

Geologic Cross Section C-C'

Figure
4b

LANDAU ASSOCIATES, INC. | G:\Projects\1148009\010\014\Cross Sections A B C\x cross sections A B C.dwg (A) "Figure 4b" 9/12/2018



Geologic Profile Transect D

Horizontal Scale in Feet: 1"=100'
Vertical Scale in Feet: 1"=10'

▨ MSW (municipal solid waste)
▨ WD (wood debris)
▨ SP (clean sand)
▨ SM (sand with fines)
▨ SP-SM
▨ BD (large concrete debris & boulders)

▨ GP (clean gravel)
▨ GM (gravel with fines)
▨ GM-GP
▨ GW (well graded gravel)
▨ ML (silt and sand)

Legend

7,200 Sample location of wood debris tested for heating value. Heating value provided in BTU/LB

Groundwater well and screen interval

— ▽ — Approximate groundwater surface, seasonal high (September 2014)

▽ATD Approximate groundwater surface at time of exploration (September

Source: Yakima County GIS; SLR, URS, Parametrix 2008, Boise 1985.

0 100 200
Scale in Feet
10x Vertical Exaggeration

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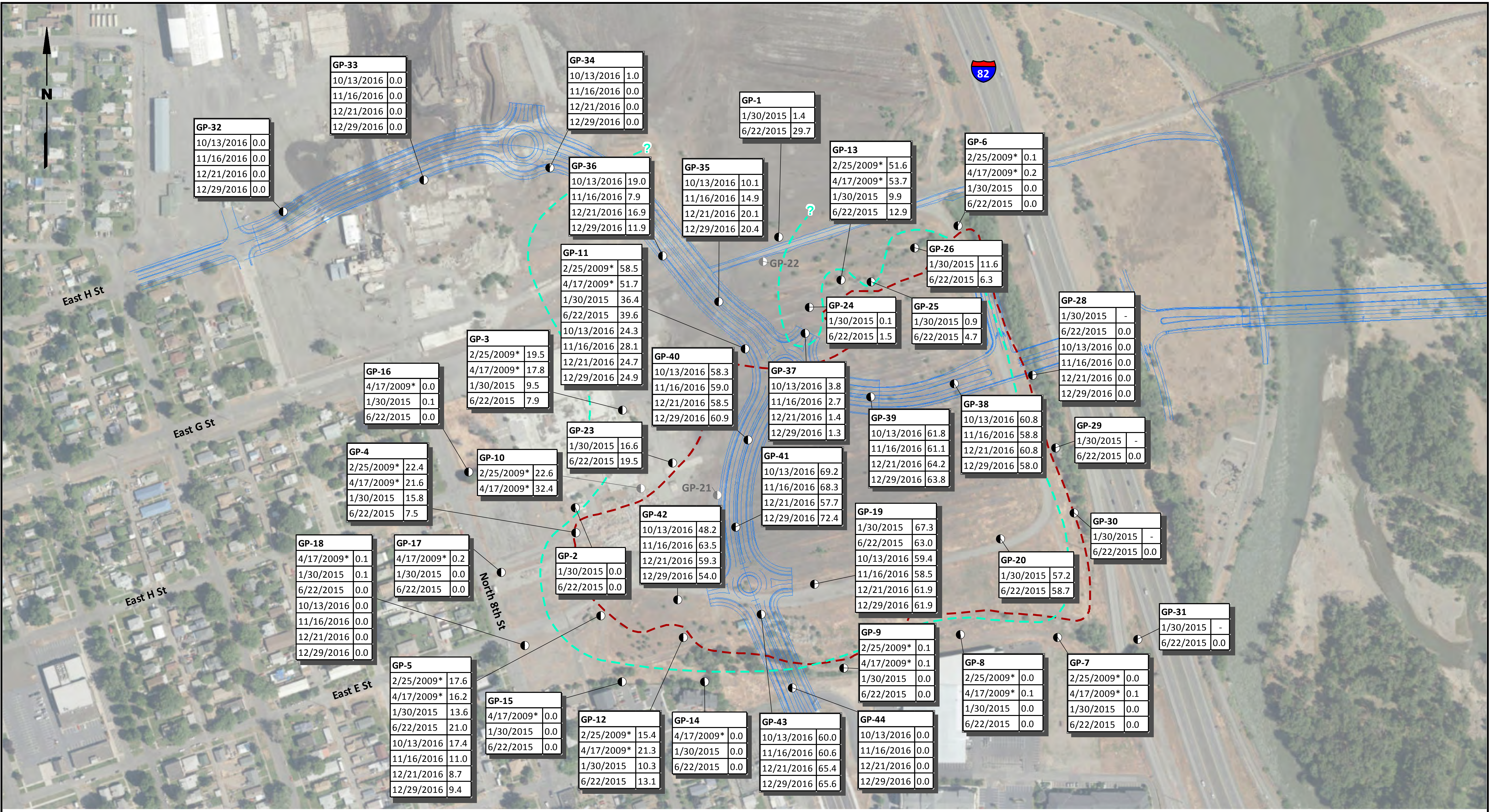
Closed City of Yakima
Landfill Site
Yakima, Washington

Geologic Cross Section D-D'

Figure
5

LANDAU ASSOCIATES, INC. | G:\Projects\1148\009\010\014\Cross Sections A B C\x cross sections A B C.dwg (A) "Figure 5" 9/12/2018



GP-33	
10/13/2016	0.0
11/16/2016	0.0
12/21/2016	0.0
12/29/2016	0.0

GP-34	
10/13/2016	1.0
11/16/2016	0.0
12/21/2016	0.0
12/29/2016	0.0

GP-32	
10/13/2016	0.0
11/16/2016	0.0
12/21/2016	0.0
12/29/2016	0.0

GP-1	
1/30/2015	1.4
6/22/2015	29.7

GP-36	
10/13/2016	19.0
11/16/2016	7.9
12/21/2016	16.9
12/29/2016	11.9

GP-35	
10/13/2016	10.1
11/16/2016	14.9
12/21/2016	20.1
12/29/2016	20.4

GP-13	
2/25/2009*	51.6
4/17/2009*	53.7
1/30/2015	9.9
6/22/2015	12.9

GP-6	
2/25/2009*	0.1
4/17/2009*	0.2
1/30/2015	0.0
6/22/2015	0.0

GP-26	
1/30/2015	11.6
6/22/2015	6.3

GP-11	
2/25/2009*	58.5
4/17/2009*	51.7
1/30/2015	36.4
6/22/2015	39.6
10/13/2016	24.3
11/16/2016	28.1
12/21/2016	24.7
12/29/2016	24.9

GP-24	
1/30/2015	0.1
6/22/2015	1.5

GP-25	
1/30/2015	0.9
6/22/2015	4.7

GP-28	
1/30/2015	-
6/22/2015	0.0
10/13/2016	0.0
11/16/2016	0.0
12/21/2016	0.0
12/29/2016	0.0

GP-3	
2/25/2009*	19.5
4/17/2009*	17.8
1/30/2015	9.5
6/22/2015	7.9

GP-40	
10/13/2016	58.3
11/16/2016	59.0
12/21/2016	58.5
12/29/2016	60.9

GP-16	
4/17/2009*	0.0
1/30/2015	0.1
6/22/2015	0.0

GP-37	
10/13/2016	3.8
11/16/2016	2.7
12/21/2016	1.4
12/29/2016	1.3

GP-38	
10/13/2016	60.8
11/16/2016	58.8
12/21/2016	60.8
12/29/2016	58.0

GP-39	
10/13/2016	61.8
11/16/2016	61.1
12/21/2016	64.2
12/29/2016	63.8

GP-29	
1/30/2015	-
6/22/2015	0.0

GP-23	
1/30/2015	16.6
6/22/2015	19.5

GP-4	
2/25/2009*	22.4
4/17/2009*	21.6
1/30/2015	15.8
6/22/2015	7.5

GP-10	
2/25/2009*	22.6
4/17/2009*	32.4

GP-41	
10/13/2016	69.2
11/16/2016	68.3
12/21/2016	57.7
12/29/2016	72.4

GP-42	
10/13/2016	48.2
11/16/2016	63.5
12/21/2016	59.3
12/29/2016	54.0

GP-19	
1/30/2015	67.3
6/22/2015	63.0
10/13/2016	59.4
11/16/2016	58.5
12/21/2016	61.9
12/29/2016	61.9

GP-30	
1/30/2015	-
6/22/2015	0.0

GP-20	
1/30/2015	57.2
6/22/2015	58.7

GP-18	
4/17/2009*	0.1
1/30/2015	0.1
6/22/2015	0.0
10/13/2016	0.0
11/16/2016	0.0
12/21/2016	0.0
12/29/2016	0.0

GP-17	
4/17/2009*	0.2
1/30/2015	0.0
6/22/2015	0.0

GP-2	
1/30/2015	0.0
6/22/2015	0.0

GP-31	
1/30/2015	-
6/22/2015	0.0

GP-9	
2/25/2009*	0.1
4/17/2009*	0.1
1/30/2015	0.0
6/22/2015	0.0

GP-8	
2/25/2009*	0.0
4/17/2009*	0.1
1/30/2015	0.0
6/22/2015	0.0

GP-7	
2/25/2009*	0.0
4/17/2009*	0.1
1/30/2015	0.0
6/22/2015	0.0

GP-5	
2/25/2009*	17.6
4/17/2009*	16.2
1/30/2015	13.6
6/22/2015	21.0
10/13/2016	17.4
11/16/2016	11.0
12/21/2016	8.7
12/29/2016	9.4

GP-15	
4/17/2009*	0.0
1/30/2015	0.0
6/22/2015	0.0

GP-12	
2/25/2009*	15.4
4/17/2009*	21.3
1/30/2015	10.3
6/22/2015	13.1

GP-14	
4/17/2009*	0.0
1/30/2015	0.0
6/22/2015	0.0

GP-43	
10/13/2016	60.0
11/16/2016	60.6
12/21/2016	65.4
12/29/2016	65.6

GP-44	
10/13/2016	0.0
11/16/2016	0.0
12/21/2016	0.0
12/29/2016	0.0

Legend

◐ Gas Probe

◐ Gas Probe (Destroyed)

-- Extent of Municipal Solid Waste

-- Approximate Extent of Landfill Gas (Methane >5% by volume)

GP-7	
2/25/2009*	0.0
4/17/2009*	0.1
1/30/2015	0.0
6/22/2015	0.0

Monitoring Date – Methane Concentration (% by volume)

*Data reported by SLR (2009)

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Data Source: Esri World Imagery.

0 300 600

Scale in Feet

Landau Associates

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Closed City of Yakima
Landfill Site
Yakima, Washington

Landfill Gas Monitoring Results

Figure
6

Table 1
Test Pit Soil and Wood Debris - Analytical Results
Transportation Cooridor
Yakima, Washington

	Location ID, Sample Depth Interval (ft), Laboratory Sample ID, Sample Date, and Sample Type										
Analyte	**TP-15-16 1.5-2.0 EV16100003-01 9/27/2016 N**	**TP-16B-16 0-2.0 EV16100003-02 9/28/2016 N**	**TP-1-16 S-1 1.0-2.0 EV16100095-01 9/26/2016 N**	**TP-6-16 S-2 1.5-2.0 EV16100095-02 9/26/2016 N**	**TP-9-16 S-1 0-1.5 EV16100095-03 9/26/2016 N**	**TP-9B-16 S-4 8.0-9.0 EV16100095-04 9/29/2016 N**	**TP-9C-16 S-3 5.0-6.0 EV16100095-05 9/30/2016 N**	**TP-10-16 S-2 1.0-2.0 EV16100095-06 9/26/2016 N**	**TP-10-16 S-5 10.0-12.0 EV16100095-07 9/26/2016 N**	**TP-10A-16 S-4 6.0-7.0 EV16100095-08 9/29/2016 N**	**TP-10B-16 S-4 5.0-5.5 EV16100095-09 9/29/2016 N**
Petroleum Hydrocarbons (mg/kg; NWTPH-dx)											
Diesel Range Organics	620 U	25 U	--	--	--	--	--	--	--	--	--
Oil Range Organics	**14,000**	**500**	--	--	--	--	--	--	--	--	--
TCLP Metals (mg/L; SW-846 7470/6020)											
Mercury	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
Arsenic	--	--	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Barium	--	--	**3.0**	**0.25**	**0.29**	**0.24**	**0.23**	**0.31**	**0.28**	**0.18**	**0.17**
Cadmium	--	--	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Chromium	--	--	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Lead	--	--	**0.042**	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Selenium	--	--	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Silver	--	--	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Gross Heating Value (BTU/lb; ASTM D5865)											
Heating Value	--	--	**7,200**	**4,600**	**6,600**	**3,500**	**7,300**	**3,100**	**6,000**	**8,600**	**5,300**
Chlorine (mg/kg; EPA 9056)											
Chlorine	--	--	--	--	--	--	--	--	--	**56**	--

Table 1
Test Pit Soil and Wood Debris - Analytical Results
Transportation Cooridor
Yakima, Washington

	Location ID, Sample Depth Interval (ft), Laboratory Sample ID, Sample Date, and Sample Type										
	TP-11-16 S-3	**TP-11A-16 S-3**	**TP-11B-16 S-5**	**TP-25-16 S-5**	**TP-26-16 S-3**	**TP-26A-16 S-3**	**TP-26B-16 S-3**	**TP-28-16 S-1**	**TP-34-16 S-4**	**TP-34-16 S-5**	**TP-34A-16 S-1**
	3.0-3.5	**5.0-6.0**	**8.0-9.0**	**8.0-10.0**	**4.0-4.5**	**6.0-7.0**	**4.0-5.0**	**1.0-2.0**	**6.0-7.0**	**10.0-11.0**	**0-3.0**
	EV16100095-10	**EV16100095-11**	**EV16100095-12**	**EV16100095-13**	**EV16100095-14**	**EV16100095-15**	**EV16100095-16**	**EV16100095-17**	**EV16100095-18**	**EV16100095-19**	**EV16100095-20**
	9/26/2016	**9/29/2016**	**9/29/2016**	**9/28/2016**	**9/28/2016**	**9/30/2016**	**9/30/2016**	**9/28/2016**	**9/30/2016**	**9/30/2016**	**9/30/2016**
Analyte	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Petroleum Hydrocarbons (mg/kg; NWTPH-dx)											
Diesel Range Organics	--	--	--	--	--	--	--	--	--	--	--
Oil Range Organics	--	--	--	--	--	--	--	--	--	--	--
TCLP Metals (mg/L; SW-846 7470/6020)											
Mercury	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
Arsenic	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Barium	**0.18**	**0.27**	**0.23**	**0.19**	**0.21**	**0.27**	**0.33**	**0.20**	**0.28**	**0.20**	**0.25**
Cadmium	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Chromium	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Lead	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	**0.025**
Selenium	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Silver	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Gross Heating Value (BTU/lb; ASTM D5865)											
Heating Value	**9,200**	**5,500**	**4,600**	**7,300**	**9,000**	**7,100**	**8,500**	**4,400**	**7,000**	**9,600**	**6,600**
Chlorine (mg/kg; EPA 9056)											
Chlorine	**41**	--	--	--	**56**	--	**130**	--	--	**53**	--

Notes

Bold = detected analyte

U = The analyte was not detected at the reported concentration.

Abbreviations and Acronyms

-- = not analyzed
BTU = British Thermal Unit
EPA = US Environmental Protection Agency
ft = feet
ID = identification
lb = pound
mg/kg = miligrams per kilogram
mg/L = miligrams per liter
N = primary sample
NWTPH = Northwest Total Petroleum Hydrocarbon
TCLP = Toxicity Characteristic Leaching Procedure

Table 2
Landfill Gas Monitoring Field Measurements
Transportation Corridor
Yakima, Washington

Monitoring Point	Methane (pbv)				Carbon Dioxide (pbv)				Oxygen (pbv)				Balance Gasses (pbv)				Static Pressure (inches of water)			
	10/13/16	11/16/16	12/21/16	12/29/16	10/13/16	11/16/16	12/21/16	12/29/16	10/13/16	11/16/16	12/21/16	12/29/16	10/13/16	11/16/16	12/21/16	12/29/16	10/13/16	11/16/16	12/21/16	12/29/16
GP-5	17.4	11.0	8.7	9.4	23.0	17.5	16.9	17.2	0.0	0.7	0.0	0.3	59.6	70.9	74.4	73.10	0.03	-0.03	-0.02	0.01
GP-11	24.3	28.1	24.7	24.9	31.3	34.3	32.2	32.3	0.0	0.0	0.0	0.2	44.4	37.6	43.1	42.6	0.03	0.03	0.00	0.00
GP-18	0.0	0.0	0.0	0.0	1.6	2.0	1.5	1.5	20.3	19.3	18.9	19.9	78.0	78.7	79.6	78.5	-0.02	0.02	-0.01	-0.03
GP-19	59.4	58.5	61.9	61.9	40.5	41.5	38.1	37.8	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.05	-0.02	0.01	0.05
GP-28	0.0	0.0	0.0	0.0	19.6	18.8	11.7	11.5	3.3	4.8	9.9	10.2	77.1	76.4	78.3	78.2	-0.02	-0.01	-0.01	-0.01
GP-32	0.0	0.0	0.0	0.0	1.5	1.6	1.2	1.2	20.2	20.0	19.8	20.2	78.3	78.4	79.1	78.5	0.00	0.00	0.02	0.02
GP-33	0.0	0.0	0.0	0.0	9.8	10.8	10.0	10.4	7.3	5.6	4.6	6.5	82.9	83.6	85.4	83.0	0.00	-0.02	0.01	-0.01
GP-34	1.0	0.0	0.0	0.0	7.0	12.9	3.2	3.6	0.0	0.2	16.9	17.5	92.0	86.8	79.9	78.8	-0.01	-0.01	0.00	-0.01
GP-35	10.1	14.9	20.1	20.4	23.5	24.7	25.0	25.6	0.0	0.0	0.0	0.2	66.4	60.4	54.8	53.8	-0.03	0.04	-0.55	0.04
GP-36	19.0	9.9	16.9	11.9	32.6	27.5	26.3	22.0	0.0	0.0	0.0	0.3	48.4	62.5	56.8	65.8	0.00	-0.04	-0.01	-0.01
GP-37	3.8	2.7	1.4	1.3	23.8	25.7	21.7	21.3	0.0	0.0	0.0	0.2	72.4	71.6	76.9	77.2	0.01	0.02	-0.22	0.01
GP-38	60.8	58.8	60.8	58.0	38.1	41.2	39.2	39.1	0.0	0.0	0.0	0.3	1.1	0.0	0.0	2.6	-0.01	-0.02	0.00	0.06
GP-39	61.8	61.1	64.2	63.8	38.2	38.9	35.8	35.8	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.05	-0.04	0.05	12.84
GP-40	58.3	59.0	58.5	60.9	38.9	41.0	33.8	37.1	0.0	0.0	0.0	0.2	2.9	0.0	7.7	1.8	0.12	0.07	0.11	0.09
GP-41	69.2	68.3	57.7	72.4	30.3	31.7	22.9	27.3	0.0	0.0	0.0	0.2	0.6	0.0	19.4	1.8	0.12	0.01	0.11	0.11
GP-42	48.2	63.5	59.3	54.0	36.7	35.9	30.5	29.5	0.0	0.0	0.0	0.3	15.1	0.9	10.2	16.2	0.05	0.02	0.04	9.90
GP-43	60.0	60.6	65.4	65.6	40.0	39.4	34.6	34.1	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.02	-0.05	0.00	0.00
GP-44	0.0	0.0	0.0	0.0	2.3	3.6	3.0	3.0	19.1	17.5	16.6	18.0	78.6	78.9	80.4	78.9	-0.02	0.02	0.00	0.01
Ambient	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	21.7	21.1	19.2	20.9	78.1	78.8	80.7	78.8	0.00	0.01	0.00	0.00

pbv = percent by volume

Table 3
Landfill Gas Monitoring Data - Analytical Results
Transportation Corridor
Yakima, Washington

Analyte	Cas No	Sample ID, Laboratory ID, Sample Date, and Results									
		Ambient-11162016 P1605444-003 11/16/2016	Ambient-12292016 P1700001-001 12/29/2016	GP-38-11162016 P1605444-005 11/16/2016	GP-38-12292016 P1700001-002 12/29/2016	GP-39-11162016 P1605444-004 11/16/2016	GP-39-12292016 P1700001-003 12/29/2016	GP-41-11162016 P1605444-002 11/16/2016	GP-41-12292016 P1700001-005 12/29/2016	GP-43-11162016 P1605444-001 11/16/2016	GP-43-12292016 P1700001-004 12/29/2016
ASTM D1946 (%, v/v)											
Oxygen	7782-44-7	**22.0**	**22.2**	**1.72**	**0.286**	0.13 U	0.22 U	**0.254**	**0.376**	**7.30**	**0.380**
Nitrogen	7727-37-9	**77.9**	**77.8**	**8.71**	**5.76**	**0.668**	**1.18**	**10.2**	**4.02**	**26.2**	**2.82**
Carbon Monoxide	630-08-0	0.12 U	0.22 U	0.15 U	0.22 U	0.13 U	0.22 U	0.15 U	0.23 U	0.14 U	0.22 U
Methane	74-82-8	0.12 U	0.22 U	**55.1**	**57.9**	**64.0**	**66.0**	**57.5**	**70.5**	**42.6**	**65.9**
Carbon Dioxide	124-38-9	0.12 U	0.22 U	**34.4**	**36.0**	**35.2**	**32.6**	**32.0**	**25.1**	**23.9**	**30.8**
EPA 25C Modified (ppmV)											
Total Gaseous Nonmethane Organics (TGNMO) as Methane		1.2 U	2.2 U	**220**	**250**	**630**	**600**	**640**	**310**	**350**	**230**
ASTM D 5504-12 (µg/m3)											
Hydrogen Sulfide	7783-06-4	8.3 U	15 U	10 U	**3,400**	**14,000**	**12,000**	10 U	**640**	**10,000**	**5,100**
Carbonyl Sulfide	463-58-1	15 U	27 U	**63**	27 U	16 U	27 U	18 U	28 U	17 U	27 U
Methyl Mercaptan	74-93-1	12 U	22 U	14 U	**38**	**37**	22 U	14 U	23 U	**59**	**30**
Ethyl Mercaptan	75-08-1	15 U	28 U	19 U	27 U	**39**	**28**	19 U	29 U	**45**	28 U
Dimethyl Sulfide	75-18-3	15 U	28 U	19 U	27 U	17 U	28 U	19 U	29 U	**47**	**110**
Carbon Disulfide	75-15-0	9.3 U	17 U	11 U	17 U	10 U	17 U	11 U	**110**	11 U	17 U
Isopropyl Mercaptan	75-33-2	19 U	34 U	23 U	34 U	21 U	34 U	23 U	36 U	21 U	34 U
tert-Butyl Mercaptan	75-66-1	22 U	41 U	27 U	40 U	25 U	40 U	27 U	42 U	25 U	41 U
n-Propyl Mercaptan	107-03-9	19 U	34 U	23 U	34 U	21 U	34 U	23 U	36 U	21 U	34 U
Ethyl Methyl Sulfide	624-89-5	19 U	34 U	23 U	34 U	21 U	34 U	23 U	36 U	21 U	34 U
Thiophene	110-02-1	20 U	38 U	25 U	37 U	23 U	38 U	25 U	39 U	24 U	38 U
Isobutyl Mercaptan	513-44-0	22 U	41 U	27 U	40 U	25 U	40 U	27 U	42 U	25 U	41 U
Diethyl Sulfide	352-93-2	22 U	41 U	27 U	40 U	25 U	40 U	27 U	42 U	25 U	41 U
n-Butyl Mercaptan	109-79-5	22 U	41 U	27 U	40 U	25 U	40 U	27 U	42 U	25 U	41 U
Dimethyl Disulfide	624-92-0	11 U	21 U	14 U	21 U	13 U	21 U	14 U	22 U	13 U	21 U
3-Methylthiophene	616-44-4	24 U	44 U	29 U	43 U	27 U	44 U	29 U	46 U	28 U	44 U
Tetrahydrothiophene	110-01-0	21 U	40 U	26 U	39 U	24 U	39 U	26 U	41 U	25 U	40 U
2,5-Dimethylthiophene	638-02-8	27 U	50 U	33 U	50 U	31 U	50 U	34 U	53 U	32 U	51 U
2-Ethylthiophene	872-55-9	27 U	50 U	33 U	50 U	31 U	50 U	34 U	53 U	32 U	51 U
Diethyl Disulfide	110-81-6	15 U	27 U	18 U	27 U	17 U	27 U	18 U	29 U	17 U	28 U
EPA TO-15 Modified (µg/m^3)											
Propene	115-07-1	**1.3**	**3.4**	**800**	**870**	**800**	**1,200**	**500**	**1,500**	**800**	**1,200**
Dichlorodifluoromethane (CFC 12)	75-71-8	**2.2**	**2.1**	**110**	**53**	**970**	**1,100**	**1,100**	**4,100**	**1,600**	**1,500**
Chloromethane	74-87-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,2-Dichloro-1,1,2,2-Tetrafluoroethane (CFC 114)	76-14-2	0.60 U	1.1 U	**1,400**	**1,100**	**1,100**	**1,300**	**980**	**2,900**	**980**	**1,200**
Vinyl Chloride	75-01-4	0.60 U	1.1 U	**90**	**78**	**6,600**	**11,000**	**3,700**	**9,400**	**3,900**	**5,400**
1,3-Butadiene	106-99-0	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Bromomethane	74-83-9	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Chloroethane	75-00-3	0.60 U	1.1 U	37 U	**26**	170 U	**83**	150 U	57 U	69 U	37 U
Ethanol	64-17-5	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	690 U	370 U
Acetonitrile	75-05-8	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U

Table 3
Landfill Gas Monitoring Data - Analytical Results
Transportation Corridor
Yakima, Washington

Analyte	Cas No	Sample ID, Laboratory ID, Sample Date, and Results									
		Ambient-11162016 P1605444-003 11/16/2016	Ambient-12292016 P1700001-001 12/29/2016	GP-38-11162016 P1605444-005 11/16/2016	GP-38-12292016 P1700001-002 12/29/2016	GP-39-11162016 P1605444-004 11/16/2016	GP-39-12292016 P1700001-003 12/29/2016	GP-41-11162016 P1605444-002 11/16/2016	GP-41-12292016 P1700001-005 12/29/2016	GP-43-11162016 P1605444-001 11/16/2016	GP-43-12292016 P1700001-004 12/29/2016
Acrolein	107-02-8	2.4 U	4.4 U	150 U	43 U	670 U	220 U	590 U	230 U	280 U	150 U
Acetone	67-64-1	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	**4,200**	**970**
Trichlorofluoromethane	75-69-4	**1.1**	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	**510**	**430**
2-Propanol (Isopropyl Alcohol)	67-63-0	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	**1,700**	370 U
Acrylonitrile	107-13-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,1-Dichloroethene	75-35-4	0.60 U	1.1 U	37 U	**11**	170 U	55 U	150 U	57 U	**99**	**81**
Methylene Chloride	75-09-2	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	**110**	**85**
3-Chloro-1-propene (Allyl Chloride)	107-05-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Trichlorotrifluoroethane	76-13-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Carbon Disulfide	75-15-0	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	690 U	370 U
trans-1,2-Dichloroethene	156-60-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	**150**	**120**
1,1-Dichloroethane	75-34-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Methyl tert-Butyl Ether	1634-04-4	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Vinyl Acetate	108-05-4	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	690 U	370 U
2-Butanone (MEK)	78-93-3	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	**5,500**	**1,500**
cis-1,2-Dichloroethene	156-59-2	0.60 U	1.1 U	37 U	**21**	**1,500**	**380**	**970**	**97**	**5,100**	**2,800**
Ethyl Acetate	141-78-6	1.2 U	**3.3**	73 U	22 U	340 U	110 U	290 U	110 U	140 U	74 U
n-Hexane	110-54-3	0.60 U	1.1 U	**830**	**920**	**820**	**840**	**400**	**620**	**660**	**580**
Chloroform	67-66-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Tetrahydrofuran (THF)	109-99-9	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	**1,100**	**910**
1,2-Dichloroethane	107-06-2	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,1,1-Trichloroethane	71-55-6	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Benzene	71-43-2	**0.60**	1.1 U	**78**	**70**	**410**	**450**	**220**	**490**	**370**	**340**
Carbon Tetrachloride	56-23-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Cyclohexane	110-82-7	1.2 U	2.2 U	**1,800**	**2,200**	**2,800**	**3,000**	**320**	**410**	**580**	**500**
1,2-Dichloropropane	78-87-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Bromodichloromethane	75-27-4	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Trichloroethene	79-01-6	0.60 U	1.1 U	37 U	**19**	170 U	**77**	150 U	57 U	**460**	**450**
1,4-Dioxane	123-91-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Methyl Methacrylate	80-62-6	1.2 U	2.2 U	73 U	22 U	340 U	110 U	290 U	110 U	140 U	74 U
n-Heptane	142-82-5	0.60 U	1.1 U	**2,200**	**3,100**	**2,000**	**2,400**	**490**	**920**	**2,000**	**1,900**
cis-1,3-Dichloropropene	10061-01-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
4-Methyl-2-pentanone	108-10-1	0.60 U	1.1 U	37 U	11 U	170 U	**78**	150 U	57 U	**1,000**	**630**
trans-1,3-Dichloropropene	10061-02-6	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,1,2-Trichloroethane	79-00-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Toluene	108-88-3	**2.2**	1.1 U	**110**	**54**	**1,900**	**1,400**	**260**	**550**	**8,400**	**6,300**
2-Hexanone	591-78-6	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Dibromochloromethane	124-48-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,2-Dibromoethane	106-93-4	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
n-Butyl Acetate	123-86-4	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
n-Octane	111-65-9	0.60 U	1.1 U	**490**	**260**	**1,700**	**1,900**	**320**	**1,800**	**1,800**	**1,500**

Table 3
Landfill Gas Monitoring Data - Analytical Results
Transportation Corridor
Yakima, Washington

Analyte	Cas No	Sample ID, Laboratory ID, Sample Date, and Results									
		Ambient-11162016 P1605444-003 11/16/2016	Ambient-12292016 P1700001-001 12/29/2016	GP-38-11162016 P1605444-005 11/16/2016	GP-38-12292016 P1700001-002 12/29/2016	GP-39-11162016 P1605444-004 11/16/2016	GP-39-12292016 P1700001-003 12/29/2016	GP-41-11162016 P1605444-002 11/16/2016	GP-41-12292016 P1700001-005 12/29/2016	GP-43-11162016 P1605444-001 11/16/2016	GP-43-12292016 P1700001-004 12/29/2016
Tetrachloroethene	127-18-4	0.60 U	1.1 U	37 U	11 U	170 U	**67**	**230**	57 U	**810**	**640**
Chlorobenzene	108-90-7	0.60 U	1.1 U	37 U	**190**	170 U	55 U	150 U	57 U	**96**	37 U
Ethylbenzene	100-41-4	0.60 U	1.1 U	**38**	**62**	**3,800**	**4,200**	150 U	**910**	**4,500**	**3,800**
m,p-Xylenes	179601-23-1	1.2 U	2.2 U	**1,200**	**440**	**7,600**	**8,600**	290 U	**2,200**	**8,600**	**7,400**
Bromoform	75-25-2	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Styrene	100-42-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	**160**	**96**
o-Xylene	95-47-6	0.60 U	1.1 U	**430**	**130**	**2,800**	**3,200**	150 U	**910**	**2,200**	**1,800**
n-Nonane	111-84-2	0.60 U	1.1 U	**140**	**200**	**13,000**	**15,000**	**480**	**9,800**	**3,200**	**3,200**
1,1,2,2-Tetrachloroethane	79-34-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Cumene	98-82-8	0.60 U	1.1 U	37 U	**300**	**690**	**780**	150 U	**240**	**750**	**550**
alpha-Pinene	80-56-8	0.60 U	1.1 U	**110**	**65**	**1,200**	**1,300**	150 U	**1,300**	**4,100**	**4,300**
n-Propylbenzene	103-65-1	0.60 U	1.1 U	37 U	**170**	**1,000**	**1,300**	150 U	**240**	**690**	**560**
4-Ethyltoluene	622-96-8	0.60 U	1.1 U	**51**	**28**	**470**	**570**	150 U	**91**	**290**	**260**
1,3,5-Trimethylbenzene	108-67-8	0.60 U	1.1 U	**220**	**110**	**1,500**	**1,800**	150 U	**520**	**550**	**450**
1,2,4-Trimethylbenzene	95-63-6	0.60 U	1.1 U	**260**	**270**	**3,400**	**3,800**	150 U	**920**	**1,500**	**1,300**
Benzyl Chloride	100-44-7	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,3-Dichlorobenzene	541-73-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,4-Dichlorobenzene	106-46-7	0.60 U	1.1 U	**61**	**100**	170 U	**69**	150 U	57 U	69 U	37 U
1,2-Dichlorobenzene	95-50-1	0.60 U	1.1 U	37 U	**22**	170 U	**79**	150 U	**76**	69 U	37 U
d-Limonene	5989-27-5	0.60 U	1.1 U	37 U	11 U	**620**	**620**	150 U	**90**	**8,000**	**6,900**
1,2-Dibromo-3-chloropropane	96-12-8	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,2,4-Trichlorobenzene	120-82-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Naphthalene	91-20-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Hexachlorobutadiene	87-68-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U

Nondetected compound show the method detection limit (MDL) as the reporting limit.

J = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

J1 = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.

U = Indicates the compound was not detected at the reported concentration.

Bold = Detected compound.

Box = Exceedance of screening level.

NA = Not analyzed.

EPA = U.S. Environmental Protection Agency

µg/m³ = micrograms per cubic meter

SIM = selected ion monitoring

APPENDIX A

Test Pit Boring Logs

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL(1)	TYPICAL DESCRIPTIONS (2)(3)
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)	▨	GW	Well-graded gravel; gravel/sand mixture(s); little or no fines
			▨	GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)	▨	GM	Silty gravel; gravel/sand/silt mixture(s)
			▨	GC	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)	▨	SW	Well-graded sand; gravelly sand; little or no fines
			▨	SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)	▨	SM	Silty sand; sand/silt mixture(s)
			▨	SC	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)		▨	ML	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
			▨	CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
			▨	OL	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)		▨	MH	Inorganic silt; micaceous or diatomaceous fine sand
			▨	CH	Inorganic clay of high plasticity; fat clay
			▨	OH	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL		▨	PT	Peat; humus; swamp soil with high organic content

OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT	■ ▨	AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK	▨	RK	Rock (See Rock Classification)
WOOD	▨	WD	Wood, lumber, wood chips
DEBRIS	▨	DB	Construction debris, garbage

Notes:
1. USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.
2. Soil descriptions are based on the general approach presented in the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the Standard Test Method for Classification of Soils for Engineering Purposes, as outlined in ASTM D 2487.
3. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

   Primary Constituent: > 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
   Secondary Constituents: > 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.
   > 15% and ≤ 30% - "gravelly," "sandy," "silty," etc.
   Additional Constituents: > 5% and ≤ 15% - "with gravel," "with sand," "with silt," etc.
   ≤ 5% - "with trace gravel," "with trace sand," "with trace silt," etc., or not noted.

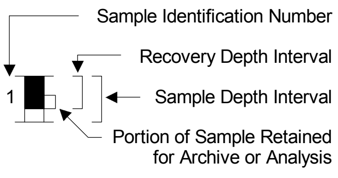
4. Soil density or consistency descriptions are based on judgement using a combination of sampler penetration blow counts, drilling or excavating conditions, field tests, and laboratory tests, as appropriate.

Drilling and Sampling Key

SAMPLER TYPE

Code	Description
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon
c	Shelby Tube
d	Grab Sample
e	Single-Tube Core Barrel
f	Double-Tube Core Barrel
g	2.50-inch O.D., 2.00-inch I.D. WSDOT
h	3.00-inch O.D., 2.375-inch I.D. Mod. California
i	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Vibrocore (Rotosonic/Geoprobe)
5	Other - See text if applicable

SAMPLE NUMBER & INTERVAL



Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

Groundwater

▽	Approximate water level at time of drilling (ATD)
▼	Approximate water level at time other than ATD

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Transportation Corridor Project
Yakima, Washington

Soil Classification System and Key

Figure
A-1

TP-1-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1058.64
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Soil Profile	Groundwater
0	1058	S-1	d5	CA-WD		WD	Brown, WOOD debris with gravel and silt (loose, dry to damp) **(FILL)**	Groundwater not encountered.
	1056	S-2	d5				Light brown, sandy, gravelly COBBLE with some concrete debris (medium dense, damp)	
5	1054							
	1052					DB	MUNICIPAL SOLID WASTE	
						DB	MUNICIPAL SOLID WASTE	
10								
15								
20								

Test Pit Completed 09/26/16
Total Depth of Test Pit = 7.0 ft.

TP-2-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1060.23
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Soil Profile	Groundwater
0	1060	S-1	d5			GP	Gray brown, sandy GRAVEL (5/8 inch minus crushed rock) (dense, damp)	Groundwater not encountered.
	1058	S-2	d5			GP-GM	Brown, GRAVEL with silt and sand (3 inch minus crushed rock) (geotextile fabric at bottom of contact) (dense, dry to damp)	
	1056					GM		
5	1054					DB	Dark brown, sandy, very silty GRAVEL with cobbles (loose to medium dense, moist)	
							MUNICIPAL SOLID WASTE	
10								
15								
20								

Test Pit Completed 09/26/16
Total Depth of Test Pit = 6.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Yakima, Washington

Log of Test Pits

Figure
A-2

TP-3-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator

Ground Elevation (ft): 1062.95

Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
0	1062	S-1	d5	
		S-2	d5	
	1060	S-3	d5	
5	1058			

Test Pit Completed 09/26/16
Total Depth of Test Pit = 5.0 ft.

USCS Symbol	
WD	Dark brown, WOOD debris (mostly fine grain wood) with gravel and sand
ML	Dark brown, gravelly, sandy SILT with some wood debris (dense, moist)
ML	Dark brown, sandy, very gravelly SILT with some wood debris (dense, moist)
DB	MUNICIPAL SOLID WASTE
DB	MUNICIPAL SOLID WASTE

Groundwater not encountered.

TP-4-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator

Ground Elevation (ft): 1063.02

Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
0	1062	S-1	d5	
		S-2	d5	
	1060			

Test Pit Completed 09/26/16
Total Depth of Test Pit = 3.5 ft.

USCS Symbol	
GM	Dark brown, sandy, silty GRAVEL with cobbles and wood debris (medium dense to dense, damp)
WD	Dark brown, gravelly, silty WOOD debris (~ 70% to 80% wood debris) (medium dense to dense, damp)
DB	MUNICIPAL SOLID WASTE

Groundwater not encountered.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
A-3

TP-5-16

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1063.81
Logged By: BEC

SAMPLE DATA

Sample Number & Interval	Sampler Type	Test Data
S-1	d5	
S-2	d5	
S-3	d5	

Depth (ft): 0, 5, 10, 15, 20
Elevation (ft): 1062, 1060

Test Pit Completed 09/26/16
Total Depth of Test Pit = 5.5 ft.

SOIL PROFILE

USCS Symbol	Description
WD	Dark brown, gravelly WOOD debris with cobbles (~50 to 60% wood debris) (loose, dry)
GP	Gray, sandy GRAVEL (gravel and 3 inch minus crushed rock)(geotextile fabric at bottom of contact) (dense, damp)
WD	Dark gray, gravelly, silty WOOD debris (mostly fine wood debris)(~70% wood debris) (medium dense to dense, damp)
DB	MUNICIPAL SOLID WASTE

GROUNDWATER

Groundwater not encountered.

TP-6-16

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1064.08
Logged By: BEC

SAMPLE DATA

Sample Number & Interval	Sampler Type	Test Data
S-1	d5	
S-2	d5	CA-WD
S-3	d5	

Depth (ft): 0, 5, 10, 15, 20
Elevation (ft): 1064, 1062

Test Pit Completed 09/26/16
Total Depth of Test Pit = 4.0 ft.

SOIL PROFILE

USCS Symbol	Description
WD	Dark brown, WOOD debris with gravel (~50% wood)
WD	Dark brown to gray, gravelly, silty WOOD debris (mostly fine grain wood)(~80%)
DB	MUNICIPAL SOLID WASTE

GROUNDWATER

Groundwater not encountered.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
A-4

TP-7-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator

Ground Elevation (ft): 1064.12

Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
0	1064	S-1	d5	
	1062	S-2	d5	
5				
10				
15				
20				

Test Pit Completed 09/26/16
Total Depth of Test Pit = 4.0 ft.

USCS Symbol	Description
WD	Brown, WOOD debris with gravel and cobbles (~50% wood debris) (loose, dry)
WD	Dark brown, WOOD debris with gravel (~50% wood debris) (dense, damp)
DB	MUNICIPAL SOLID WASTE

Groundwater not encountered.

TP-8-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator

Ground Elevation (ft): 1063.09

Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
0		S-1	d5	
	1062			
	1060	S-2	d5	
		S-3	d5	
5				
10				
15				
20				

Test Pit Completed 09/26/16
Total Depth of Test Pit = 5.0 ft.

USCS Symbol	Description
ML	Dark brown, gravelly, sandy SILT with some abundant wood debris (fine and coarse wood debris) (~60% wood debris)
WD	Reddish brown, WOOD debris with some gravel (~90% wood debris) (dense, moist)
ML	Dark gray, sandy, gravelly SILT with wood debris (loose to medium dense, moist)
DB	MUNICIPAL SOLID WASTE

Groundwater not encountered.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION

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Yakima, Washington

Log of Test Pits

Figure
A-5

TP-9-16

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 1061.22 Logged By: BEC	
0	1060	S-1	d5	CA-WD		WD	Reddish brown, WOOD debris with some gravel (coarse wood debris to 3 foot length)(~90% wood debris) (medium dense, moist)	Groundwater not encountered.
		S-2	d5			DB	MUNICIPAL SOLID WASTE	
5								
10								
15								
20								

Test Pit Completed 09/26/16
Total Depth of Test Pit = 3.0 ft.

TP-9A-16

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 1062.37 Logged By: BEC	
0	1062	S-1	d5			WD	Dark Brown and reddish brown, WOOD debris with gravel and concrete debris (~90% wood debris) (medium dense, moist)	Groundwater not encountered.
	1060	S-2	d5			ML	Dark gray, sandy, gravelly SILT with debris (~20% wood and concrete debris) (dense, moist)	
						DB	MUNICIPAL SOLID WASTE	
5								
10								
15								
20								

Test Pit Completed 09/26/16
Total Depth of Test Pit = 4.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
A-6

TP-9B-16

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1064.69
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
0	1064	S-1	d5	
		S-5	d5	
	1062	S-2	d5	
		S-3	d5	
5	1060			
	1058			
	1056	S-4	d5	CA-WD
10	1054			
	1052			
		S-6	d5	
15	1050			
20				

USCS Symbol	Soil Profile
GM	Brown, sandy, very silty GRAVEL with abundant wood debris (dense, dry to damp)
WD	Brown, gravelly, sandy WOOD debris (dense, moist)
WD	Brown, WOOD debris (~70% shavings and 30% sawdust size wood debris) WOOD debris (~10 to 15% bark, 25% sawdust, and 60% shaving size wood debris)

GROUNDWATER: Groundwater not encountered.

Test Pit Completed 09/29/16
Total Depth of Test Pit = 16.5 ft.

TP-9C-16

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1064.65
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
0	1064	S-1	d5	
	1062	S-2	d5	
5	1060			
		S-3	d5	CA-WD
	1058			
	1056	S-4	d5	
10	1054	S-5	d5	
	1052			
		S-6	d5	
15	1050			
20				

USCS Symbol	Soil Profile
WD	Brown, WOOD debris with gravel and sand (~80% bark and 15% shaving size wood debris) (dense, dry)
WD	Brown, WOOD debris with gravel (~90% shaving and sawdust size wood debris) (medium dense to dense, damp) - numerous logs from 7 to 15 feet
WD	Brown, WOOD debris (~ 80% chips and 20% shavings size wood debris)
WD	Brown, WOOD debris (~ 50% sawdust and 50% shavings size wood debris)

GROUNDWATER: Groundwater not encountered.

Test Pit Completed 09/30/16
Total Depth of Test Pit = 15.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
A-7

TP-09D-16

SAMPLE DATA				SOIL PROFILE	GROUNDWATER

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1061.83
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	USCS Symbol	Description	Groundwater
0	1060	S-1	d5		WD	Brown, gravelly WOOD debris (~60% bark and 40% shaving size wood debris)	Groundwater not encountered.
					DB	MUNICIPAL SOLID WASTE	

Test Pit Completed 09/30/16
Total Depth of Test Pit = 2.5 ft.

TP-10-16

SAMPLE DATA				SOIL PROFILE	GROUNDWATER

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1064.21
Logged By: BEC

Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
1064	S-1	d5	
	S-2	d5	CA-WD
1060	S-3	d5	
1058	S-4	d5	
1052	S-5	d5	CA-WD
1052	S-6	d5	
1050	S-7	d5	

USCS Symbol	Description
GM	Brown, silty, sandy GRAVEL with cobbles and some wood debris (~ 10% wood debris) (medium dense, moist)
WD	Brown to reddish brown, WOOD debris with gravel (~90% wood debris) (dense, moist)
WD	Brown, WOOD debris (~ 50% shaving and 50% sawdust size wood debris)
WD	Brown, WOOD debris with some gravel (~ 80% shaving and 15% bark size wood debris)
WD	Brown WOOD debris with numerous logs from 8 to 13 feet (~ 2 foot diameter to 8 foot lengths) - becoming wet at 15 feet

Groundwater not encountered.

Test Pit Completed 09/26/16
Total Depth of Test Pit = 15.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

TP-10A-16

SAMPLE DATA				SOIL PROFILE	
Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	USCS Symbol	
1064	S-1	d5		GM	Dark brown, sandy, silty GRAVEL with cobbles (dense, dry to damp)
	S-2	d5		GP	Gray, sandy GRAVEL with cobbles (dense, damp to moist)
1062					
	S-3	d5		WD	Dark brown, WOOD debris with trace cobbles and small boulders and logs (~ 80% shaving and 20% bark size wood debris) (dense, moist)
1060				WD	Reddish brown, WOOD debris(~ 80% shaving and 20% sawdust size wood debris) with scattered logs
1058	S-4	d5	CA-WD		
1056					
	S-5	d5		WD	Dark brown, WOOD debris (~ 50% bark and 50% shaving size wood debris) more weathered wood debris and scattered logs 8.5 to 10 feet - scattered logs 8.5 to 10 feet and numerous logs 10 to 15 feet
1054					
1052					
1050	S-6	d5			

Depth (ft): 0, 5, 10, 15, 20

Excavation Method: Tracked Excavator

Ground Elevation (ft): 1064.44

Logged By: BEC

GROUNDWATER

Groundwater not encountered.

Test Pit Completed 09/29/16
Total Depth of Test Pit = 15.0 ft.

TP-10B-16

SAMPLE DATA				SOIL PROFILE	
Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	USCS Symbol	
1064	S-1	d5		ML	Dark brown, sandy, gravelly SILT with cobbles and abundant wood debris (dense, damp)
1062	S-2	d5		SM	Brown, silty, very gravelly SAND with wood debris with lens of bark and saw dust (dense, moist)
1060	S-3	d5		WD	Dark brown and light brown, WOOD debris (~ 50% shaving and 50% sawdust size wood debris) refusal on numerous logs 7.5 to 8 foot depth
	S-4	d5	CA-WD		
1058					

Depth (ft): 0, 5, 10, 15, 20

Excavation Method: Tracked Excavator

Ground Elevation (ft): 1064.02

Logged By: BEC

GROUNDWATER

Groundwater not encountered.

Test Pit Completed 09/29/16
Total Depth of Test Pit = 8.0 ft.

Notes: 1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION

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Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
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TP-11-16

SAMPLE DATA

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
0	1064	S-1	d5	
		S-2	d5	
	1062	S-3	d5	CA-WD
5	1060			
	1058	S-4	d5	
	1056			
10		S-5	d5	
	1054			
15				
20				

Test Pit Completed 09/26/16
Total Depth of Test Pit = 12.0 ft.

SOIL PROFILE

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1064.72
Logged By: BEC

USCS Symbol	Description
	Brown, quarry spalls (6 to 8 minus) (very dense, moist)
WD	Dark brown, sandy, gravelly WOOD debris (`30% wood debris) (dense, moist)
WD	Reddish brown, WOOD debris (mixture of coarse and fine wood size debris) - numberous logs 6 to 12 feet - refusal on numerous logs

GROUNDWATER

Groundwater not encountered.

TP-11A-16

SAMPLE DATA

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
0		S-1	d5	
	1064			
	1062	S-2	d5	
5	1060	S-3	d5	CA-WD
	1058			
	1056			
10				
15				
20				

Test Pit Completed 09/29/16
Total Depth of Test Pit = 11.0 ft.

SOIL PROFILE

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1065.07
Logged By: BEC

USCS Symbol	Description
GM	Brown, silty, sandy GRAVEL with cobbles (9 inch minus quarry spalls) (medium dense to dense, damp)
WD	Brown, silty, sandy WOOD debris (~ 50% wood debris) (medium dense, damp)
WD	Brown, WOOD debris with trace cobbles and small boulders (~ 60% bark and 40% shaving and sawdust size wood debris) - logs 6 to 11 feet - refusal on logs running parallel to trench

GROUNDWATER

Groundwater not encountered.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION

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Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
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TP-11B-16

SAMPLE DATA				SOIL PROFILE	
Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	USCS Symbol	
1064	S-1	d5		GM	Brown, sandy, silty GRAVEL (~ 9 inch minus quarry spalls) (dense, dry)
	S-2	d5		GM	Dark gray, sandy, silty GRAVEL (~ 3 inch minus crushed rock) with wood debris (dense, damp)
1062	S-3	d5		ML	Dark gray, sandy, gravelly SILT with wood debris (logs and bark) (hard, moist)
1060	S-4	d5		SM	Dark gray, gravelly, silty SAND with cobbles and abundant wood debris (logs, bark and shaving) (loose, moist)
1058					
1056	S-5	d5	CA-WD	WD	Brown, WOOD debris (shaving and sawdust size wood debris - numerous logs at 8 to 9.5 feet - refusal because of numerous logs

Depth (ft): 0, 5, 10, 15, 20

Excavation Method: Tracked Excavator

Ground Elevation (ft): 1064.53

Logged By: BEC

Test Pit Completed 09/29/16
Total Depth of Test Pit = 9.5 ft.

GROUNDWATER

Groundwater not encountered.

TP-12-16

SAMPLE DATA				SOIL PROFILE	
Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	USCS Symbol	
1064	S-1	d5		GM	Brown, sandy, silty GRAVEL (~ 3 inch minus crushed rock) (very dense, damp)
1062	S-2	d5		GM	Dark brown, sandy, silty GRAVEL with trace organics (loose to medium dense, moist) - soil side wall sloughing from 3 or 4 feet to bottom of excavation at 9.5 feet
1060	S-3	d5			
1058					
	S-4	d5		SM	Dark brown, gravelly, silty SAND with concrete and wood debris and trace small boulders (loose, damp to moist) - black charcoal (burnt wood?) - logs at 9.5 feet - refusal because of numerous logs and concrete debris
1056	S-5	d5			

Depth (ft): 0, 5, 10, 15, 20

Excavation Method: Tracked Excavator

Ground Elevation (ft): 1064.22

Logged By: BEC

Test Pit Completed 09/27/16
Total Depth of Test Pit = 9.5 ft.

GROUNDWATER

Groundwater not encountered.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Yakima, Washington

Log of Test Pits

Figure
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TP-12A-16

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1063.50
Logged By: BEC

SAMPLE DATA

Sample Number & Interval	Sampler Type	Test Data
S-1	d5	
S-2	d5	
S-3	d5	
S-4	d5	

Test Pit Completed 09/30/16
Total Depth of Test Pit = 10.0 ft.

SOIL PROFILE

USCS Symbol	Description
GM	Brown, silty, sandy GRAVEL with cobbles and concrete debris (16 inch diameter) and abundant wood debris (medium dense, dry to damp)
GP-GM	Gray, sandy, cobbly GRAVEL with silt (dense, damp)
GP-GM	Dark gray, medium to coarse sandy, very cobbly GRAVEL with silt and trace wood debris (medium dense to dense, damp)
GM	Dark brown, silty, sandy GRAVEL with cobbles and trace wood debris (dense, moist) - abandoned excavation because of concern of utilities below a pea gravel layer crossing excavation base (dense, moist)

GROUNDWATER

Groundwater not encountered.

TP-13-16

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1064.65
Logged By: BEC

SAMPLE DATA

Sample Number & Interval	Sampler Type	Test Data
S-1	d5	
S-2	d5	
S-3	d5	
S-4	d5	
S-5	d5	
S-6	d5	
S-7	d5	
S-8	d5	

Test Pit Completed 09/27/16
Total Depth of Test Pit = 15.3 ft.

SOIL PROFILE

USCS Symbol	Description
WD	WOOD debris (chip size wood debris)
GM	Brown, sandy, silty GRAVEL and cobbles (rounded and crushed) with concrete and wood debris (~5% wood debris) (dense, damp)
GM	Gray, sandy GRAVEL (1 1/4 inch minus crushed) with silt and some wood debris (dense, damp)
SP-SM	Gray, gravelly SAND with silt, cobbles, and small boulders and wood and concrete debris (medium dense, moist)
GP	Gray, sandy GRAVEL with cobbles and small boulders (medium dense, moist)
WD	Reddish brown, WOOD debris with gravel and sand
WD	Brown, WOOD debris (sawdust size wood debris)

GROUNDWATER

▽ Slow Seepage groundwater seepage encountered at 15.0 ft.

Notes:
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2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Yakima, Washington

Log of Test Pits

Figure
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TP-13A-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1062.73
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
0	1062	S-1	d5	
		S-2	d5	
	1060			
5	1058	S-3	d5	
	1056			
	1054	S-4	d5	
10	1052	S-5	d5	
	1050	S-6	d5	
15				
20				

Test Pit Completed 09/29/16
Total Depth of Test Pit = 14.0 ft.

USCS Symbol	Description
GM	Brown, sandy, silty GRAVEL (9 inch minus quarry spalls) with wood debris (dense, damp)
GP	Gray and brown, medium to coarse sandy GRAVEL with cobbles and trace silt and wood debris (dense, damp)
WD	Brown, WOOD debris (~ 90% bark and 10% shaving size wood debris)
GP/ GM	Brown, sandy, cobbly GRAVEL with varing silt content (loose, damp)
SM	Gray, silty medium SAND (loose, moist)
GP	Gray to brown, medium to coarse sandy, cobbly GRAVEL (medium dense to dense, moist to wet) - excavation stopped because of water in excavation, excavation was 35 foot long due to old loose backfill (trench fill)

▽ Moderate Seepage groundwater seepage encountered at 13.5 ft.

TP-14-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1063.52
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
0		S-1	d5	
	1062	S-2	d5	
	1060	S-3	d5	
5	1058			
	1056	S-4	d5	
10	1054	S-5	d5	
	1052			
		S-6	d5	
15				
20				

Test Pit Completed 09/27/16
Total Depth of Test Pit = 13.5 ft.

USCS Symbol	Description
GP- GM	Brown, sandy GRAVEL (3 inch minus crushed) with silt and trace wood debris (very dense, dry)
GP	Gray, sandy, very cobbly GRAVEL with trace silt and small boulders (dense, damp to moist)
SM	Dark gray, gravelly, silty SAND with wood debris (loose, moist)
SM	Dark gray, gravelly, very silty, fine to medium SAND with some wood debris (loose to medium dense, moist)
GP	Gray, medium to coarse sandy, cobbly GRAVEL (medium dense, moist)

▽ Moderate Seepage groundwater seepage encountered at 13.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
A-13

TP-14A-16

SAMPLE DATA

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
0	1064	S-1	d5	
		S-2	d5	
	1062	S-3	d5	
		S-4	d5	
5	1060	S-5	d5	
	1058			
	1056	S-6	d5	
10	1054	S-7	d5	
	1052	S-8	d5	
15				
20				

Test Pit Completed 09/29/16
Total Depth of Test Pit = 14.0 ft.

SOIL PROFILE

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1064.18
Logged By: BEC

USCS Symbol	Description
SM	Brown, silty, very gravelly SAND with wood debris (gravel rounded and crushed) (very dense, damp)
GM	Brown, silty, sandy GRAVEL (3 inch minus crushed) with brick debris (very dense, damp)
GM	Gray, silty, sandy GRAVEL with trace brick debris (very dense, damp)
GM	Dark gray, sandy, silty GRAVEL (crushed and rounded) with wood debris (dense, damp)
GP	Gray, medium to coarse sandy GRAVEL with cobbles (dense, damp)
WD	Brown, WOOD debris (~ 100% bark size wood debris) - becoming approximately 60% bark and 40% shaving size wood debris
GP	Gray, medium to coarse sandy, cobbly GRAVEL

GROUNDWATER

Moderate Seepage groundwater seepage encountered at 14.0 ft.

TP-15-16

SAMPLE DATA

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
0	1064	S-1	d5	
		S-2	d5	CA
	1062			
		S-3	d5	
5	1060	S-4	d5	
	1058	S-5	d5	
	1056			
10	1054	S-6	d5	
	1052	S-7	d5	
15				
20				

Test Pit Completed 09/27/16
Total Depth of Test Pit = 13.0 ft.

SOIL PROFILE

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1064.70
Logged By: BEC

USCS Symbol	Description
GM	Brown, silty, sandy GRAVEL (3 inch minus crushed) with wood debris (dense, dry)
GM	Gray and brown, silty, sandy GRAVEL with cobbles and petroleum-like odor and dark staining (at 1.5 to 2 feet) - side wall water seepage (waterline leakage?)
WD	Brown and reddish brown, WOOD debris (fine chips)
GP	Gray medium to coarse sandy GRAVEL with cobbles (medium dense, wet) - water encountered at 12.75 feet, excavation stopped because of water in excavation

GROUNDWATER

▽ Moderate Seepage groundwater seepage encountered at 5.5 ft.

▽ Moderate Seepage groundwater seepage encountered at 12.8 ft.

Notes:
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2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
A-14

TP-16-16

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1066.46
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	SOIL PROFILE	GROUNDWATER
0	1066	S-1	d5			GM	Brown, silty, sandy GRAVEL with cobbles and trace wood debris (dense, dry)	Groundwater not encountered.
	1064	S-2	d5			GM	Gray, sandy, silty GRAVEL and BOULDERS (basalt rock to 3 to 4 foot length) (medium dense to dense, damp)	
5	1062							
	1060	S-3	d5				- refusal at 6.75 feet because of large boulders	
10								
15								
20								

Test Pit Completed 09/27/16
Total Depth of Test Pit = 6.8 ft.

TP-16A-16

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1065.34
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	SOIL PROFILE	GROUNDWATER
0		S-1	d5			GM	Light brown, sandy, GRAVEL with cobbles (medium dense to dense, damp)	
	1064	S-2	d5				Dark gray, sandy, silty BOULDER (basalt rock to 3 foot diameter) (medium dense to dense, damp) - refusal at 2.25 feet because of large boulders	Groundwater not encountered.
5								
10								
15								
20								

Test Pit Completed 09/28/16
Total Depth of Test Pit = 2.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION

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Yakima, Washington

Log of Test Pits

Figure
A-15

TP-16B-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1065.36
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Soil Profile	Groundwater
0	1064	S-1	d5	CA		GM	Dark gray, sandy, silty GRAVEL with cobbles and boulders with petroleum like odor and staining (at 1 to 2,5 feet) and some concrete, wood, metal, and plastic debris (construction debris?) (medium dense, damp)	Groundwater not encountered.
		S-2	d5				Dark gray, sandy, silty BOULDER (basalt rock to 3 foot diameter) (medium dense, moist) - refusal at 2.75 feet because of large boulders	

Test Pit Completed 09/28/16
Total Depth of Test Pit = 3.0 ft.

Depth (ft): 0, 5, 10, 15, 20

TP-16C-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1073.87
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Soil Profile	Groundwater
0		S-1	d5			GM	Brown, silty, sandy, very cobbly GRAVEL (quarry spalls to 12 diameter and rounded gravel) (dense, dry to damp)	Groundwater not encountered.
	1072	S-2	d5					
	1070						Dark gray, sandy, silty BOULDER (basalt rock to 3 to 4 foot diameter) (medium dense to dense, dry to damp) - refusal at 4 feet because of large boulders	

Test Pit Completed 09/30/16
Total Depth of Test Pit = 4.0 ft.

Depth (ft): 0, 5, 10, 15, 20

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
A-16

TP-17-16

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 1066.22 Logged By: BEC	
0	1066 1064 1062	S-1	d5				Dark gray, sandy, silty BOULDER (basalt rock to 3 to 4 foot diameter) (medium dense to dense, dry to damp)	Groundwater not encountered.
5							- refusal at 4.5 feet because of large boulders	
10								
15								
20								

Test Pit Completed 09/27/16
Total Depth of Test Pit = 4.5 ft.

TP-18-16

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 1069.17 Logged By: BEC	
0	1068	S-1	d5				Dark gray, sandy, silty BOULDER (basalt rock to 3 to 4 foot diameter) with wood debris and logs (dense, damp)	Groundwater not encountered.
5							- refusal at 3 feet because of large boulders	
10								
15								
20								

Test Pit Completed 09/27/16
Total Depth of Test Pit = 3.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Yakima, Washington

Log of Test Pits

Figure
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TP-18A-16

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	

Excavation Method: Tracked Excavator

Ground Elevation (ft): 1069.34

Logged By: BEC

Depth (ft): 0, 5, 10, 15, 20

Elevation (ft): 1068, 1066, 1064, 1062, 1060

Sample Number & Interval	Sampler Type
S-1	d5
S-2	d5
S-3	d5
S-4	d5
S-5	d5

Test Pit Completed 09/30/16
Total Depth of Test Pit = 11.0 ft.

USCS Symbol	Description
GM	Dark brown, sandy, very silty GRAVEL with cobbles (9 inch minus quarry spalls) (dense, dry to damp)
GM	Gray, silty, sandy GRAVEL (2 1/4 inch minus crushed rock) and abundant concrete (8 to 9 inch length)
ML	Brown, gravelly, fine sandy SILT with cobbles and some wood debris (lumber) and boulders and some reinforcing steel debris (medium dense to dense, damp)
SM	Gray, very silty, fine SAND (loose, damp to moist)
	Dark gray, silty, sandy, cobbly BOULDERS with some voids between boulders (basalt rock to 4.5 foot diameter) (loose, moist) - refusal at 11 feet because of large boulders

Groundwater not encountered.

TP-19-16

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	

Excavation Method: Tracked Excavator

Ground Elevation (ft): 1070.00

Logged By: BEC

Depth (ft): 0, 5, 10, 15, 20

Elevation (ft): 1070, 1068, 1066, 1064, 1062, 1060, 1058

Sample Number & Interval	Sampler Type
S-1	d5
S-2	d5
S-3	d5
S-4	d5

Test Pit Completed 09/27/16
Total Depth of Test Pit = 12.5 ft.

USCS Symbol	Description
AC	Asphalt pavement (0.25 to 0.2 foot thickness) and 0.4 foot thickness 5/8 inch minus crushed rock (dense, damp)
	Brown, sandy, gravelly COBBLE (dense, damp)
GP	Brown to gray brown, medium to coarse sandy, cobbly GRAVEL (medium dense, damp)

▽ Moderate Seepage groundwater seepage encountered at 12.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Yakima, Washington

Log of Test Pits

Figure
A-18

TP-20-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1070.87
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
0	1070	S-1	d5	
	1068	S-2	d5	
		S-3	d5	
5	1066			
	1064	S-4	d5	

USCS Symbol	Description
GM	Brown, sandy, silty GRAVEL with abundant wood debris (1 1/4 inch minus crushed rock) (dense, dry to damp)
SM	Light reddish brown, very silty, fine SAND (medium dense, damp)
GP	Brown, medium to coarse sandy GRAVEL with cobbles and trace silt (dense, damp)

Groundwater not encountered.

Test Pit Completed 09/27/16
Total Depth of Test Pit = 8.5 ft.

refusal at 8.5 feet with heavy soil side wall caving - caving from 4 to 8.5 feet

TP-21-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1071.26
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
0		S-1	d5	
	1070	S-2	d5	
	1068	S-3	d5	
5	1066	S-4	d5	
	1064	S-5	d5	

USCS Symbol	Description
PT	Sod/Topsoil
ML	Light brown, fine sandy SILT with roots and gravel (medium dense, dry to damp)
GP	Gray brown, sandy, very cobbly GRAVEL (dense, damp)

Groundwater not encountered.

Test Pit Completed 09/27/16
Total Depth of Test Pit = 8.0 ft.

refusal at 8 feet with heavy soil side wall caving - caving from 3 to 8 feet

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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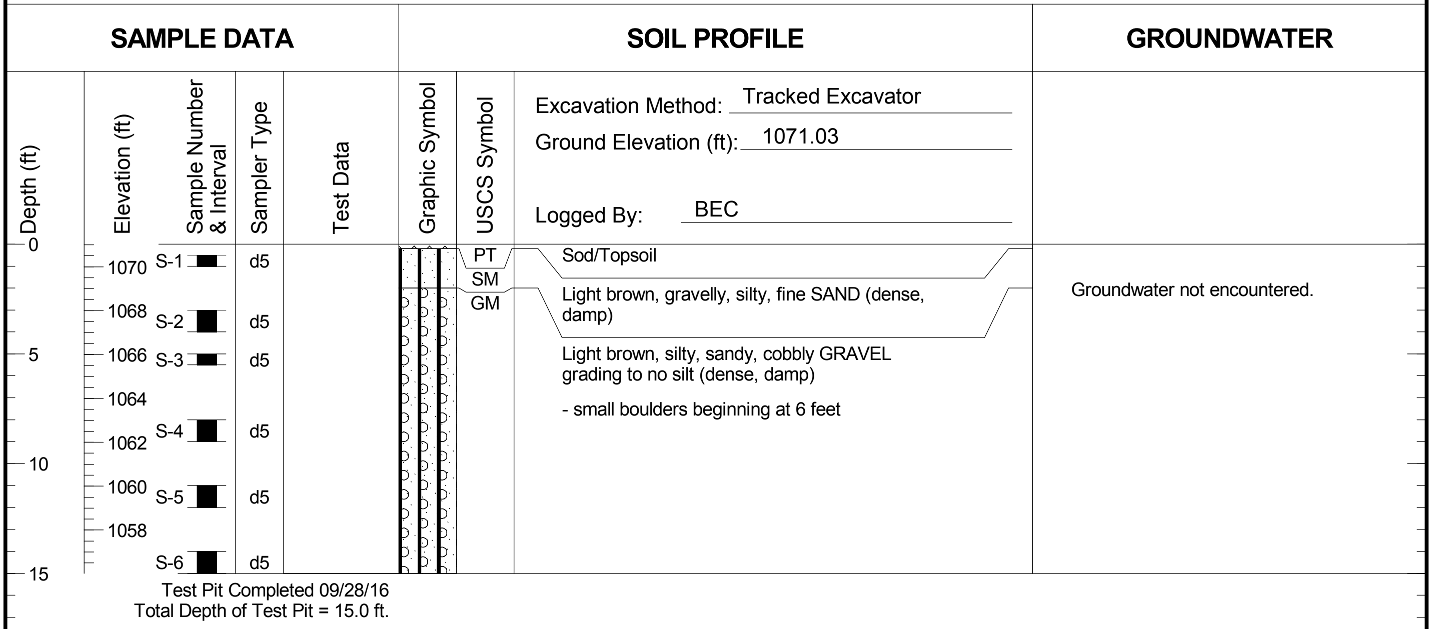
Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
A-19

TP-22-16



Excavation Method: Tracked Excavator
Ground Elevation (ft): 1071.03
Logged By: BEC

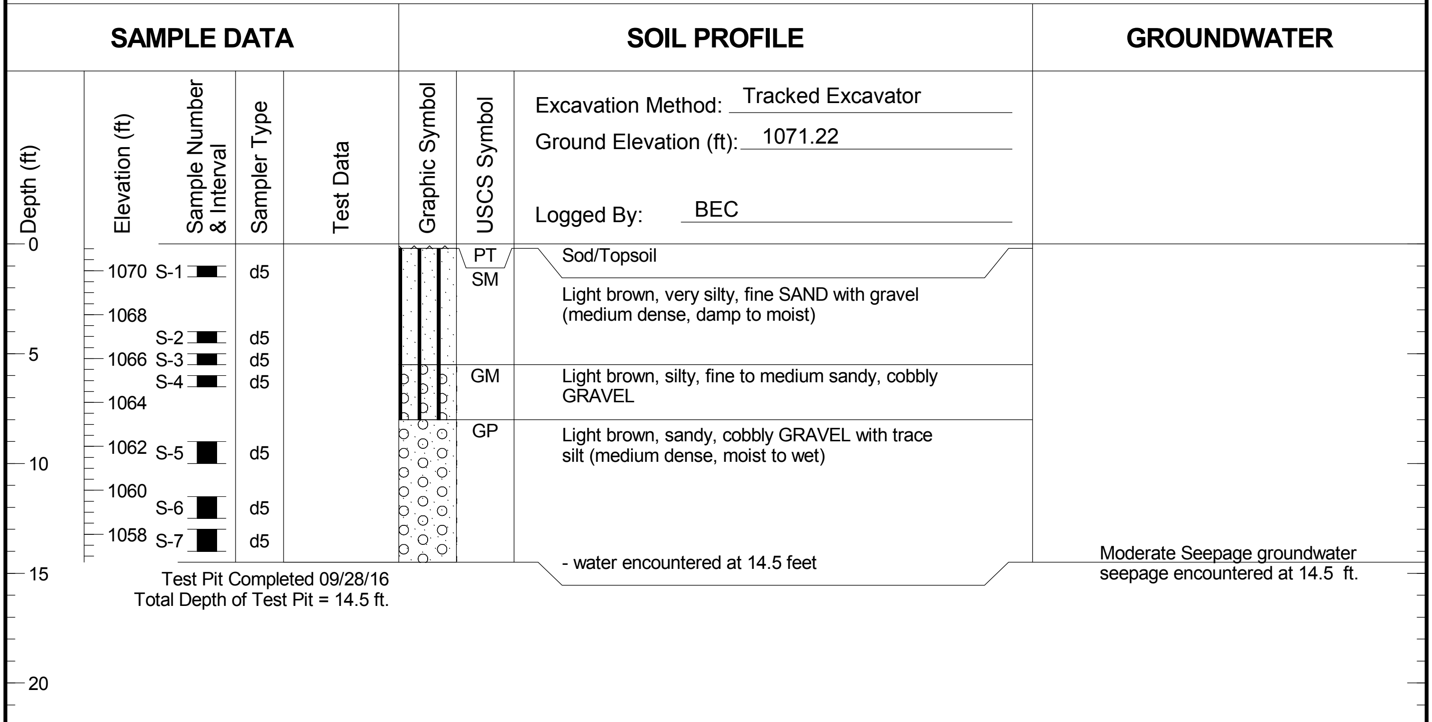
Sample Number & Interval	Sampler Type
S-1	d5
S-2	d5
S-3	d5
S-4	d5
S-5	d5
S-6	d5

USCS Symbol	Description
PT	Sod/Topsoil
SM	Light brown, gravelly, silty, fine SAND (dense, damp)
GM	Light brown, silty, sandy, cobbly GRAVEL grading to no silt (dense, damp) - small boulders beginning at 6 feet

Groundwater not encountered.

Test Pit Completed 09/28/16
Total Depth of Test Pit = 15.0 ft.

TP-23-16



Excavation Method: Tracked Excavator
Ground Elevation (ft): 1071.22
Logged By: BEC

Sample Number & Interval	Sampler Type
S-1	d5
S-2	d5
S-3	d5
S-4	d5
S-5	d5
S-6	d5
S-7	d5

USCS Symbol	Description
PT	Sod/Topsoil
SM	Light brown, very silty, fine SAND with gravel (medium dense, damp to moist)
GM	Light brown, silty, fine to medium sandy, cobbly GRAVEL
GP	Light brown, sandy, cobbly GRAVEL with trace silt (medium dense, moist to wet) - water encountered at 14.5 feet

Moderate Seepage groundwater seepage encountered at 14.5 ft.

Test Pit Completed 09/28/16
Total Depth of Test Pit = 14.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
A-20

TP-24-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1064.71
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	USCS Symbol	Soil Profile	Groundwater
0	1064	S-1	d5		SM	Light brown, gravelly, silty SAND with concrete debris and few metal and brick debris (medium dense, damp)	Groundwater not encountered.
	1062	S-2	d5		DB	Light brown, CONCRETE debris with silt, sand, and gravel (concrete debris 0 to 2.5 foot thickness and 5 to 6 foot in length) voids under some of the concrete debris refusal at 6 feet in concrete debris	
5	1060						
10							
15							
20							

Test Pit Completed 09/28/16
Total Depth of Test Pit = 6.0 ft.

TP-24A-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1064.54
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	USCS Symbol	Soil Profile	Groundwater
0	1064	S-1	d5		GM	Brown, sandy, very silty GRAVEL with cobbles (dense, dry to damp)	Groundwater not encountered.
	1062	S-2	d5		GM	Dark gray, silty, sandy GRAVEL with concrete and reinforcing steel debris (medium dense to dense, damp)	
5	1060	S-3	d5		SM	Gray, very silty, fine to medium SAND with wood debris (loose to medium dense, damp)	
	1058	S-4	d5		GP	Gray, medium to coarse sandy GRAVEL with cobbles (loose to medium dense, damp)	
	1056	S-5	d5		WD	Brown, WOOD debris (sawdust size wood debris) - test pit location at end of abundant concrete debris beginning at TP-24A-16 (65' length trench excavated)	
10							
15							
20							

Test Pit Completed 09/28/16
Total Depth of Test Pit = 9.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION

LANDAU ASSOCIATES

Transportation Corridor Project Yakima, Washington	Log of Test Pits	Figure A-21

TP-25-16

SAMPLE DATA | SOIL PROFILE | GROUNDWATER

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1064.57
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
0	1064	S-1	d5	
	1062	S-2	d5	
5	1060	S-3	d5	
	1058	S-4	d5	
	1056	S-5	d5	CA-WD
10	1054			
	1052	S-6	d5	
15		S-7	d5	

Test Pit Completed 09/28/16
Total Depth of Test Pit = 14.5 ft.

USCS Symbol	Description
GM	Dark brown, sandy, silty GRAVEL with cobbles and some wood debris (very dense, damp)
GP	Gray, medium sandy GRAVEL with cobbles and trace silt (very dense, damp)
SM	Dark gray, very silty, fine SAND with lens of wood debris from 4 to 7 feet (sawdust size wood debris) (dense, damp to moist)
WD	Brown, WOOD debris (~ 80% bark and 20% sawdust and grading to 40% bark and 60% sawdust size wood debris)
GP	Gray, medium to coarse sandy GRAVEL with cobbles (dense, wet) - water encountered at 14.5 feet

Groundwater: Moderate Seepage groundwater seepage encountered at 14.5 ft.

TP-26-16

SAMPLE DATA | SOIL PROFILE | GROUNDWATER

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1065.12
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
0	1064	S-1	d5	
	1062	S-2	d5	
5	1060	S-3	d5	CA-WD
	1058	S-4	d5	
	1056	S-5	d5	
10	1054	S-6	d5	
	1052			
15		S-7	d5	

Test Pit Completed 09/28/16
Total Depth of Test Pit = 15.0 ft.

USCS Symbol	Description
GM	Brown, silty, sandy GRAVEL (9 to 12 inch minus quarry spalls) with abundant wood debris (medium dense, damp)
WD	Reddish brown, WOOD debris (~ 9 to 12 inch minus bark and shaving size debris)
WD	Reddish brown, WOOD debris (~ 8 inch minus bark and chip size 4 to 10 feet and below 10 feet 90% bark and 10% shavings sized wood debris) - numberous logs below 10 feet
WD	Brown, WOOD debris (~ 80% shaving and 20% bark wood size debris)
DB	MUNICIPAL SOLID WASTE

Groundwater: Groundwater not encountered.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
A-22

TP-26A-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1065.56
Logged By: BEC

Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
1064	S-1	d5	
1062	S-2	d5	
1058	S-3	d5	CA-WD
1054	S-4	d5	
1052	S-5	d5	

USCS Symbol	Description	Groundwater
WD	Brown, gravelly, sandy WOOD debris (~80% bark and shaving wood debris) with layers of gray and brown sandy GRAVEL (9 inch minus quarry spalls) with wood debris (medium dense, moist)	Groundwater not encountered.
WD	Brown, WOOD debris (~ 80% bark and 20% shaving at 6 feet 50% bark and 50% shaving size wood debris) - logs at 9 to 15 feet	
WD	Brown, WOOD debris (~ 50% sawdust and 50% shaving size wood debris)	

Test Pit Completed 09/30/16
Total Depth of Test Pit = 15.0 ft.

TP-26B-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1065.49
Logged By: BEC

Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data
	S-1	d5	
1064	S-2	d5	
1062	S-3	d5	CA-WD

USCS Symbol	Description	Groundwater
GM	Brown, silty, sandy GRAVEL (9 inch minus quarry spalls with some rounded gravel) (medium dense, moist)	Groundwater not encountered.
	Gray brown, silty, gravelly COBBLE (12 inch minus quarry spalls) (medium dense, moist)	
WD	Reddish brown, WOOD debris (~ 50% bark and 50% shaving size wood debris)	
DB	MUNICIPAL SOLID WASTE	

Test Pit Completed 09/30/16
Total Depth of Test Pit = 8.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
A-23

TP-27-16

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 1060.29 Logged By: BEC	
0	1060 1058	S-1	d5			WD	Brown, WOOD debris (bark and chips) with 30 foot long by 2 foot diameter log	Groundwater not encountered.
						DB	MUNICIPAL SOLID WASTE	

Test Pit Completed 09/28/16
Total Depth of Test Pit = 3.0 ft.

TP-28-16

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 1061.00 Logged By: BEC	
0	1060	S-1	d5	CA-WD		WD	Brown, WOOD debris (~ 80% bark and 20% shaving size wood debris)	Groundwater not encountered.
						DB	MUNICIPAL SOLID WASTE	

Test Pit Completed 09/28/16
Total Depth of Test Pit = 2.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
A-24

TP-29-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1060.28
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol		Groundwater
0	1060					ML	Brown, sandy, very gravelly SILT with abundent of wood debris (~ 20%) (dense, damp)	Groundwater not encountered.
		S-1	d5					
	1058	S-2	d5			SM	Gray, silty, fine to medium SAND to gravelly, silty, fine to medium SAND with wood debris (medium dense, moist)	
		S-3	d5					
5	1056					GM	Gray, silty, very sandy GRAVEL with wood debris with logs from 4 to 6 feet	
						DB	MUNICIPAL SOLID WASTE	
10								
15								
20								

Test Pit Completed 09/28/16
Total Depth of Test Pit = 5.5 ft.

TP-30-16

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1059.82
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol		Groundwater
0		S-1	d5			WD	Dark brown, WOOD debris with silt, sand, and gravel (~ 80% wood debris)	Groundwater not encountered.
	1058	S-2	d5			SM	Gray, silty, very gravelly, fine to medium SAND with some plastic and rubber tire (medium dense, moist)	
						DB	MUNICIPAL SOLID WASTE	
5								
10								
15								
20								

Test Pit Completed 09/28/16
Total Depth of Test Pit = 2.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
A-25

TP-31-16

Excavation Method: Tracked Excavator

Ground Elevation (ft): 1058.54

Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	USCS Symbol	SOIL PROFILE	GROUNDWATER
0	1058	S-1	d5		WD	Brown, WOOD debris (~ 50% bark, 30% shaving, and 20% sawdust size wood debris)	
		S-2	d5		ML	Gray, sandy, very gravelly SILT (medium stiff, moist)	Groundwater not encountered.
					DB	MUNICIPAL SOLID WASTE	

Test Pit Completed 09/29/16
Total Depth of Test Pit = 2.0 ft.

TP-32-16

Excavation Method: Tracked Excavator

Ground Elevation (ft): 1058.12

Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	USCS Symbol	SOIL PROFILE	GROUNDWATER
0	1058	S-1	d5		WD	Brown to reddish brown, WOOD debris with some sand and gravel (~ 40% shaving, 25% bark, and 25% sawdust size wood debris)	
	1056	S-2	d5		SM	Dark gray, gravelly, silty, fine to medium SAND with scattered plastic, wood, and metal debris (medium dense, moist to wet)	Groundwater not encountered.
					DB	MUNICIPAL SOLID WASTE	

Test Pit Completed 09/29/16
Total Depth of Test Pit = 3.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Yakima, Washington

Log of Test Pits

Figure
A-26

TP-33-16

SAMPLE DATA	SOIL PROFILE	GROUNDWATER

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1058.41
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Description
0	1058	S-1	d5			ML	Brown, gravelly, sandy SILT with glass and abundant wood debris (loose, damp)
						DB	MUNICIPAL SOLID WASTE
5							
10							
15							
20							

Test Pit Completed 09/29/16
Total Depth of Test Pit = 1.8 ft.

Groundwater not encountered.

TP-34-16

SAMPLE DATA	SOIL PROFILE	GROUNDWATER

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1064.21
Logged By: BEC

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Description
0	1064	S-1	d5			WD	Reddish brown, WOOD debris with gravel (6 inch minus quarry spalls) (~ 70% bark and 25% shaving size wood debris) (medium dense, moist)
	1062	S-2	d5			GM	Gray, sandy, silty, gravelly COBBLE (12 inch quarry spalls) (dense, wet)
	1060	S-3	d5			WD	Brown, WOOD debris (~ 80 to 100% bark and 0 to 20% shaving size wood debris)
5							
	1058	S-4	d5	CA-WD			
	1056						
10	1054	S-5	d5	CA-WD			- numerous logs 10 to 15 feet
	1052						
	1050	S-6	d5			ML	Gray, sandy, gravelly SILT with abundant wood debris (medium dense, wet)
15		S-7	d5			GP-GM	Gray, medium to coarse cobbly GRAVEL with silt (dense, moist)
	1048						
20							

Test Pit Completed 09/30/16
Total Depth of Test Pit = 16.5 ft.

Groundwater not encountered.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
A-27

TP-34A-16

Excavation Method: Tracked Excavator
Ground Elevation (ft): 1058.82
Logged By: BEC

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol		
0	1058 1056	S-1	d5	CA-WD		WD	Brown, WOOD debris (~ 100% bark size wood debris)	Groundwater not encountered.
						GP	Gray, medium to coarse sandy GRAVEL with cobbles (medium dense, moist)	
						DB	MUNICIPAL SOLID WASTE	

Test Pit Completed 09/30/16
Total Depth of Test Pit = 3.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Transportation Corridor Project
Yakima, Washington

Log of Test Pits

Figure
A-28

APPENDIX B

Landfill Gas Probes Logs

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL$^{(1)}$	TYPICAL DESCRIPTIONS $^{(2)(3)}$
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)	▨	**GW**	Well-graded gravel; gravel/sand mixture(s); little or no fines
			▨	**GP**	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)	▨	**GM**	Silty gravel; gravel/sand/silt mixture(s)
			▨	**GC**	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)	▨	**SW**	Well-graded sand; gravelly sand; little or no fines
			▨	**SP**	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)	▨	**SM**	Silty sand; sand/silt mixture(s)
			▨	**SC**	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)		▨	**ML**	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
			▨	**CL**	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
			▨	**OL**	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)		▨	**MH**	Inorganic silt; micaceous or diatomaceous fine sand
			▨	**CH**	Inorganic clay of high plasticity; fat clay
			▨	**OH**	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL		▨	**PT**	Peat; humus; swamp soil with high organic content

OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT	■ ▨	**AC** or **PC**	Asphalt concrete pavement or Portland cement pavement
ROCK	▨	**RK**	Rock (See Rock Classification)
WOOD	▨	**WD**	Wood, lumber, wood chips
DEBRIS	▨	**DB**	Construction debris, garbage

Notes:
1. USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.
2. Soil descriptions are based on the general approach presented in the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the Standard Test Method for Classification of Soils for Engineering Purposes, as outlined in ASTM D 2487.
3. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

Primary Constituent:	> 50%	- "GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents:	> 30% and ≤ 50%	- "very gravelly," "very sandy," "very silty," etc.
	> 15% and ≤ 30%	- "gravelly," "sandy," "silty," etc.
Additional Constituents:	> 5% and ≤ 15%	- "with gravel," "with sand," "with silt," etc.
	≤ 5%	- "with trace gravel," "with trace sand," "with trace silt," etc., or not noted.

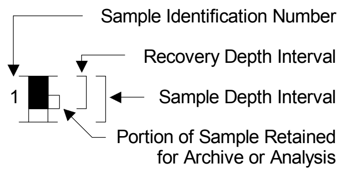
4. Soil density or consistency descriptions are based on judgement using a combination of sampler penetration blow counts, drilling or excavating conditions, field tests, and laboratory tests, as appropriate.

Drilling and Sampling Key

SAMPLER TYPE

Code	Description
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon
c	Shelby Tube
d	Grab Sample
e	Single-Tube Core Barrel
f	Double-Tube Core Barrel
g	2.50-inch O.D., 2.00-inch I.D. WSDOT
h	3.00-inch O.D., 2.375-inch I.D. Mod. California
i	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Vibrocore (Rotosonic/Geoprobe)
5	Other - See text if applicable

SAMPLE NUMBER & INTERVAL



Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

Groundwater

▽	Approximate water level at time of drilling (ATD)
▼	Approximate water level at time other than ATD

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Yakima, Washington

Soil Classification System and Key

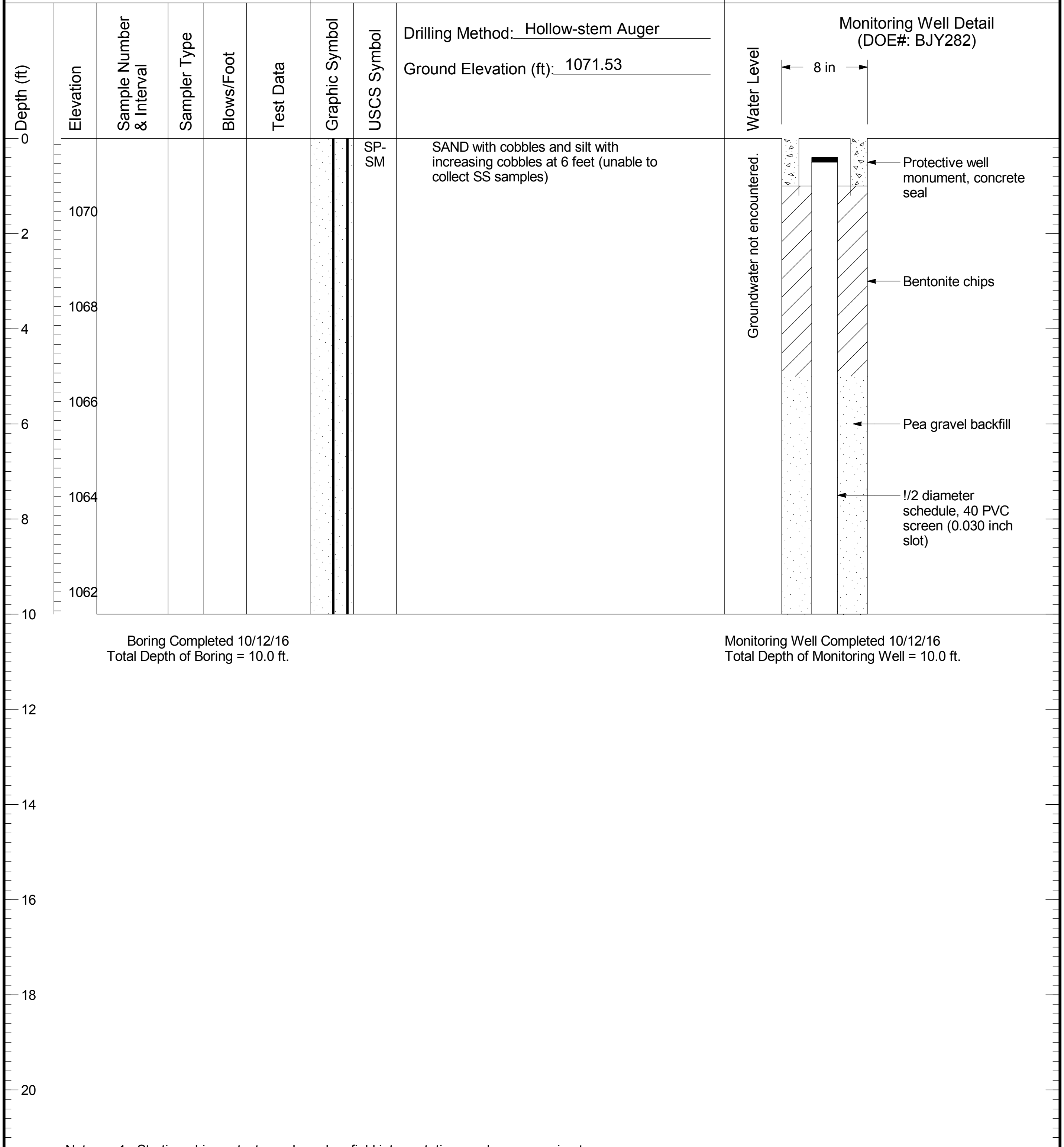
Figure
B-1

GP-32

SAMPLE DATA	SOIL PROFILE	GROUNDWATER

Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1071.53



SAND with cobbles and silt with increasing cobbles at 6 feet (unable to collect SS samples)

Boring Completed 10/12/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

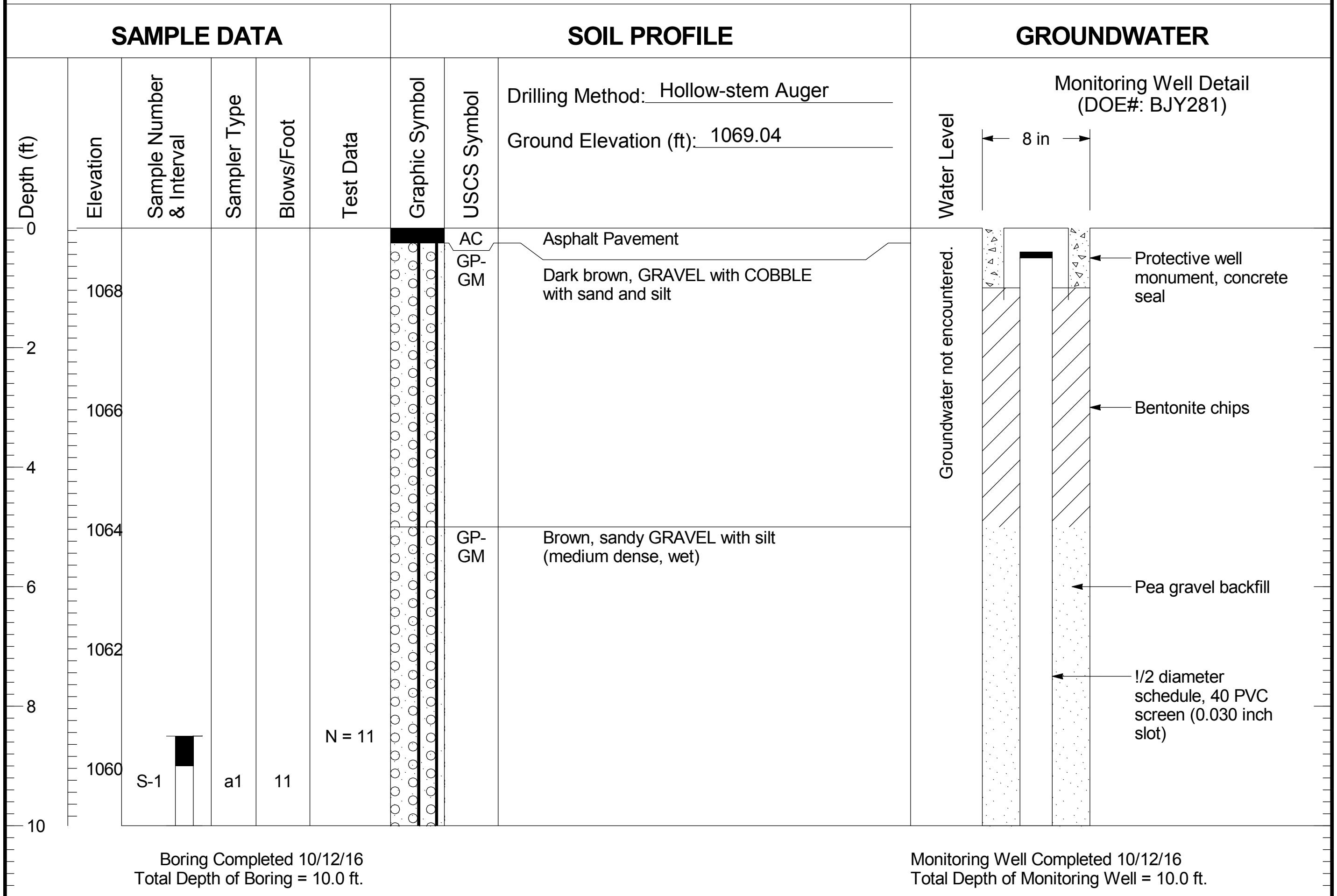
LANDAU
ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-32

Figure
B-2

GP-33



Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1069.04

USCS Symbol	Description
AC	Asphalt Pavement
GP-GM	Dark brown, GRAVEL with COBBLE with sand and silt
GP-GM	Brown, sandy GRAVEL with silt (medium dense, wet)

Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
S-1	a1	11	N = 11

Boring Completed 10/12/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG W/ ELEVATION

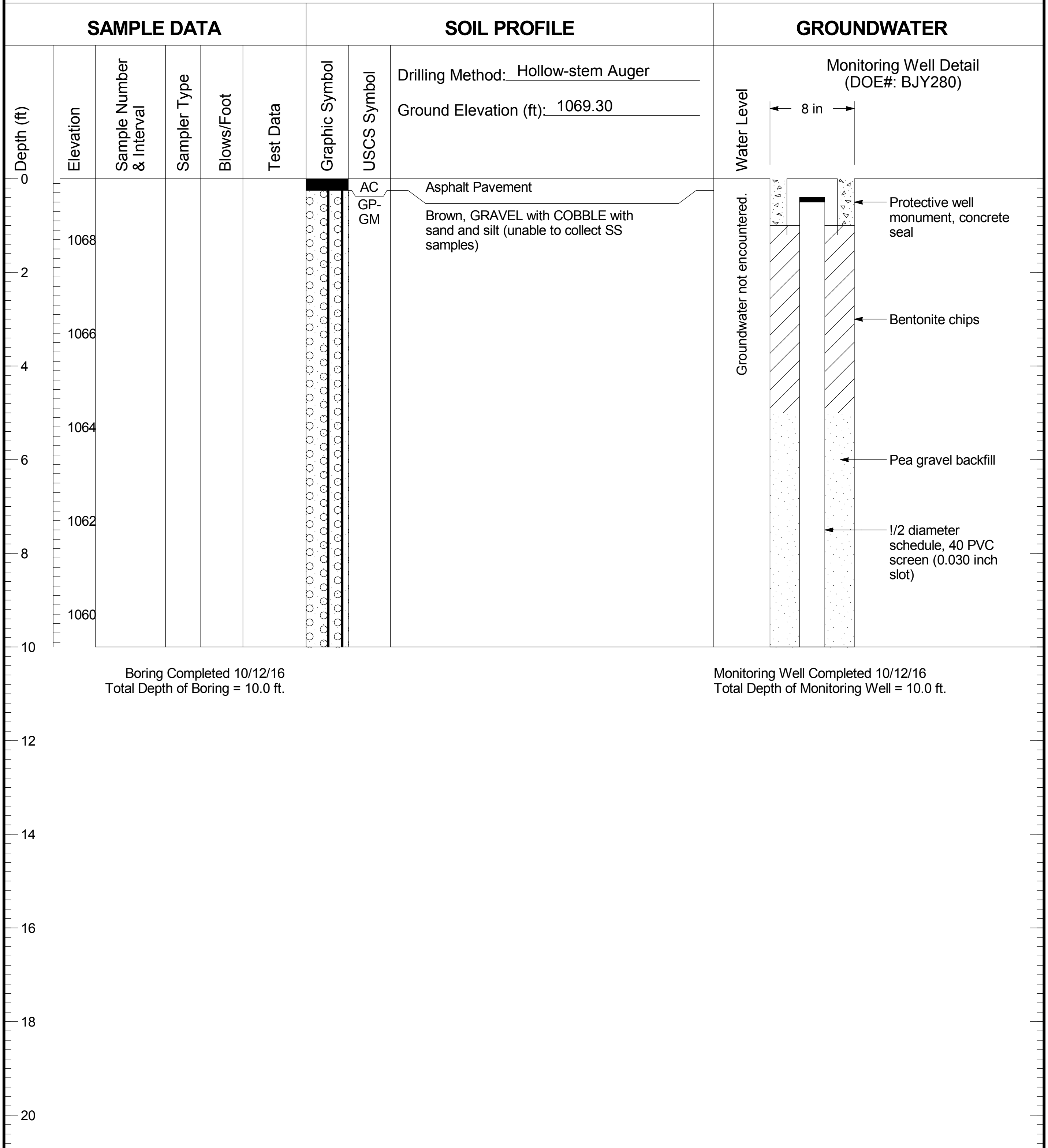
LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-33

Figure
B-3

GP-34



Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1069.30

Asphalt Pavement

Brown, GRAVEL with COBBLE with sand and silt (unable to collect SS samples)

Boring Completed 10/12/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

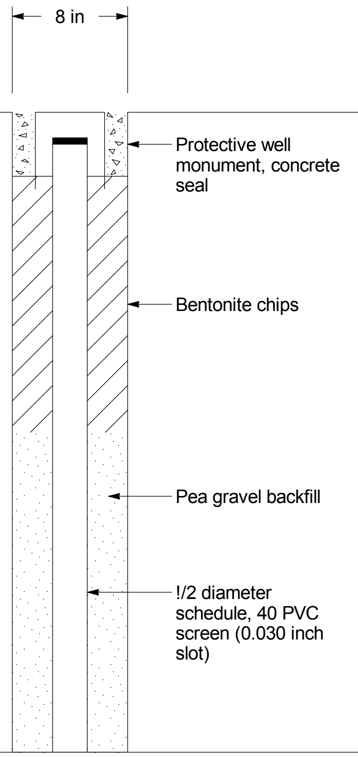
Log of Monitoring Well GP-34

Figure
B-4

GP-35

SAMPLE DATA						SOIL PROFILE		GROUNDWATER
Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	USCS Symbol	Drilling Method: Hollow-stem Auger Ground Elevation (ft): 1064.56	Water Level
0	1064					WD	Reddish brown, WOOD debris (dense, moist)	Groundwater not encountered.
2	1062							
4	1060	S-1	a1	32	PID=15; LEL=6; N = 32			
6	1058					GP-GM	Brown, GRAVEL with COBBLE with sand and silt (unable to collect SS sample)	
8	1056							
10								

Monitoring Well Detail
(DOE#: BJY278)



Boring Completed 10/11/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

Log of Monitoring Well GP-35

Figure
B-5

GP-36

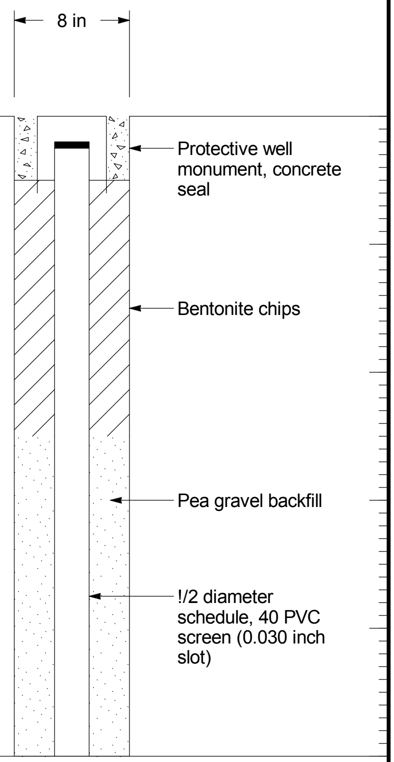
SAMPLE DATA						SOIL PROFILE		
Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Drilling Method: Hollow-stem Auger Ground Elevation (ft): 1064.53
0	1064						SP-SM	Brown, very gravelly, fine SAND with silt with wood debris (unable to collect SS samples)
2	1062				PID=13;LEL=0			
4	1060	S-1	a1					
6	1058						ML	Brown to gray, sandy SILT with wood debris and gravel (unable to collect SS samples)
8	1056	S-2	a1					
10								

Boring Completed 10/12/16
Total Depth of Boring = 10.0 ft.

GROUNDWATER

Water Level: Groundwater not encountered.

Monitoring Well Detail
(DOE#: BJY279)



Monitoring Well Completed 10/12/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-36

Figure
B-6

GP-37

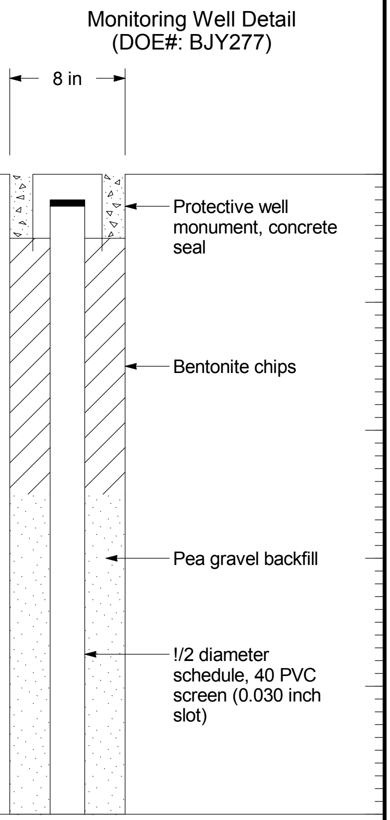
SAMPLE DATA / SOIL PROFILE / GROUNDWATER

Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1065.82

Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	USCS Symbol	
0						WD	Brown, WOOD debris (fine to coarse size) (loose to medium dense, damp)
2	1064						
4	1062	S-1	a1	15	PID=1;LEL=5; N = 15		
6	1060						
8	1058	S-2	a1	9	PID=10.4;LEL=7; N = 5		
10	1056						
12							
14							
16							
18							
20							

Water Level: Groundwater not encountered.



Boring Completed 10/11/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

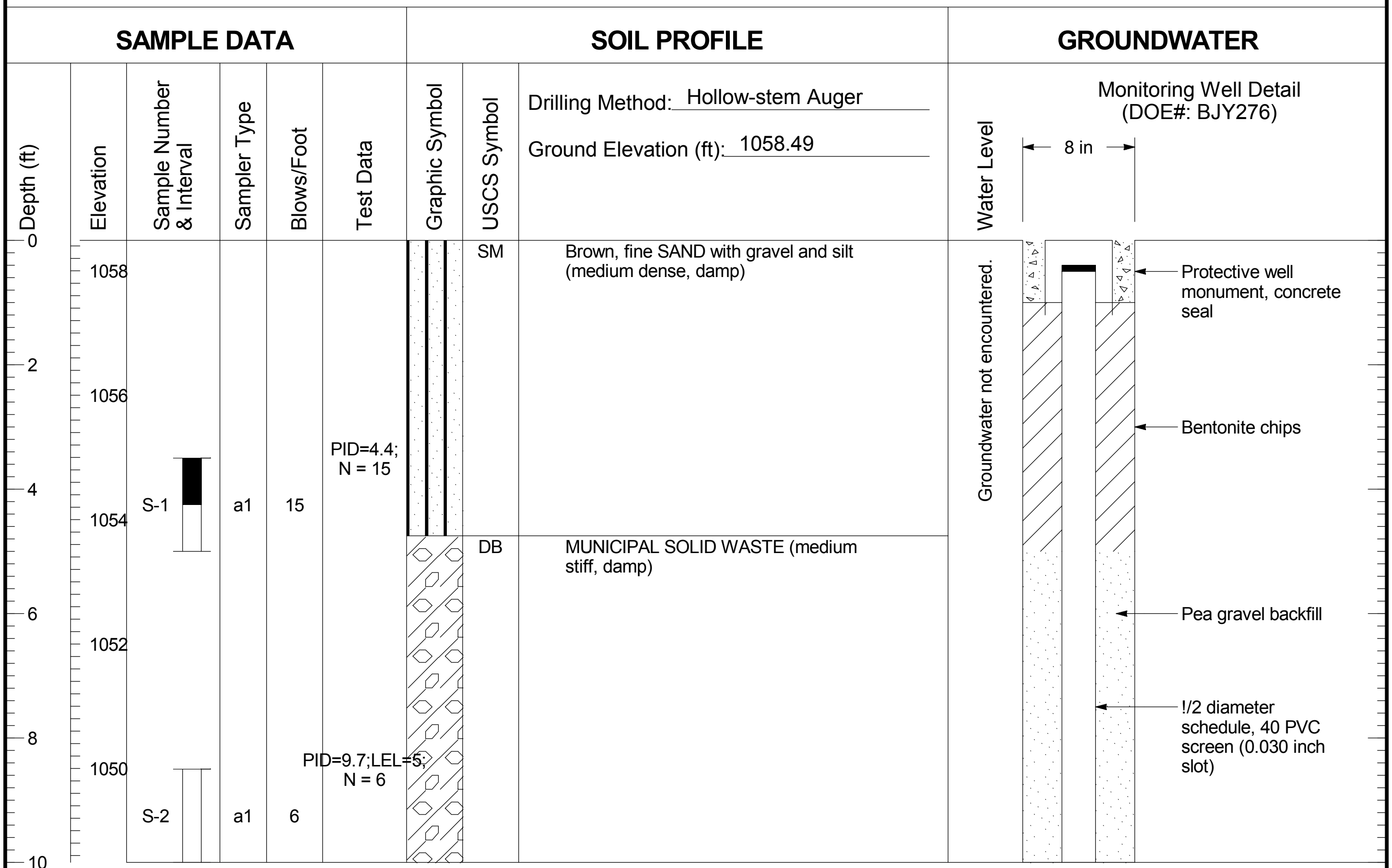
LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-37

Figure
B-7

GP-38



Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1058.49

Monitoring Well Detail
(DOE#: BJY276)

Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
S-1	a1	15	PID=4.4; N = 15
S-2	a1	6	PID=9.7;LEL=5; N = 6

USCS Symbol	Description
SM	Brown, fine SAND with gravel and silt (medium dense, damp)
DB	MUNICIPAL SOLID WASTE (medium stiff, damp)

Protective well monument, concrete seal

Bentonite chips

Pea gravel backfill

!/2 diameter schedule, 40 PVC screen (0.030 inch slot)

Boring Completed 10/11/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16
Total Depth of Monitoring Well = 10.0 ft.

Notes: 1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

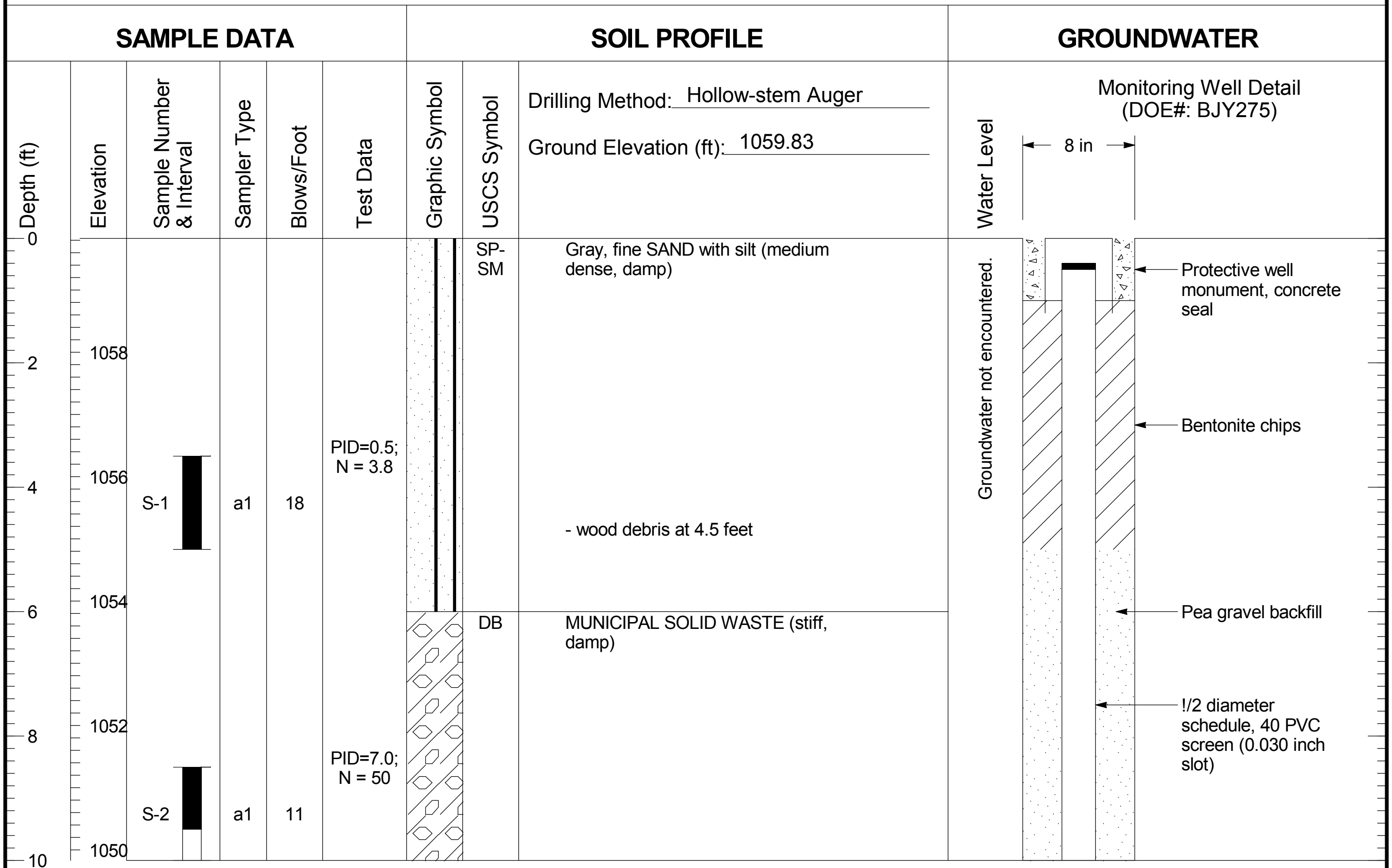
LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-38

Figure
B-8

GP-39



Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
S-1	a1	18	PID=0.5; N = 3.8
S-2	a1	11	PID=7.0; N = 50

Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1059.83

USCS Symbol	
SP-SM	Gray, fine SAND with silt (medium dense, damp) - wood debris at 4.5 feet
DB	MUNICIPAL SOLID WASTE (stiff, damp)

Monitoring Well Detail
(DOE#: BJY275)

Groundwater not encountered.

Boring Completed 10/11/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

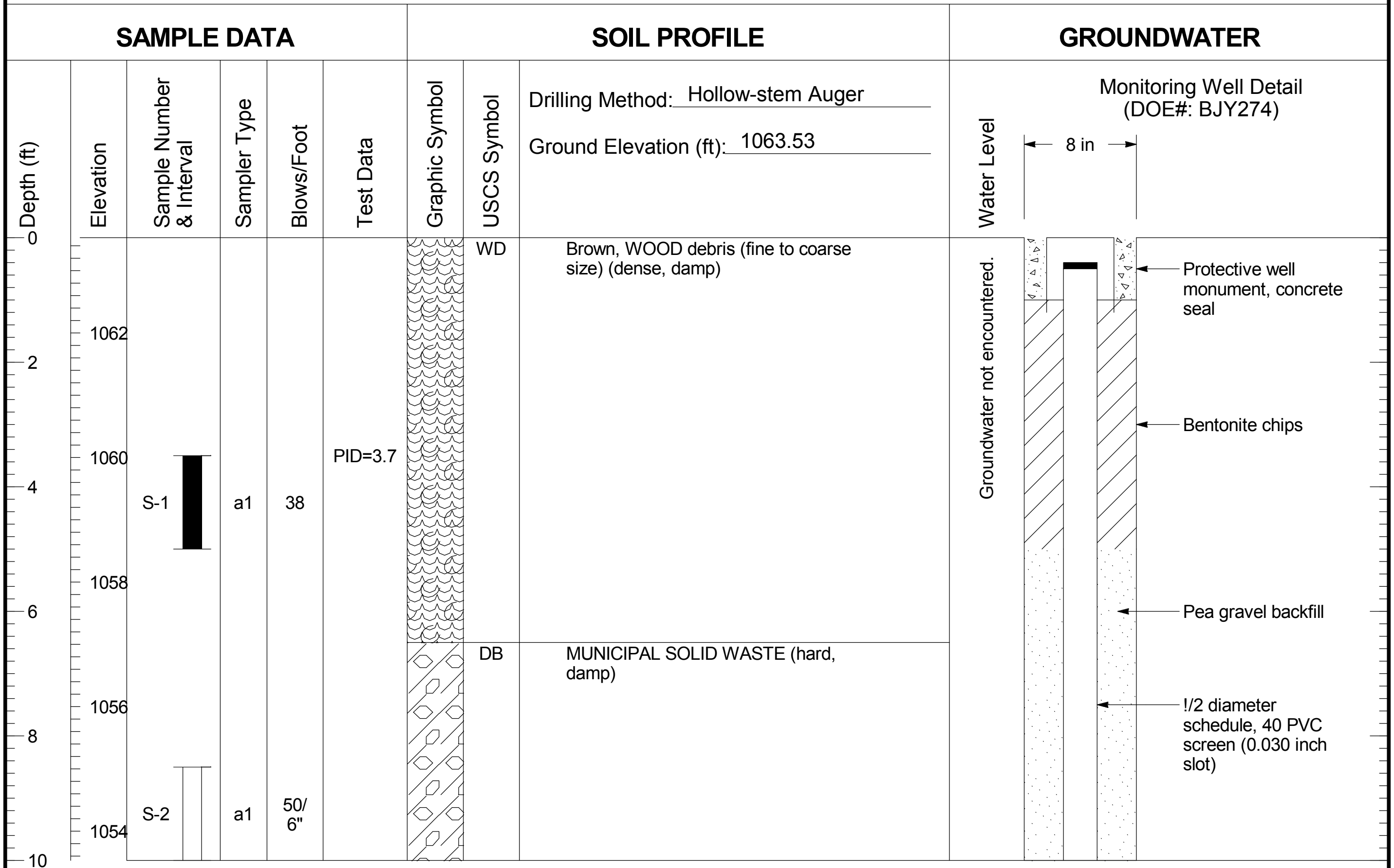
Log of Monitoring Well GP-39

Figure
B-9

GP-40

Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1063.53



Boring Completed 10/11/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-40

Figure
B-10

GP-41

Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	SOIL PROFILE
0							DB	MUNICIPAL SOLID WASTE (very stiff, damp)
	1062							
2								
	1060							
4		S-1	a1	21	N = 21			
	1058							
6								
	1056							
8					PID=1; N = 26			
	1054	S-2	a1	26				
10								

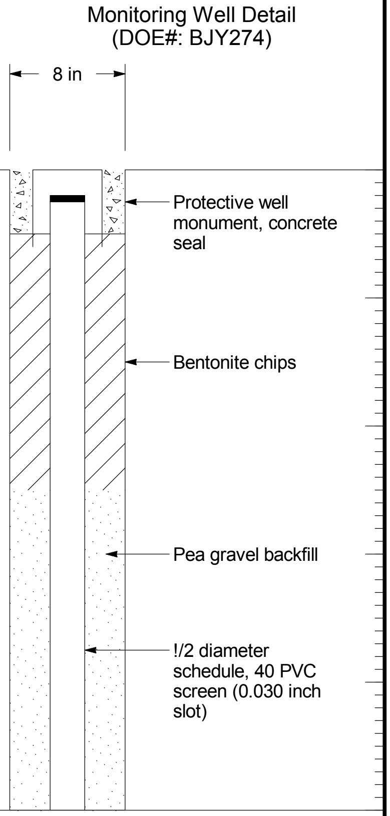
Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1063.24

GROUNDWATER

Water Level: Groundwater not encountered.

Monitoring Well Detail
(DOE#: BJY274)



Boring Completed 10/10/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/10/16
Total Depth of Monitoring Well = 10.0 ft.

Depth (ft): 12, 14, 16, 18, 20

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-41

Figure
B-11

GP-42

SAMPLE DATA

Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
0					
	1062				
2					
	1060				
4					
	1058	S-1	a1	11	N = 11
6					
	1056				
8					
					N = 20
	1054	S-2	a1	20	
10					
12					
14					
16					
18					
20					

Boring Completed 10/11/16
Total Depth of Boring = 10.0 ft.

SOIL PROFILE

Drilling Method: Hollow-stem Auger

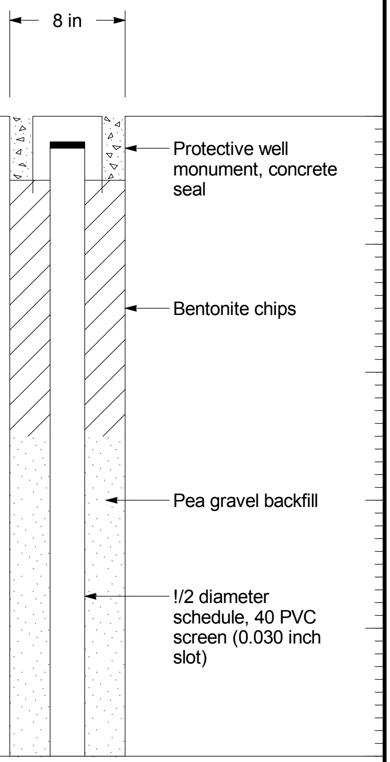
Ground Elevation (ft): 1063.03

Graphic Symbol	USCS Symbol	Description
	SM	Brown, SAND with silt and gravel to very silty, fine SAND with wood debris (medium dense, damp)
	SP-SM	Gray, SAND with silt and gravel (medium dense, damp)

GROUNDWATER

Water Level: Groundwater not encountered.

Monitoring Well Detail
(DOE#: BJY272)



Monitoring Well Completed 10/11/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-42

Figure
B-12

GP-43

SAMPLE DATA / SOIL PROFILE / GROUNDWATER

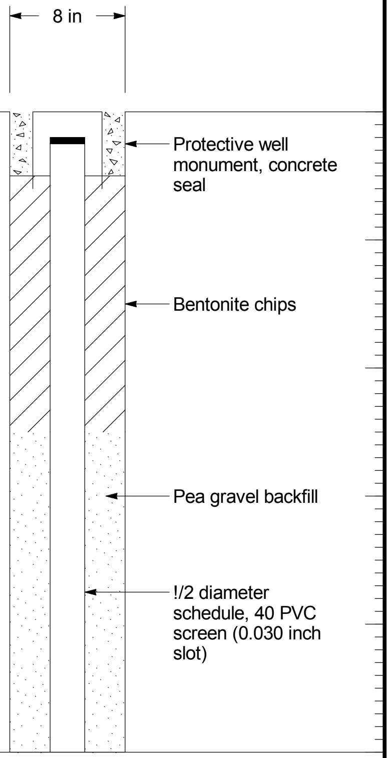
Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1058.77

Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	USCS Symbol	Soil Profile	Water Level
0						DB	MUNICIPAL SOLID WASTE (stiff to very stiff, damp)	Groundwater not encountered.
4–5.5	1054	S-1	a1	18	PID=9.2;LEL=4; N = 17			
8–9.5	1050	S-2	a1	10	N = 10			
10								

Boring Completed 10/10/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Detail
(DOE#: BJY271)



Monitoring Well Completed 10/10/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

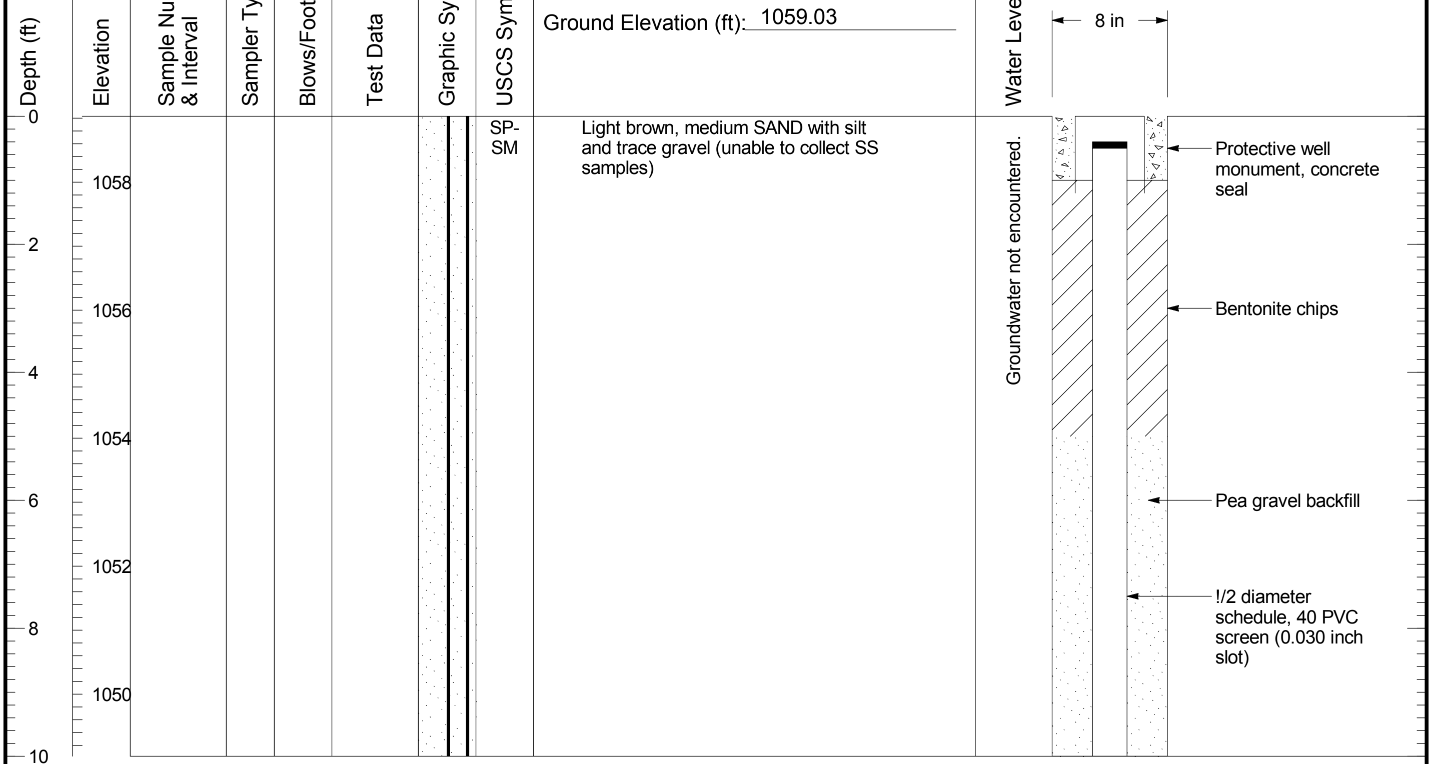
Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-43

Figure
B-13

GP-44

SAMPLE DATA						SOIL PROFILE			GROUNDWATER	
Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Drilling Method: Hollow-stem Auger Ground Elevation (ft): 1059.03	Water Level	Monitoring Well Detail (DOE#: BJY283)
0–10	1059.03–1049.03						SP-SM	Light brown, medium SAND with silt and trace gravel (unable to collect SS samples)	Groundwater not encountered.	



Boring Completed 10/12/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-44

Figure
B-14

APPENDIX C

Analytical Laboratory Reports

October 10, 2016

Mr. Piper Roelen
Landau Associates, Inc.
130 - 2nd Ave. S.
Edmonds, WA 98020

Dear Mr. Roelen,

On October 3rd, 2 samples were received by our laboratory and assigned our laboratory project number EV16100003. The project was identified as your Transportation Corridor - 1148009.010.013. The sample identification and requested analyses are outlined on the attached chain of custody record.

No abnormalities or nonconformances were observed during the analyses of the project samples.

Please do not hesitate to call me if you have any questions or if I can be of further assistance.

Sincerely,

ALS Laboratory Group

Rick Bagan

Rick Bagan
Laboratory Director

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	10/10/2016
		ALS JOB#:	EV16100003
		ALS SAMPLE#:	EV16100003-01
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/03/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/27/2016 10:45:00 AM
CLIENT SAMPLE ID	TP-15-16(1.5-2)09272016	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Diesel Range (C12-C24)	NWTPH-DX w/ SGA	U	620	25	MG/KG	10/06/2016	EBS
TPH-Oil Range (C24-C40)	NWTPH-DX w/ SGA	**14000**	1200	25	MG/KG	10/06/2016	EBS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
C25 25X Dilution	NWTPH-DX w/ SGA	**109 DS2**	10/06/2016	EBS

U - Analyte analyzed for but not detected at level above reporting limit.
DS2 - Due to high dilution factor surrogate results should be considered uncontrolled.
Chromatogram indicates that it is likely that sample contains light oil.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	10/10/2016
		ALS JOB#:	EV16100003
		ALS SAMPLE#:	EV16100003-02
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/03/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/28/2016 9:55:00 AM
CLIENT SAMPLE ID	TP-16B-16(0-2)09282016	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
TPH-Diesel Range (C12-C24)	NWTPH-DX w/ SGA	U	25	1	MG/KG	10/06/2016	EBS
TPH-Oil Range (C24-C40)	NWTPH-DX w/ SGA	**500**	50	1	MG/KG	10/06/2016	EBS

SURROGATE	METHOD	%REC	ANALYSIS DATE	ANALYSIS BY
C25	NWTPH-DX w/ SGA	**80.2**	10/06/2016	EBS

U - Analyte analyzed for but not detected at level above reporting limit.
Chromatogram indicates that it is likely that sample contains lube oil.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS SDG#: WDOE ACCREDITATION:	10/10/2016 EV16100003 C601
CLIENT CONTACT:	Piper Roelen		
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013		

LABORATORY BLANK RESULTS

MB-092716S - Batch 108429 - Soil by NWTPH-DX

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
TPH-Diesel Range (C12-C24)	NWTPH-DX	U	MG/KG	25	09/27/2016	EBS
TPH-Oil Range (C24-C40)	NWTPH-DX	U	MG/KG	50	09/27/2016	EBS

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	10/10/2016
		ALS SDG#:	EV16100003
		WDOE ACCREDITATION:	C601
CLIENT CONTACT:	Piper Roelen		
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013		

LABORATORY CONTROL SAMPLE RESULTS

ALS Test Batch ID: 108429 - Soil by NWTPH-DX

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
TPH-Diesel Range (C12-C24) - BS	NWTPH-DX	**94.5**			75.5	122.1	09/27/2016	EBS
TPH-Diesel Range (C12-C24) - BSD	NWTPH-DX	**99.7**	**5**		75.5	122.1	09/27/2016	EBS

APPROVED BY

Laboratory Director

ALS ENVIRONMENTAL

Sample Receiving Checklist

Client: Landau Associates ALS Job #: EV16100003

Project: Yakima, WA Transportation Corridor - 1148009.010.013

Received Date: 10/3/16 Received Time: 12:00 By: RB

Type of shipping container: Cooler X Box ___ Other ___

Shipped via: FedEx Ground ___ UPS ___ Mail ___ Courier ALS Hand Delivered ___
FedEx Express ___

	Yes	No	N/A
Were custody seals on outside of shipping container? If yes, how many? 2 Where? Top / Side Custody seal date: 10/2 Seal name: Landau Assoc.	X		
Was Chain of Custody properly filled out (ink, signed, dated, etc.)?	X		
Did all bottles have labels?	X		
Did all bottle labels and tags agree with Chain of Custody?	X		
Were samples received within hold time?	X		
Did all bottles arrive in good condition (unbroken, etc.)?	X		
Was sufficient amount of sample sent for the tests indicated?	X		
Was correct preservation added to samples?			X

If no, Sample Control added preservative to the following:

Sample Number	Reagent	Analyte

	Yes	No	N/A
Were VOA vials checked for absence of air bubbles? Bubbles present in sample #: ___			X

Temperature of cooler upon receipt: 6.8 °C on Ice [✓ Cold] Cool Ambient N/A

Explain any discrepancies: ___

Was client contacted? ___ Who was called? ___ By whom? ___ Date: ___

Outcome of call: ___

LANDAU ASSOCIATES

☒ Seattle (Edmonds) (425) 778-0907
☐ Tacoma (253) 926-2493
☐ Spokane (509) 327-9737
☐ Portland (503) 542-1080
☐ ______

Chain-of-Custody Record

Date 9/30/16
Page 1 of 1

EV16100003

Project Name Transportation Corridor
Project No. 1148009.010.013
Project Location/Event Yakima, WA
Sampler's Name Brian Christiansen
Project Contact Piper Roelen
Send Results To Piper Roelen

Testing Parameters

Sample I.D.	Date	Time	Matrix	No. of Containers	NWTPH-Dx
TP45-16(1.5-2)09272016	9/27/16	1045	Soil	1	✓
TP16B-16(0-2)09282016	9/28/16	0955	Soil	1	✓

Turnaround Time
☒ Standard
☐ Accelerated
☐ ______

Observations/Comments

X Allow water samples to settle, collect aliquot from clear portion

X NWTPH-Dx - run acid wash silica gel cleanup

__ Analyze for EPH if no specific product identified

VOC/BTEX/VPH (soil):

__ non-preserved

__ preserved w/methanol

__ preserved w/sodium bisulfate

__ Freeze upon receipt

__ Dissolved metal water samples field filtered

Other ______

Special Shipment/Handling or Storage Requirements Courier

Method of Shipment Courier

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature	Signature	Signature
Printed Name Brian Christiansen	Printed Name Rick Bagw	Printed Name	Printed Name
Company Landau Associates	Company ALS	Company	Company
Date 10/2/16 Time 1:30 PM	Date 10/3/16 Time 12:00	Date Time	Date Time

WHITE COPY - Project File YELLOW COPY - Laboratory PINK COPY - Client Representative

November 4, 2016

Mr. Piper Roelen
Landau Associates, Inc.
130 - 2nd Ave. S.
Edmonds, WA 98020

Dear Mr. Roelen,

On October 14th, 20 samples were received by our laboratory and assigned our laboratory project number EV16100095. The project was identified as your Transportation Corridor - 1148009.010.013. The sample identification and requested analyses are outlined on the attached chain of custody record.

No abnormalities or nonconformances were observed during the analyses of the project samples.

Please do not hesitate to call me if you have any questions or if I can be of further assistance.

Sincerely,

ALS Laboratory Group

Rick Bagan
Laboratory Director

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	11/4/2016
		ALS JOB#:	EV16100095
		ALS SAMPLE#:	EV16100095-01
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/26/2016
CLIENT SAMPLE ID	TP-1-16 S-1 (1-2)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	**3.0**	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	**0.042**	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	**7200**	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-02
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/26/2016
CLIENT SAMPLE ID	TP-6-16 S-2 (15-2)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.25**	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	**4600**	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-03
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/26/2016
CLIENT SAMPLE ID	TP-9-16 S-1 (0-1.5)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.29**	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	**6600**	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-04
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/29/2016
CLIENT SAMPLE ID	TP-9B-16 S-4 (8-9)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.24**	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	**3500**	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-05
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/30/2016
CLIENT SAMPLE ID	TP-9C-16 S-3 (5-6)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.23**	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	**7300**	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-06
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/26/2016
CLIENT SAMPLE ID	TP-10-16 S-2 (1-2)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.31**	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	**3100**	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-07
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/26/2016
CLIENT SAMPLE ID	TP-10-16 S-5 (10-12)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.28**	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	**6000**	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-08
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/29/2016
CLIENT SAMPLE ID	TP-10A-16 S-4 (6-7)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.18**	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	**8600**	0	1	BTU/lb	10/18/2016	ALTU
Chlorine	EPA-5050/9056	**56**	0	1	MG/KG	11/03/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-09
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/29/2016
CLIENT SAMPLE ID	TP-10B-16 S-4 (5-5.5)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.17**	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	**5300**	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-10
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/26/2016
CLIENT SAMPLE ID	TP-11-16 S-3 (3-3.5)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.18**	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	**9200**	0	1	BTU/lb	10/18/2016	ALTU
Chlorine	EPA-5050/9056	**41**	0	1	MG/KG	11/03/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-11
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/29/2016
CLIENT SAMPLE ID	TP-11A-16 S-3 (5-6)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.27**	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	**5500**	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	11/4/2016
		ALS JOB#:	EV16100095
		ALS SAMPLE#:	EV16100095-12
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/29/2016
CLIENT SAMPLE ID	TP-11B-16 S-5 (8-9)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.23**	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	**4600**	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-13
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/28/2016
CLIENT SAMPLE ID	TP-25-16 S-5 (8-10)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.19**	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	**7300**	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-14
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/28/2016
CLIENT SAMPLE ID	TP-26-16 S-3 (4-4.5)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.21**	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	**9000**	0	1	BTU/lb	10/18/2016	ALTU
Chlorine	EPA-5050/9056	**56**	0	1	MG/KG	11/03/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-15
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/30/2016
CLIENT SAMPLE ID	TP-26A-16 S-3 (6-7)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.27**	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	**7100**	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-16
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/30/2016
CLIENT SAMPLE ID	TP-26B-16 S-3 (4-5)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.33**	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	**8500**	0	1	BTU/lb	10/18/2016	ALTU
Chlorine	EPA-5050/9056	**130**	0	1	MG/KG	11/03/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-17
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/28/2016
CLIENT SAMPLE ID	TP-28-16 S-1 (1-2)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.20**	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	**4400**	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	11/4/2016
		ALS JOB#:	EV16100095
		ALS SAMPLE#:	EV16100095-18
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/30/2016
CLIENT SAMPLE ID	TP-34-16 S-4 (6-7)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.28**	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	**7000**	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-19
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/30/2016
CLIENT SAMPLE ID	TP-34-16 S-5 (10-11)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.20**	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	**9600**	0	1	BTU/lb	10/18/2016	ALTU
Chlorine	EPA-5050/9056	**53**	0	1	MG/KG	11/03/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	11/4/2016 EV16100095 EV16100095-20
CLIENT CONTACT:	Piper Roelen	DATE RECEIVED:	10/14/2016
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	COLLECTION DATE:	9/30/2016
CLIENT SAMPLE ID	TP-34A-16 S-1 (0-3)	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	**0.25**	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	**0.025**	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	**6600**	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	11/4/2016
		ALS SDG#:	EV16100095
		WDOE ACCREDITATION:	C601
CLIENT CONTACT:	Piper Roelen		
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013		

LABORATORY BLANK RESULTS

MBLK-283820 - Batch R283820 - TCLP Extract by EPA-7470

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	MG/L	0.00020	10/26/2016	RAL

U - Analyte analyzed for but not detected at level above reporting limit.

MBLK-283821 - Batch R283821 - TCLP Extract by EPA-6020

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Arsenic (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/26/2016	RAL

U - Analyte analyzed for but not detected at level above reporting limit.

MBLK-283823 - Batch R283823 - TCLP Extract by EPA-6020

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Arsenic (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/28/2016	RAL

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS SDG#: WDOE ACCREDITATION:	11/4/2016 EV16100095 C601
CLIENT CONTACT:	Piper Roelen		
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013		

LABORATORY CONTROL SAMPLE RESULTS

ALS Test Batch ID: R283820 - TCLP Extract by EPA-7470

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP) - BS	EPA-7470/1311	**94.0**			85	115	10/26/2016	RAL
Mercury (TCLP) - BSD	EPA-7470/1311	**91.0**	**3**		85	115	10/26/2016	RAL

ALS Test Batch ID: R283821 - TCLP Extract by EPA-6020

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Arsenic (TCLP) - BS	EPA-6020/1311	**99.0**			89.1	110	10/26/2016	RAL
Arsenic (TCLP) - BSD	EPA-6020/1311	**99.4**	**0**		89.1	110	10/26/2016	RAL
Barium (TCLP) - BS	EPA-6020/1311	**101**			88.5	108	10/26/2016	RAL
Barium (TCLP) - BSD	EPA-6020/1311	**100**	**0**		88.5	108	10/26/2016	RAL
Cadmium (TCLP) - BS	EPA-6020/1311	**101**			89.4	109	10/26/2016	RAL
Cadmium (TCLP) - BSD	EPA-6020/1311	**102**	**1**		89.4	109	10/26/2016	RAL
Chromium (TCLP) - BS	EPA-6020/1311	**102**			86.2	107	10/26/2016	RAL
Chromium (TCLP) - BSD	EPA-6020/1311	**102**	**0**		86.2	107	10/26/2016	RAL
Lead (TCLP) - BS	EPA-6020/1311	**99.5**			87.5	107	10/26/2016	RAL
Lead (TCLP) - BSD	EPA-6020/1311	**101**	**2**		87.5	107	10/26/2016	RAL
Selenium (TCLP) - BS	EPA-6020/1311	**102**			90.2	113	10/26/2016	RAL
Selenium (TCLP) - BSD	EPA-6020/1311	**102**	**0**		90.2	113	10/26/2016	RAL
Silver (TCLP) - BS	EPA-6020/1311	**101**			80	120	10/26/2016	RAL
Silver (TCLP) - BSD	EPA-6020/1311	**98.2**	**3**		80	120	10/26/2016	RAL

ALS Test Batch ID: R283823 - TCLP Extract by EPA-6020

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Arsenic (TCLP) - BS	EPA-6020/1311	**96.9**			89.1	110	10/28/2016	RAL
Arsenic (TCLP) - BSD	EPA-6020/1311	**97.6**	**1**		89.1	110	10/28/2016	RAL
Barium (TCLP) - BS	EPA-6020/1311	**99.6**			88.5	108	10/28/2016	RAL
Barium (TCLP) - BSD	EPA-6020/1311	**99.6**	**0**		88.5	108	10/28/2016	RAL
Cadmium (TCLP) - BS	EPA-6020/1311	**98.1**			89.4	109	10/28/2016	RAL
Cadmium (TCLP) - BSD	EPA-6020/1311	**99.5**	**1**		89.4	109	10/28/2016	RAL
Chromium (TCLP) - BS	EPA-6020/1311	**96.8**			86.2	107	10/28/2016	RAL
Chromium (TCLP) - BSD	EPA-6020/1311	**97.2**	**0**		86.2	107	10/28/2016	RAL
Lead (TCLP) - BS	EPA-6020/1311	**96.6**			87.5	107	10/28/2016	RAL
Lead (TCLP) - BSD	EPA-6020/1311	**97.5**	**1**		87.5	107	10/28/2016	RAL
Selenium (TCLP) - BS	EPA-6020/1311	**98.1**			90.2	113	10/28/2016	RAL
Selenium (TCLP) - BSD	EPA-6020/1311	**99.7**	**2**		90.2	113	10/28/2016	RAL
Silver (TCLP) - BS	EPA-6020/1311	**93.7**			80	120	10/28/2016	RAL
Silver (TCLP) - BSD	EPA-6020/1311	**92.2**	**2**		80	120	10/28/2016	RAL

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	11/4/2016
		ALS SDG#:	EV16100095
		WDOE ACCREDITATION:	C601
CLIENT CONTACT:	Piper Roelen		
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013		

LABORATORY CONTROL SAMPLE RESULTS

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY

APPROVED BY

Laboratory Director

LANDAU ASSOCIATES

☒ Seattle/Edmonds (425) 778-0907
☐ Tacoma (253) 926-2493
☐ Spokane (509) 327-9737
☐ Portland (503) 542-1080
☐ ____________

EV1610095

Chain-of-Custody Record

Date 10/13/2016
Page 1 of 2

Project Name Transportation Corridor
Project No. 1140009.010.013
Project Location/Event Yakima WA
Sampler's Name Brian Christianson
Project Contact Piper Roelen
Send Results To Piper Roelen

Turnaround Time
☒ Standard
☐ Accelerated
☐ ____________

Testing Parameters

	Sample I.D.	Date	Time	Matrix	No. of Containers	TCLP (RCRA) 8 metals	BTU (ASTM D2015)	Chlorine (EPA 9056)*
1	TP-1-16 S-1 (1-2)	9/26/16		Solid	1	✓	✓	
2	TP-6-16 S-2 (1.5-2)	9/26/16			2	✓	✓	
3	TP-9-16 S-1 (0-1.5)	9/26/16			3	✓	✓	
4	TP-9B-16 S-4 (8-9)	9/29/16			4	✓	✓	
5	TP-9C-16 S-3 (5-6)	9/30/16			5	✓	✓	
6	TP-10-16 S-2 (1-2)	9/26/16			6	✓	✓	
7	TP-10-16 S-5 (10-12)	9/26/16			7	✓	✓	
8	TP-10A-16 S-4 (6-7)	9/29/16			8	✓	✓	⊗
9	TP-10B-16 S-4 (5-5.5)	9/29/16			9	✓	✓	
10	TP-11-16 S-3 (3-3.5)	9/26/16			10	✓	✓	⊗
11	TP-11A-16 S-3 (5-6)	9/29/16				✓	✓	
12	TP-11B-16 S-5 (8-9)	9/29/16				✓	✓	
13	TP-25-16 S-5 (8-10)	9/28/16				✓	✓	
14	TP-26-16 S-3 (4-4.5)	9/28/16				✓	✓	⊗
15	TP-26A-16 S-3 (6-7)	9/30/16				✓	✓	
16	TP-26B-16 S-3 (4-5)	9/30/16				✓	✓	⊗
17	TP-28-16 S-1 (1-2)	9/28/16				✓	✓	
18	TP-34-16 S-4 (6-7)	9/30/16				✓	✓	

Observations/Comments

X Allow water samples to settle, collect aliquot from clear portion

__ NWTPH-Dx - run acid wash silica gel cleanup

__ Analyze for EPH if no specific product identified

VOC/BTEX/VPH (soil):
__ non-preserved
__ preserved w/methanol
__ preserved w/sodium bisulfate
__ Freeze upon receipt
__ Dissolved metal water samples field filtered

Other *Chlorine Analysis on 5 samples with the highest BTU values

Special Shipment/Handling or Storage Requirements Courier

Method of Shipment Courier

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature Shawn Robinson	Signature	Signature
Printed Name Brian E Christianson	Printed Name Shawn Robinson	Printed Name	Printed Name
Company Landau Assoc.	Company ALS	Company	Company
Date 10/13/16 Time 3:30pm	Date 10/14/16 Time 12:35pm	Date Time	Date Time

WHITE COPY - Project File YELLOW COPY - Laboratory PINK COPY - Client Representative

12/2014

Landau Associates

☒ Seattle/Edmonds (425) 778-0907
☐ **Tacoma** (253) 926-2493
☐ **Spokane** (509) 327-9737
☐ **Portland** (503) 542-1080
☐

Chain-of-Custody Record

EV16100095

Date 10/13/2016
Page 2 of 2

Project Name Transportation Corridor
Project No. 1148009.010.013
Project Location/Event Yakima, WA
Sampler's Name Brian Christianson
Project Contact Piper Roelen
Send Results To Piper Roelen

Turnaround Time
☒ Standard
☐ Accelerated
☐

Testing Parameters

	Sample I.D.	Date	Time	Matrix	No. of Containers	TCLP (RCRA) 8 metals	BTU (ASTM D2015)	Chlorine (EPA) 9056 *									
19	TP-34-16 S-5 (10-11)	9/30/16		Solid		/	/	⊗									
20	TP-34A-16 S-1 (0-3)	9/30/16		↓		/	/										

Observations/Comments

X Allow water samples to settle, collect aliquot from clear portion

___ NWTPH-Dx - run acid wash silica gel cleanup

___ Analyze for EPH if no specific product identified

VOC/BTEX/VPH (soil):

___ non-preserved

___ preserved w/methanol

___ preserved w/sodium bisulfate

___ Freeze upon receipt

___ Dissolved metal water samples field filtered

Other *Chlorine Analysis on 5 samples with the highest BTU values

Special Shipment/Handling or Storage Requirements Courier

Method of Shipment Courier

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature Shawn Robinson	Signature	Signature
Printed Name Brian E Christianson	Printed Name Shawn Robinson	Printed Name	Printed Name
Company Landau Assoc.	Company ALS	Company	Company
Date 10/13/16 Time 3:30pm	Date 10/14/16 Time 12:35pm	Date Time	Date Time

WHITE COPY - Project File **YELLOW COPY - Laboratory** **PINK COPY - Client Representative**

12/2014

ALS ENVIRONMENTAL

Sample Receiving Checklist

Client: Landau Associates ALS Job #: EV16100095

Project: Transportation Corridor - 1148009.010.013

Received Date: 10/14/16 Received Time: 12:35pm By:

Type of shipping container: Cooler X Box ____ Other ____

Shipped via: FedEx Ground ____ UPS ____ Mail ____ Courier X ALS Hand Delivered ____
FedEx Express ____

	Yes	No	N/A
Were custody seals on outside of shipping container?	X		

If yes, how many? 2 Where? Top of each cooler
Custody seal date: 10/13/16 Seal name: Landau

	Yes	No	N/A
Was Chain of Custody properly filled out (ink, signed, dated, etc.)?	X		
Did all bottles have labels?	X		
Did all bottle labels and tags agree with Chain of Custody?	X		
Were samples received within hold time?	X		
Did all bottles arrive in good condition (unbroken, etc.)?	X		
Was sufficient amount of sample sent for the tests indicated?	X		
Was correct preservation added to samples?			X

If no, Sample Control added preservative to the following:

Sample Number	Reagent	Analyte

	Yes	No	N/A
Were VOA vials checked for absence of air bubbles?			X

Bubbles present in sample #: ____

Temperature of cooler upon receipt: 19.6°c each cooler Cold Cool [✓ Ambient] N/A

Explain any discrepancies: ____

Was client contacted? ____ Who was called? ____ By whom? ____ Date: ____

Outcome of call: ____

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

LABORATORY REPORT

December 7, 2016

Cody Johnson
Landau Associates, Inc.
130 2nd Ave. South
Edmonds, WA 98020

RE: Transportation Corridor Investigation / 1148009.010.014

Dear Cody:

Enclosed are the results of the samples submitted to our laboratory on November 21, 2016. For your reference, these analyses have been assigned our service request number P1605444.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

Kate Kaneko

By Kate Kaneko at 11:24 am, 12/07/16

Kate Kaneko
Project Manager

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
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www.alsglobal.com

Client: Landau Associates, Inc. Service Request No: P1605444
Project: Transportation Corridor Investigation / 1148009.010.014

CASE NARRATIVE

The samples were received intact under chain of custody on November 21, 2016 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Fixed Gases Analysis

The samples were analyzed for fixed gases (oxygen, nitrogen, carbon monoxide, methane and carbon dioxide) according to ASTM D1946 (single injection) using a gas chromatograph equipped with a thermal conductivity detector (TCD). This procedure is described in laboratory SOP VOA-EPA3C. This method is included on the laboratory's DoD-ELAP scope of accreditation, however it is not part of the NELAP accreditation.

Sulfur Analysis

The samples were also analyzed for twenty sulfur compounds per ASTM D 5504-12 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan. This method is included on the laboratory's NELAP scope of accreditation, however it is not part of the DoD-ELAP accreditation.

Total Gaseous Non-Methane Organics as Methane Analysis

The samples were also analyzed for total gaseous non-methane organics as methane according to modified EPA Method 25C. The analyses included a single sample injection (method modification) analyzed by gas chromatography using flame ionization detection/total combustion analysis. This method is not included on the laboratory's NELAP or DoD-ELAP scope of accreditation.

Volatile Organic Compound Analysis

The samples were also analyzed for volatile organic compounds in accordance with EPA Method TO-15 from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition (EPA/625/R-96/010b), January, 1999. This procedure is described in laboratory SOP VOA-TO15. The analytical system was comprised of a gas chromatograph / mass spectrometer (GC/MS) interfaced to a whole-air preconcentrator. The method was

CASE NARRATIVE

modified to include the use of helium as a diluent gas in place of zero-grade air for container pressurization. When necessary, analytical sample volumes were adjusted by a correction factor for containers pressurized with helium. A summary sheet has been included listing the affected samples. This method is included on the laboratory's NELAP and DoD-ELAP scope of accreditation. Any analytes flagged with an X are not included on the NELAP or DoD-ELAP accreditation.

The containers were cleaned, prior to sampling, down to the method reporting limit (MRL) reported for this project. Please note, projects which require reporting below the MRL could have results between the MRL and method detection limit (MDL) that are biased high.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.

ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Arizona DHS	http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home	AZ0694
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Louisiana DEQ (NELAP)	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	05071
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2016036
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	977273
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-003
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
PJLA (DoD ELAP)	http://www.pjlabs.com/search-accredited-labs	65818 (Testing)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-16-7
Utah DOH (NELAP)	http://health.utah.gov/lab/environmental-lab-certification/	CA016272016-6
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Landau Associates, Inc.

Service Request: P1605444

Project ID: Transportation Corridor Investigation / 1148009.010.014

Date Received: 11/21/2016

Time Received: 10:15

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	ASTM D1946-90(2006) - Fxd Gases Can	ASTM D5504-08 - Sulfur Can	25C Modified - TGNMO+ 1X Can	TO-15 - VOC Cans
GP-43-11162016	P1605444-001	Air	11/16/2016	16:24	SSC00302	-1.61	3.31	X	X	X	X
GP-41-11162016	P1605444-002	Air	11/16/2016	16:32	SSC00106	-2.49	3.27	X	X	X	X
Ambient-11162016	P1605444-003	Air	11/16/2016	17:00	SSC00078	0.54	3.47	X	X	X	X
GP-39-11162016	P1605444-004	Air	11/16/2016	16:48	SSC00347	-1.25	3.36	X	X	X	X
GP-38-11162016	P1605444-005	Air	11/16/2016	17:33	SSC00127	-2.22	3.48	X	X	X	X

ALS ENVIRONMENTAL

Sample Volume Correction for Helium Pressurization for SCAN Analysis

Sample ID	Pi	Pf	Sample Volume (L)	Adjusted Volume (L)
P1605444-003	0.54	3.47	0.930	1.00
P1605444-005	-2.22	3.48	0.018	0.0200

Validation Date: 10/13/09

Template Name: MFC_GCF_backfill.xls

I:\A-GCMS\Helium pressurization\P1605444_HE Pressurization_SCAN_1611301703_LHakobyan.xls

Printed: 12/7/16

1 of 1

Air - Chain of Custody Record & Analytical Service Request

Page 1 of 1

ALS

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10-Day-Standard

ALS Project No. P1605444

ALS Contact:

Company Name & Address (Reporting Information)
LANDAU ASSOCIATES
130 2nd Avenue South
Edmonds, WA 98020

Project Manager: Piper Roelen

Phone: (425) 778-0907

Fax: —

Email Address for Result Reporting: proelen@landauinc.com; jdavis@landauinc.com

Project Name: Transportation Corridor Investigation

Project Number: 1148009.010.014

P.O. # / Billing Information: 1148009.010.014 / ~~City of Yakima Landfill Site Project~~ CLOSED ← City of Yakima Landfill Site Project
Invoice through LAI

Sampler (Print & Sign): Stephanie Renando

Analysis Method

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume	Total Reduced Sulfur ASTM D-5504	Fixed gases ASTM D-1945	NMOC's (EPA 25C)	VOC's (TO-15)	Comments e.g. Actual Preservative or specific instructions
GP-43-11162016		11/16/16	1624	SSC00302	SFC00113	-29.09	-5	6L	X	X	X	X	methane, CO2, CO, O2, nitrogen
GP-41-11162016		11/16/16	1632	SSC00106	SFC00026	-29.00	-5	6L	X	X	X	X	↓
Ambient-11162016		11/16/16	1700	SSC00078	SFC00144	-28.94	-7	6L	X	X	X	X	↓
GP-39-11162016		11/16/16	1648	SSC00347	SFC00135	-29.24	-4	6L	X	X	X	X	↓
GP-38-11162016		11/16/16	1733	SSC00127	SFC00095	-29.27	-5	6L	X	X	X	X	↓

Report Tier Levels - please select
Tier I - Results (Default in not specified) ____
Tier II (Results + QC Summaries ____
Tier III (Results + QC & Calibration Summaries) ____
Tier IV (Date Validation Package) 10% Surcharge ____

EDD required YES / No
Type: ____ Units: ____

Chain of Custody Seal: (Circle)
[✓ INTACT] BROKEN ABSENT

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature) SR Date: 11/17/16 Time: 1615
Received by: (Signature) Date: Time:

Relinquished by: (Signature) FEDEX Date: Time:
Received by: (Signature) Date: 11/21/16 Time: 10K

Cooler / Blank Temperature ____°C

ALS Environmental

Sample Acceptance Check Form

Client: Landau Associates, Inc. Work order: P1605444

Project: Transportation Corridor Investigation / 1148009.010.014

Sample(s) received on: 11/21/16 Date opened: 11/21/16 by: ADAVID

Note: This form is used for <u>all</u> samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Did **sample containers** arrive in good condition?	☒	☐	☐
3	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
4	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
5	Was **sample volume** received adequate for analysis?	☒	☐	☐
6	Are samples within specified holding times?	☒	☐	☐
7	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☒
8	Were **custody seals** on outside of cooler/Box/Container?	☒	☐	☐
	Location of seal(s)? Sealing Lid?	☒	☐	☐
	Were signature and date included?	☒	☐	☐
	Were seals intact?	☒	☐	☐
9	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **<u>VOA vials</u>** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?	☐	☐	☒
10	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
11	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1605444-001.01	6.0 L Silonite Can					
P1605444-002.01	6.0 L Silonite Can					
P1605444-003.01	6.0 L Silonite Can					
P1605444-004.01	6.0 L Silonite Can					
P1605444-005.01	6.0 L Silonite Can					

Explain any discrepancies: (include lab sample ID numbers):

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Landau Associates, Inc.**
Client Sample ID: **GP-43-11162016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444
ALS Sample ID: P1605444-001

Test Code: ASTM D1946
Instrument ID: HP5890 II/GC1/TCD
Analyst: Adam McAfee
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00302

Date Collected: 11/16/16
Date Received: 11/21/16
Date Analyzed: 11/29/16
Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -1.61 Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	**Oxygen***	**7.30**	0.14	
7727-37-9	**Nitrogen**	**26.2**	0.14	
630-08-0	Carbon Monoxide	ND	0.14	
74-82-8	**Methane**	**42.6**	0.14	
124-38-9	**Carbon Dioxide**	**23.9**	0.14	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client:	**Landau Associates, Inc.**		
Client Sample ID:	**GP-41-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-002

Test Code:	ASTM D1946	Date Collected:	11/16/16
Instrument ID:	HP5890 II/GC1/TCD	Date Received:	11/21/16
Analyst:	Adam McAfee	Date Analyzed:	11/29/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.10 ml(s)
Test Notes:			
Container ID:	SSC00106		

Initial Pressure (psig): -2.49 Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	Compound	Result %, v/v		MRL %, v/v	Data Qualifier
7782-44-7	**Oxygen***	**0.254**		0.15	
7727-37-9	**Nitrogen**	**10.2**		0.15	
630-08-0	Carbon Monoxide		ND	0.15	
74-82-8	**Methane**	**57.5**		0.15	
124-38-9	**Carbon Dioxide**	**32.0**		0.15	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Landau Associates, Inc.**
Client Sample ID: **Ambient-11162016** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-003

Test Code: ASTM D1946 Date Collected: 11/16/16
Instrument ID: HP5890 II/GC1/TCD Date Received: 11/21/16
Analyst: Adam McAfee Date Analyzed: 11/29/16
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.10 ml(s)
Test Notes:
Container ID: SSC00078

Initial Pressure (psig): 0.54 Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	**Oxygen***	**22.0**	0.12	
7727-37-9	**Nitrogen**	**77.9**	0.12	
630-08-0	Carbon Monoxide	ND	0.12	
74-82-8	Methane	ND	0.12	
124-38-9	Carbon Dioxide	ND	0.12	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Landau Associates, Inc.**
Client Sample ID: **GP-39-11162016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444
ALS Sample ID: P1605444-004

Test Code: ASTM D1946
Instrument ID: HP5890 II/GC1/TCD
Analyst: Adam McAfee
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00347

Date Collected: 11/16/16
Date Received: 11/21/16
Date Analyzed: 11/29/16
Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -1.25 Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	**Compound**	**Result** **%, v/v**	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.13	
7727-37-9	**Nitrogen**	**0.668**	0.13	
630-08-0	Carbon Monoxide	ND	0.13	
74-82-8	**Methane**	**64.0**	0.13	
124-38-9	**Carbon Dioxide**	**35.2**	0.13	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client:	**Landau Associates, Inc.**		
Client Sample ID:	**GP-38-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-005

Test Code:	ASTM D1946	Date Collected:	11/16/16
Instrument ID:	HP5890 II/GC1/TCD	Date Received:	11/21/16
Analyst:	Adam McAfee	Date Analyzed:	11/29/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.10 ml(s)
Test Notes:			
Container ID:	SSC00127		

Initial Pressure (psig): -2.22 Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	**Oxygen***	**1.72**	0.15	
7727-37-9	**Nitrogen**	**8.71**	0.15	
630-08-0	Carbon Monoxide	ND	0.15	
74-82-8	**Methane**	**55.1**	0.15	
124-38-9	**Carbon Dioxide**	**34.4**	0.15	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161129-MB

Test Code:	ASTM D1946	Date Collected:	NA
Instrument ID:	HP5890 II/GC1/TCD	Date Received:	NA
Analyst:	Adam McAfee	Date Analyzed:	11/29/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.10 ml(s)
Test Notes:			

CAS #	**Compound**	**Result** **%, v/v**	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: **Landau Associates, Inc.**
Client Sample ID: **Lab Control Sample**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444
ALS Sample ID: P161129-LCS

Test Code: ASTM D1946
Instrument ID: HP5890 II/GC1/TCD
Analyst: Adam McAfee
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/29/16
Volume(s) Analyzed: NA ml(s)

CAS #	**Compound**	Spike Amount ppmV	**Result ppmV**	**% Recovery**	ALS Acceptance Limits	Data Qualifier
7782-44-7	Oxygen*	50,000	**52,000**	**104**	97-108	
7727-37-9	Nitrogen	50,000	**51,700**	**103**	89-113	
630-08-0	Carbon Monoxide	50,000	**51,400**	**103**	98-108	
74-82-8	Methane	50,000	**49,600**	**99**	94-111	
124-38-9	Carbon Dioxide	50,000	**49,600**	**99**	94-104	

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Landau Associates, Inc.**
Client Sample ID: **GP-43-11162016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444
ALS Sample ID: P1605444-001

Test Code:	ASTM D 5504-12	Date Collected:	11/16/16
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	16:24
Analyst:	Mike Conejo	Date Received:	11/21/16
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	11/23/16
Test Notes:		Time Analyzed:	07:45
Container ID:	SSC00302	Volume(s) Analyzed:	1.0 ml(s)

Initial Pressure (psig): -1.61 Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**10,000**	9.6	**7,200**	6.9	
463-58-1	Carbonyl Sulfide	ND	17	ND	6.9	
74-93-1	Methyl Mercaptan	**59**	14	**30**	6.9	
75-08-1	Ethyl Mercaptan	**45**	18	**18**	6.9	
75-18-3	Dimethyl Sulfide	**47**	18	**19**	6.9	
75-15-0	Carbon Disulfide	ND	11	ND	3.5	
75-33-2	Isopropyl Mercaptan	ND	21	ND	6.9	
75-66-1	tert-Butyl Mercaptan	ND	25	ND	6.9	
107-03-9	n-Propyl Mercaptan	ND	21	ND	6.9	
624-89-5	Ethyl Methyl Sulfide	ND	21	ND	6.9	
110-02-1	Thiophene	ND	24	ND	6.9	
513-44-0	Isobutyl Mercaptan	ND	25	ND	6.9	
352-93-2	Diethyl Sulfide	ND	25	ND	6.9	
109-79-5	n-Butyl Mercaptan	ND	25	ND	6.9	
624-92-0	Dimethyl Disulfide	ND	13	ND	3.5	
616-44-4	3-Methylthiophene	ND	28	ND	6.9	
110-01-0	Tetrahydrothiophene	ND	25	ND	6.9	
638-02-8	2,5-Dimethylthiophene	ND	32	ND	6.9	
872-55-9	2-Ethylthiophene	ND	32	ND	6.9	
110-81-6	Diethyl Disulfide	ND	17	ND	3.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates, Inc.**
Client Sample ID: **GP-41-11162016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444
ALS Sample ID: P1605444-002

Test Code: ASTM D 5504-12
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00106

Date Collected: 11/16/16
Time Collected: 16:32
Date Received: 11/21/16
Date Analyzed: 11/23/16
Time Analyzed: 07:58
Volume(s) Analyzed: 1.0 ml(s)

Initial Pressure (psig): -2.49 Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	**Compound**	**Result** **µg/m³**	MRL µg/m³	**Result** **ppbV**	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	10	ND	7.4	
463-58-1	Carbonyl Sulfide	ND	18	ND	7.4	
74-93-1	Methyl Mercaptan	ND	14	ND	7.4	
75-08-1	Ethyl Mercaptan	ND	19	ND	7.4	
75-18-3	Dimethyl Sulfide	ND	19	ND	7.4	
75-15-0	Carbon Disulfide	ND	11	ND	3.7	
75-33-2	Isopropyl Mercaptan	ND	23	ND	7.4	
75-66-1	tert-Butyl Mercaptan	ND	27	ND	7.4	
107-03-9	n-Propyl Mercaptan	ND	23	ND	7.4	
624-89-5	Ethyl Methyl Sulfide	ND	23	ND	7.4	
110-02-1	Thiophene	ND	25	ND	7.4	
513-44-0	Isobutyl Mercaptan	ND	27	ND	7.4	
352-93-2	Diethyl Sulfide	ND	27	ND	7.4	
109-79-5	n-Butyl Mercaptan	ND	27	ND	7.4	
624-92-0	Dimethyl Disulfide	ND	14	ND	3.7	
616-44-4	3-Methylthiophene	ND	29	ND	7.4	
110-01-0	Tetrahydrothiophene	ND	26	ND	7.4	
638-02-8	2,5-Dimethylthiophene	ND	34	ND	7.4	
872-55-9	2-Ethylthiophene	ND	34	ND	7.4	
110-81-6	Diethyl Disulfide	ND	18	ND	3.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Ambient-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-003

Test Code:	ASTM D 5504-12	Date Collected:	11/16/16
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	17:00
Analyst:	Mike Conejo	Date Received:	11/21/16
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	11/23/16
Test Notes:		Time Analyzed:	08:10
Container ID:	SSC00078	Volume(s) Analyzed:	1.0 ml(s)

Initial Pressure (psig): 0.54 Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	8.3	ND	6.0	
463-58-1	Carbonyl Sulfide	ND	15	ND	6.0	
74-93-1	Methyl Mercaptan	ND	12	ND	6.0	
75-08-1	Ethyl Mercaptan	ND	15	ND	6.0	
75-18-3	Dimethyl Sulfide	ND	15	ND	6.0	
75-15-0	Carbon Disulfide	ND	9.3	ND	3.0	
75-33-2	Isopropyl Mercaptan	ND	19	ND	6.0	
75-66-1	tert-Butyl Mercaptan	ND	22	ND	6.0	
107-03-9	n-Propyl Mercaptan	ND	19	ND	6.0	
624-89-5	Ethyl Methyl Sulfide	ND	19	ND	6.0	
110-02-1	Thiophene	ND	20	ND	6.0	
513-44-0	Isobutyl Mercaptan	ND	22	ND	6.0	
352-93-2	Diethyl Sulfide	ND	22	ND	6.0	
109-79-5	n-Butyl Mercaptan	ND	22	ND	6.0	
624-92-0	Dimethyl Disulfide	ND	11	ND	3.0	
616-44-4	3-Methylthiophene	ND	24	ND	6.0	
110-01-0	Tetrahydrothiophene	ND	21	ND	6.0	
638-02-8	2,5-Dimethylthiophene	ND	27	ND	6.0	
872-55-9	2-Ethylthiophene	ND	27	ND	6.0	
110-81-6	Diethyl Disulfide	ND	15	ND	3.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**GP-39-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-004

Test Code:	ASTM D 5504-12	Date Collected:	11/16/16
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	16:48
Analyst:	Mike Conejo	Date Received:	11/21/16
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	11/23/16
Test Notes:		Time Analyzed:	08:24
Container ID:	SSC00347	Volume(s) Analyzed:	1.0 ml(s)

Initial Pressure (psig): -1.25 Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**14,000**	9.3	**10,000**	6.7	
463-58-1	Carbonyl Sulfide	ND	16	ND	6.7	
74-93-1	Methyl Mercaptan	**37**	13	**19**	6.7	
75-08-1	Ethyl Mercaptan	**39**	17	**15**	6.7	
75-18-3	Dimethyl Sulfide	ND	17	ND	6.7	
75-15-0	Carbon Disulfide	ND	10	ND	3.4	
75-33-2	Isopropyl Mercaptan	ND	21	ND	6.7	
75-66-1	tert-Butyl Mercaptan	ND	25	ND	6.7	
107-03-9	n-Propyl Mercaptan	ND	21	ND	6.7	
624-89-5	Ethyl Methyl Sulfide	ND	21	ND	6.7	
110-02-1	Thiophene	ND	23	ND	6.7	
513-44-0	Isobutyl Mercaptan	ND	25	ND	6.7	
352-93-2	Diethyl Sulfide	ND	25	ND	6.7	
109-79-5	n-Butyl Mercaptan	ND	25	ND	6.7	
624-92-0	Dimethyl Disulfide	ND	13	ND	3.4	
616-44-4	3-Methylthiophene	ND	27	ND	6.7	
110-01-0	Tetrahydrothiophene	ND	24	ND	6.7	
638-02-8	2,5-Dimethylthiophene	ND	31	ND	6.7	
872-55-9	2-Ethylthiophene	ND	31	ND	6.7	
110-81-6	Diethyl Disulfide	ND	17	ND	3.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**GP-38-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-005

Test Code:	ASTM D 5504-12	Date Collected:	11/16/16
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	17:33
Analyst:	Mike Conejo	Date Received:	11/21/16
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	11/23/16
Test Notes:		Time Analyzed:	08:37
Container ID:	SSC00127	Volume(s) Analyzed:	1.0 ml(s)

Initial Pressure (psig): -2.22 Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	10	ND	7.3	
463-58-1	Carbonyl Sulfide	**63**	18	**26**	7.3	
74-93-1	Methyl Mercaptan	ND	14	ND	7.3	
75-08-1	Ethyl Mercaptan	ND	19	ND	7.3	
75-18-3	Dimethyl Sulfide	ND	19	ND	7.3	
75-15-0	Carbon Disulfide	ND	11	ND	3.7	
75-33-2	Isopropyl Mercaptan	ND	23	ND	7.3	
75-66-1	tert-Butyl Mercaptan	ND	27	ND	7.3	
107-03-9	n-Propyl Mercaptan	ND	23	ND	7.3	
624-89-5	Ethyl Methyl Sulfide	ND	23	ND	7.3	
110-02-1	Thiophene	ND	25	ND	7.3	
513-44-0	Isobutyl Mercaptan	ND	27	ND	7.3	
352-93-2	Diethyl Sulfide	ND	27	ND	7.3	
109-79-5	n-Butyl Mercaptan	ND	27	ND	7.3	
624-92-0	Dimethyl Disulfide	ND	14	ND	3.7	
616-44-4	3-Methylthiophene	ND	29	ND	7.3	
110-01-0	Tetrahydrothiophene	ND	26	ND	7.3	
638-02-8	2,5-Dimethylthiophene	ND	33	ND	7.3	
872-55-9	2-Ethylthiophene	ND	33	ND	7.3	
110-81-6	Diethyl Disulfide	ND	18	ND	3.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161123-MB

Test Code:	ASTM D 5504-12	Date Collected:	NA
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	NA
Analyst:	Mike Conejo	Date Received:	NA
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	11/23/16
Test Notes:		Time Analyzed:	07:26
		Volume(s) Analyzed:	1.0 ml(s)

CAS #	Compound	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
463-58-1	Carbonyl Sulfide	ND	12	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-08-1	Ethyl Mercaptan	ND	13	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
75-15-0	Carbon Disulfide	ND	7.8	ND	2.5	
75-33-2	Isopropyl Mercaptan	ND	16	ND	5.0	
75-66-1	tert-Butyl Mercaptan	ND	18	ND	5.0	
107-03-9	n-Propyl Mercaptan	ND	16	ND	5.0	
624-89-5	Ethyl Methyl Sulfide	ND	16	ND	5.0	
110-02-1	Thiophene	ND	17	ND	5.0	
513-44-0	Isobutyl Mercaptan	ND	18	ND	5.0	
352-93-2	Diethyl Sulfide	ND	18	ND	5.0	
109-79-5	n-Butyl Mercaptan	ND	18	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	
616-44-4	3-Methylthiophene	ND	20	ND	5.0	
110-01-0	Tetrahydrothiophene	ND	18	ND	5.0	
638-02-8	2,5-Dimethylthiophene	ND	23	ND	5.0	
872-55-9	2-Ethylthiophene	ND	23	ND	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client: **Landau Associates, Inc.**
Client Sample ID: **Lab Control Sample**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444
ALS Sample ID: P161123-LCS

Test Code: ASTM D 5504-12
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/23/16
Volume(s) Analyzed: NA ml(s)

CAS #	**Compound**	Spike Amount ppbV	**Result ppbV**	**% Recovery**	ALS Acceptance Limits	Data Qualifier
7783-06-4	Hydrogen Sulfide	1,000	**1,080**	**108**	75-148	
463-58-1	Carbonyl Sulfide	1,000	**1,050**	**105**	70-137	
74-93-1	Methyl Mercaptan	1,000	**1,040**	**104**	72-139	

RESULTS OF ANALYSIS
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Client: **Landau Associates, Inc.**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Project ID: P1605444

Total Gaseous Nonmethane Organics (TGNMO) as Methane

Test Code: EPA Method 25C Modified
Instrument ID: HP5890 II/GC1/FID/TCA
Analyst: Adam McAfee
Sampling Media: 6.0 L Silonite Canister(s)
Test Notes:

Date(s) Collected: 11/16/16
Date Received: 11/21/16
Date Analyzed: #N/A

Client Sample ID	ALS Sample ID	Canister Dilution Factor	Injection Volume ml(s)	**Result ppmV**	MRL ppmV	Data Qualifier
GP-43-11162016	P1605444-001	1.38	0.50	**350**	1.4	
GP-41-11162016	P1605444-002	1.47	0.50	**640**	1.5	
Ambient-11162016	P1605444-003	1.19	0.50	ND	1.2	
GP-39-11162016	P1605444-004	1.34	0.50	**630**	1.3	
GP-38-11162016	P1605444-005	1.46	0.50	**220**	1.5	
Method Blank	P161129-MB	1.00	0.50	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: **Landau Associates, Inc.**
Client Sample ID: **Lab Control Sample**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444
ALS Sample ID: P161129-LCS

Test Code: EPA Method 25C Modified
Instrument ID: HP5890 II/GC1/FID/TCA
Analyst: Adam McAfee
Sampling Media: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/29/16
Volume(s) Analyzed: NA ml(s)

Compound	Spike Amount ppmV	**Result ppmV**	**% Recovery**	ALS Acceptance Limits
Total Gaseous Nonmethane Organics (TGNMO) as Methane	300	**266**	**89**	85-121

Data Qualifier

ALS ENVIRONMENTAL

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Client: **Landau Associates, Inc.**

Client Sample ID: **GP-43-11162016** ALS Project ID: P1605444

Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-001

Test Code: EPA TO-15 Modified Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 11/21/16

Analyst: Lusine Hakobyan Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.010 Liter(s)

Test Notes:

Container ID: SSC00302

Initial Pressure (psig): -1.61 Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	**800**	69	**470**	40	
75-71-8	Dichlorodifluoromethane (CFC 12)	**1,600**	69	**330**	14	
74-87-3	Chloromethane	ND	69	ND	33	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	**980**	69	**140**	9.9	
75-01-4	Vinyl Chloride	**3,900**	69	**1,500**	27	
106-99-0	1,3-Butadiene	ND	69	ND	31	
74-83-9	Bromomethane	ND	69	ND	18	
75-00-3	Chloroethane	ND	69	ND	26	
64-17-5	Ethanol	ND	690	ND	370	
75-05-8	Acetonitrile	ND	69	ND	41	
107-02-8	Acrolein	ND	280	ND	120	
67-64-1	Acetone	**4,200**	690	**1,800**	290	
75-69-4	Trichlorofluoromethane	**510**	69	**91**	12	
67-63-0	2-Propanol (Isopropyl Alcohol)	**1,700**	690	**690**	280	
107-13-1	Acrylonitrile	ND	69	ND	32	
75-35-4	1,1-Dichloroethene	**99**	69	**25**	17	
75-09-2	Methylene Chloride	**110**	69	**32**	20	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	69	ND	22	
76-13-1	Trichlorotrifluoroethane	ND	69	ND	9.0	
75-15-0	Carbon Disulfide	ND	690	ND	220	
156-60-5	trans-1,2-Dichloroethene	**150**	69	**38**	17	
75-34-3	1,1-Dichloroethane	ND	69	ND	17	
1634-04-4	Methyl tert-Butyl Ether	ND	69	ND	19	
108-05-4	Vinyl Acetate	ND	690	ND	200	
78-93-3	2-Butanone (MEK)	**5,500**	690	**1,900**	230	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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RESULTS OF ANALYSIS

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Client: **Landau Associates, Inc.**
Client Sample ID: **GP-43-11162016** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-001

Test Code: EPA TO-15 Modified Date Collected: 11/16/16
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 11/21/16
Analyst: Lusine Hakobyan Date Analyzed: 11/30/16
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.010 Liter(s)
Test Notes:
Container ID: SSC00302

Initial Pressure (psig): -1.61 Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	**5,100**	69	**1,300**	17	
141-78-6	Ethyl Acetate	ND	140	ND	38	
110-54-3	n-Hexane	**660**	69	**190**	20	
67-66-3	Chloroform	ND	69	ND	14	
109-99-9	Tetrahydrofuran (THF)	**1,100**	69	**360**	23	
107-06-2	1,2-Dichloroethane	ND	69	ND	17	
71-55-6	1,1,1-Trichloroethane	ND	69	ND	13	
71-43-2	Benzene	**370**	69	**120**	22	
56-23-5	Carbon Tetrachloride	ND	69	ND	11	
110-82-7	Cyclohexane	**580**	140	**170**	40	
78-87-5	1,2-Dichloropropane	ND	69	ND	15	
75-27-4	Bromodichloromethane	ND	69	ND	10	
79-01-6	Trichloroethene	**460**	69	**86**	13	
123-91-1	1,4-Dioxane	ND	69	ND	19	
80-62-6	Methyl Methacrylate	ND	140	ND	34	
142-82-5	n-Heptane	**2,000**	69	**500**	17	
10061-01-5	cis-1,3-Dichloropropene	ND	69	ND	15	
108-10-1	4-Methyl-2-pentanone	**1,000**	69	**240**	17	
10061-02-6	trans-1,3-Dichloropropene	ND	69	ND	15	
79-00-5	1,1,2-Trichloroethane	ND	69	ND	13	
108-88-3	Toluene	**8,400**	69	**2,200**	18	
591-78-6	2-Hexanone	ND	69	ND	17	
124-48-1	Dibromochloromethane	ND	69	ND	8.1	
106-93-4	1,2-Dibromoethane	ND	69	ND	9.0	
123-86-4	n-Butyl Acetate	ND	69	ND	15	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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RESULTS OF ANALYSIS

Client:	**Landau Associates, Inc.**		
Client Sample ID:	**GP-43-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-001
Test Code:	EPA TO-15 Modified	Date Collected:	11/16/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	11/21/16
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.010 Liter(s)
Test Notes:			
Container ID:	SSC00302		

Initial Pressure (psig): -1.61 Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	**1,800**	69	**380**	15	
127-18-4	Tetrachloroethene	**810**	69	**120**	10	
108-90-7	Chlorobenzene	**96**	69	**21**	15	
100-41-4	Ethylbenzene	**4,500**	69	**1,000**	16	
179601-23-1	m,p-Xylenes	**8,600**	140	**2,000**	32	
75-25-2	Bromoform	ND	69	ND	6.7	
100-42-5	Styrene	**160**	69	**38**	16	
95-47-6	o-Xylene	**2,200**	69	**510**	16	
111-84-2	n-Nonane	**3,200**	69	**610**	13	
79-34-5	1,1,2,2-Tetrachloroethane	ND	69	ND	10	
98-82-8	Cumene	**750**	69	**150**	14	
80-56-8	alpha-Pinene	**4,100**	69	**730**	12	
103-65-1	n-Propylbenzene	**690**	69	**140**	14	
622-96-8	4-Ethyltoluene	**290**	69	**59**	14	
108-67-8	1,3,5-Trimethylbenzene	**550**	69	**110**	14	
95-63-6	1,2,4-Trimethylbenzene	**1,500**	69	**310**	14	
100-44-7	Benzyl Chloride	ND	69	ND	13	
541-73-1	1,3-Dichlorobenzene	ND	69	ND	11	
106-46-7	1,4-Dichlorobenzene	ND	69	ND	11	
95-50-1	1,2-Dichlorobenzene	ND	69	ND	11	
5989-27-5	d-Limonene	**8,000**	69	**1,400**	12	
96-12-8	1,2-Dibromo-3-chloropropane	ND	69	ND	7.1	
120-82-1	1,2,4-Trichlorobenzene	ND	69	ND	9.3	
91-20-3	Naphthalene	ND	69	ND	13	
87-68-3	Hexachlorobutadiene	ND	69	ND	6.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**GP-41-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-002
Test Code:	EPA TO-15 Modified	Date Collected:	11/16/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	11/21/16
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.0050 Liter(s)
Test Notes:			
Container ID:	SSC00106		

Initial Pressure (psig): -2.49 Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	**500**	150	**290**	85	
75-71-8	Dichlorodifluoromethane (CFC 12)	**1,100**	150	**210**	30	
74-87-3	Chloromethane	ND	150	ND	71	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	**980**	150	**140**	21	
75-01-4	Vinyl Chloride	**3,700**	150	**1,500**	58	
106-99-0	1,3-Butadiene	ND	150	ND	66	
74-83-9	Bromomethane	ND	150	ND	38	
75-00-3	Chloroethane	ND	150	ND	56	
64-17-5	Ethanol	ND	1,500	ND	780	
75-05-8	Acetonitrile	ND	150	ND	88	
107-02-8	Acrolein	ND	590	ND	260	
67-64-1	Acetone	ND	1,500	ND	620	
75-69-4	Trichlorofluoromethane	ND	150	ND	26	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	1,500	ND	600	
107-13-1	Acrylonitrile	ND	150	ND	68	
75-35-4	1,1-Dichloroethene	ND	150	ND	37	
75-09-2	Methylene Chloride	ND	150	ND	42	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	150	ND	47	
76-13-1	Trichlorotrifluoroethane	ND	150	ND	19	
75-15-0	Carbon Disulfide	ND	1,500	ND	470	
156-60-5	trans-1,2-Dichloroethene	ND	150	ND	37	
75-34-3	1,1-Dichloroethane	ND	150	ND	36	
1634-04-4	Methyl tert-Butyl Ether	ND	150	ND	41	
108-05-4	Vinyl Acetate	ND	1,500	ND	420	
78-93-3	2-Butanone (MEK)	ND	1,500	ND	500	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

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Client: **Landau Associates, Inc.**

Client Sample ID: **GP-41-11162016** ALS Project ID: P1605444

Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-002

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00106

Date Collected: 11/16/16
Date Received: 11/21/16
Date Analyzed: 11/30/16
Volume(s) Analyzed: 0.0050 Liter(s)

Initial Pressure (psig): -2.49 Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	**970**	150	**250**	37	
141-78-6	Ethyl Acetate	ND	290	ND	82	
110-54-3	n-Hexane	**400**	150	**110**	42	
67-66-3	Chloroform	ND	150	ND	30	
109-99-9	Tetrahydrofuran (THF)	ND	150	ND	50	
107-06-2	1,2-Dichloroethane	ND	150	ND	36	
71-55-6	1,1,1-Trichloroethane	ND	150	ND	27	
71-43-2	Benzene	**220**	150	**69**	46	
56-23-5	Carbon Tetrachloride	ND	150	ND	23	
110-82-7	Cyclohexane	**320**	290	**93**	85	
78-87-5	1,2-Dichloropropane	ND	150	ND	32	
75-27-4	Bromodichloromethane	ND	150	ND	22	
79-01-6	Trichloroethene	ND	150	ND	27	
123-91-1	1,4-Dioxane	ND	150	ND	41	
80-62-6	Methyl Methacrylate	ND	290	ND	72	
142-82-5	n-Heptane	**490**	150	**120**	36	
10061-01-5	cis-1,3-Dichloropropene	ND	150	ND	32	
108-10-1	4-Methyl-2-pentanone	ND	150	ND	36	
10061-02-6	trans-1,3-Dichloropropene	ND	150	ND	32	
79-00-5	1,1,2-Trichloroethane	ND	150	ND	27	
108-88-3	Toluene	**260**	150	**70**	39	
591-78-6	2-Hexanone	ND	150	ND	36	
124-48-1	Dibromochloromethane	ND	150	ND	17	
106-93-4	1,2-Dibromoethane	ND	150	ND	19	
123-86-4	n-Butyl Acetate	ND	150	ND	31	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**GP-41-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-002
Test Code:	EPA TO-15 Modified	Date Collected:	11/16/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	11/21/16
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.0050 Liter(s)
Test Notes:			
Container ID:	SSC00106		

Initial Pressure (psig): -2.49 Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	**320**	150	**69**	31	
127-18-4	Tetrachloroethene	**230**	150	**34**	22	
108-90-7	Chlorobenzene	ND	150	ND	32	
100-41-4	Ethylbenzene	ND	150	ND	34	
179601-23-1	m,p-Xylenes	ND	290	ND	68	
75-25-2	Bromoform	ND	150	ND	14	
100-42-5	Styrene	ND	150	ND	35	
95-47-6	o-Xylene	ND	150	ND	34	
111-84-2	n-Nonane	**480**	150	**91**	28	
79-34-5	1,1,2,2-Tetrachloroethane	ND	150	ND	21	
98-82-8	Cumene	ND	150	ND	30	
80-56-8	alpha-Pinene	ND	150	ND	26	
103-65-1	n-Propylbenzene	ND	150	ND	30	
622-96-8	4-Ethyltoluene	ND	150	ND	30	
108-67-8	1,3,5-Trimethylbenzene	ND	150	ND	30	
95-63-6	1,2,4-Trimethylbenzene	ND	150	ND	30	
100-44-7	Benzyl Chloride	ND	150	ND	28	
541-73-1	1,3-Dichlorobenzene	ND	150	ND	24	
106-46-7	1,4-Dichlorobenzene	ND	150	ND	24	
95-50-1	1,2-Dichlorobenzene	ND	150	ND	24	
5989-27-5	d-Limonene	ND	150	ND	26	
96-12-8	1,2-Dibromo-3-chloropropane	ND	150	ND	15	
120-82-1	1,2,4-Trichlorobenzene	ND	150	ND	20	
91-20-3	Naphthalene	ND	150	ND	28	
87-68-3	Hexachlorobutadiene	ND	150	ND	14	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Client: **Landau Associates, Inc.**
Client Sample ID: **Ambient-11162016** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-003

Test Code: EPA TO-15 Modified Date Collected: 11/16/16
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 11/21/16
Analyst: Lusine Hakobyan Date Analyzed: 12/5/16
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:
Container ID: SSC00078

Initial Pressure (psig): 0.54 Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	**1.3**	0.60	**0.78**	0.35	
75-71-8	Dichlorodifluoromethane (CFC 12)	**2.2**	0.60	**0.45**	0.12	
74-87-3	Chloromethane	ND	0.60	ND	0.29	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.60	ND	0.085	
75-01-4	Vinyl Chloride	ND	0.60	ND	0.23	
106-99-0	1,3-Butadiene	ND	0.60	ND	0.27	
74-83-9	Bromomethane	ND	0.60	ND	0.15	
75-00-3	Chloroethane	ND	0.60	ND	0.23	
64-17-5	Ethanol	ND	6.0	ND	3.2	
75-05-8	Acetonitrile	ND	0.60	ND	0.35	
107-02-8	Acrolein	ND	2.4	ND	1.0	
67-64-1	Acetone	ND	6.0	ND	2.5	
75-69-4	Trichlorofluoromethane	**1.1**	0.60	**0.20**	0.11	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	6.0	ND	2.4	
107-13-1	Acrylonitrile	ND	0.60	ND	0.27	
75-35-4	1,1-Dichloroethene	ND	0.60	ND	0.15	
75-09-2	Methylene Chloride	ND	0.60	ND	0.17	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.60	ND	0.19	
76-13-1	Trichlorotrifluoroethane	ND	0.60	ND	0.078	
75-15-0	Carbon Disulfide	ND	6.0	ND	1.9	
156-60-5	trans-1,2-Dichloroethene	ND	0.60	ND	0.15	
75-34-3	1,1-Dichloroethane	ND	0.60	ND	0.15	
1634-04-4	Methyl tert-Butyl Ether	ND	0.60	ND	0.17	
108-05-4	Vinyl Acetate	ND	6.0	ND	1.7	
78-93-3	2-Butanone (MEK)	ND	6.0	ND	2.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Ambient-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-003
Test Code:	EPA TO-15 Modified	Date Collected:	11/16/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	11/21/16
Analyst:	Lusine Hakobyan	Date Analyzed:	12/5/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			
Container ID:	SSC00078		

Initial Pressure (psig): 0.54 Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	ND	0.60	ND	0.15	
141-78-6	Ethyl Acetate	ND	1.2	ND	0.33	
110-54-3	n-Hexane	ND	0.60	ND	0.17	
67-66-3	Chloroform	ND	0.60	ND	0.12	
109-99-9	Tetrahydrofuran (THF)	ND	0.60	ND	0.20	
107-06-2	1,2-Dichloroethane	ND	0.60	ND	0.15	
71-55-6	1,1,1-Trichloroethane	ND	0.60	ND	0.11	
71-43-2	Benzene	**0.60**	0.60	**0.19**	0.19	
56-23-5	Carbon Tetrachloride	ND	0.60	ND	0.095	
110-82-7	Cyclohexane	ND	1.2	ND	0.35	
78-87-5	1,2-Dichloropropane	ND	0.60	ND	0.13	
75-27-4	Bromodichloromethane	ND	0.60	ND	0.089	
79-01-6	Trichloroethene	ND	0.60	ND	0.11	
123-91-1	1,4-Dioxane	ND	0.60	ND	0.17	
80-62-6	Methyl Methacrylate	ND	1.2	ND	0.29	
142-82-5	n-Heptane	ND	0.60	ND	0.15	
10061-01-5	cis-1,3-Dichloropropene	ND	0.60	ND	0.13	
108-10-1	4-Methyl-2-pentanone	ND	0.60	ND	0.15	
10061-02-6	trans-1,3-Dichloropropene	ND	0.60	ND	0.13	
79-00-5	1,1,2-Trichloroethane	ND	0.60	ND	0.11	
108-88-3	Toluene	**2.2**	0.60	**0.59**	0.16	
591-78-6	2-Hexanone	ND	0.60	ND	0.15	
124-48-1	Dibromochloromethane	ND	0.60	ND	0.070	
106-93-4	1,2-Dibromoethane	ND	0.60	ND	0.077	
123-86-4	n-Butyl Acetate	ND	0.60	ND	0.13	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
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ALS ENVIRONMENTAL

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Ambient-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-003

Test Code:	EPA TO-15 Modified	Date Collected:	11/16/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	11/21/16
Analyst:	Lusine Hakobyan	Date Analyzed:	12/5/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			
Container ID:	SSC00078		

Initial Pressure (psig): 0.54 Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.60	ND	0.13	
127-18-4	Tetrachloroethene	ND	0.60	ND	0.088	
108-90-7	Chlorobenzene	ND	0.60	ND	0.13	
100-41-4	Ethylbenzene	ND	0.60	ND	0.14	
179601-23-1	m,p-Xylenes	ND	1.2	ND	0.27	
75-25-2	Bromoform	ND	0.60	ND	0.058	
100-42-5	Styrene	ND	0.60	ND	0.14	
95-47-6	o-Xylene	ND	0.60	ND	0.14	
111-84-2	n-Nonane	ND	0.60	ND	0.11	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.60	ND	0.087	
98-82-8	Cumene	ND	0.60	ND	0.12	
80-56-8	alpha-Pinene	ND	0.60	ND	0.11	
103-65-1	n-Propylbenzene	ND	0.60	ND	0.12	
622-96-8	4-Ethyltoluene	ND	0.60	ND	0.12	
108-67-8	1,3,5-Trimethylbenzene	ND	0.60	ND	0.12	
95-63-6	1,2,4-Trimethylbenzene	ND	0.60	ND	0.12	
100-44-7	Benzyl Chloride	ND	0.60	ND	0.11	
541-73-1	1,3-Dichlorobenzene	ND	0.60	ND	0.099	
106-46-7	1,4-Dichlorobenzene	ND	0.60	ND	0.099	
95-50-1	1,2-Dichlorobenzene	ND	0.60	ND	0.099	
5989-27-5	d-Limonene	ND	0.60	ND	0.11	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.60	ND	0.062	
120-82-1	1,2,4-Trichlorobenzene	ND	0.60	ND	0.080	
91-20-3	Naphthalene	ND	0.60	ND	0.11	
87-68-3	Hexachlorobutadiene	ND	0.60	ND	0.056	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Landau Associates, Inc.**
Client Sample ID: **GP-39-11162016** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-004

Test Code:	EPA TO-15 Modified	Date Collected:	11/16/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	11/21/16
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.0040 Liter(s)
Test Notes:			
Container ID:	SSC00347		

Initial Pressure (psig): -1.25 Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	**800**	170	**460**	97	
75-71-8	Dichlorodifluoromethane (CFC 12)	**970**	170	**200**	34	
74-87-3	Chloromethane	ND	170	ND	81	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	**1,100**	170	**150**	24	
75-01-4	Vinyl Chloride	**6,600**	170	**2,600**	66	
106-99-0	1,3-Butadiene	ND	170	ND	76	
74-83-9	Bromomethane	ND	170	ND	43	
75-00-3	Chloroethane	ND	170	ND	64	
64-17-5	Ethanol	ND	1,700	ND	890	
75-05-8	Acetonitrile	ND	170	ND	100	
107-02-8	Acrolein	ND	670	ND	290	
67-64-1	Acetone	ND	1,700	ND	710	
75-69-4	Trichlorofluoromethane	ND	170	ND	30	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	1,700	ND	680	
107-13-1	Acrylonitrile	ND	170	ND	77	
75-35-4	1,1-Dichloroethene	ND	170	ND	42	
75-09-2	Methylene Chloride	ND	170	ND	48	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	170	ND	54	
76-13-1	Trichlorotrifluoroethane	ND	170	ND	22	
75-15-0	Carbon Disulfide	ND	1,700	ND	540	
156-60-5	trans-1,2-Dichloroethene	ND	170	ND	42	
75-34-3	1,1-Dichloroethane	ND	170	ND	41	
1634-04-4	Methyl tert-Butyl Ether	ND	170	ND	46	
108-05-4	Vinyl Acetate	ND	1,700	ND	480	
78-93-3	2-Butanone (MEK)	ND	1,700	ND	570	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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RESULTS OF ANALYSIS

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Client: **Landau Associates, Inc.**
Client Sample ID: **GP-39-11162016** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-004

Test Code: EPA TO-15 Modified Date Collected: 11/16/16
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 11/21/16
Analyst: Lusine Hakobyan Date Analyzed: 11/30/16
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.0040 Liter(s)
Test Notes:
Container ID: SSC00347

Initial Pressure (psig): -1.25 Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	**Compound**	**Result** **µg/m³**	MRL µg/m³	**Result** **ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	**1,500**	170	**380**	42	
141-78-6	Ethyl Acetate	ND	340	ND	93	
110-54-3	n-Hexane	**820**	170	**230**	48	
67-66-3	Chloroform	ND	170	ND	34	
109-99-9	Tetrahydrofuran (THF)	ND	170	ND	57	
107-06-2	1,2-Dichloroethane	ND	170	ND	41	
71-55-6	1,1,1-Trichloroethane	ND	170	ND	31	
71-43-2	Benzene	**410**	170	**130**	52	
56-23-5	Carbon Tetrachloride	ND	170	ND	27	
110-82-7	Cyclohexane	**2,800**	340	**820**	97	
78-87-5	1,2-Dichloropropane	ND	170	ND	36	
75-27-4	Bromodichloromethane	ND	170	ND	25	
79-01-6	Trichloroethene	ND	170	ND	31	
123-91-1	1,4-Dioxane	ND	170	ND	46	
80-62-6	Methyl Methacrylate	ND	340	ND	82	
142-82-5	n-Heptane	**2,000**	170	**490**	41	
10061-01-5	cis-1,3-Dichloropropene	ND	170	ND	37	
108-10-1	4-Methyl-2-pentanone	ND	170	ND	41	
10061-02-6	trans-1,3-Dichloropropene	ND	170	ND	37	
79-00-5	1,1,2-Trichloroethane	ND	170	ND	31	
108-88-3	Toluene	**1,900**	170	**500**	44	
591-78-6	2-Hexanone	ND	170	ND	41	
124-48-1	Dibromochloromethane	ND	170	ND	20	
106-93-4	1,2-Dibromoethane	ND	170	ND	22	
123-86-4	n-Butyl Acetate	ND	170	ND	35	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client:	**Landau Associates, Inc.**		
Client Sample ID:	**GP-39-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-004
Test Code:	EPA TO-15 Modified	Date Collected:	11/16/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	11/21/16
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.0040 Liter(s)
Test Notes:			
Container ID:	SSC00347		

Initial Pressure (psig): -1.25 Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
111-65-9	n-Octane	**1,700**	170	**360**	36	
127-18-4	Tetrachloroethene	ND	170	ND	25	
108-90-7	Chlorobenzene	ND	170	ND	36	
100-41-4	Ethylbenzene	**3,800**	170	**870**	39	
179601-23-1	m,p-Xylenes	**7,600**	340	**1,700**	77	
75-25-2	Bromoform	ND	170	ND	16	
100-42-5	Styrene	ND	170	ND	39	
95-47-6	o-Xylene	**2,800**	170	**640**	39	
111-84-2	n-Nonane	**13,000**	170	**2,500**	32	
79-34-5	1,1,2,2-Tetrachloroethane	ND	170	ND	24	
98-82-8	Cumene	**690**	170	**140**	34	
80-56-8	alpha-Pinene	**1,200**	170	**220**	30	
103-65-1	n-Propylbenzene	**1,000**	170	**210**	34	
622-96-8	4-Ethyltoluene	**470**	170	**95**	34	
108-67-8	1,3,5-Trimethylbenzene	**1,500**	170	**310**	34	
95-63-6	1,2,4-Trimethylbenzene	**3,400**	170	**700**	34	
100-44-7	Benzyl Chloride	ND	170	ND	32	
541-73-1	1,3-Dichlorobenzene	ND	170	ND	28	
106-46-7	1,4-Dichlorobenzene	ND	170	ND	28	
95-50-1	1,2-Dichlorobenzene	ND	170	ND	28	
5989-27-5	d-Limonene	**620**	170	**110**	30	
96-12-8	1,2-Dibromo-3-chloropropane	ND	170	ND	17	
120-82-1	1,2,4-Trichlorobenzene	ND	170	ND	23	
91-20-3	Naphthalene	ND	170	ND	32	
87-68-3	Hexachlorobutadiene	ND	170	ND	16	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates, Inc.**
Client Sample ID: **GP-38-11162016** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-005

Test Code: EPA TO-15 Modified Date Collected: 11/16/16
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 11/21/16
Analyst: Lusine Hakobyan Date Analyzed: 11/30/16
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.020 Liter(s)
Test Notes:
Container ID: SSC00127

Initial Pressure (psig): -2.22 Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	**800**	37	**460**	21	
75-71-8	Dichlorodifluoromethane (CFC 12)	**110**	37	**23**	7.4	
74-87-3	Chloromethane	ND	37	ND	18	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	**1,400**	37	**190**	5.2	
75-01-4	Vinyl Chloride	**90**	37	**35**	14	
106-99-0	1,3-Butadiene	ND	37	ND	17	
74-83-9	Bromomethane	ND	37	ND	9.4	
75-00-3	Chloroethane	ND	37	ND	14	
64-17-5	Ethanol	ND	370	ND	190	
75-05-8	Acetonitrile	ND	37	ND	22	
107-02-8	Acrolein	ND	150	ND	64	
67-64-1	Acetone	ND	370	ND	150	
75-69-4	Trichlorofluoromethane	ND	37	ND	6.5	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	370	ND	150	
107-13-1	Acrylonitrile	ND	37	ND	17	
75-35-4	1,1-Dichloroethene	ND	37	ND	9.2	
75-09-2	Methylene Chloride	ND	37	ND	11	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	37	ND	12	
76-13-1	Trichlorotrifluoroethane	ND	37	ND	4.8	
75-15-0	Carbon Disulfide	ND	370	ND	120	
156-60-5	trans-1,2-Dichloroethene	ND	37	ND	9.2	
75-34-3	1,1-Dichloroethane	ND	37	ND	9.0	
1634-04-4	Methyl tert-Butyl Ether	ND	37	ND	10	
108-05-4	Vinyl Acetate	ND	370	ND	100	
78-93-3	2-Butanone (MEK)	ND	370	ND	120	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**GP-38-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-005

Test Code:	EPA TO-15 Modified	Date Collected:	11/16/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	11/21/16
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.020 Liter(s)
Test Notes:			
Container ID:	SSC00127		

Initial Pressure (psig): -2.22 Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	ND	37	ND	9.2	
141-78-6	Ethyl Acetate	ND	73	ND	20	
110-54-3	n-Hexane	**830**	37	**240**	10	
67-66-3	Chloroform	ND	37	ND	7.5	
109-99-9	Tetrahydrofuran (THF)	ND	37	ND	12	
107-06-2	1,2-Dichloroethane	ND	37	ND	9.0	
71-55-6	1,1,1-Trichloroethane	ND	37	ND	6.7	
71-43-2	Benzene	**78**	37	**25**	11	
56-23-5	Carbon Tetrachloride	ND	37	ND	5.8	
110-82-7	Cyclohexane	**1,800**	73	**530**	21	
78-87-5	1,2-Dichloropropane	ND	37	ND	7.9	
75-27-4	Bromodichloromethane	ND	37	ND	5.5	
79-01-6	Trichloroethene	ND	37	ND	6.8	
123-91-1	1,4-Dioxane	ND	37	ND	10	
80-62-6	Methyl Methacrylate	ND	73	ND	18	
142-82-5	n-Heptane	**2,200**	37	**540**	8.9	
10061-01-5	cis-1,3-Dichloropropene	ND	37	ND	8.0	
108-10-1	4-Methyl-2-pentanone	ND	37	ND	8.9	
10061-02-6	trans-1,3-Dichloropropene	ND	37	ND	8.0	
79-00-5	1,1,2-Trichloroethane	ND	37	ND	6.7	
108-88-3	Toluene	**110**	37	**30**	9.7	
591-78-6	2-Hexanone	ND	37	ND	8.9	
124-48-1	Dibromochloromethane	ND	37	ND	4.3	
106-93-4	1,2-Dibromoethane	ND	37	ND	4.8	
123-86-4	n-Butyl Acetate	ND	37	ND	7.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates, Inc.**
Client Sample ID: **GP-38-11162016** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-005

Test Code: EPA TO-15 Modified Date Collected: 11/16/16
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 11/21/16
Analyst: Lusine Hakobyan Date Analyzed: 11/30/16
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.020 Liter(s)
Test Notes:
Container ID: SSC00127

Initial Pressure (psig): -2.22 Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	Compound	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
111-65-9	n-Octane	**490**	37	**100**	7.8	
127-18-4	Tetrachloroethene	ND	37	ND	5.4	
108-90-7	Chlorobenzene	ND	37	ND	7.9	
100-41-4	Ethylbenzene	**38**	37	**8.8**	8.4	
179601-23-1	m,p-Xylenes	**1,200**	73	**280**	17	
75-25-2	Bromoform	ND	37	ND	3.5	
100-42-5	Styrene	ND	37	ND	8.6	
95-47-6	o-Xylene	**430**	37	**98**	8.4	
111-84-2	n-Nonane	**140**	37	**26**	7.0	
79-34-5	1,1,2,2-Tetrachloroethane	ND	37	ND	5.3	
98-82-8	Cumene	ND	37	ND	7.4	
80-56-8	alpha-Pinene	**110**	37	**21**	6.6	
103-65-1	n-Propylbenzene	ND	37	ND	7.4	
622-96-8	4-Ethyltoluene	**51**	37	**10**	7.4	
108-67-8	1,3,5-Trimethylbenzene	**220**	37	**46**	7.4	
95-63-6	1,2,4-Trimethylbenzene	**260**	37	**53**	7.4	
100-44-7	Benzyl Chloride	ND	37	ND	7.1	
541-73-1	1,3-Dichlorobenzene	ND	37	ND	6.1	
106-46-7	1,4-Dichlorobenzene	**61**	37	**10**	6.1	
95-50-1	1,2-Dichlorobenzene	ND	37	ND	6.1	
5989-27-5	d-Limonene	ND	37	ND	6.6	
96-12-8	1,2-Dibromo-3-chloropropane	ND	37	ND	3.8	
120-82-1	1,2,4-Trichlorobenzene	ND	37	ND	4.9	
91-20-3	Naphthalene	ND	37	ND	7.0	
87-68-3	Hexachlorobutadiene	ND	37	ND	3.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161130-MB
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161130-MB

Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates, Inc.**
Client Sample ID: **Method Blank**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444
ALS Sample ID: P161130-MB

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/30/16
Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates, Inc.**
Client Sample ID: **Method Blank** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P161205-MB

Test Code: EPA TO-15 Modified Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: NA
Analyst: Lusine Hakobyan Date Analyzed: 12/5/16
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161205-MB
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	12/5/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result** **µg/m³**	MRL µg/m³	**Result** **ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

RESULTS OF ANALYSIS
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Client: **Landau Associates, Inc.**
Client Sample ID: **Method Blank** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P161205-MB

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 12/5/16
Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

SURROGATE SPIKE RECOVERY RESULTS

Page 1 of 1

Client: **Landau Associates, Inc.**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**
ALS Project ID: P1605444

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister(s)
Test Notes:

Date(s) Collected: 11/16/16
Date(s) Received: 11/21/16
Date(s) Analyzed: 11/30 - 12/5/16

		1,2-Dichloroethane-d4	**Toluene-d8**	**Bromofluorobenzene**		
Client Sample ID	**ALS Sample ID**	Percent Recovered	Percent Recovered	Percent Recovered	Acceptance Limits	**Data Qualifier**
Method Blank	P161130-MB	**97**	**103**	**102**	70-130	
Method Blank	P161205-MB	**91**	**104**	**108**	70-130	
Lab Control Sample	P161130-LCS	**93**	**100**	**107**	70-130	
Lab Control Sample	P161205-LCS	**89**	**102**	**112**	70-130	
GP-43-11162016	P1605444-001	**94**	**98**	**108**	70-130	
GP-41-11162016	P1605444-002	**94**	**97**	**106**	70-130	
Ambient-11162016	P1605444-003	**92**	**102**	**111**	70-130	
GP-39-11162016	P1605444-004	**94**	**98**	**107**	70-130	
GP-38-11162016	P1605444-005	**93**	**96**	**104**	70-130	

Surrogate percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly from the on-column percent recovery.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161130-LCS
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.125 Liter(s)
Test Notes:			

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
115-07-1	Propene	210	**191**	**91**	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	**197**	**94**	68-109	
74-87-3	Chloromethane	210	**195**	**93**	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	**188**	**89**	66-114	
75-01-4	Vinyl Chloride	210	**200**	**95**	61-125	
106-99-0	1,3-Butadiene	210	**223**	**106**	62-144	
74-83-9	Bromomethane	210	**204**	**97**	73-123	
75-00-3	Chloroethane	210	**210**	**100**	69-122	
64-17-5	Ethanol	1,060	**996**	**94**	62-124	
75-05-8	Acetonitrile	213	**206**	**97**	57-114	
107-02-8	Acrolein	212	**172**	**81**	62-116	
67-64-1	Acetone	1,060	**967**	**91**	57-117	
75-69-4	Trichlorofluoromethane	210	**191**	**91**	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	**406**	**96**	66-121	
107-13-1	Acrylonitrile	213	**210**	**99**	68-123	
75-35-4	1,1-Dichloroethene	213	**217**	**102**	76-118	
75-09-2	Methylene Chloride	212	**193**	**91**	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	**203**	**96**	65-126	
76-13-1	Trichlorotrifluoroethane	212	**204**	**96**	73-114	
75-15-0	Carbon Disulfide	213	**212**	**100**	57-102	
156-60-5	trans-1,2-Dichloroethene	213	**207**	**97**	74-123	
75-34-3	1,1-Dichloroethane	212	**199**	**94**	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	**195**	**92**	69-113	
108-05-4	Vinyl Acetate	1,060	**1060**	**100**	76-128	
78-93-3	2-Butanone (MEK)	212	**198**	**93**	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161130-LCS
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.125 Liter(s)
Test Notes:			

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	212	**200**	**94**	72-117	
141-78-6	Ethyl Acetate	426	**417**	**98**	68-127	
110-54-3	n-Hexane	213	**190**	**89**	55-116	
67-66-3	Chloroform	212	**193**	**91**	70-109	
109-99-9	Tetrahydrofuran (THF)	213	**192**	**90**	72-113	
107-06-2	1,2-Dichloroethane	212	**188**	**89**	69-113	
71-55-6	1,1,1-Trichloroethane	212	**200**	**94**	72-115	
71-43-2	Benzene	212	**180**	**85**	65-107	
56-23-5	Carbon Tetrachloride	213	**208**	**98**	71-113	
110-82-7	Cyclohexane	425	**400**	**94**	71-115	
78-87-5	1,2-Dichloropropane	212	**198**	**93**	71-115	
75-27-4	Bromodichloromethane	214	**214**	**100**	75-118	
79-01-6	Trichloroethene	212	**205**	**97**	68-114	
123-91-1	1,4-Dioxane	213	**200**	**94**	81-131	
80-62-6	Methyl Methacrylate	424	**425**	**100**	72-130	
142-82-5	n-Heptane	213	**194**	**91**	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	**216**	**103**	77-126	
108-10-1	4-Methyl-2-pentanone	213	**212**	**100**	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	**224**	**105**	79-125	
79-00-5	1,1,2-Trichloroethane	212	**207**	**98**	75-119	
108-88-3	Toluene	212	**203**	**96**	59-118	
591-78-6	2-Hexanone	213	**201**	**94**	69-129	
124-48-1	Dibromochloromethane	213	**227**	**107**	74-136	
106-93-4	1,2-Dibromoethane	212	**212**	**100**	73-131	
123-86-4	n-Butyl Acetate	216	**198**	**92**	69-130	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 3 of 3

Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161130-LCS
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.125 Liter(s)
Test Notes:			

CAS #	Compound	Spike Amount µg/m³	Result µg/m³	% Recovery	ALS Acceptance Limits	Data Qualifier
111-65-9	n-Octane	212	**198**	**93**	66-120	
127-18-4	Tetrachloroethene	213	**208**	**98**	65-130	
108-90-7	Chlorobenzene	212	**201**	**95**	68-120	
100-41-4	Ethylbenzene	212	**197**	**93**	68-122	
179601-23-1	m,p-Xylenes	424	**393**	**93**	68-123	
75-25-2	Bromoform	212	**250**	**118**	69-130	
100-42-5	Styrene	212	**207**	**98**	71-133	
95-47-6	o-Xylene	212	**199**	**94**	68-122	
111-84-2	n-Nonane	212	**192**	**91**	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	**218**	**103**	69-130	
98-82-8	Cumene	212	**211**	**100**	70-123	
80-56-8	alpha-Pinene	213	**204**	**96**	70-128	
103-65-1	n-Propylbenzene	214	**206**	**96**	69-125	
622-96-8	4-Ethyltoluene	212	**206**	**97**	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	**196**	**92**	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	**201**	**95**	67-129	
100-44-7	Benzyl Chloride	212	**244**	**115**	79-138	
541-73-1	1,3-Dichlorobenzene	212	**227**	**107**	65-136	
106-46-7	1,4-Dichlorobenzene	213	**200**	**94**	66-141	
95-50-1	1,2-Dichlorobenzene	212	**214**	**101**	67-136	
5989-27-5	d-Limonene	212	**208**	**98**	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	**259**	**122**	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	**258**	**122**	64-134	
91-20-3	Naphthalene	214	**266**	**124**	62-136	
87-68-3	Hexachlorobutadiene	213	**247**	**116**	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY
Page 1 of 3

Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161205-LCS
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	12/5/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.125 Liter(s)
Test Notes:			

CAS #	Compound	Spike Amount µg/m³	Result µg/m³	% Recovery	ALS Acceptance Limits	Data Qualifier
115-07-1	Propene	210	**179**	**85**	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	**185**	**88**	68-109	
74-87-3	Chloromethane	210	**173**	**82**	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	**184**	**87**	66-114	
75-01-4	Vinyl Chloride	210	**184**	**88**	61-125	
106-99-0	1,3-Butadiene	210	**221**	**105**	62-144	
74-83-9	Bromomethane	210	**203**	**97**	73-123	
75-00-3	Chloroethane	210	**203**	**97**	69-122	
64-17-5	Ethanol	1,060	**930**	**88**	62-124	
75-05-8	Acetonitrile	213	**193**	**91**	57-114	
107-02-8	Acrolein	212	**164**	**77**	62-116	
67-64-1	Acetone	1,060	**908**	**86**	57-117	
75-69-4	Trichlorofluoromethane	210	**181**	**86**	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	**369**	**87**	66-121	
107-13-1	Acrylonitrile	213	**199**	**93**	68-123	
75-35-4	1,1-Dichloroethene	213	**210**	**99**	76-118	
75-09-2	Methylene Chloride	212	**186**	**88**	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	**188**	**89**	65-126	
76-13-1	Trichlorotrifluoroethane	212	**199**	**94**	73-114	
75-15-0	Carbon Disulfide	213	**205**	**96**	57-102	
156-60-5	trans-1,2-Dichloroethene	213	**196**	**92**	74-123	
75-34-3	1,1-Dichloroethane	212	**189**	**89**	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	**187**	**88**	69-113	
108-05-4	Vinyl Acetate	1,060	**1000**	**94**	76-128	
78-93-3	2-Butanone (MEK)	212	**190**	**90**	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161205-LCS

Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	12/5/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.125 Liter(s)
Test Notes:			

CAS #	Compound	Spike Amount µg/m³	Result µg/m³	% Recovery	ALS Acceptance Limits	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	212	**189**	**89**	72-117	
141-78-6	Ethyl Acetate	426	**389**	**91**	68-127	
110-54-3	n-Hexane	213	**176**	**83**	55-116	
67-66-3	Chloroform	212	**184**	**87**	70-109	
109-99-9	Tetrahydrofuran (THF)	213	**184**	**86**	72-113	
107-06-2	1,2-Dichloroethane	212	**175**	**83**	69-113	
71-55-6	1,1,1-Trichloroethane	212	**189**	**89**	72-115	
71-43-2	Benzene	212	**172**	**81**	65-107	
56-23-5	Carbon Tetrachloride	213	**198**	**93**	71-113	
110-82-7	Cyclohexane	425	**385**	**91**	71-115	
78-87-5	1,2-Dichloropropane	212	**189**	**89**	71-115	
75-27-4	Bromodichloromethane	214	**200**	**93**	75-118	
79-01-6	Trichloroethene	212	**201**	**95**	68-114	
123-91-1	1,4-Dioxane	213	**192**	**90**	81-131	
80-62-6	Methyl Methacrylate	424	**408**	**96**	72-130	
142-82-5	n-Heptane	213	**187**	**88**	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	**204**	**97**	77-126	
108-10-1	4-Methyl-2-pentanone	213	**199**	**93**	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	**211**	**99**	79-125	
79-00-5	1,1,2-Trichloroethane	212	**199**	**94**	75-119	
108-88-3	Toluene	212	**198**	**93**	59-118	
591-78-6	2-Hexanone	213	**186**	**87**	69-129	
124-48-1	Dibromochloromethane	213	**224**	**105**	74-136	
106-93-4	1,2-Dibromoethane	212	**208**	**98**	73-131	
123-86-4	n-Butyl Acetate	216	**185**	**86**	69-130	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 3 of 3

Client: **Landau Associates, Inc.**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P161205-LCS

Test Code: EPA TO-15 Modified Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: NA
Analyst: Lusine Hakobyan Date Analyzed: 12/5/16
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.125 Liter(s)
Test Notes:

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
111-65-9	n-Octane	212	**190**	**90**	66-120	
127-18-4	Tetrachloroethene	213	**207**	**97**	65-130	
108-90-7	Chlorobenzene	212	**198**	**93**	68-120	
100-41-4	Ethylbenzene	212	**192**	**91**	68-122	
179601-23-1	m,p-Xylenes	424	**378**	**89**	68-123	
75-25-2	Bromoform	212	**248**	**117**	69-130	
100-42-5	Styrene	212	**203**	**96**	71-133	
95-47-6	o-Xylene	212	**193**	**91**	68-122	
111-84-2	n-Nonane	212	**179**	**84**	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	**210**	**99**	69-130	
98-82-8	Cumene	212	**206**	**97**	70-123	
80-56-8	alpha-Pinene	213	**197**	**92**	70-128	
103-65-1	n-Propylbenzene	214	**198**	**93**	69-125	
622-96-8	4-Ethyltoluene	212	**194**	**92**	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	**187**	**88**	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	**186**	**88**	67-129	
100-44-7	Benzyl Chloride	212	**225**	**106**	79-138	
541-73-1	1,3-Dichlorobenzene	212	**219**	**103**	65-136	
106-46-7	1,4-Dichlorobenzene	213	**195**	**92**	66-141	
95-50-1	1,2-Dichlorobenzene	212	**206**	**97**	67-136	
5989-27-5	d-Limonene	212	**181**	**85**	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	**257**	**121**	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	**256**	**121**	64-134	
91-20-3	Naphthalene	214	**258**	**121**	62-136	
87-68-3	Hexachlorobutadiene	213	**248**	**116**	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

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LABORATORY REPORT

January 17, 2017

Piper Roelen
Landau Associates,Inc.
130 2nd Ave. South
Edmonds, WA 98020

RE: Transportation Corridor Investigation / 1148009.010.014

Dear Piper:

Enclosed are the results of the samples submitted to our laboratory on January 3, 2017. For your reference, these analyses have been assigned our service request number P1700001.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

Kate Kaneko
By Kate Kaneko at 7:43 am, 01/17/17

Kate Kaneko
Project Manager

Client: Landau Associates,Inc. Service Request No: P1700001
Project: Transportation Corridor Investigation / 1148009.010.014

CASE NARRATIVE

The samples were received intact under chain of custody on January 3, 2017 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Fixed Gases Analysis

The samples were analyzed for fixed gases (oxygen, nitrogen, carbon monoxide, methane and carbon dioxide) according to modified EPA Method 3C (single injection) using a gas chromatograph equipped with a thermal conductivity detector (TCD). This procedure is described in laboratory SOP VOA-EPA3C. This method is included on the laboratory's DoD-ELAP scope of accreditation, however it is not part of the NELAP accreditation.

Sulfur Analysis

The samples were also analyzed for twenty sulfur compounds per ASTM D 5504-12 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan. This method is included on the laboratory's NELAP scope of accreditation, however it is not part of the DoD-ELAP accreditation.

Total Gaseous Non-Methane Organics as Methane Analysis

The samples were also analyzed for total gaseous non-methane organics as methane according to modified EPA Method 25C. The analyses included a single sample injection (method modification) analyzed by gas chromatography using flame ionization detection/total combustion analysis. This method is not included on the laboratory's NELAP or DoD-ELAP scope of accreditation.

Volatile Organic Compound Analysis

The samples were also analyzed for volatile organic compounds in accordance with EPA Method TO-15 from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition (EPA/625/R-96/010b), January, 1999. This procedure is described in laboratory SOP VOA-TO15. The analytical system was comprised of a gas chromatograph / mass spectrometer (GC/MS) interfaced to a whole-air preconcentrator. The method was modified to include the use of helium as a diluent gas in place of zero-grade air for container pressurization. When necessary, analytical sample volumes were adjusted by a correction factor

Client: Landau Associates,Inc. Service Request No: P1700001
Project: Transportation Corridor Investigation / 1148009.010.014

CASE NARRATIVE

for containers pressurized with helium. A summary sheet has been included listing the affected samples. This method is included on the laboratory's NELAP and DoD-ELAP scope of accreditation. Any analytes flagged with an X are not included on the NELAP or DoD-ELAP accreditation.

The containers were cleaned, prior to sampling, down to the method reporting limit (MRL) reported for this project. Please note, projects which require reporting below the MRL could have results between the MRL and method detection limit (MDL) that are biased high.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.

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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Arizona DHS	http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home	AZ0694
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Louisiana DEQ (NELAP)	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	05071
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2016036
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	1177034
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-003
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
PJLA (DoD ELAP)	http://www.pjlabs.com/search-accredited-labs	65818 (Testing)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-16-7
Utah DOH (NELAP)	http://health.utah.gov/lab/environmental-lab-certification/	CA016272016-6
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Landau Associates,Inc.
Service Request: P1700001
Project ID: Transportation Corridor Investigation / 1148009.010.014

Date Received: 1/3/2017
Time Received: 09:15

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	ASTM D1946-90(2006) - Fxd Gases Can	ASTM D 5504-12 - Sulfur Can	25C Modified - TGNMO+ 1X Can	TO-15 Modified - VOC Cans
Ambient-12292016	P1700001-001	Air	12/29/2016	13:07	SSC00151	0.05	3.91	X	X	X	X
GP-38-12292016	P1700001-002	Air	12/29/2016	13:30	SSC00258	0.22	3.92	X	X	X	X
GP-39-12292016	P1700001-003	Air	12/29/2016	14:15	SSC00120	0.04	3.81	X	X	X	X
GP-43-12292016	P1700001-004	Air	12/29/2016	14:30	SSC00277	0.11	4.07	X	X	X	X
GP-41-12292016	P1700001-005	Air	12/29/2016	14:45	SSC00402	-0.33	3.74	X	X	X	X

Air - Chain of Custody Record & Analytical Service Request

Page 1 of 1

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Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10-Day-Standard

ALS Project No. ~~P160~~ P1700001

ALS Contact:

Company Name & Address (Reporting Information)
Landau Associates
130 2nd Ave. South
Edmonds, WA 98026

Project Name Transportation Corridor Investigation

Project Number 1148009.010.014

Project Manager Piper Roelen

P.O. # / Billing Information 1148009.010.014 Closed City of Yakima Landfill Site Project
Invoice through LAI

Phone (425) 778-0907

Fax —

Email Address for Result Reporting proelen@landauinc.com, ~~tod~~ cjohnson@landauinc.com sdavis@landauinc.com

Sampler (Print & Sign) Stephanie Renando

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume	Analysis Method: Total Reduced Sulfur ASTM D-5504	Analysis Method: Fixed Gases * ASTM D-1945	Analysis Method: NMOC's (EPA 25C)	Analysis Method: VOC's (TO-15)	Comments e.g. Actual Preservative or specific instructions
Ambient-12292016	①	12/29/16	1307	SSC00151	SFC00105	-17.49	-4	6L	X	X	X	X	*methane, CO_2, CO, O_2, Nitrogen
GP-38-12292016	②	12/29/16	1330	SSC00258	SFC00095	-17.58	-0.09	6L	X	X	X	X	↓
GP-39-12292016	③	12/29/16	1415	SSC00120	SFC00144	-17.64	-7	6L	X	X	X	X	↓
GP-43-12292016	④	12/29/16	1430	SSC00277	SFC00113	-17.64	-0.70	6L	X	X	X	X	↓
GP-41-12292016	⑤	12/29/16	1445	SSC00402	SFC00161	-17.67	-4	6L	X	X	X	X	↓

Report Tier Levels - please select
Tier I - Results (Default in not specified) ____
Tier II (Results + QC Summaries ____
Tier III (Results + QC & Calibration Summaries) ____
Tier IV (Date Validation Package) 10% Surcharge ____

EDD required YES / No
Type: ________ Units: ________

Chain of Custody Seal: (Circle)
INTACT BROKEN [✓ ABSENT]

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)	Date: 12/29/16	Time: 1600	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature) #26X	Date:	Time:	Received by: (Signature)	Date: 1/3/17	Time: 0915

Cooler / Blank Temperature ____ °C

ALS Environmental

Sample Acceptance Check Form

Client: Landau Associates, Inc. Work order: P1700001

Project: Transportation Corridor Investigation / 1148009.010.014

Sample(s) received on: 1/3/17 Date opened: 1/3/17 by: ADAVID

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	**No**	**N/A**
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Did **sample containers** arrive in good condition?	☒	☐	☐
3	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
4	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
5	Was **sample volume** received adequate for analysis?	☒	☐	☐
6	Are samples within specified holding times?	☒	☐	☐
7	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☒
8	Were **custody seals** on outside of cooler/Box/Container?	☐	☒	☐
	Location of seal(s)? Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
9	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
10	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
11	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1700001-001.01	6.0 L Silonite Can					
P1700001-002.01	6.0 L Silonite Can					
P1700001-003.01	6.0 L Silonite Can					
P1700001-004.01	6.0 L Silonite Can					
P1700001-005.01	6.0 L Silonite Can					

Explain any discrepancies: (include lab sample ID numbers):

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Ambient-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-001

Test Code:	ASTM D1946	Date Collected:	12/29/16
Instrument ID:	HP5890 II/GC1/TCD	Date Received:	1/3/17
Analyst:	Mike Conejo	Date Analyzed:	1/3/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.10 ml(s)
Test Notes:			
Container ID:	SSC00151		

Canister Dilution Factor: 2.20

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	**Oxygen***	**22.2**	0.22	
7727-37-9	**Nitrogen**	**77.8**	0.22	
630-08-0	Carbon Monoxide	ND	0.22	
74-82-8	Methane	ND	0.22	
124-38-9	Carbon Dioxide	ND	0.22	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS
Page 1 of 1

Client: **Landau Associates,Inc.**
Client Sample ID: **GP-38-12292016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P1700001-002

Test Code: ASTM D1946
Instrument ID: HP5890 II/GC1/TCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00258

Date Collected: 12/29/16
Date Received: 1/3/17
Date Analyzed: 1/3/17
Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.16

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	**Oxygen***	**0.286**	0.22	
7727-37-9	**Nitrogen**	**5.76**	0.22	
630-08-0	Carbon Monoxide	ND	0.22	
74-82-8	**Methane**	**57.9**	0.22	
124-38-9	**Carbon Dioxide**	**36.0**	0.22	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-39-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-003

Test Code:	ASTM D1946	Date Collected:	12/29/16
Instrument ID:	HP5890 II/GC1/TCD	Date Received:	1/3/17
Analyst:	Mike Conejo	Date Analyzed:	1/3/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.10 ml(s)
Test Notes:			
Container ID:	SSC00120		

Canister Dilution Factor: 2.19

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.22	
7727-37-9	**Nitrogen**	**1.18**	0.22	
630-08-0	Carbon Monoxide	ND	0.22	
74-82-8	**Methane**	**66.0**	0.22	
124-38-9	**Carbon Dioxide**	**32.6**	0.22	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Landau Associates,Inc.**
Client Sample ID: **GP-43-12292016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P1700001-004

Test Code: ASTM D1946
Instrument ID: HP5890 II/GC1/TCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00277

Date Collected: 12/29/16
Date Received: 1/3/17
Date Analyzed: 1/4/17
Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.21

CAS #	Compound	Result %, v/v		MRL %, v/v	Data Qualifier
7782-44-7	**Oxygen***	**0.380**		0.22	
7727-37-9	**Nitrogen**	**2.82**		0.22	
630-08-0	Carbon Monoxide		ND	0.22	
74-82-8	**Methane**	**65.9**		0.22	
124-38-9	**Carbon Dioxide**	**30.8**		0.22	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Landau Associates,Inc.**
Client Sample ID: **GP-41-12292016** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1700001-005

Test Code: ASTM D1946 Date Collected: 12/29/16
Instrument ID: HP5890 II/GC1/TCD Date Received: 1/3/17
Analyst: Mike Conejo Date Analyzed: 1/4/17
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.10 ml(s)
Test Notes:
Container ID: SSC00402

Canister Dilution Factor: 2.29

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	**Oxygen***	**0.376**	0.23	
7727-37-9	**Nitrogen**	**4.02**	0.23	
630-08-0	Carbon Monoxide	ND	0.23	
74-82-8	**Methane**	**70.5**	0.23	
124-38-9	**Carbon Dioxide**	**25.1**	0.23	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P170103-MB

Test Code:	ASTM D1946	Date Collected:	NA
Instrument ID:	HP5890 II/GC1/TCD	Date Received:	NA
Analyst:	Mike Conejo	Date Analyzed:	1/03/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.10 ml(s)
Test Notes:			

CAS #	**Compound**	**Result %, v/v**	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Landau Associates,Inc.**
Client Sample ID: **Method Blank**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P170104-MB

Test Code: ASTM D1946
Instrument ID: HP5890 II/GC1/TCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 1/04/17
Volume(s) Analyzed: 0.10 ml(s)

CAS #	**Compound**	**Result %, v/v**	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P170103-LCS

Test Code:	ASTM D1946	Date Collected:	NA
Instrument ID:	HP5890 II/GC1/TCD	Date Received:	NA
Analyst:	Mike Conejo	Date Analyzed:	1/03/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	NA ml(s)
Test Notes:			

CAS #	**Compound**	Spike Amount ppmV	**Result ppmV**	**% Recovery**	ALS Acceptance Limits	Data Qualifier
7782-44-7	Oxygen*	50,000	**53,000**	**106**	97-108	
7727-37-9	Nitrogen	50,000	**52,900**	**106**	89-113	
630-08-0	Carbon Monoxide	50,000	**52,200**	**104**	98-108	
74-82-8	Methane	50,000	**50,300**	**101**	94-111	
124-38-9	Carbon Dioxide	50,000	**50,200**	**100**	94-104	

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P170104-LCS

Test Code:	ASTM D1946	Date Collected:	NA
Instrument ID:	HP5890 II/GC1/TCD	Date Received:	NA
Analyst:	Mike Conejo	Date Analyzed:	1/04/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	NA ml(s)
Test Notes:			

CAS #	**Compound**	Spike Amount ppmV	**Result ppmV**	**% Recovery**	ALS Acceptance Limits	Data Qualifier
7782-44-7	Oxygen*	50,000	**53,000**	**106**	97-108	
7727-37-9	Nitrogen	50,000	**53,800**	**108**	89-113	
630-08-0	Carbon Monoxide	50,000	**51,800**	**104**	98-108	
74-82-8	Methane	50,000	**50,000**	**100**	94-111	
124-38-9	Carbon Dioxide	50,000	**49,800**	**100**	94-104	

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **Ambient-12292016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P1700001-001

Test Code: ASTM D 5504-12
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00151

Date Collected: 12/29/16
Time Collected: 13:07
Date Received: 1/3/17
Date Analyzed: 1/3/17
Time Analyzed: 15:18
Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 2.20

CAS #	**Compound**	**Result** **µg/m³**	MRL µg/m³	**Result** **ppbV**	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	15	ND	11	
463-58-1	Carbonyl Sulfide	ND	27	ND	11	
74-93-1	Methyl Mercaptan	ND	22	ND	11	
75-08-1	Ethyl Mercaptan	ND	28	ND	11	
75-18-3	Dimethyl Sulfide	ND	28	ND	11	
75-15-0	Carbon Disulfide	ND	17	ND	5.5	
75-33-2	Isopropyl Mercaptan	ND	34	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	41	ND	11	
107-03-9	n-Propyl Mercaptan	ND	34	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	34	ND	11	
110-02-1	Thiophene	ND	38	ND	11	
513-44-0	Isobutyl Mercaptan	ND	41	ND	11	
352-93-2	Diethyl Sulfide	ND	41	ND	11	
109-79-5	n-Butyl Mercaptan	ND	41	ND	11	
624-92-0	Dimethyl Disulfide	ND	21	ND	5.5	
616-44-4	3-Methylthiophene	ND	44	ND	11	
110-01-0	Tetrahydrothiophene	ND	40	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	50	ND	11	
872-55-9	2-Ethylthiophene	ND	50	ND	11	
110-81-6	Diethyl Disulfide	ND	27	ND	5.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-38-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-002

Test Code:	ASTM D 5504-12	Date Collected:	12/29/16
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	13:30
Analyst:	Mike Conejo	Date Received:	1/3/17
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	1/3/17
Test Notes:		Time Analyzed:	15:42
Container ID:	SSC00258	Volume(s) Analyzed:	1.0 ml(s)

Canister Dilution Factor: 2.16

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**3,400**	15	**2,400**	11	
463-58-1	Carbonyl Sulfide	ND	27	ND	11	
74-93-1	Methyl Mercaptan	**38**	21	**19**	11	
75-08-1	Ethyl Mercaptan	ND	27	ND	11	
75-18-3	Dimethyl Sulfide	ND	27	ND	11	
75-15-0	Carbon Disulfide	ND	17	ND	5.4	
75-33-2	Isopropyl Mercaptan	ND	34	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	40	ND	11	
107-03-9	n-Propyl Mercaptan	ND	34	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	34	ND	11	
110-02-1	Thiophene	ND	37	ND	11	
513-44-0	Isobutyl Mercaptan	ND	40	ND	11	
352-93-2	Diethyl Sulfide	ND	40	ND	11	
109-79-5	n-Butyl Mercaptan	ND	40	ND	11	
624-92-0	Dimethyl Disulfide	ND	21	ND	5.4	
616-44-4	3-Methylthiophene	ND	43	ND	11	
110-01-0	Tetrahydrothiophene	ND	39	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	50	ND	11	
872-55-9	2-Ethylthiophene	ND	50	ND	11	
110-81-6	Diethyl Disulfide	ND	27	ND	5.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **GP-39-12292016** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1700001-003

Test Code: ASTM D 5504-12 Date Collected: 12/29/16
Instrument ID: Agilent 6890A/GC13/SCD Time Collected: 14:15
Analyst: Mike Conejo Date Received: 1/3/17
Sample Type: 6.0 L Silonite Canister Date Analyzed: 1/3/17
Test Notes: Time Analyzed: 16:00
Container ID: SSC00120 Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 2.19

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**12,000**	15	**8,800**	11	
463-58-1	Carbonyl Sulfide	ND	27	ND	11	
74-93-1	Methyl Mercaptan	ND	22	ND	11	
75-08-1	Ethyl Mercaptan	**28**	28	**11**	11	
75-18-3	Dimethyl Sulfide	ND	28	ND	11	
75-15-0	Carbon Disulfide	ND	17	ND	5.5	
75-33-2	Isopropyl Mercaptan	ND	34	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	40	ND	11	
107-03-9	n-Propyl Mercaptan	ND	34	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	34	ND	11	
110-02-1	Thiophene	ND	38	ND	11	
513-44-0	Isobutyl Mercaptan	ND	40	ND	11	
352-93-2	Diethyl Sulfide	ND	40	ND	11	
109-79-5	n-Butyl Mercaptan	ND	40	ND	11	
624-92-0	Dimethyl Disulfide	ND	21	ND	5.5	
616-44-4	3-Methylthiophene	ND	44	ND	11	
110-01-0	Tetrahydrothiophene	ND	39	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	50	ND	11	
872-55-9	2-Ethylthiophene	ND	50	ND	11	
110-81-6	Diethyl Disulfide	ND	27	ND	5.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **GP-43-12292016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P1700001-004

Test Code: ASTM D 5504-12
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00277

Date Collected: 12/29/16
Time Collected: 14:30
Date Received: 1/3/17
Date Analyzed: 1/3/17
Time Analyzed: 16:18
Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 2.21

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**5,100**	15	**3,600**	11	
463-58-1	Carbonyl Sulfide	ND	27	ND	11	
74-93-1	Methyl Mercaptan	**30**	22	**15**	11	
75-08-1	Ethyl Mercaptan	ND	28	ND	11	
75-18-3	Dimethyl Sulfide	**110**	28	**42**	11	
75-15-0	Carbon Disulfide	ND	17	ND	5.5	
75-33-2	Isopropyl Mercaptan	ND	34	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	41	ND	11	
107-03-9	n-Propyl Mercaptan	ND	34	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	34	ND	11	
110-02-1	Thiophene	ND	38	ND	11	
513-44-0	Isobutyl Mercaptan	ND	41	ND	11	
352-93-2	Diethyl Sulfide	ND	41	ND	11	
109-79-5	n-Butyl Mercaptan	ND	41	ND	11	
624-92-0	Dimethyl Disulfide	ND	21	ND	5.5	
616-44-4	3-Methylthiophene	ND	44	ND	11	
110-01-0	Tetrahydrothiophene	ND	40	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	51	ND	11	
872-55-9	2-Ethylthiophene	ND	51	ND	11	
110-81-6	Diethyl Disulfide	ND	28	ND	5.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-41-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-005

Test Code:	ASTM D 5504-12	Date Collected:	12/29/16
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	14:45
Analyst:	Mike Conejo	Date Received:	1/3/17
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	1/3/17
Test Notes:		Time Analyzed:	16:36
Container ID:	SSC00402	Volume(s) Analyzed:	1.0 ml(s)

Canister Dilution Factor: 2.29

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**640**	16	**460**	11	
463-58-1	Carbonyl Sulfide	ND	28	ND	11	
74-93-1	Methyl Mercaptan	ND	23	ND	11	
75-08-1	Ethyl Mercaptan	ND	29	ND	11	
75-18-3	Dimethyl Sulfide	ND	29	ND	11	
75-15-0	Carbon Disulfide	**110**	18	**34**	5.7	
75-33-2	Isopropyl Mercaptan	ND	36	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	42	ND	11	
107-03-9	n-Propyl Mercaptan	ND	36	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	36	ND	11	
110-02-1	Thiophene	ND	39	ND	11	
513-44-0	Isobutyl Mercaptan	ND	42	ND	11	
352-93-2	Diethyl Sulfide	ND	42	ND	11	
109-79-5	n-Butyl Mercaptan	ND	42	ND	11	
624-92-0	Dimethyl Disulfide	ND	22	ND	5.7	
616-44-4	3-Methylthiophene	ND	46	ND	11	
110-01-0	Tetrahydrothiophene	ND	41	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	53	ND	11	
872-55-9	2-Ethylthiophene	ND	53	ND	11	
110-81-6	Diethyl Disulfide	ND	29	ND	5.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS
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Client: **Landau Associates,Inc.**
Client Sample ID: **Method Blank**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P170103-MB

Test Code: ASTM D 5504-12
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Time Collected: NA
Date Received: NA
Date Analyzed: 1/03/17
Time Analyzed: 08:21
Volume(s) Analyzed: 1.0 ml(s)

CAS #	**Compound**	**Result** **µg/m³**	MRL µg/m³	**Result** **ppbV**	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
463-58-1	Carbonyl Sulfide	ND	12	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-08-1	Ethyl Mercaptan	ND	13	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
75-15-0	Carbon Disulfide	ND	7.8	ND	2.5	
75-33-2	Isopropyl Mercaptan	ND	16	ND	5.0	
75-66-1	tert-Butyl Mercaptan	ND	18	ND	5.0	
107-03-9	n-Propyl Mercaptan	ND	16	ND	5.0	
624-89-5	Ethyl Methyl Sulfide	ND	16	ND	5.0	
110-02-1	Thiophene	ND	17	ND	5.0	
513-44-0	Isobutyl Mercaptan	ND	18	ND	5.0	
352-93-2	Diethyl Sulfide	ND	18	ND	5.0	
109-79-5	n-Butyl Mercaptan	ND	18	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	
616-44-4	3-Methylthiophene	ND	20	ND	5.0	
110-01-0	Tetrahydrothiophene	ND	18	ND	5.0	
638-02-8	2,5-Dimethylthiophene	ND	23	ND	5.0	
872-55-9	2-Ethylthiophene	ND	23	ND	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client: **Landau Associates,Inc.**
Client Sample ID: **Lab Control Sample**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P170103-LCS

Test Code: ASTM D 5504-12
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 1/03/17
Volume(s) Analyzed: NA ml(s)

CAS #	**Compound**	Spike Amount ppbV	**Result ppbV**	**% Recovery**	ALS Acceptance Limits	Data Qualifier
7783-06-4	Hydrogen Sulfide	1,000	**1,040**	**104**	75-148	
463-58-1	Carbonyl Sulfide	1,000	**1,060**	**106**	70-137	
74-93-1	Methyl Mercaptan	1,000	**1,050**	**105**	72-139	

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RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**

Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Project ID: P1700001

Total Gaseous Nonmethane Organics (TGNMO) as Methane

Test Code: EPA Method 25C Modified

Instrument ID: HP5890 II/GC1/FID/TCA

Analyst: Mike Conejo

Sampling Media: 6.0 L Silonite Canister(s)

Test Notes:

Date(s) Collected: 12/29/16

Date Received: 1/3/17

Date Analyzed: 1/5/17

Client Sample ID	ALS Sample ID	Canister Dilution Factor	Injection Volume ml(s)	**Result ppmV**	MRL ppmV	Data Qualifier
Ambient-12292016	P1700001-001	2.20	0.50	ND	2.2	
GP-38-12292016	P1700001-002	2.16	0.50	**250**	2.2	
GP-39-12292016	P1700001-003	2.19	0.50	**600**	2.2	
GP-43-12292016	P1700001-004	2.21	0.50	**230**	2.2	
GP-41-12292016	P1700001-005	2.29	0.50	**310**	2.3	
Method Blank	P170105-MB	1.00	0.50	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P170105-LCS

Test Code:	EPA Method 25C Modified	Date Collected:	NA
Instrument ID:	HP5890 II/GC1/FID/TCA	Date Received:	NA
Analyst:	Mike Conejo	Date Analyzed:	1/05/17
Sampling Media:	6.0 L Silonite Canister	Volume(s) Analyzed:	NA ml(s)
Test Notes:			

Compound	Spike Amount ppmV	**Result ppmV**	**% Recovery**	ALS Acceptance Limits	Data Qualifier
Total Gaseous Nonmethane Organics (TGNMO) as Methane	1,000	**902**	**90**	85-121	

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **Ambient-12292016** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1700001-001

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00151

Date Collected: 12/29/16
Date Received: 1/3/17
Date Analyzed: 1/4/17
Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 2.20

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	**3.4**	1.1	**2.0**	0.64	
75-71-8	Dichlorodifluoromethane (CFC 12)	**2.1**	1.1	**0.42**	0.22	
74-87-3	Chloromethane	ND	1.1	ND	0.53	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	1.1	ND	0.16	
75-01-4	Vinyl Chloride	ND	1.1	ND	0.43	
106-99-0	1,3-Butadiene	ND	1.1	ND	0.50	
74-83-9	Bromomethane	ND	1.1	ND	0.28	
75-00-3	Chloroethane	ND	1.1	ND	0.42	
64-17-5	Ethanol	ND	11	ND	5.8	
75-05-8	Acetonitrile	ND	1.1	ND	0.66	
107-02-8	Acrolein	ND	4.4	ND	1.9	
67-64-1	Acetone	ND	11	ND	4.6	
75-69-4	Trichlorofluoromethane	ND	1.1	ND	0.20	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	11	ND	4.5	
107-13-1	Acrylonitrile	ND	1.1	ND	0.51	
75-35-4	1,1-Dichloroethene	ND	1.1	ND	0.28	
75-09-2	Methylene Chloride	ND	1.1	ND	0.32	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	1.1	ND	0.35	
76-13-1	Trichlorotrifluoroethane	ND	1.1	ND	0.14	
75-15-0	Carbon Disulfide	ND	11	ND	3.5	
156-60-5	trans-1,2-Dichloroethene	ND	1.1	ND	0.28	
75-34-3	1,1-Dichloroethane	ND	1.1	ND	0.27	
1634-04-4	Methyl tert-Butyl Ether	ND	1.1	ND	0.31	
108-05-4	Vinyl Acetate	ND	11	ND	3.1	
78-93-3	2-Butanone (MEK)	ND	11	ND	3.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Ambient-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-001

Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			
Container ID:	SSC00151		

Canister Dilution Factor: 2.20

CAS #	**Compound**	**Result** **µg/m³**	MRL µg/m³	**Result** **ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	ND	1.1	ND	0.28	
141-78-6	Ethyl Acetate	**3.3**	2.2	**0.92**	0.61	
110-54-3	n-Hexane	ND	1.1	ND	0.31	
67-66-3	Chloroform	ND	1.1	ND	0.23	
109-99-9	Tetrahydrofuran (THF)	ND	1.1	ND	0.37	
107-06-2	1,2-Dichloroethane	ND	1.1	ND	0.27	
71-55-6	1,1,1-Trichloroethane	ND	1.1	ND	0.20	
71-43-2	Benzene	ND	1.1	ND	0.34	
56-23-5	Carbon Tetrachloride	ND	1.1	ND	0.17	
110-82-7	Cyclohexane	ND	2.2	ND	0.64	
78-87-5	1,2-Dichloropropane	ND	1.1	ND	0.24	
75-27-4	Bromodichloromethane	ND	1.1	ND	0.16	
79-01-6	Trichloroethene	ND	1.1	ND	0.20	
123-91-1	1,4-Dioxane	ND	1.1	ND	0.31	
80-62-6	Methyl Methacrylate	ND	2.2	ND	0.54	
142-82-5	n-Heptane	ND	1.1	ND	0.27	
10061-01-5	cis-1,3-Dichloropropene	ND	1.1	ND	0.24	
108-10-1	4-Methyl-2-pentanone	ND	1.1	ND	0.27	
10061-02-6	trans-1,3-Dichloropropene	ND	1.1	ND	0.24	
79-00-5	1,1,2-Trichloroethane	ND	1.1	ND	0.20	
108-88-3	Toluene	ND	1.1	ND	0.29	
591-78-6	2-Hexanone	ND	1.1	ND	0.27	
124-48-1	Dibromochloromethane	ND	1.1	ND	0.13	
106-93-4	1,2-Dibromoethane	ND	1.1	ND	0.14	
123-86-4	n-Butyl Acetate	ND	1.1	ND	0.23	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **Ambient-12292016** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1700001-001

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00151

Date Collected: 12/29/16
Date Received: 1/3/17
Date Analyzed: 1/4/17
Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 2.20

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
111-65-9	n-Octane	ND	1.1	ND	0.24	
127-18-4	Tetrachloroethene	ND	1.1	ND	0.16	
108-90-7	Chlorobenzene	ND	1.1	ND	0.24	
100-41-4	Ethylbenzene	ND	1.1	ND	0.25	
179601-23-1	m,p-Xylenes	ND	2.2	ND	0.51	
75-25-2	Bromoform	ND	1.1	ND	0.11	
100-42-5	Styrene	ND	1.1	ND	0.26	
95-47-6	o-Xylene	ND	1.1	ND	0.25	
111-84-2	n-Nonane	ND	1.1	ND	0.21	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.1	ND	0.16	
98-82-8	Cumene	ND	1.1	ND	0.22	
80-56-8	alpha-Pinene	ND	1.1	ND	0.20	
103-65-1	n-Propylbenzene	ND	1.1	ND	0.22	
622-96-8	4-Ethyltoluene	ND	1.1	ND	0.22	
108-67-8	1,3,5-Trimethylbenzene	ND	1.1	ND	0.22	
95-63-6	1,2,4-Trimethylbenzene	ND	1.1	ND	0.22	
100-44-7	Benzyl Chloride	ND	1.1	ND	0.21	
541-73-1	1,3-Dichlorobenzene	ND	1.1	ND	0.18	
106-46-7	1,4-Dichlorobenzene	ND	1.1	ND	0.18	
95-50-1	1,2-Dichlorobenzene	ND	1.1	ND	0.18	
5989-27-5	d-Limonene	ND	1.1	ND	0.20	
96-12-8	1,2-Dibromo-3-chloropropane	ND	1.1	ND	0.11	
120-82-1	1,2,4-Trichlorobenzene	ND	1.1	ND	0.15	
91-20-3	Naphthalene	ND	1.1	ND	0.21	
87-68-3	Hexachlorobutadiene	ND	1.1	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **GP-38-12292016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P1700001-002

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00258

Date Collected: 12/29/16
Date Received: 1/3/17
Date Analyzed: 1/4 - 1/5/17
Volume(s) Analyzed: 0.10 Liter(s)
0.020 Liter(s)

Canister Dilution Factor: 2.16

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	**870**	11	**500**	6.3	
75-71-8	Dichlorodifluoromethane (CFC 12)	**53**	11	**11**	2.2	
74-87-3	Chloromethane	ND	11	ND	5.2	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	**1,100**	11	**150**	1.5	
75-01-4	Vinyl Chloride	**78**	11	**30**	4.2	
106-99-0	1,3-Butadiene	ND	11	ND	4.9	
74-83-9	Bromomethane	ND	11	ND	2.8	
75-00-3	Chloroethane	**26**	11	**9.9**	4.1	
64-17-5	Ethanol	ND	110	ND	57	
75-05-8	Acetonitrile	ND	11	ND	6.4	
107-02-8	Acrolein	ND	43	ND	19	
67-64-1	Acetone	ND	110	ND	45	
75-69-4	Trichlorofluoromethane	ND	11	ND	1.9	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	110	ND	44	
107-13-1	Acrylonitrile	ND	11	ND	5.0	
75-35-4	1,1-Dichloroethene	**11**	11	**2.9**	2.7	
75-09-2	Methylene Chloride	ND	11	ND	3.1	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	11	ND	3.5	
76-13-1	Trichlorotrifluoroethane	ND	11	ND	1.4	
75-15-0	Carbon Disulfide	ND	110	ND	35	
156-60-5	trans-1,2-Dichloroethene	ND	11	ND	2.7	
75-34-3	1,1-Dichloroethane	ND	11	ND	2.7	
1634-04-4	Methyl tert-Butyl Ether	ND	11	ND	3.0	
108-05-4	Vinyl Acetate	ND	110	ND	31	
78-93-3	2-Butanone (MEK)	ND	110	ND	37	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-38-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-002

Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/4 - 1/5/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.10 Liter(s)
Test Notes:			0.020 Liter(s)
Container ID:	SSC00258		

Canister Dilution Factor: 2.16

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	**21**	11	**5.4**	2.7	
141-78-6	Ethyl Acetate	ND	22	ND	6.0	
110-54-3	n-Hexane	**920**	11	**260**	3.1	
67-66-3	Chloroform	ND	11	ND	2.2	
109-99-9	Tetrahydrofuran (THF)	ND	11	ND	3.7	
107-06-2	1,2-Dichloroethane	ND	11	ND	2.7	
71-55-6	1,1,1-Trichloroethane	ND	11	ND	2.0	
71-43-2	Benzene	**70**	11	**22**	3.4	
56-23-5	Carbon Tetrachloride	ND	11	ND	1.7	
110-82-7	Cyclohexane	**2,200**	22	**640**	6.3	
78-87-5	1,2-Dichloropropane	ND	11	ND	2.3	
75-27-4	Bromodichloromethane	ND	11	ND	1.6	
79-01-6	Trichloroethene	**19**	11	**3.4**	2.0	
123-91-1	1,4-Dioxane	ND	11	ND	3.0	
80-62-6	Methyl Methacrylate	ND	22	ND	5.3	
142-82-5	n-Heptane	**3,100**	54	**760**	13	**D**
10061-01-5	cis-1,3-Dichloropropene	ND	11	ND	2.4	
108-10-1	4-Methyl-2-pentanone	ND	11	ND	2.6	
10061-02-6	trans-1,3-Dichloropropene	ND	11	ND	2.4	
79-00-5	1,1,2-Trichloroethane	ND	11	ND	2.0	
108-88-3	Toluene	**54**	11	**14**	2.9	
591-78-6	2-Hexanone	ND	11	ND	2.6	
124-48-1	Dibromochloromethane	ND	11	ND	1.3	
106-93-4	1,2-Dibromoethane	ND	11	ND	1.4	
123-86-4	n-Butyl Acetate	ND	11	ND	2.3	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
D = The reported result is from a dilution.

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RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-38-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-002
Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/4 - 1/5/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.10 Liter(s)
Test Notes:			0.020 Liter(s)
Container ID:	SSC00258		

Canister Dilution Factor: 2.16

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	**260**	11	**56**	2.3	
127-18-4	Tetrachloroethene	ND	11	ND	1.6	
108-90-7	Chlorobenzene	**190**	11	**42**	2.3	
100-41-4	Ethylbenzene	**62**	11	**14**	2.5	
179601-23-1	m,p-Xylenes	**440**	22	**100**	5.0	
75-25-2	Bromoform	ND	11	ND	1.0	
100-42-5	Styrene	ND	11	ND	2.5	
95-47-6	o-Xylene	**130**	11	**29**	2.5	
111-84-2	n-Nonane	**200**	11	**38**	2.1	
79-34-5	1,1,2,2-Tetrachloroethane	ND	11	ND	1.6	
98-82-8	Cumene	**300**	11	**62**	2.2	
80-56-8	alpha-Pinene	**65**	11	**12**	1.9	
103-65-1	n-Propylbenzene	**170**	11	**35**	2.2	
622-96-8	4-Ethyltoluene	**28**	11	**5.7**	2.2	
108-67-8	1,3,5-Trimethylbenzene	**110**	11	**23**	2.2	
95-63-6	1,2,4-Trimethylbenzene	**270**	11	**56**	2.2	
100-44-7	Benzyl Chloride	ND	11	ND	2.1	
541-73-1	1,3-Dichlorobenzene	ND	11	ND	1.8	
106-46-7	1,4-Dichlorobenzene	**100**	11	**17**	1.8	
95-50-1	1,2-Dichlorobenzene	**22**	11	**3.6**	1.8	
5989-27-5	d-Limonene	ND	11	ND	1.9	
96-12-8	1,2-Dibromo-3-chloropropane	ND	11	ND	1.1	
120-82-1	1,2,4-Trichlorobenzene	ND	11	ND	1.5	
91-20-3	Naphthalene	ND	11	ND	2.1	
87-68-3	Hexachlorobutadiene	ND	11	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-39-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-003
Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/5/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.020 Liter(s)
Test Notes:			0.010 Liter(s)
Container ID:	SSC00120		

Canister Dilution Factor: 2.19

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	**1,200**	55	**700**	32	
75-71-8	Dichlorodifluoromethane (CFC 12)	**1,100**	55	**210**	11	
74-87-3	Chloromethane	ND	55	ND	27	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	**1,300**	55	**190**	7.8	
75-01-4	Vinyl Chloride	**11,000**	55	**4,200**	21	
106-99-0	1,3-Butadiene	ND	55	ND	25	
74-83-9	Bromomethane	ND	55	ND	14	
75-00-3	Chloroethane	**83**	55	**32**	21	
64-17-5	Ethanol	ND	550	ND	290	
75-05-8	Acetonitrile	ND	55	ND	33	
107-02-8	Acrolein	ND	220	ND	96	
67-64-1	Acetone	ND	550	ND	230	
75-69-4	Trichlorofluoromethane	ND	55	ND	9.7	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	550	ND	220	
107-13-1	Acrylonitrile	ND	55	ND	25	
75-35-4	1,1-Dichloroethene	ND	55	ND	14	
75-09-2	Methylene Chloride	ND	55	ND	16	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	55	ND	17	
76-13-1	Trichlorotrifluoroethane	ND	55	ND	7.1	
75-15-0	Carbon Disulfide	ND	550	ND	180	
156-60-5	trans-1,2-Dichloroethene	ND	55	ND	14	
75-34-3	1,1-Dichloroethane	ND	55	ND	14	
1634-04-4	Methyl tert-Butyl Ether	ND	55	ND	15	
108-05-4	Vinyl Acetate	ND	550	ND	160	
78-93-3	2-Butanone (MEK)	ND	550	ND	190	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-39-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-003
Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/5/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.020 Liter(s)
Test Notes:			0.010 Liter(s)
Container ID:	SSC00120		

Canister Dilution Factor: 2.19

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	**380**	55	**95**	14	
141-78-6	Ethyl Acetate	ND	110	ND	30	
110-54-3	n-Hexane	**840**	55	**240**	16	
67-66-3	Chloroform	ND	55	ND	11	
109-99-9	Tetrahydrofuran (THF)	ND	55	ND	19	
107-06-2	1,2-Dichloroethane	ND	55	ND	14	
71-55-6	1,1,1-Trichloroethane	ND	55	ND	10	
71-43-2	Benzene	**450**	55	**140**	17	
56-23-5	Carbon Tetrachloride	ND	55	ND	8.7	
110-82-7	Cyclohexane	**3,000**	110	**880**	32	
78-87-5	1,2-Dichloropropane	ND	55	ND	12	
75-27-4	Bromodichloromethane	ND	55	ND	8.2	
79-01-6	Trichloroethene	**77**	55	**14**	10	
123-91-1	1,4-Dioxane	ND	55	ND	15	
80-62-6	Methyl Methacrylate	ND	110	ND	27	
142-82-5	n-Heptane	**2,400**	55	**580**	13	
10061-01-5	cis-1,3-Dichloropropene	ND	55	ND	12	
108-10-1	4-Methyl-2-pentanone	**78**	55	**19**	13	
10061-02-6	trans-1,3-Dichloropropene	ND	55	ND	12	
79-00-5	1,1,2-Trichloroethane	ND	55	ND	10	
108-88-3	Toluene	**1,400**	55	**380**	15	
591-78-6	2-Hexanone	ND	55	ND	13	
124-48-1	Dibromochloromethane	ND	55	ND	6.4	
106-93-4	1,2-Dibromoethane	ND	55	ND	7.1	
123-86-4	n-Butyl Acetate	ND	55	ND	12	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-39-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-003
Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/5/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.020 Liter(s)
Test Notes:			0.010 Liter(s)
Container ID:	SSC00120		

Canister Dilution Factor: 2.19

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
111-65-9	n-Octane	**1,900**	55	**400**	12	
127-18-4	Tetrachloroethene	**67**	55	**9.9**	8.1	
108-90-7	Chlorobenzene	ND	55	ND	12	
100-41-4	Ethylbenzene	**4,200**	55	**960**	13	
179601-23-1	m,p-Xylenes	**8,600**	110	**2,000**	25	
75-25-2	Bromoform	ND	55	ND	5.3	
100-42-5	Styrene	ND	55	ND	13	
95-47-6	o-Xylene	**3,200**	55	**730**	13	
111-84-2	n-Nonane	**15,000**	110	**2,900**	21	**D**
79-34-5	1,1,2,2-Tetrachloroethane	ND	55	ND	8.0	
98-82-8	Cumene	**780**	55	**160**	11	
80-56-8	alpha-Pinene	**1,300**	55	**230**	9.8	
103-65-1	n-Propylbenzene	**1,300**	55	**260**	11	
622-96-8	4-Ethyltoluene	**570**	55	**120**	11	
108-67-8	1,3,5-Trimethylbenzene	**1,800**	55	**360**	11	
95-63-6	1,2,4-Trimethylbenzene	**3,800**	55	**780**	11	
100-44-7	Benzyl Chloride	ND	55	ND	11	
541-73-1	1,3-Dichlorobenzene	ND	55	ND	9.1	
106-46-7	1,4-Dichlorobenzene	**69**	55	**11**	9.1	
95-50-1	1,2-Dichlorobenzene	**79**	55	**13**	9.1	
5989-27-5	d-Limonene	**620**	55	**110**	9.8	
96-12-8	1,2-Dibromo-3-chloropropane	ND	55	ND	5.7	
120-82-1	1,2,4-Trichlorobenzene	ND	55	ND	7.4	
91-20-3	Naphthalene	ND	55	ND	10	
87-68-3	Hexachlorobutadiene	ND	55	ND	5.1	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
D = The reported result is from a dilution.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-43-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-004

Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.030 Liter(s)
Test Notes:			
Container ID:	SSC00277		

Canister Dilution Factor: 2.21

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	**1,200**	37	**670**	21	
75-71-8	Dichlorodifluoromethane (CFC 12)	**1,500**	37	**290**	7.5	
74-87-3	Chloromethane	ND	37	ND	18	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	**1,200**	37	**170**	5.3	
75-01-4	Vinyl Chloride	**5,400**	37	**2,100**	14	
106-99-0	1,3-Butadiene	ND	37	ND	17	
74-83-9	Bromomethane	ND	37	ND	9.5	
75-00-3	Chloroethane	ND	37	ND	14	
64-17-5	Ethanol	ND	370	ND	200	
75-05-8	Acetonitrile	ND	37	ND	22	
107-02-8	Acrolein	ND	150	ND	64	
67-64-1	Acetone	**970**	370	**410**	160	
75-69-4	Trichlorofluoromethane	**430**	37	**77**	6.6	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	370	ND	150	
107-13-1	Acrylonitrile	ND	37	ND	17	
75-35-4	1,1-Dichloroethene	**81**	37	**21**	9.3	
75-09-2	Methylene Chloride	**85**	37	**24**	11	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	37	ND	12	
76-13-1	Trichlorotrifluoroethane	ND	37	ND	4.8	
75-15-0	Carbon Disulfide	ND	370	ND	120	
156-60-5	trans-1,2-Dichloroethene	**120**	37	**31**	9.3	
75-34-3	1,1-Dichloroethane	ND	37	ND	9.1	
1634-04-4	Methyl tert-Butyl Ether	ND	37	ND	10	
108-05-4	Vinyl Acetate	ND	370	ND	100	
78-93-3	2-Butanone (MEK)	**1,500**	370	**510**	120	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-43-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-004
Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.030 Liter(s)
Test Notes:			
Container ID:	SSC00277		

Canister Dilution Factor: 2.21

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	**2,800**	37	**710**	9.3	
141-78-6	Ethyl Acetate	ND	74	ND	20	
110-54-3	n-Hexane	**580**	37	**170**	10	
67-66-3	Chloroform	ND	37	ND	7.5	
109-99-9	Tetrahydrofuran (THF)	**910**	37	**310**	12	
107-06-2	1,2-Dichloroethane	ND	37	ND	9.1	
71-55-6	1,1,1-Trichloroethane	ND	37	ND	6.8	
71-43-2	Benzene	**340**	37	**110**	12	
56-23-5	Carbon Tetrachloride	ND	37	ND	5.9	
110-82-7	Cyclohexane	**500**	74	**140**	21	
78-87-5	1,2-Dichloropropane	ND	37	ND	8.0	
75-27-4	Bromodichloromethane	ND	37	ND	5.5	
79-01-6	Trichloroethene	**450**	37	**83**	6.9	
123-91-1	1,4-Dioxane	ND	37	ND	10	
80-62-6	Methyl Methacrylate	ND	74	ND	18	
142-82-5	n-Heptane	**1,900**	37	**470**	9.0	
10061-01-5	cis-1,3-Dichloropropene	ND	37	ND	8.1	
108-10-1	4-Methyl-2-pentanone	**630**	37	**150**	9.0	
10061-02-6	trans-1,3-Dichloropropene	ND	37	ND	8.1	
79-00-5	1,1,2-Trichloroethane	ND	37	ND	6.8	
108-88-3	Toluene	**6,300**	37	**1,700**	9.8	
591-78-6	2-Hexanone	ND	37	ND	9.0	
124-48-1	Dibromochloromethane	ND	37	ND	4.3	
106-93-4	1,2-Dibromoethane	ND	37	ND	4.8	
123-86-4	n-Butyl Acetate	ND	37	ND	7.8	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **GP-43-12292016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P1700001-004

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00277

Date Collected: 12/29/16
Date Received: 1/3/17
Date Analyzed: 1/4/17
Volume(s) Analyzed: 0.030 Liter(s)

Canister Dilution Factor: 2.21

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
111-65-9	n-Octane	**1,500**	37	**310**	7.9	
127-18-4	Tetrachloroethene	**640**	37	**94**	5.4	
108-90-7	Chlorobenzene	ND	37	ND	8.0	
100-41-4	Ethylbenzene	**3,800**	37	**880**	8.5	
179601-23-1	m,p-Xylenes	**7,400**	74	**1,700**	17	
75-25-2	Bromoform	ND	37	ND	3.6	
100-42-5	Styrene	**96**	37	**23**	8.7	
95-47-6	o-Xylene	**1,800**	37	**420**	8.5	
111-84-2	n-Nonane	**3,200**	37	**610**	7.0	
79-34-5	1,1,2,2-Tetrachloroethane	ND	37	ND	5.4	
98-82-8	Cumene	**550**	37	**110**	7.5	
80-56-8	alpha-Pinene	**4,300**	37	**780**	6.6	
103-65-1	n-Propylbenzene	**560**	37	**110**	7.5	
622-96-8	4-Ethyltoluene	**260**	37	**53**	7.5	
108-67-8	1,3,5-Trimethylbenzene	**450**	37	**92**	7.5	
95-63-6	1,2,4-Trimethylbenzene	**1,300**	37	**270**	7.5	
100-44-7	Benzyl Chloride	ND	37	ND	7.1	
541-73-1	1,3-Dichlorobenzene	ND	37	ND	6.1	
106-46-7	1,4-Dichlorobenzene	ND	37	ND	6.1	
95-50-1	1,2-Dichlorobenzene	ND	37	ND	6.1	
5989-27-5	d-Limonene	**6,900**	37	**1,200**	6.6	
96-12-8	1,2-Dibromo-3-chloropropane	ND	37	ND	3.8	
120-82-1	1,2,4-Trichlorobenzene	ND	37	ND	5.0	
91-20-3	Naphthalene	ND	37	ND	7.0	
87-68-3	Hexachlorobutadiene	ND	37	ND	3.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-41-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-005

Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/5/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.020 Liter(s)
Test Notes:			
Container ID:	SSC00402		

Canister Dilution Factor: 2.29

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	**1,500**	57	**880**	33	
75-71-8	Dichlorodifluoromethane (CFC 12)	**4,100**	57	**830**	12	
74-87-3	Chloromethane	ND	57	ND	28	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	**2,900**	57	**410**	8.2	
75-01-4	Vinyl Chloride	**9,400**	57	**3,700**	22	
106-99-0	1,3-Butadiene	ND	57	ND	26	
74-83-9	Bromomethane	ND	57	ND	15	
75-00-3	Chloroethane	ND	57	ND	22	
64-17-5	Ethanol	ND	570	ND	300	
75-05-8	Acetonitrile	ND	57	ND	34	
107-02-8	Acrolein	ND	230	ND	100	
67-64-1	Acetone	ND	570	ND	240	
75-69-4	Trichlorofluoromethane	ND	57	ND	10	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	570	ND	230	
107-13-1	Acrylonitrile	ND	57	ND	26	
75-35-4	1,1-Dichloroethene	ND	57	ND	14	
75-09-2	Methylene Chloride	ND	57	ND	16	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	57	ND	18	
76-13-1	Trichlorotrifluoroethane	ND	57	ND	7.5	
75-15-0	Carbon Disulfide	ND	570	ND	180	
156-60-5	trans-1,2-Dichloroethene	ND	57	ND	14	
75-34-3	1,1-Dichloroethane	ND	57	ND	14	
1634-04-4	Methyl tert-Butyl Ether	ND	57	ND	16	
108-05-4	Vinyl Acetate	ND	570	ND	160	
78-93-3	2-Butanone (MEK)	ND	570	ND	190	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
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ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **GP-41-12292016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P1700001-005

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00402

Date Collected: 12/29/16
Date Received: 1/3/17
Date Analyzed: 1/5/17
Volume(s) Analyzed: 0.020 Liter(s)

Canister Dilution Factor: 2.29

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	**97**	57	**24**	14	
141-78-6	Ethyl Acetate	ND	110	ND	32	
110-54-3	n-Hexane	**620**	57	**180**	16	
67-66-3	Chloroform	ND	57	ND	12	
109-99-9	Tetrahydrofuran (THF)	ND	57	ND	19	
107-06-2	1,2-Dichloroethane	ND	57	ND	14	
71-55-6	1,1,1-Trichloroethane	ND	57	ND	10	
71-43-2	Benzene	**490**	57	**150**	18	
56-23-5	Carbon Tetrachloride	ND	57	ND	9.1	
110-82-7	Cyclohexane	**410**	110	**120**	33	
78-87-5	1,2-Dichloropropane	ND	57	ND	12	
75-27-4	Bromodichloromethane	ND	57	ND	8.5	
79-01-6	Trichloroethene	ND	57	ND	11	
123-91-1	1,4-Dioxane	ND	57	ND	16	
80-62-6	Methyl Methacrylate	ND	110	ND	28	
142-82-5	n-Heptane	**920**	57	**230**	14	
10061-01-5	cis-1,3-Dichloropropene	ND	57	ND	13	
108-10-1	4-Methyl-2-pentanone	ND	57	ND	14	
10061-02-6	trans-1,3-Dichloropropene	ND	57	ND	13	
79-00-5	1,1,2-Trichloroethane	ND	57	ND	10	
108-88-3	Toluene	**550**	57	**150**	15	
591-78-6	2-Hexanone	ND	57	ND	14	
124-48-1	Dibromochloromethane	ND	57	ND	6.7	
106-93-4	1,2-Dibromoethane	ND	57	ND	7.5	
123-86-4	n-Butyl Acetate	ND	57	ND	12	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **GP-41-12292016** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1700001-005

Test Code: EPA TO-15 Modified Date Collected: 12/29/16
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 1/3/17
Analyst: Lusine Hakobyan Date Analyzed: 1/5/17
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.020 Liter(s)
Test Notes:
Container ID: SSC00402

Canister Dilution Factor: 2.29

CAS #	Compound	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
111-65-9	n-Octane	**1,800**	57	**380**	12	
127-18-4	Tetrachloroethene	ND	57	ND	8.4	
108-90-7	Chlorobenzene	ND	57	ND	12	
100-41-4	Ethylbenzene	**910**	57	**210**	13	
179601-23-1	m,p-Xylenes	**2,200**	110	**510**	26	
75-25-2	Bromoform	ND	57	ND	5.5	
100-42-5	Styrene	ND	57	ND	13	
95-47-6	o-Xylene	**910**	57	**210**	13	
111-84-2	n-Nonane	**9,800**	57	**1,900**	11	
79-34-5	1,1,2,2-Tetrachloroethane	ND	57	ND	8.3	
98-82-8	Cumene	**240**	57	**48**	12	
80-56-8	alpha-Pinene	**1,300**	57	**220**	10	
103-65-1	n-Propylbenzene	**240**	57	**48**	12	
622-96-8	4-Ethyltoluene	**91**	57	**19**	12	
108-67-8	1,3,5-Trimethylbenzene	**520**	57	**110**	12	
95-63-6	1,2,4-Trimethylbenzene	**920**	57	**190**	12	
100-44-7	Benzyl Chloride	ND	57	ND	11	
541-73-1	1,3-Dichlorobenzene	ND	57	ND	9.5	
106-46-7	1,4-Dichlorobenzene	ND	57	ND	9.5	
95-50-1	1,2-Dichlorobenzene	**76**	57	**13**	9.5	
5989-27-5	d-Limonene	**90**	57	**16**	10	
96-12-8	1,2-Dibromo-3-chloropropane	ND	57	ND	5.9	
120-82-1	1,2,4-Trichlorobenzene	ND	57	ND	7.7	
91-20-3	Naphthalene	ND	57	ND	11	
87-68-3	Hexachlorobutadiene	ND	57	ND	5.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P170104-MB
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Cory Lewis	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **Method Blank** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Cory Lewis
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 1/4/17
Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
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ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **Method Blank**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Cory Lewis
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 1/4/17
Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P170104-MB
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **Method Blank**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 1/4/17
Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **Method Blank** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 1/4/17
Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

SURROGATE SPIKE RECOVERY RESULTS

Client: **Landau Associates,Inc.**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**
ALS Project ID: P1700001

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Cory Lewis
Sample Type: 6.0 L Silonite Canister(s)
Test Notes:

Date(s) Collected: 12/29/16
Date(s) Received: 1/3/17
Date(s) Analyzed: 1/4 - 1/5/17

Client Sample ID	**ALS Sample ID**	**1,2-Dichloroethane-d4** Percent Recovered	**Toluene-d8** Percent Recovered	**Bromofluorobenzene** Percent Recovered	Acceptance Limits	**Data Qualifier**
Method Blank	P170104-MB	**105**	**100**	**91**	70-130	
Method Blank	P170104-MB	**106**	**98**	**93**	70-130	
Lab Control Sample	P170104-LCS	**102**	**97**	**94**	70-130	
Lab Control Sample	P170104-LCS	**106**	**96**	**95**	70-130	
Ambient-12292016	P1700001-001	**107**	**97**	**91**	70-130	
GP-38-12292016	P1700001-002	**105**	**73**	**84**	70-130	
GP-39-12292016	P1700001-003	**105**	**85**	**94**	70-130	
GP-43-12292016	P1700001-004	**106**	**86**	**91**	70-130	
GP-41-12292016	P1700001-005	**108**	**89**	**96**	70-130	

Surrogate percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly from the on-column percent recovery.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client: **Landau Associates,Inc.**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: NA
Analyst: Cory Lewis Date Analyzed: 1/4/17
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.125 Liter(s)
Test Notes:

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
115-07-1	Propene	210	**191**	**91**	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	**188**	**90**	68-109	
74-87-3	Chloromethane	210	**180**	**86**	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	**177**	**84**	66-114	
75-01-4	Vinyl Chloride	210	**215**	**102**	61-125	
106-99-0	1,3-Butadiene	210	**231**	**110**	62-144	
74-83-9	Bromomethane	210	**193**	**92**	73-123	
75-00-3	Chloroethane	210	**206**	**98**	69-122	
64-17-5	Ethanol	1,060	**1050**	**99**	62-124	
75-05-8	Acetonitrile	213	**212**	**100**	57-114	
107-02-8	Acrolein	212	**182**	**86**	62-116	
67-64-1	Acetone	1,060	**1040**	**98**	57-117	
75-69-4	Trichlorofluoromethane	210	**182**	**87**	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	**427**	**101**	66-121	
107-13-1	Acrylonitrile	213	**209**	**98**	68-123	
75-35-4	1,1-Dichloroethene	213	**198**	**93**	76-118	
75-09-2	Methylene Chloride	212	**199**	**94**	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	**217**	**102**	65-126	
76-13-1	Trichlorotrifluoroethane	212	**180**	**85**	73-114	
75-15-0	Carbon Disulfide	213	**206**	**97**	57-102	
156-60-5	trans-1,2-Dichloroethene	213	**204**	**96**	74-123	
75-34-3	1,1-Dichloroethane	212	**199**	**94**	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	**191**	**90**	69-113	
108-05-4	Vinyl Acetate	1,060	**1190**	**112**	76-128	
78-93-3	2-Butanone (MEK)	212	**211**	**100**	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P170104-LCS
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Cory Lewis	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.125 Liter(s)
Test Notes:			

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	212	**202**	**95**	72-117	
141-78-6	Ethyl Acetate	426	**479**	**112**	68-127	
110-54-3	n-Hexane	213	**228**	**107**	55-116	
67-66-3	Chloroform	212	**192**	**91**	70-109	
109-99-9	Tetrahydrofuran (THF)	213	**195**	**92**	72-113	
107-06-2	1,2-Dichloroethane	212	**193**	**91**	69-113	
71-55-6	1,1,1-Trichloroethane	212	**188**	**89**	72-115	
71-43-2	Benzene	212	**194**	**92**	65-107	
56-23-5	Carbon Tetrachloride	213	**193**	**91**	71-113	
110-82-7	Cyclohexane	425	**409**	**96**	71-115	
78-87-5	1,2-Dichloropropane	212	**200**	**94**	71-115	
75-27-4	Bromodichloromethane	214	**206**	**96**	75-118	
79-01-6	Trichloroethene	212	**187**	**88**	68-114	
123-91-1	1,4-Dioxane	213	**208**	**98**	81-131	
80-62-6	Methyl Methacrylate	424	**419**	**99**	72-130	
142-82-5	n-Heptane	213	**205**	**96**	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	**213**	**101**	77-126	
108-10-1	4-Methyl-2-pentanone	213	**214**	**100**	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	**215**	**101**	79-125	
79-00-5	1,1,2-Trichloroethane	212	**198**	**93**	75-119	
108-88-3	Toluene	212	**185**	**87**	59-118	
591-78-6	2-Hexanone	213	**208**	**98**	69-129	
124-48-1	Dibromochloromethane	213	**193**	**91**	74-136	
106-93-4	1,2-Dibromoethane	212	**190**	**90**	73-131	
123-86-4	n-Butyl Acetate	216	**215**	**100**	69-130	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P170104-LCS
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Cory Lewis	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.125 Liter(s)
Test Notes:			

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
111-65-9	n-Octane	212	**202**	**95**	66-120	
127-18-4	Tetrachloroethene	213	**179**	**84**	65-130	
108-90-7	Chlorobenzene	212	**184**	**87**	68-120	
100-41-4	Ethylbenzene	212	**197**	**93**	68-122	
179601-23-1	m,p-Xylenes	424	**409**	**96**	68-123	
75-25-2	Bromoform	212	**201**	**95**	69-130	
100-42-5	Styrene	212	**199**	**94**	71-133	
95-47-6	o-Xylene	212	**201**	**95**	68-122	
111-84-2	n-Nonane	212	**206**	**97**	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	**223**	**105**	69-130	
98-82-8	Cumene	212	**193**	**91**	70-123	
80-56-8	alpha-Pinene	213	**199**	**93**	70-128	
103-65-1	n-Propylbenzene	214	**208**	**97**	69-125	
622-96-8	4-Ethyltoluene	212	**214**	**101**	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	**196**	**92**	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	**227**	**107**	67-129	
100-44-7	Benzyl Chloride	212	**245**	**116**	79-138	
541-73-1	1,3-Dichlorobenzene	212	**233**	**110**	65-136	
106-46-7	1,4-Dichlorobenzene	213	**192**	**90**	66-141	
95-50-1	1,2-Dichlorobenzene	212	**211**	**100**	67-136	
5989-27-5	d-Limonene	212	**238**	**112**	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	**212**	**100**	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	**231**	**109**	64-134	
91-20-3	Naphthalene	214	**241**	**113**	62-136	
87-68-3	Hexachlorobutadiene	213	**199**	**93**	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 3

Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P170104-LCS
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.125 Liter(s)
Test Notes:			

CAS #	Compound	Spike Amount µg/m³	Result µg/m³	% Recovery	ALS Acceptance Limits	Data Qualifier
115-07-1	Propene	210	**193**	**92**	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	**189**	**90**	68-109	
74-87-3	Chloromethane	210	**173**	**82**	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	**174**	**82**	66-114	
75-01-4	Vinyl Chloride	210	**213**	**101**	61-125	
106-99-0	1,3-Butadiene	210	**221**	**105**	62-144	
74-83-9	Bromomethane	210	**199**	**95**	73-123	
75-00-3	Chloroethane	210	**209**	**100**	69-122	
64-17-5	Ethanol	1,060	**1060**	**100**	62-124	
75-05-8	Acetonitrile	213	**216**	**101**	57-114	
107-02-8	Acrolein	212	**188**	**89**	62-116	
67-64-1	Acetone	1,060	**1050**	**99**	57-117	
75-69-4	Trichlorofluoromethane	210	**184**	**88**	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	**430**	**101**	66-121	
107-13-1	Acrylonitrile	213	**209**	**98**	68-123	
75-35-4	1,1-Dichloroethene	213	**199**	**93**	76-118	
75-09-2	Methylene Chloride	212	**196**	**92**	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	**219**	**103**	65-126	
76-13-1	Trichlorotrifluoroethane	212	**180**	**85**	73-114	
75-15-0	Carbon Disulfide	213	**205**	**96**	57-102	
156-60-5	trans-1,2-Dichloroethene	213	**208**	**98**	74-123	
75-34-3	1,1-Dichloroethane	212	**201**	**95**	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	**193**	**91**	69-113	
108-05-4	Vinyl Acetate	1,060	**1130**	**107**	76-128	
78-93-3	2-Butanone (MEK)	212	**207**	**98**	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client: **Landau Associates,Inc.**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: NA
Analyst: Lusine Hakobyan Date Analyzed: 1/4/17
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.125 Liter(s)
Test Notes:

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	212	**204**	**96**	72-117	
141-78-6	Ethyl Acetate	426	**473**	**111**	68-127	
110-54-3	n-Hexane	213	**226**	**106**	55-116	
67-66-3	Chloroform	212	**193**	**91**	70-109	
109-99-9	Tetrahydrofuran (THF)	213	**194**	**91**	72-113	
107-06-2	1,2-Dichloroethane	212	**197**	**93**	69-113	
71-55-6	1,1,1-Trichloroethane	212	**187**	**88**	72-115	
71-43-2	Benzene	212	**188**	**89**	65-107	
56-23-5	Carbon Tetrachloride	213	**192**	**90**	71-113	
110-82-7	Cyclohexane	425	**398**	**94**	71-115	
78-87-5	1,2-Dichloropropane	212	**198**	**93**	71-115	
75-27-4	Bromodichloromethane	214	**203**	**95**	75-118	
79-01-6	Trichloroethene	212	**183**	**86**	68-114	
123-91-1	1,4-Dioxane	213	**204**	**96**	81-131	
80-62-6	Methyl Methacrylate	424	**405**	**96**	72-130	
142-82-5	n-Heptane	213	**201**	**94**	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	**210**	**100**	77-126	
108-10-1	4-Methyl-2-pentanone	213	**210**	**99**	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	**214**	**100**	79-125	
79-00-5	1,1,2-Trichloroethane	212	**193**	**91**	75-119	
108-88-3	Toluene	212	**175**	**83**	59-118	
591-78-6	2-Hexanone	213	**198**	**93**	69-129	
124-48-1	Dibromochloromethane	213	**185**	**87**	74-136	
106-93-4	1,2-Dibromoethane	212	**181**	**85**	73-131	
123-86-4	n-Butyl Acetate	216	**206**	**95**	69-130	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 3 of 3

Client: **Landau Associates,Inc.**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: NA
Analyst: Lusine Hakobyan Date Analyzed: 1/4/17
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.125 Liter(s)
Test Notes:

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
111-65-9	n-Octane	212	**195**	**92**	66-120	
127-18-4	Tetrachloroethene	213	**171**	**80**	65-130	
108-90-7	Chlorobenzene	212	**175**	**83**	68-120	
100-41-4	Ethylbenzene	212	**186**	**88**	68-122	
179601-23-1	m,p-Xylenes	424	**384**	**91**	68-123	
75-25-2	Bromoform	212	**191**	**90**	69-130	
100-42-5	Styrene	212	**187**	**88**	71-133	
95-47-6	o-Xylene	212	**190**	**90**	68-122	
111-84-2	n-Nonane	212	**196**	**92**	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	**208**	**98**	69-130	
98-82-8	Cumene	212	**182**	**86**	70-123	
80-56-8	alpha-Pinene	213	**188**	**88**	70-128	
103-65-1	n-Propylbenzene	214	**194**	**91**	69-125	
622-96-8	4-Ethyltoluene	212	**199**	**94**	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	**183**	**86**	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	**209**	**99**	67-129	
100-44-7	Benzyl Chloride	212	**230**	**108**	79-138	
541-73-1	1,3-Dichlorobenzene	212	**215**	**101**	65-136	
106-46-7	1,4-Dichlorobenzene	213	**178**	**84**	66-141	
95-50-1	1,2-Dichlorobenzene	212	**193**	**91**	67-136	
5989-27-5	d-Limonene	212	**221**	**104**	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	**200**	**94**	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	**219**	**103**	64-134	
91-20-3	Naphthalene	214	**226**	**106**	62-136	
87-68-3	Hexachlorobutadiene	213	**191**	**90**	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

APPENDIX B

Transportation Corridor Landfill Gas Evaluation

(March 2017)

Technical Memorandum

TO: Ms. Joan Davenport, Strategic Project Manager
Mr. Brett Sheffield, City Engineer
City of Yakima

FROM: Cody Johnson, PE and Piper Roelen, PE

DATE: March 24, 2017

RE: **Transportation Corridor Landfill Gas Evaluation**
Former Boise Cascade Mill Site and Closed City of Yakima Landfill Site
Yakima, Washington
Facility/Site No. 1927
LAI Project No. 1148009.010.015

Landau Associates, Inc. (LAI) has prepared the following technical memorandum for the City of Yakima (City) to summarize landfill gas (LFG) monitoring activities and predicted LFG production rates at the former Boise Cascade Mill Site and the closed City Landfill Site (collectively referred to as the Site). The focus of our investigations was to collect Site-specific information regarding subsurface LFG conditions to support design of the planned transportation corridor that will be constructed across much of the Site. This investigation may also provide additional information that can be considered for incorporation into the ongoing remedial investigation (RI) efforts at the closed City Landfill Site.

Site Background

The Site is located on the eastern edge of the City adjacent to Interstate 82 (I-82; Figure 1). The overall Site includes 20 parcels (19 parcels owned by LeeLynn, Inc. and Wiley Mt., Inc. and 1 parcel owned by OfficeMax Corporation), totaling approximately 207 acres. A BNSF-owned right-of-way (ROW) with railroad tracks runs in an east-west orientation through the middle of the Site. The closed municipal solid waste (MSW) landfill is located at the southern end of the Site and was operated by the City between 1963 and 1970. As part of landfill operations, MSW was placed in a former log pond that originally occupied the Site (City of Yakima 1996). When landfill operations ceased, the MSW was covered and the area brought to grade with a mixture of fill soil and wood debris. The Site was then used until 2010 for log storage, including temporary log storage and log-chipping operations by the tenant of the Landfill Site, Yakima Resources, LLC (Yakima Resources).

The planned transportation corridor that will extend across the Site includes the northern extension of Bravo Boulevard and the East-West Corridor from East H Street to the bridge crossing over I-82 and the Yakima River (Figure 1). The transportation corridor is being designed by the Lochner and HLA Engineering & Land Surveying, Inc. (HLA) team in consultation with the City and Yakima County (County). The proposed alignment for the transportation corridor will require construction activities, including subsurface disturbance, in many areas of the Site that are known to be underlain by varying amounts of wood debris and MSW resulting from historical operations. Based on the significant quantities of MSW and wood debris present throughout the project area, it is necessary to determine how much gas may be produced during the degradation of these materials over time, and what constituents may be in the gas that may trigger health and safety or air emissions requirements.

The LFG monitoring and LFG generation modeling results summarized below are based on Site-specific data collected along the proposed roadway alignments. The information will be necessary to address technical design considerations with respect to the management of LFG generated by the wood debris and MSW during development of the transportation corridor design.

Landfill Gas Field Characterization

The southern portion of the proposed roadway alignment will be constructed over the former MSW landfill. The landfill generates LFG which can create an inhalation and explosion hazard if not properly controlled and vented. In order to collect the additional data needed to support project design and planning for construction LFG controls, a network of LFG monitoring probes were installed and monitored, as described in the following sections.

Landfill Gas Probe Installation

To evaluate LFG in the project area, 13 new LFG monitoring probes (GP-32 through GP-44) were installed along the proposed roadway alignment. The spacing of LFG probes along the alignments is approximately 400 feet (ft) between probes north of the railroad tracks (where no MSW is located and wood debris is less abundant) and approximately 250 ft between probes within the area of the former landfill. Five existing LFG probes (GP-5, GP-11, GP-18, GP-19, and GP-28) were previously installed as part of remedial investigation activities. The five existing LFG probes are located within or proximal to the alignments, and were used to limit the number of new installations required. The locations of the new and previously-existing LFG monitoring probes are presented on Figure 1.

The new LFG probes were installed in October 2016 using hollow-stem auger drilling methods, consistent with procedures and materials of construction used for previous LFG probe installations at the Site. A 3.25–inch outside diameter Dames & Moore sampler was used with a 300 pound hammer and a 30-inch drop to retrieve split spoon samples of the materials encountered, and measure the blow counts required to penetrate into the underlying material. Each boring was advanced to 10 feet below ground surface (ft BGS). The LFG probes were completed with 0.5-inch-diameter Schedule 40 PVC pipe with a 5-ft screen from 5 to 10 feet BGS. The screens were constructed with 0.03-inch to 0.04-inch machine-slotted perforations. The filter pack surrounding the screens consisted of pea gravel to facilitate soil vapor/LFG movement into the probe during purging and monitoring. The location and ground surface elevation of each new LFG probe was surveyed by HLA.

The LFG probes are considered temporary installations, and were completed with flush-mounted monuments encased in concrete, with an aboveground location marker, but no protective bollards were installed around the monuments. The probes were constructed by a licensed well driller and an LAI field scientist observed the drilling cuttings and prepared a boring and installation log at each location. The boring logs for the LFG probes are provided in Appendix A.

Landfill Gas Monitoring

LFG monitoring was conducted at the 13 new probes and the 5 existing monitoring points during 4 monitoring events completed on October 13, November 16, December 21, and December 29, 2016 as part of the LFG evaluation. The LFG measurements were collected during conditions of falling barometric pressure to minimize potential atmospheric dilution effects. A Landtec GEM 5000 soil vapor/LFG analyzer was used to monitor *in situ* concentrations of methane, oxygen, carbon dioxide, and balance gases (the mixture of all other gases making up the balance of the air sample), to evaluate for potential soil-vapor impacts from degrading MSW or wood debris.

In addition to the data collected using the portable LFG analyzer, samples of LFG were collected during the second and fourth monitoring events at the four LFG monitoring probe locations with the highest concentrations of methane based on evaluation of the initial monitoring event result (GP-38, GP-39, GP41, and GP-43). The samples were collected into certified-clean stainless steel Summa canisters with Silonite linings for laboratory analysis of total reduced sulfur by ASTM International (ASTM) standard D-5504, fixed gases (methane, carbon dioxide, carbon monoxide, oxygen, and nitrogen) by ASTM D-1945, non-methane organic compounds (NMOCs) by US Environmental Protection Agency (EPA) Method 25C, and volatile organic compounds (VOCs) by EPA Compendium Method TO-15.

The field measurement results are presented in Table 1. A summary of the laboratory analytical results is presented in Table 2 and the analytical laboratory reports are included in Appendix B.

Discussion of Results

Based on the monitoring and sampling results, the MSW and wood debris continues to generate LFG in the project area, as evidenced by elevated levels of methane and carbon dioxide, and depressed concentrations of oxygen. As anticipated, the highest concentrations of methane were detected in areas of buried MSW, ranging from approximately 48 to 72 percent by volume (pbv). Lower methane concentrations were detected outside the landfill boundaries where only buried wood debris is present, ranging from approximately 1 to 20 pbv. Methane was typically not detected at monitoring points where MSW or wood debris is not present, except at locations in close proximity to MSW or wood debris deposits. Figure 2 shows the limits of the MSW landfill and presents the concentrations of methane detected during the four 2016 monitoring events.

The elevated levels of methane identified by the monitoring results confirm that LFG control will be a necessary part of construction throughout areas on and adjacent to the landfill because of potential explosive hazards.

Although methane is the primary constituent of interest in the LFG, other parameters were analyzed to provide additional information about the processes occurring in the subsurface. This information will support design of the mitigation system, support air permitting efforts, and provide an indication where odorous compounds or VOCs are present, which may need to be addressed as part of the mitigation system.

The laboratory fixed-gas results are similar to the concentrations measured using the hand-held LFG analyzer, confirming the usability of the field-collected data for design. Carbon monoxide is one of the parameters reported in the fixed-gas analysis. The lack of carbon monoxide in the samples indicates combustion is not occurring in the waste mass. This is an important finding because of the relatively thin layer of soil cover over the MSW. Carbon dioxide, methane, and oxygen results appear to be consistent with the conceptual site model: degradable waste is continuing to produce LFG and at elevated concentrations that warrant mitigation considerations during construction.

Elevated concentrations of hydrogen sulfide (H_2S) were also detected in several samples. These detections will be an important consideration in developing health and safety plans for construction, and also indicate the areas most likely to have odor concerns that will need to be addressed as part of the long-term mitigation system. The most notable of these observations was a detection of 14,000 micrograms per cubic meter ($\mu g/m^3$) H_2S in GP-39 on November 11, 2016.

Static pressure measurements were low across the landfill, ranging generally from -0.55 to 0.11 inches of water (in. H_2O). The pressure measurements will be used in assessing where areas of migration concern are located. The high pressure measured at monitoring probes GP-39 and GP-42 of (12.84 in. H_2O and 9.90 in. H_2O, respectively) are considered anomalous. Although the monitored parameter levels varied somewhat between the four monitoring events, the events indicated generally similar conditions for the purposes of designing an appropriate LFG control system.

The results of VOC testing indicate detectable concentrations of VOCs in the LFG coming from within the MSW landfill boundaries. The VOCs detected are those typically associated with LFG; however, they are present at relatively low concentrations in comparison to landfills with more recent deposits. For reference, the total mass of non-methane VOCs in LFG is typically about 840 parts per million (ppm), normalized to hexane (EPA 2008). This is equivalent to approximately 3,000,000 $\mu g/m^3$ (the unit of measurement in which the landfill VOC data are presented in Table 2). The highest observed total VOC concentration (expressed as the sum of all detected VOCs) was at GP-39 in the sample collected on November 16 29, 2016, with a concentration of approximately 76,500 $\mu g/m^3$—less than 3 percent of the concentration typically present in LFG. The VOC data are used in combination with the LFG generation estimates discussed below to evaluate emissions from the landfill. The estimate of emissions will be a required element of the construction design and permitting process.

Landfill Gas Generation Modeling

This section summarizes the LFG production rate evaluation for the Site. The LFG production rate was estimated using the EPA's LandGEM spreadsheet model—the industry standard approach for estimating LFG emissions for regulatory compliance and a tool for LFG control system design. The estimate is based on the waste age, type, quantity of buried waste, and the subsurface environment.

Modeling Approach

LandGEM is a spreadsheet-based model prepared by EPA that estimates the overall flow rate of LFG from a MSW landfill based on user input regarding the amount of waste buried, the year of burial, and other parameters developed by EPA based on landfills across the US. Emissions factors used in the model are from the Compilation of Air Pollutant Emission Factors (AP-42; EPA 1998). The model allows variation of parameters affecting the overall LFG production capacity of the waste (given infinite time), and the rate at which the LFG is released—each constrained to typically observed ranges.

Two models were prepared based on assumptions regarding future site conditions. Scenario 1 models the LFG generated by the wood debris and MSW present on the Landfill Site, the area where the highest concentrations of methane were observed, and where the buried mass of waste is most concentrated. Scenario 2 is similar, but assumes the wood debris and MSW beneath the roadway is removed and replaced with structural fill for geotechnical purposes, as described in LAI's draft technical memo(LAI 2016). This option is discussed in that technical memorandum as a way to reduce long-term maintenance costs associated with repair of differential settlement damage that could be caused by the continued degradation of the wood debris or MSW beneath the proposed roadway alignment. If that action is taken based on geotechnical considerations, the model results for Scenario 2 described herein will provide the information needed to support design and permitting efforts for LFG mitigation.

Scenario 1

According to the Remedial Investigation Report (SLR 2009) prepared by SLR International Corporation (SLR), approximately 408,500 cubic yards (CY) of MSW was buried on the Landfill Site between 1963 and 1970. Based on this volume, and a typical unit weight of 1.5 tons per CY, the total mass of MSW on the Landfill Site is estimated to be approximately 612,750 tons. The volume of wood debris present at the Site was evaluated using observations of the thickness of wood debris in logs of explorations (i.e., test pits, soil borings, monitoring wells) advanced on the Landfill Site by SLR (SLR 2009, 2010). The total estimated volume of buried wood debris at the Site was estimated to be 1,418,500 CY. Based on a unit weight of 0.4 tons per CY this corresponds to a total mass of 567,400 tons. This includes wood debris buried on the Mill Site and the Landfill Site. Because of the proximity of portions of the roadway alignment to areas of buried wood debris on the Mill Site and the potential for surface capping during site development, it is appropriate to combine these potential methane sources in the landfill gas estimation model. It should be noted that Yakima Resources is conducting ongoing wood debris salvage operations, so the actual volume of wood debris is likely lower. However, there is insufficient data to estimate the volume of wood debris that has been removed. The LFG generation rate and mass determined using the LandGEM model should therefore be considered to be conservative.

It is unknown when the wood debris was first deposited on the Landfill Site. The earliest record indicating that the Landfill Site was used for wood storage is a 1920 Sanborn Map showing a log pond on the Site (URS 2003). The years of waste acceptance for the wood debris were therefore set at 1920 to 2006 for estimating the potential gas generation from this material. Assuming the total mass of wood debris was buried throughout this period, the annual wood debris acceptance rate is approximately 6,600 tons per year. The MSW acceptance rate was assumed also to be consistent throughout the 8 years of operation from 1963 to 1970, resulting in an acceptance rate of approximately 76,600 tons per year. Because LandGEM limits the landfill acceptance period to 80 years, three individual modeling runs were executed to account for the contributions from: the first 80 years of wood debris deposition, the last 6 years of wood debris deposition, and the 8 years of MSW acceptance. The combined results of the three models represents the total generation rate.

LandGEM requires user inputs for the methane generation rate (k) and potential methane generation capacity (L_o) of the waste, and non-methane organic compounds (NMOCs) concentration and methane content at the site. The model provides standard inputs, but also allows for site-specific user inputs when additional data is available. The selected values for each are discussed below:

- **Methane Generation Rate:** Two different k values were selected for the MSW and wood debris model runs. For the MSW, the Clean Air Act (CAA) value for arid areas (defined as areas receiving less than 25 inches of rain per year of 0.02 year^{-1}) was selected from the model standard inputs. The CAA value is conservative and is required when determining whether a landfill is subject to the control requirements of the New Source Performance Standards/Emissions Guidelines (NSPS/EG) or National Emissions Standards for Hazardous Air Pollutants Compliance standards (NESHAPS). Due to the typically lower surface area of wood debris compared to MSW and the higher concentration of non-methane generating material, a lower k value of 0.01 year^{-1} was selected for the wood debris model runs. This value is based on a study conducted by the National Council for Air and Stream Improvement (NCASI) regarding decomposition of forest products in solid waste landfills (NCASI 2004).
- **Potential Methane Generation Capacity:** Similar to the k values, different L_o values were selected for the MSW and wood debris model runs. For the MSW, the CAA standard value for arid areas of 170 cubic meters per megagram was used. For the wood debris, an L_o value of 200 was selected based on the NCASI study.
- **NMOC Concentration:** A value of 67 parts per million by volume (ppmv) as hexane was used for all model runs. This parameter is site-specific and independent of the waste type, so a single value for all model runs is appropriate. The value was determined by averaging the

NMOC concentrations from the October 13 and December 27 LFG sampling events and then converting from ppmv as methane to ppmv as hexane.

- **Methane Content:** Similar to the NMOC concentration, this parameter is also site-specific and independent of waste type, so a single value of 42 pbv was used for all model runs. This value was determined by averaging the non-zero field-measured methane results from all four LFG monitoring events conducted between October 13 and December 27, 2016.

The modeling results for Scenario 1 indicate an estimated average LFG gas generation rate from wood debris of 101 cubic feet per minute (cfm) and 112 cfm from MSW for a combined total LFG generation rate of 213 cfm for year 2017. Figure 3 presents the total combined LFG generation curve developed by combining the output from the three modeling runs discussed above. Table 3 presents a summary of the model output for total LFG and methane production from 2017 through 2060. Appendix C contains the LandGEM model report, which includes a summary of inputs and tables providing yearly predicted values for total LFG, NMOCs, carbon dioxide, and methane production from 1920 through 2060.

Scenario 2

Scenario 2 assumes the biodegradable material is removed from beneath the roadway during construction and replaced with structural fill. This will result in an overall reduction in the amount of LFG-generating material at the Site. It is estimated that approximately 117,500 in-place CY of MSW and 46,900 in-place CY of wood debris is present below the proposed 150-ft-wide roadway alignment, assuming 1H:1V cut slopes downward from the limits of the roadway (LAI 2016). These volumes correspond to 176,250 tons of MSW and 18,760 tons of wood debris.

The LFG generation modeling runs for this scenario were set up in a similar manner as for Scenario 1, but with a subtraction of the masses of wood debris and MSW noted above in 2017. The other model parameters used for this scenario were identical to Scenario 1.

The modeling results for Scenario 2 indicate an estimated average LFG gas generation rate from wood debris of 97.6 cfm and 79.6 cfm from MSW for a combined total LFG generation rate of approximately 177 cfm for year 2017. Figure 4 presents the total combined LFG generation curve developed by combining the output from the three modeling runs discussed above. Table 4 presents a summary of the model output for total LFG and methane production from 2017 through 2060. Appendix D contains the LandGEM model report which includes a summary of inputs and tables providing yearly predicted values for total LFG, NMOCs, carbon dioxide, and methane production from 1920 through 2060.

Conclusion

This data report is intended to provide the raw data that will be necessary during future design and permitting efforts. Some preliminary conclusions can be drawn from the raw data without requiring further evaluation. Based on the results of the additional field LFG monitoring and the modeling efforts, it is apparent that the wood debris and MSW at the Site are generating significant quantities of LFG at and near the proposed construction area, and will continue to do so into the foreseeable future. As a result, LFG mitigation will be required as part of construction for the roadway alignment, as well as for future development and/or capping scenarios on the Landfill Site. The methane and total LFG production rates included in Tables 3 and 4 provide data that can be used for LFG mitigation design.

Although LFG emissions have been occurring at the Site for decades in an uncontrolled manner, the thin soil cover present at the surface likely allows the gases to ventilate relatively freely to the atmosphere with little migration beyond the limits of the waste. Paving over areas that generate gas can cause accumulation of the gas to unsafe or unhealthy levels, and can promote lateral migration. Construction will need to provide for controlled ventilation to prevent accumulation of gases beneath the relatively impermeable surface. Construction will also need to provide for the prevention of migration—including through utility trenches that may be a part of the construction plans. The vents installed for mitigation will be considered new sources of air pollution by the State of Washington, even though the gases currently pass through the soil to the atmosphere in an uncontrolled manner. The new source review process will require further evaluation of the generation rate and VOC concentration data provided herein, in order to determine if treatment of the ventilated gases, or air permitting is required. In order to evaluate whether an air permit (or substantive requirements thereof) will be required, an estimate of the total annual emissions for hazardous and toxic air pollutants will be required. The LFG production rates, combined with the VOC data provided in Table 2 can be used for this calculation to evaluate compliance with CAA permitting requirements as well as Model Toxics Control Act (MTCA) cleanup requirements (because this is a MTCA cleanup site) .

Limitations

This technical memorandum has been prepared for the exclusive use of the City of Yakima for specific application to the Former Boise Cascade Mill Site and Closed City of Yakima Landfill Site Transportation Corridor LFG Evaluation. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of LAI. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by LAI, shall be at the user's sole risk. LAI warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

LANDAU ASSOCIATES, INC.

Cody Johnson, PE
Senior Engineer

Piper Roelen, PE
Senior Associate

CMJ/JMD/PMR/ljc
[P:\1148\009\R\TRANSPORTATION CORRIDOR INVESTIGATION\LFG EVALUATION\REPORT FOLDER\LFG TM FOR TRANS CORRIDOR FINAL 032417.DOCX]

Attachments:
Figure 1. Landfill Gas Monitoring Probe Locations
Figure 2. Landfill Gas Monitoring Results
Figure 3. LandGEM Model Emissions for Scenario 1
Figure 4. LandGEM Model Emissions for Scenario 2
Table 1. Landfill Gas Monitoring Field Measurements
Table 2. Landfill Gas Monitoring Data – Analytical Results
Table 3. Scenario 1: Total LFG and Methane Production
Table 4. Scenario 2: Total LFG and Methane Production
Appendix A. Landfill Gas Probe Installation Logs
Appendix B. Analytical Laboratory Reports
Appendix C. LandGEM Model Summary – Scenario 1
Appendix D. LandGEM Model Summary – Scenario 2

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Legend

◐ Gas Probe Location and Designation - LAI 2016

◐ Existing Gas Probe Location and Designation

-- Extent of Municipal Solid Waste

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 300 600

Scale in Feet

Data Source: SLR 2009; Esri World Imagery.

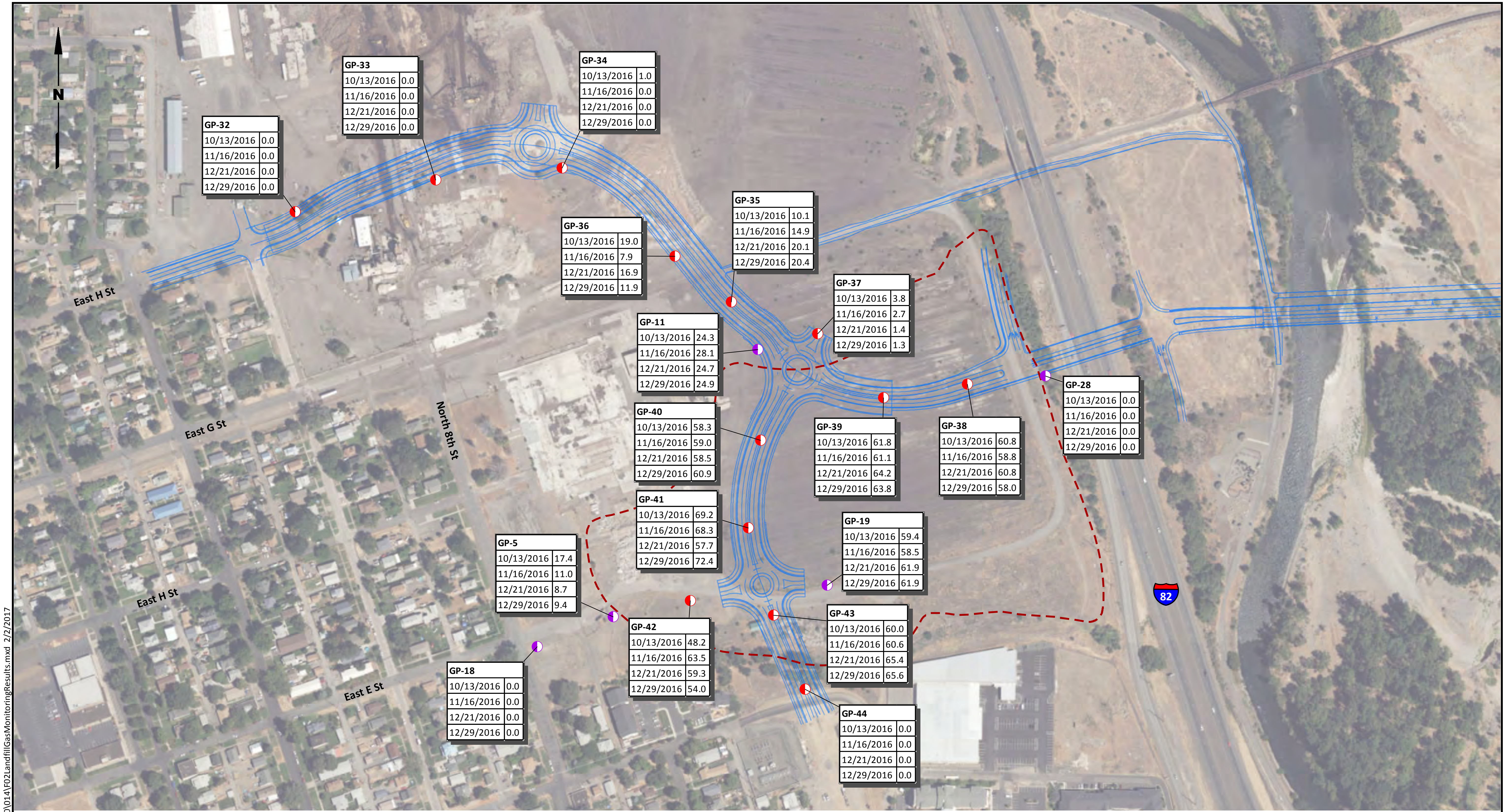
Closed City of Yakima
Landfill Site
Yakima, Washington

Landfill Gas Monitoring Probe Locations

Figure
1

Landau Associates

G:\Projects\1148\009\010\014\F01 Landfill Gas Monitoring Probe Locations.mxd 2/2/2017



GP-32	
10/13/2016	0.0
11/16/2016	0.0
12/21/2016	0.0
12/29/2016	0.0

GP-33	
10/13/2016	0.0
11/16/2016	0.0
12/21/2016	0.0
12/29/2016	0.0

GP-34	
10/13/2016	1.0
11/16/2016	0.0
12/21/2016	0.0
12/29/2016	0.0

GP-35	
10/13/2016	10.1
11/16/2016	14.9
12/21/2016	20.1
12/29/2016	20.4

GP-36	
10/13/2016	19.0
11/16/2016	7.9
12/21/2016	16.9
12/29/2016	11.9

GP-37	
10/13/2016	3.8
11/16/2016	2.7
12/21/2016	1.4
12/29/2016	1.3

GP-11	
10/13/2016	24.3
11/16/2016	28.1
12/21/2016	24.7
12/29/2016	24.9

GP-28	
10/13/2016	0.0
11/16/2016	0.0
12/21/2016	0.0
12/29/2016	0.0

GP-40	
10/13/2016	58.3
11/16/2016	59.0
12/21/2016	58.5
12/29/2016	60.9

GP-39	
10/13/2016	61.8
11/16/2016	61.1
12/21/2016	64.2
12/29/2016	63.8

GP-38	
10/13/2016	60.8
11/16/2016	58.8
12/21/2016	60.8
12/29/2016	58.0

GP-41	
10/13/2016	69.2
11/16/2016	68.3
12/21/2016	57.7
12/29/2016	72.4

GP-19	
10/13/2016	59.4
11/16/2016	58.5
12/21/2016	61.9
12/29/2016	61.9

GP-5	
10/13/2016	17.4
11/16/2016	11.0
12/21/2016	8.7
12/29/2016	9.4

GP-43	
10/13/2016	60.0
11/16/2016	60.6
12/21/2016	65.4
12/29/2016	65.6

GP-42	
10/13/2016	48.2
11/16/2016	63.5
12/21/2016	59.3
12/29/2016	54.0

GP-18	
10/13/2016	0.0
11/16/2016	0.0
12/21/2016	0.0
12/29/2016	0.0

GP-44	
10/13/2016	0.0
11/16/2016	0.0
12/21/2016	0.0
12/29/2016	0.0

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Legend

- 🔴 Gas Probe Location and Designation - LAI 2016
- 🟣 Existing Gas Probe Location and Designation
- - - Extent of Municipal Solid Waste

Monitoring Date – Methane Concentration (% by volume)

GP-18	
10/13/2016	0.0
11/16/2016	0.0
12/21/2016	0.0
12/29/2016	0.0

0 300 600

Scale in Feet

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

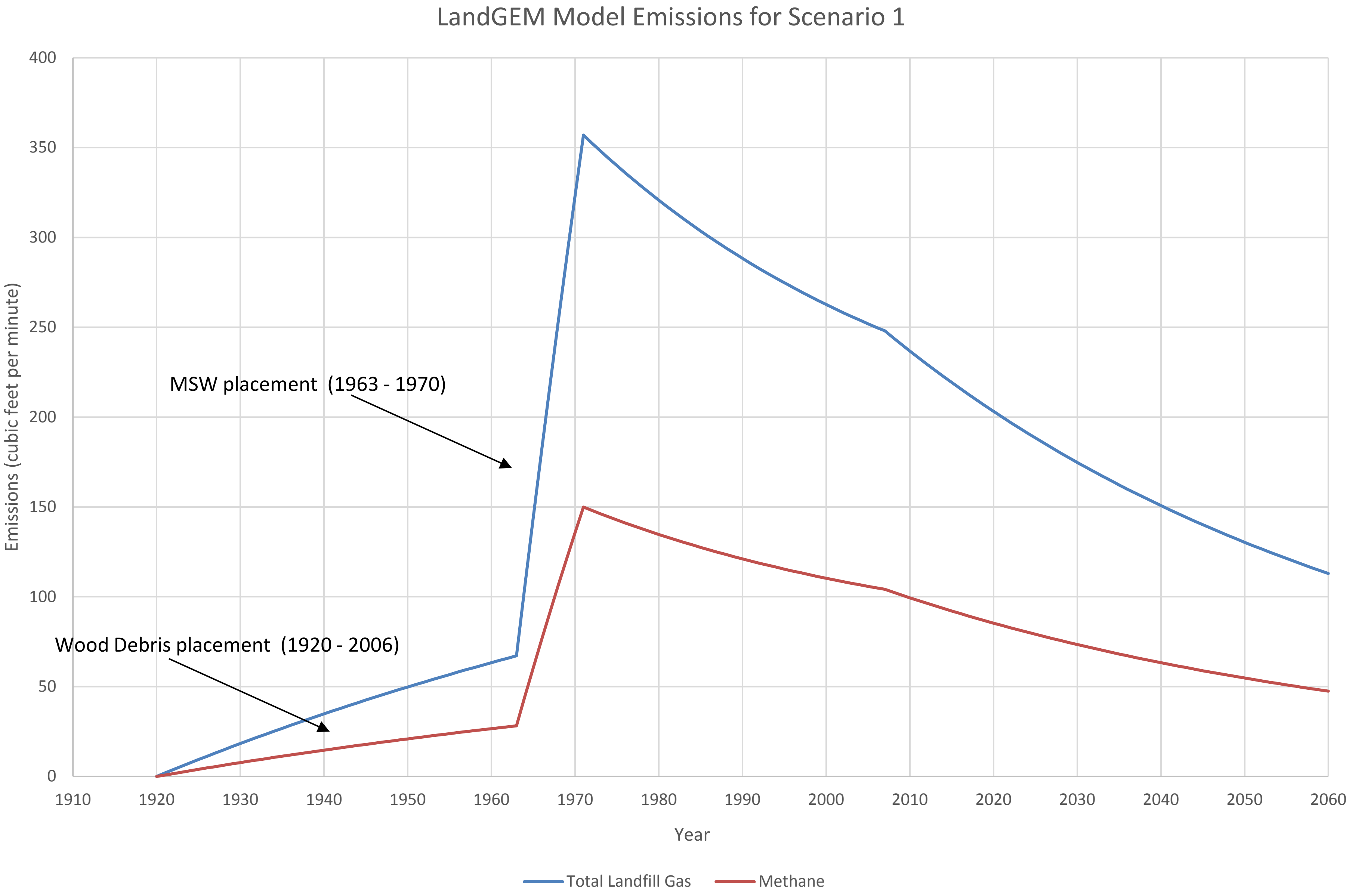
Data Source: SLR 2009; Esri World Imagery.

Landau Associates

Closed City of Yakima
Landfill Site
Yakima, Washington

Landfill Gas Monitoring Results

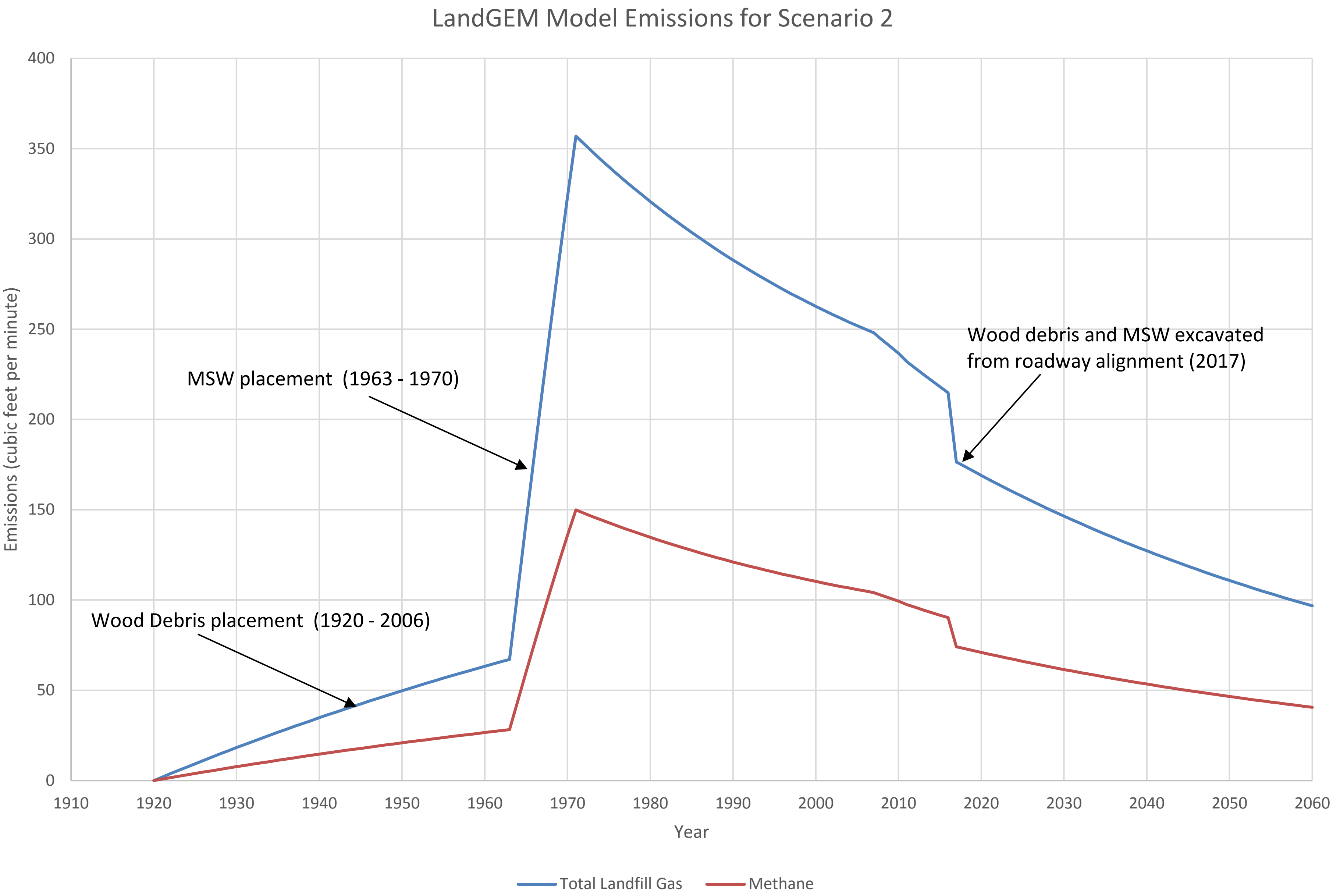
Figure
2



Closed City of Yakima
Landfill Site
Yakima, Washington

LandGEM Model Emissions for Scenario 1

Figure
3



Closed City of Yakima Landfill Site Yakima, Washington	**LandGEM Model Emissions for Scenario 2**	Figure 4

LANDAU ASSOCIATES

Table 1
Landfill Gas Monitoring Field Measurements
Transportation Corridor
Yakima, Washington

Monitoring Point	Methane (pbv)				Carbon Dioxide (pbv)				Oxygen (pbv)				Balance Gasses (pbv)				Static Pressure (inches of water)			
	10/13/16	11/16/16	12/21/16	12/29/16	10/13/16	11/16/16	12/21/16	12/29/16	10/13/16	11/16/16	12/21/16	12/29/16	10/13/16	11/16/16	12/21/16	12/29/16	10/13/16	11/16/16	12/21/16	12/29/16
GP-5	17.4	11.0	8.7	9.4	23.0	17.5	16.9	17.2	0.0	0.7	0.0	0.3	59.6	70.9	74.4	73.10	0.03	-0.03	-0.02	0.01
GP-11	24.3	28.1	24.7	24.9	31.3	34.3	32.2	32.3	0.0	0.0	0.0	0.2	44.4	37.6	43.1	42.6	0.03	0.03	0.00	0.00
GP-18	0.0	0.0	0.0	0.0	1.6	2.0	1.5	1.5	20.3	19.3	18.9	19.9	78.0	78.7	79.6	78.5	-0.02	0.02	-0.01	-0.03
GP-19	59.4	58.5	61.9	61.9	40.5	41.5	38.1	37.8	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.05	-0.02	0.01	0.05
GP-28	0.0	0.0	0.0	0.0	19.6	18.8	11.7	11.5	3.3	4.8	9.9	10.2	77.1	76.4	78.3	78.2	-0.02	-0.01	-0.01	-0.01
GP-32	0.0	0.0	0.0	0.0	1.5	1.6	1.2	1.2	20.2	20.0	19.8	20.2	78.3	78.4	79.1	78.5	0.00	0.00	0.02	0.02
GP-33	0.0	0.0	0.0	0.0	9.8	10.8	10.0	10.4	7.3	5.6	4.6	6.5	82.9	83.6	85.4	83.0	0.00	-0.02	0.01	-0.01
GP-34	1.0	0.0	0.0	0.0	7.0	12.9	3.2	3.6	0.0	0.2	16.9	17.5	92.0	86.8	79.9	78.8	-0.01	-0.01	0.00	-0.01
GP-35	10.1	14.9	20.1	20.4	23.5	24.7	25.0	25.6	0.0	0.0	0.0	0.2	66.4	60.4	54.8	53.8	-0.03	0.04	-0.55	0.04
GP-36	19.0	9.9	16.9	11.9	32.6	27.5	26.3	22.0	0.0	0.0	0.0	0.3	48.4	62.5	56.8	65.8	0.00	-0.04	-0.01	-0.01
GP-37	3.8	2.7	1.4	1.3	23.8	25.7	21.7	21.3	0.0	0.0	0.0	0.2	72.4	71.6	76.9	77.2	0.01	0.02	-0.22	0.01
GP-38	60.8	58.8	60.8	58.0	38.1	41.2	39.2	39.1	0.0	0.0	0.0	0.3	1.1	0.0	0.0	2.6	-0.01	-0.02	0.00	0.06
GP-39	61.8	61.1	64.2	63.8	38.2	38.9	35.8	35.8	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.05	-0.04	0.05	12.84
GP-40	58.3	59.0	58.5	60.9	38.9	41.0	33.8	37.1	0.0	0.0	0.0	0.2	2.9	0.0	7.7	1.8	0.12	0.07	0.11	0.09
GP-41	69.2	68.3	57.7	72.4	30.3	31.7	22.9	27.3	0.0	0.0	0.0	0.2	0.6	0.0	19.4	1.8	0.12	0.01	0.11	0.11
GP-42	48.2	63.5	59.3	54.0	36.7	35.9	30.5	29.5	0.0	0.0	0.0	0.3	15.1	0.9	10.2	16.2	0.05	0.02	0.04	9.90
GP-43	60.0	60.6	65.4	65.6	40.0	39.4	34.6	34.1	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.02	-0.05	0.00	0.00
GP-44	0.0	0.0	0.0	0.0	2.3	3.6	3.0	3.0	19.1	17.5	16.6	18.0	78.6	78.9	80.4	78.9	-0.02	0.02	0.00	0.01
Ambient	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	21.7	21.1	19.2	20.9	78.1	78.8	80.7	78.8	0.00	0.01	0.00	0.00

pbv = percent by volume

Table 2
Landfill Gas Monitoring Data - Analytical Results
Transportation Corridor
Yakima, Washington

Analyte	Cas No	Sample ID, Laboratory ID, Sample Date, and Results									
		Ambient-11162016 P1605444-003 11/16/2016	Ambient-12292016 P1700001-001 12/29/2016	GP-38-11162016 P1605444-005 11/16/2016	GP-38-12292016 P1700001-002 12/29/2016	GP-39-11162016 P1605444-004 11/16/2016	GP-39-12292016 P1700001-003 12/29/2016	GP-41-11162016 P1605444-002 11/16/2016	GP-41-12292016 P1700001-005 12/29/2016	GP-43-11162016 P1605444-001 11/16/2016	GP-43-12292016 P1700001-004 12/29/2016
ASTM D1946 (%, v/v)											
Oxygen	7782-44-7	**22.0**	**22.2**	**1.72**	**0.286**	0.13 U	0.22 U	**0.254**	**0.376**	**7.30**	**0.380**
Nitrogen	7727-37-9	**77.9**	**77.8**	**8.71**	**5.76**	**0.668**	**1.18**	**10.2**	**4.02**	**26.2**	**2.82**
Carbon Monoxide	630-08-0	0.12 U	0.22 U	0.15 U	0.22 U	0.13 U	0.22 U	0.15 U	0.23 U	0.14 U	0.22 U
Methane	74-82-8	0.12 U	0.22 U	**55.1**	**57.9**	**64.0**	**66.0**	**57.5**	**70.5**	**42.6**	**65.9**
Carbon Dioxide	124-38-9	0.12 U	0.22 U	**34.4**	**36.0**	**35.2**	**32.6**	**32.0**	**25.1**	**23.9**	**30.8**
EPA 25C Modified (ppmV)											
Total Gaseous Nonmethane Organics (TGNMO) as Methane		1.2 U	2.2 U	**220**	**250**	**630**	**600**	**640**	**310**	**350**	**230**
ASTM D 5504-12 (µg/m3)											
Hydrogen Sulfide	7783-06-4	8.3 U	15 U	10 U	**3,400**	**14,000**	**12,000**	10 U	**640**	**10,000**	**5,100**
Carbonyl Sulfide	463-58-1	15 U	27 U	**63**	27 U	16 U	27 U	18 U	28 U	17 U	27 U
Methyl Mercaptan	74-93-1	12 U	22 U	14 U	**38**	**37**	22 U	14 U	23 U	**59**	**30**
Ethyl Mercaptan	75-08-1	15 U	28 U	19 U	27 U	**39**	**28**	19 U	29 U	**45**	28 U
Dimethyl Sulfide	75-18-3	15 U	28 U	19 U	27 U	17 U	28 U	19 U	29 U	**47**	**110**
Carbon Disulfide	75-15-0	9.3 U	17 U	11 U	17 U	10 U	17 U	11 U	**110**	11 U	17 U
Isopropyl Mercaptan	75-33-2	19 U	34 U	23 U	34 U	21 U	34 U	23 U	36 U	21 U	34 U
tert-Butyl Mercaptan	75-66-1	22 U	41 U	27 U	40 U	25 U	40 U	27 U	42 U	25 U	41 U
n-Propyl Mercaptan	107-03-9	19 U	34 U	23 U	34 U	21 U	34 U	23 U	36 U	21 U	34 U
Ethyl Methyl Sulfide	624-89-5	19 U	34 U	23 U	34 U	21 U	34 U	23 U	36 U	21 U	34 U
Thiophene	110-02-1	20 U	38 U	25 U	37 U	23 U	38 U	25 U	39 U	24 U	38 U
Isobutyl Mercaptan	513-44-0	22 U	41 U	27 U	40 U	25 U	40 U	27 U	42 U	25 U	41 U
Diethyl Sulfide	352-93-2	22 U	41 U	27 U	40 U	25 U	40 U	27 U	42 U	25 U	41 U
n-Butyl Mercaptan	109-79-5	22 U	41 U	27 U	40 U	25 U	40 U	27 U	42 U	25 U	41 U
Dimethyl Disulfide	624-92-0	11 U	21 U	14 U	21 U	13 U	21 U	14 U	22 U	13 U	21 U
3-Methylthiophene	616-44-4	24 U	44 U	29 U	43 U	27 U	44 U	29 U	46 U	28 U	44 U
Tetrahydrothiophene	110-01-0	21 U	40 U	26 U	39 U	24 U	39 U	26 U	41 U	25 U	40 U
2,5-Dimethylthiophene	638-02-8	27 U	50 U	33 U	50 U	31 U	50 U	34 U	53 U	32 U	51 U
2-Ethylthiophene	872-55-9	27 U	50 U	33 U	50 U	31 U	50 U	34 U	53 U	32 U	51 U
Diethyl Disulfide	110-81-6	15 U	27 U	18 U	27 U	17 U	27 U	18 U	29 U	17 U	28 U
EPA TO-15 Modified (µg/m^3)											
Propene	115-07-1	**1.3**	**3.4**	**800**	**870**	**800**	**1,200**	**500**	**1,500**	**800**	**1,200**
Dichlorodifluoromethane (CFC 12)	75-71-8	**2.2**	**2.1**	**110**	**53**	**970**	**1,100**	**1,100**	**4,100**	**1,600**	**1,500**
Chloromethane	74-87-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,2-Dichloro-1,1,2,2-Tetrafluoroethane (CFC 114)	76-14-2	0.60 U	1.1 U	**1,400**	**1,100**	**1,100**	**1,300**	**980**	**2,900**	**980**	**1,200**
Vinyl Chloride	75-01-4	0.60 U	1.1 U	**90**	**78**	**6,600**	**11,000**	**3,700**	**9,400**	**3,900**	**5,400**
1,3-Butadiene	106-99-0	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Bromomethane	74-83-9	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Chloroethane	75-00-3	0.60 U	1.1 U	37 U	**26**	170 U	**83**	150 U	57 U	69 U	37 U
Ethanol	64-17-5	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	690 U	370 U
Acetonitrile	75-05-8	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Acrolein	107-02-8	2.4 U	4.4 U	150 U	43 U	670 U	220 U	590 U	230 U	280 U	150 U
Acetone	67-64-1	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	**4,200**	**970**
Trichlorofluoromethane	75-69-4	**1.1**	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	**510**	**430**
2-Propanol (Isopropyl Alcohol)	67-63-0	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	**1,700**	370 U
Acrylonitrile	107-13-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,1-Dichloroethene	75-35-4	0.60 U	1.1 U	37 U	**11**	170 U	55 U	150 U	57 U	**99**	**81**
Methylene Chloride	75-09-2	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	**110**	**85**
3-Chloro-1-propene (Allyl Chloride)	107-05-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Trichlorotrifluoroethane	76-13-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Carbon Disulfide	75-15-0	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	690 U	370 U
trans-1,2-Dichloroethene	156-60-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	**150**	**120**
1,1-Dichloroethane	75-34-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Methyl tert-Butyl Ether	1634-04-4	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Vinyl Acetate	108-05-4	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	690 U	370 U
2-Butanone (MEK)	78-93-3	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	**5,500**	**1,500**
cis-1,2-Dichloroethene	156-59-2	0.60 U	1.1 U	37 U	**21**	**1,500**	**380**	**970**	**97**	**5,100**	**2,800**
Ethyl Acetate	141-78-6	1.2 U	**3.3**	73 U	22 U	340 U	110 U	290 U	110 U	140 U	74 U
n-Hexane	110-54-3	0.60 U	1.1 U	**830**	**920**	**820**	**840**	**400**	**620**	**660**	**580**
Chloroform	67-66-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Tetrahydrofuran (THF)	109-99-9	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	**1,100**	**910**
1,2-Dichloroethane	107-06-2	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,1,1-Trichloroethane	71-55-6	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Benzene	71-43-2	**0.60**	1.1 U	**78**	**70**	**410**	**450**	**220**	**490**	**370**	**340**
Carbon Tetrachloride	56-23-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Cyclohexane	110-82-7	1.2 U	2.2 U	**1,800**	**2,200**	**2,800**	**3,000**	**320**	**410**	**580**	**500**
1,2-Dichloropropane	78-87-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Bromodichloromethane	75-27-4	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Trichloroethene	79-01-6	0.60 U	1.1 U	37 U	**19**	170 U	**77**	150 U	57 U	**460**	**450**
1,4-Dioxane	123-91-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Methyl Methacrylate	80-62-6	1.2 U	2.2 U	73 U	22 U	340 U	110 U	290 U	110 U	140 U	74 U
n-Heptane	142-82-5	0.60 U	1.1 U	**2,200**	**3,100**	**2,000**	**2,400**	**490**	**920**	**2,000**	**1,900**
cis-1,3-Dichloropropene	10061-01-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
4-Methyl-2-pentanone	108-10-1	0.60 U	1.1 U	37 U	11 U	170 U	**78**	150 U	57 U	**1,000**	**630**
trans-1,3-Dichloropropene	10061-02-6	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,1,2-Trichloroethane	79-00-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Toluene	108-88-3	**2.2**	1.1 U	**110**	**54**	**1,900**	**1,400**	**260**	**550**	**8,400**	**6,300**
2-Hexanone	591-78-6	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Dibromochloromethane	124-48-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,2-Dibromoethane	106-93-4	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
n-Butyl Acetate	123-86-4	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
n-Octane	111-65-9	0.60 U	1.1 U	**490**	**260**	**1,700**	**1,900**	**320**	**1,800**	**1,800**	**1,500**
Tetrachloroethene	127-18-4	0.60 U	1.1 U	37 U	11 U	170 U	**67**	**230**	57 U	**810**	**640**
Chlorobenzene	108-90-7	0.60 U	1.1 U	37 U	**190**	170 U	55 U	150 U	57 U	**96**	37 U
Ethylbenzene	100-41-4	0.60 U	1.1 U	**38**	**62**	**3,800**	**4,200**	150 U	**910**	**4,500**	**3,800**
m,p-Xylenes	179601-23-1	1.2 U	2.2 U	**1,200**	**440**	**7,600**	**8,600**	290 U	**2,200**	**8,600**	**7,400**
Bromoform	75-25-2	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Styrene	100-42-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	**160**	**96**
o-Xylene	95-47-6	0.60 U	1.1 U	**430**	**130**	**2,800**	**3,200**	150 U	**910**	**2,200**	**1,800**
n-Nonane	111-84-2	0.60 U	1.1 U	**140**	**200**	**13,000**	**15,000**	**480**	**9,800**	**3,200**	**3,200**
1,1,2,2-Tetrachloroethane	79-34-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Cumene	98-82-8	0.60 U	1.1 U	37 U	**300**	**690**	**780**	150 U	**240**	**750**	**550**
alpha-Pinene	80-56-8	0.60 U	1.1 U	**110**	**65**	**1,200**	**1,300**	150 U	**1,300**	**4,100**	**4,300**
n-Propylbenzene	103-65-1	0.60 U	1.1 U	37 U	**170**	**1,000**	**1,300**	150 U	**240**	**690**	**560**
4-Ethyltoluene	622-96-8	0.60 U	1.1 U	**51**	**28**	**470**	**570**	150 U	**91**	**290**	**260**
1,3,5-Trimethylbenzene	108-67-8	0.60 U	1.1 U	**220**	**110**	**1,500**	**1,800**	150 U	**520**	**550**	**450**
1,2,4-Trimethylbenzene	95-63-6	0.60 U	1.1 U	**260**	**270**	**3,400**	**3,800**	150 U	**920**	**1,500**	**1,300**
Benzyl Chloride	100-44-7	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,3-Dichlorobenzene	541-73-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,4-Dichlorobenzene	106-46-7	0.60 U	1.1 U	**61**	**100**	170 U	**69**	150 U	57 U	69 U	37 U
1,2-Dichlorobenzene	95-50-1	0.60 U	1.1 U	37 U	**22**	170 U	**79**	150 U	**76**	69 U	37 U
d-Limonene	5989-27-5	0.60 U	1.1 U	37 U	11 U	**620**	**620**	150 U	**90**	**8,000**	**6,900**
1,2-Dibromo-3-chloropropane	96-12-8	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,2,4-Trichlorobenzene	120-82-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Naphthalene	91-20-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Hexachlorobutadiene	87-68-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U

Nondetected compound show the method detection limit (MDL) as the reporting limit.

J = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

J1 = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.

U = Indicates the compound was not detected at the reported concentration.

Bold = Detected compound.

Box = Exceedance of screening level.

NA = Not analyzed.

EPA = U.S. Environmental Protection Agency

µg/m³ = micrograms per cubic meter

SIM = selected ion monitoring

Table 3
Scenario 1: Total LFG and Methane Production
Transportation Corridor
Yakima, Washington

Year	Total landfill gas (av ft^3/min)			Methane (av ft^3/min)		
	Wood Debris	MSW	Combined	Wood Debris	MSW	Combined
2017	1.01E+02	1.12E+02	2.13E+02	4.24E+01	4.69E+01	8.93E+01
2018	9.99E+01	1.09E+02	2.09E+02	4.20E+01	4.60E+01	8.80E+01
2019	9.90E+01	1.07E+02	2.06E+02	4.16E+01	4.51E+01	8.66E+01
2020	9.80E+01	1.05E+02	2.03E+02	4.11E+01	4.42E+01	8.53E+01
2021	9.70E+01	1.03E+02	2.00E+02	4.07E+01	4.33E+01	8.40E+01
2022	9.60E+01	1.01E+02	1.97E+02	4.03E+01	4.24E+01	8.28E+01
2023	9.51E+01	9.91E+01	1.94E+02	3.99E+01	4.16E+01	8.15E+01
2024	9.41E+01	9.71E+01	1.91E+02	3.95E+01	4.08E+01	8.03E+01
2025	9.32E+01	9.52E+01	1.88E+02	3.91E+01	4.00E+01	7.91E+01
2026	9.23E+01	9.33E+01	1.86E+02	3.87E+01	3.92E+01	7.79E+01
2027	9.13E+01	9.14E+01	1.83E+02	3.84E+01	3.84E+01	7.68E+01
2028	9.04E+01	8.96E+01	1.80E+02	3.80E+01	3.76E+01	7.56E+01
2029	8.95E+01	8.79E+01	1.77E+02	3.76E+01	3.69E+01	7.45E+01
2030	8.86E+01	8.61E+01	1.75E+02	3.72E+01	3.62E+01	7.34E+01
2031	8.78E+01	8.44E+01	1.72E+02	3.69E+01	3.55E+01	7.23E+01
2032	8.69E+01	8.27E+01	1.70E+02	3.65E+01	3.48E+01	7.12E+01
2033	8.60E+01	8.11E+01	1.67E+02	3.61E+01	3.41E+01	7.02E+01
2034	8.52E+01	7.95E+01	1.65E+02	3.58E+01	3.34E+01	6.92E+01
2035	8.43E+01	7.79E+01	1.62E+02	3.54E+01	3.27E+01	6.81E+01
2036	8.35E+01	7.64E+01	1.60E+02	3.51E+01	3.21E+01	6.71E+01
2037	8.27E+01	7.49E+01	1.58E+02	3.47E+01	3.14E+01	6.62E+01
2038	8.18E+01	7.34E+01	1.55E+02	3.44E+01	3.08E+01	6.52E+01
2039	8.10E+01	7.19E+01	1.53E+02	3.40E+01	3.02E+01	6.42E+01
2040	8.02E+01	7.05E+01	1.51E+02	3.37E+01	2.96E+01	6.33E+01
2041	7.94E+01	6.91E+01	1.49E+02	3.34E+01	2.90E+01	6.24E+01
2042	7.86E+01	6.77E+01	1.46E+02	3.30E+01	2.85E+01	6.15E+01
2043	7.78E+01	6.64E+01	1.44E+02	3.27E+01	2.79E+01	6.06E+01
2044	7.71E+01	6.51E+01	1.42E+02	3.24E+01	2.73E+01	5.97E+01
2045	7.63E+01	6.38E+01	1.40E+02	3.20E+01	2.68E+01	5.88E+01
2046	7.55E+01	6.25E+01	1.38E+02	3.17E+01	2.63E+01	5.80E+01
2047	7.48E+01	6.13E+01	1.36E+02	3.14E+01	2.57E+01	5.72E+01
2048	7.40E+01	6.01E+01	1.34E+02	3.11E+01	2.52E+01	5.63E+01
2049	7.33E+01	5.89E+01	1.32E+02	3.08E+01	2.47E+01	5.55E+01
2050	7.26E+01	5.77E+01	1.30E+02	3.05E+01	2.42E+01	5.47E+01
2051	7.19E+01	5.66E+01	1.28E+02	3.02E+01	2.38E+01	5.39E+01
2052	7.11E+01	5.55E+01	1.27E+02	2.99E+01	2.33E+01	5.32E+01
2053	7.04E+01	5.44E+01	1.25E+02	2.96E+01	2.28E+01	5.24E+01
2054	6.97E+01	5.33E+01	1.23E+02	2.93E+01	2.24E+01	5.17E+01
2055	6.90E+01	5.22E+01	1.21E+02	2.90E+01	2.19E+01	5.09E+01
2056	6.83E+01	5.12E+01	1.20E+02	2.87E+01	2.15E+01	5.02E+01
2057	6.77E+01	5.02E+01	1.18E+02	2.84E+01	2.11E+01	4.95E+01
2058	6.70E+01	4.92E+01	1.16E+02	2.81E+01	2.07E+01	4.88E+01
2059	6.63E+01	4.82E+01	1.15E+02	2.79E+01	2.03E+01	4.81E+01
2060	6.57E+01	4.73E+01	1.13E+02	2.76E+01	1.99E+01	4.74E+01

Table 4
Scenario 2: Total LFG and Methane Production
Transportation Corridor
Yakima, Washington

Year	Total landfill gas (av ft^3/min)			Methane (av ft^3/min)		
	Wood Debris	MSW	Combined	Wood Debris	MSW	Combined
2017	9.76E+01	7.96E+01	1.77E+02	4.10E+01	3.34E+01	7.44E+01
2018	9.66E+01	7.80E+01	1.75E+02	4.06E+01	3.28E+01	7.33E+01
2019	9.57E+01	7.64E+01	1.72E+02	4.02E+01	3.21E+01	7.23E+01
2020	9.47E+01	7.49E+01	1.70E+02	3.98E+01	3.15E+01	7.13E+01
2021	9.38E+01	7.34E+01	1.67E+02	3.94E+01	3.08E+01	7.02E+01
2022	9.29E+01	7.20E+01	1.65E+02	3.90E+01	3.02E+01	6.92E+01
2023	9.19E+01	7.06E+01	1.62E+02	3.86E+01	2.96E+01	6.82E+01
2024	9.10E+01	6.92E+01	1.60E+02	3.82E+01	2.91E+01	6.73E+01
2025	9.01E+01	6.78E+01	1.58E+02	3.78E+01	2.85E+01	6.63E+01
2026	8.92E+01	6.65E+01	1.56E+02	3.75E+01	2.79E+01	6.54E+01
2027	8.83E+01	6.51E+01	1.53E+02	3.71E+01	2.74E+01	6.45E+01
2028	8.74E+01	6.39E+01	1.51E+02	3.67E+01	2.68E+01	6.35E+01
2029	8.66E+01	6.26E+01	1.49E+02	3.64E+01	2.63E+01	6.26E+01
2030	8.57E+01	6.14E+01	1.47E+02	3.60E+01	2.58E+01	6.18E+01
2031	8.49E+01	6.01E+01	1.45E+02	3.56E+01	2.53E+01	6.09E+01
2032	8.40E+01	5.89E+01	1.43E+02	3.53E+01	2.48E+01	6.00E+01
2033	8.32E+01	5.78E+01	1.41E+02	3.49E+01	2.43E+01	5.92E+01
2034	8.24E+01	5.66E+01	1.39E+02	3.46E+01	2.38E+01	5.84E+01
2035	8.15E+01	5.55E+01	1.37E+02	3.42E+01	2.33E+01	5.76E+01
2036	8.07E+01	5.44E+01	1.35E+02	3.39E+01	2.29E+01	5.68E+01
2037	7.99E+01	5.33E+01	1.33E+02	3.36E+01	2.24E+01	5.60E+01
2038	7.91E+01	5.23E+01	1.31E+02	3.32E+01	2.20E+01	5.52E+01
2039	7.83E+01	5.12E+01	1.30E+02	3.29E+01	2.15E+01	5.44E+01
2040	7.76E+01	5.02E+01	1.28E+02	3.26E+01	2.11E+01	5.37E+01
2041	7.68E+01	4.92E+01	1.26E+02	3.23E+01	2.07E+01	5.29E+01
2042	7.60E+01	4.83E+01	1.24E+02	3.19E+01	2.03E+01	5.22E+01
2043	7.53E+01	4.73E+01	1.23E+02	3.16E+01	1.99E+01	5.15E+01
2044	7.45E+01	4.64E+01	1.21E+02	3.13E+01	1.95E+01	5.08E+01
2045	7.38E+01	4.54E+01	1.19E+02	3.10E+01	1.91E+01	5.01E+01
2046	7.30E+01	4.45E+01	1.18E+02	3.07E+01	1.87E+01	4.94E+01
2047	7.23E+01	4.37E+01	1.16E+02	3.04E+01	1.83E+01	4.87E+01
2048	7.16E+01	4.28E+01	1.14E+02	3.01E+01	1.80E+01	4.80E+01
2049	7.09E+01	4.20E+01	1.13E+02	2.98E+01	1.76E+01	4.74E+01
2050	7.02E+01	4.11E+01	1.11E+02	2.95E+01	1.73E+01	4.67E+01
2051	6.95E+01	4.03E+01	1.10E+02	2.92E+01	1.69E+01	4.61E+01
2052	6.88E+01	3.95E+01	1.08E+02	2.89E+01	1.66E+01	4.55E+01
2053	6.81E+01	3.87E+01	1.07E+02	2.86E+01	1.63E+01	4.49E+01
2054	6.74E+01	3.80E+01	1.05E+02	2.83E+01	1.59E+01	4.43E+01
2055	6.68E+01	3.72E+01	1.04E+02	2.80E+01	1.56E+01	4.37E+01
2056	6.61E+01	3.65E+01	1.03E+02	2.78E+01	1.53E+01	4.31E+01
2057	6.54E+01	3.58E+01	1.01E+02	2.75E+01	1.50E+01	4.25E+01
2058	6.48E+01	3.50E+01	9.98E+01	2.72E+01	1.47E+01	4.19E+01
2059	6.41E+01	3.43E+01	9.85E+01	2.69E+01	1.44E+01	4.14E+01
2060	6.35E+01	3.37E+01	9.72E+01	2.67E+01	1.41E+01	4.08E+01

APPENDIX A

Landfill Gas Probe Logs

Recent Explorations

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL(1)	TYPICAL DESCRIPTIONS (2)(3)
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)	▨	**GW**	Well-graded gravel; gravel/sand mixture(s); little or no fines
			▨	**GP**	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)	▨	**GM**	Silty gravel; gravel/sand/silt mixture(s)
			▨	**GC**	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)	▨	**SW**	Well-graded sand; gravelly sand; little or no fines
			▨	**SP**	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)	▨	**SM**	Silty sand; sand/silt mixture(s)
			▨	**SC**	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)		▨	**ML**	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
			▨	**CL**	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
			▨	**OL**	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)		▨	**MH**	Inorganic silt; micaceous or diatomaceous fine sand
			▨	**CH**	Inorganic clay of high plasticity; fat clay
			▨	**OH**	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL		▨	**PT**	Peat; humus; swamp soil with high organic content

OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT	■ ▨	**AC** or **PC**	Asphalt concrete pavement or Portland cement pavement
ROCK	▨	**RK**	Rock (See Rock Classification)
WOOD	▨	**WD**	Wood, lumber, wood chips
DEBRIS	▨	**DB**	Construction debris, garbage

Notes:
1. USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.
2. Soil descriptions are based on the general approach presented in the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the Standard Test Method for Classification of Soils for Engineering Purposes, as outlined in ASTM D 2487.
3. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

   Primary Constituent: > 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
   Secondary Constituents: > 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.
   > 15% and ≤ 30% - "gravelly," "sandy," "silty," etc.
   Additional Constituents: > 5% and ≤ 15% - "with gravel," "with sand," "with silt," etc.
   ≤ 5% - "with trace gravel," "with trace sand," "with trace silt," etc., or not noted.

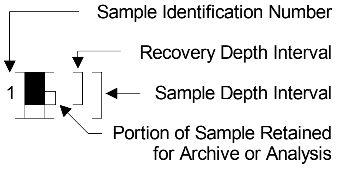
4. Soil density or consistency descriptions are based on judgement using a combination of sampler penetration blow counts, drilling or excavating conditions, field tests, and laboratory tests, as appropriate.

Drilling and Sampling Key

SAMPLER TYPE

Code	Description
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon
c	Shelby Tube
d	Grab Sample
e	Single-Tube Core Barrel
f	Double-Tube Core Barrel
g	2.50-inch O.D., 2.00-inch I.D. WSDOT
h	3.00-inch O.D., 2.375-inch I.D. Mod. California
i	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Vibrocore (Rotosonic/Geoprobe)
5	Other - See text if applicable

SAMPLE NUMBER & INTERVAL



Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

Groundwater

▽	Approximate water level at time of drilling (ATD)
▼	Approximate water level at time other than ATD

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Soil Classification System and Key

Figure
A-1

GP-32

SAMPLE DATA					SOIL PROFILE		
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	
0						SP-SM	SAND with cobbles and silt with increasing cobbles at 6 feet (unable to collect SS samples)
10							

Drilling Method: Hollow-stem Auger

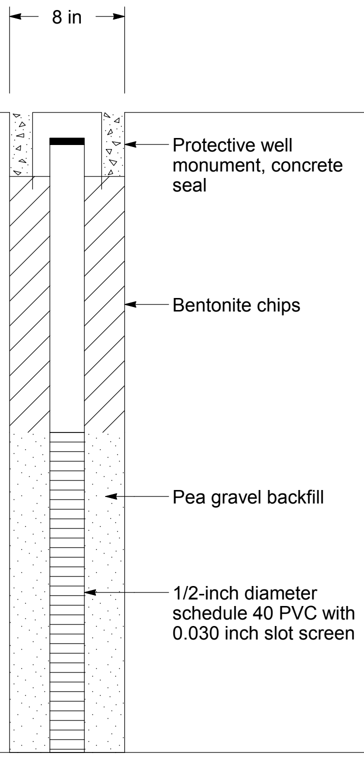
Ground Elevation (ft): 1071.53

GROUNDWATER

Water Level

Groundwater not encountered.

Monitoring Well Detail
(DOE#: BJY282)



Boring Completed 10/12/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-32

Figure
A-2

GP-33

SAMPLE DATA

Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
S-1	a1	11	N = 11

SOIL PROFILE

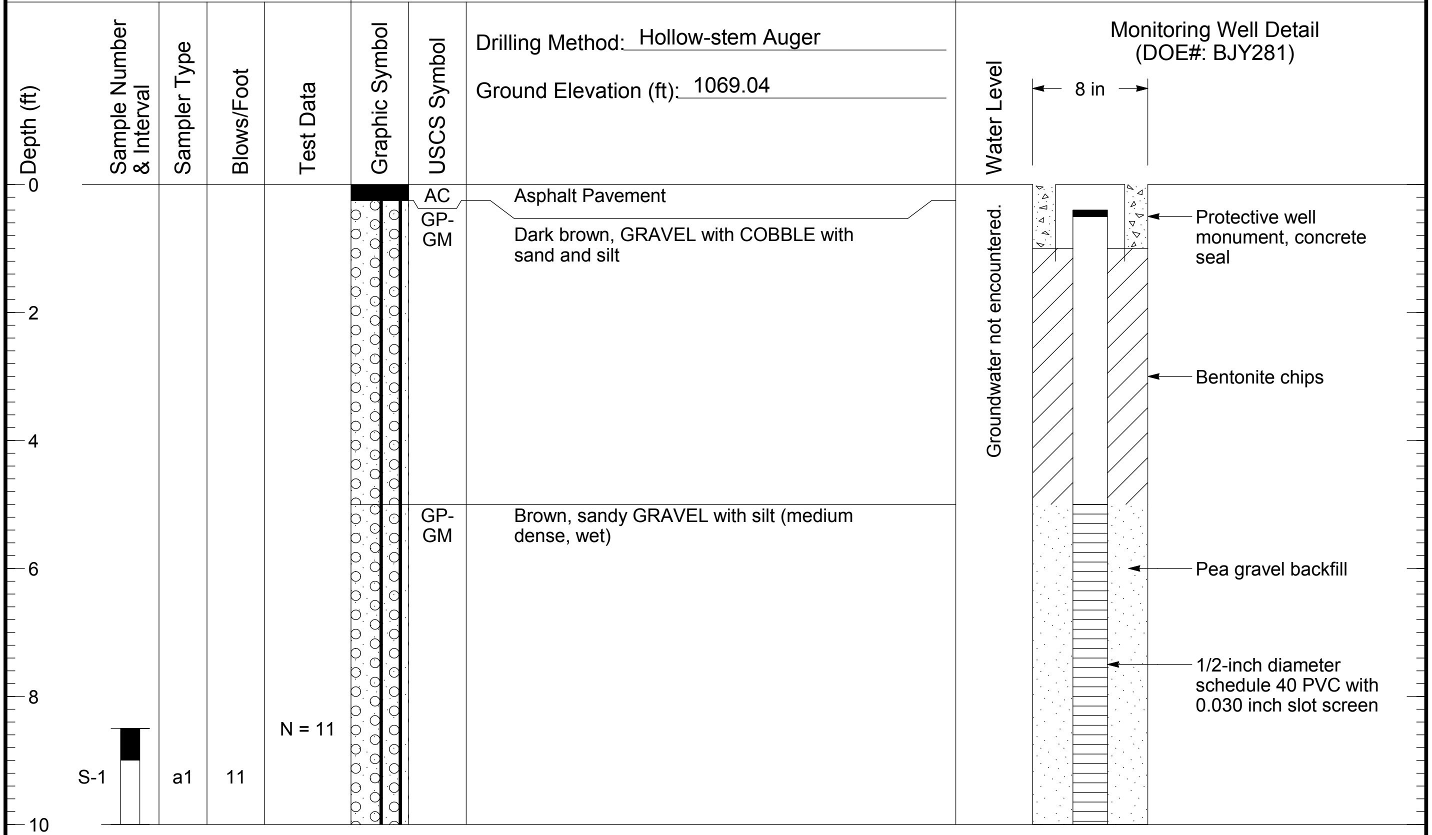
Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1069.04

USCS Symbol	
AC	Asphalt Pavement
GP-GM	Dark brown, GRAVEL with COBBLE with sand and silt
GP-GM	Brown, sandy GRAVEL with silt (medium dense, wet)

GROUNDWATER

Monitoring Well Detail (DOE#: BJY281)



Boring Completed 10/12/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

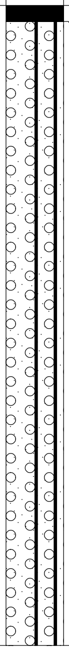
Log of Monitoring Well GP-33

Figure
A-3

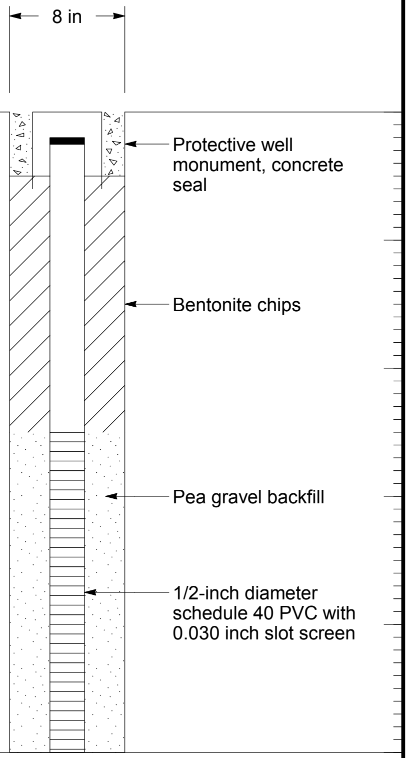
GP-34

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Drilling Method: Hollow-stem Auger Ground Elevation (ft): 1069.30	Water Level
					AC	Asphalt Pavement	Groundwater not encountered.
					GP-GM	Brown, GRAVEL with COBBLE with sand and silt (unable to collect SS samples)	

Depth (ft): 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20



Monitoring Well Detail
(DOE#: BJY280)



Boring Completed 10/12/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-34

Figure
A-4

GP-35

Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1064.56

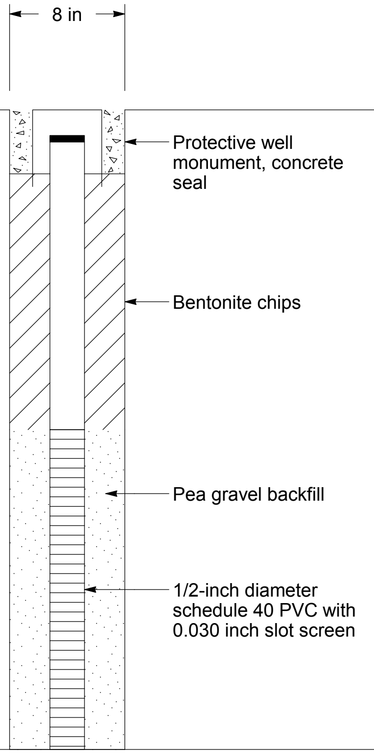
SAMPLE DATA					SOIL PROFILE		
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	
0						WD	Reddish brown, WOOD debris (dense, moist)
4	S-1	a1	32	PID=15; LEL=6; N = 32			
6						GP-GM	Brown, GRAVEL with COBBLE with sand and silt (unable to collect SS sample)
10							

Boring Completed 10/11/16
Total Depth of Boring = 10.0 ft.

GROUNDWATER

Water Level: Groundwater not encountered.

Monitoring Well Detail
(DOE#: BJY278)



Monitoring Well Completed 10/11/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project Yakima, Washington	Log of Monitoring Well GP-35	Figure A-5

GP-36

SAMPLE DATA | SOIL PROFILE | GROUNDWATER

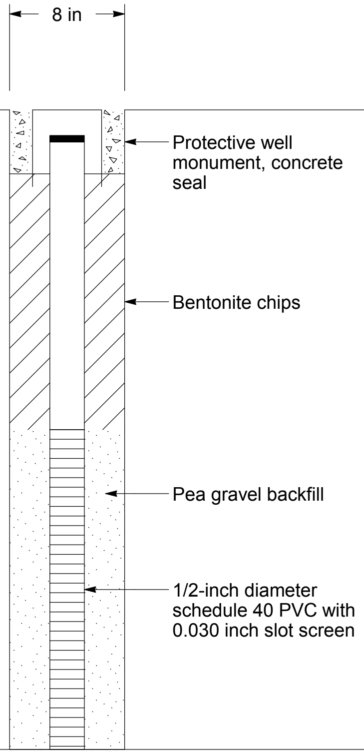
Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1064.53

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	USCS Symbol	Description	Water Level
0					SP-SM	Brown, very gravelly, fine SAND with silt with wood debris (unable to collect SS samples)	Groundwater not encountered.
4	S-1	a1		PID=13; LEL=0			
6					ML	Brown to gray, sandy SILT with wood debris and gravel (unable to collect SS samples)	
8	S-2	a1					
10							

Boring Completed 10/12/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Detail
(DOE#: BJY279)



Monitoring Well Completed 10/12/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-36

Figure
A-6

GP-37

Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1065.82

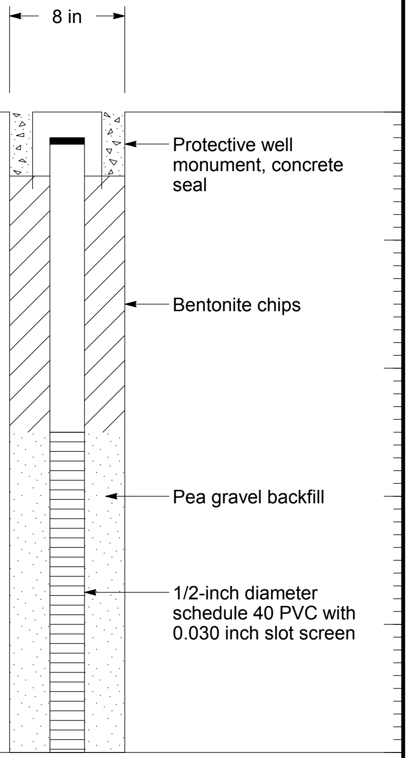
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	USCS Symbol	SOIL PROFILE
0					WD	Brown, WOOD debris (fine to coarse size) (loose to medium dense, damp)
	S-1	a1	15	PID=1; LEL=5; N = 15		
	S-2	a1	9	PID=10.4; LEL=7; N = 5		

Boring Completed 10/11/16
Total Depth of Boring = 10.0 ft.

GROUNDWATER

Water Level: Groundwater not encountered.

Monitoring Well Detail
(DOE#: BJY277)



Monitoring Well Completed 10/11/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-37

Figure
A-7

GP-38

SAMPLE DATA

Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
S-1	a1	15	PID=4.4; N = 15
S-2	a1	6	PID=9.7; LEL=5; N = 6

SOIL PROFILE

Drilling Method: Hollow-stem Auger

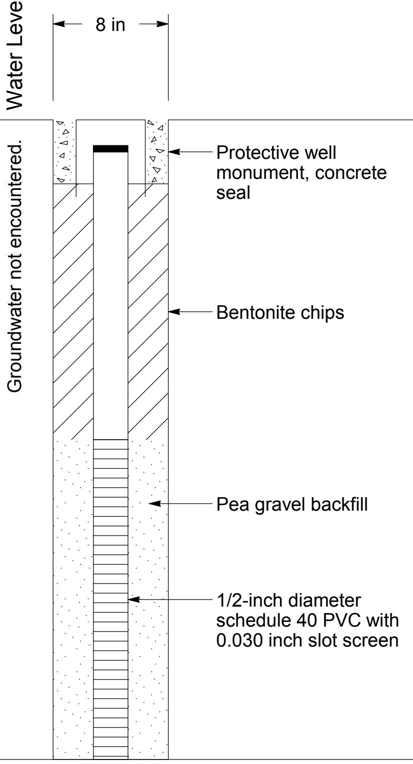
Ground Elevation (ft): 1058.49

USCS Symbol	Description
SM	Brown, fine SAND with gravel and silt (medium dense, damp)
DB	MUNICIPAL SOLID WASTE (medium stiff, damp)

GROUNDWATER

Water Level: Groundwater not encountered.

Monitoring Well Detail
(DOE#: BJY276)



Depth (ft): 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Boring Completed 10/11/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-38

Figure
A-8

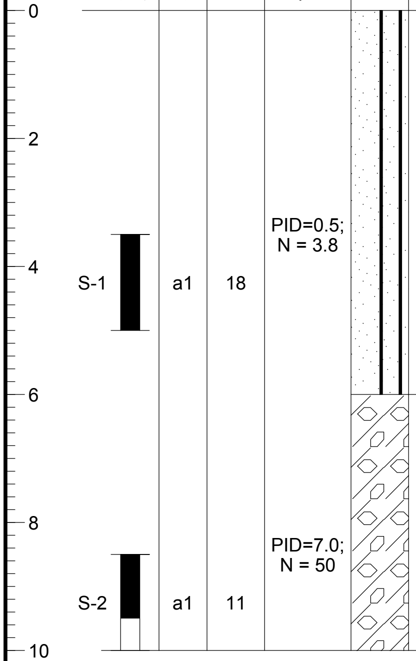
GP-39

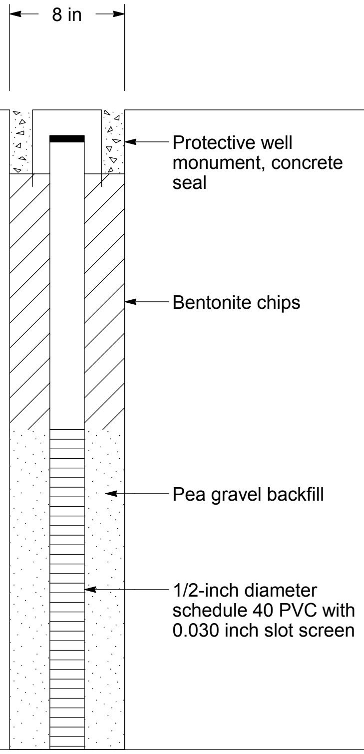
Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1059.83

Monitoring Well Detail
(DOE#: BJY275)

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol		Water Level
0						SP-SM	Gray, fine SAND with silt (medium dense, damp)	Groundwater not encountered.
4	S-1	a1	18	PID=0.5; N = 3.8			- wood debris at 4.5 feet	
6						DB	MUNICIPAL SOLID WASTE (stiff, damp)	
	S-2	a1	11	PID=7.0; N = 50				





Boring Completed 10/11/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-39

Figure
A-9

GP-40

SAMPLE DATA

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
3.5–5	S-1	a1	38	PID=3.7
8.5–10	S-2	a1	50/ 6"	

SOIL PROFILE

Drilling Method: Hollow-stem Auger

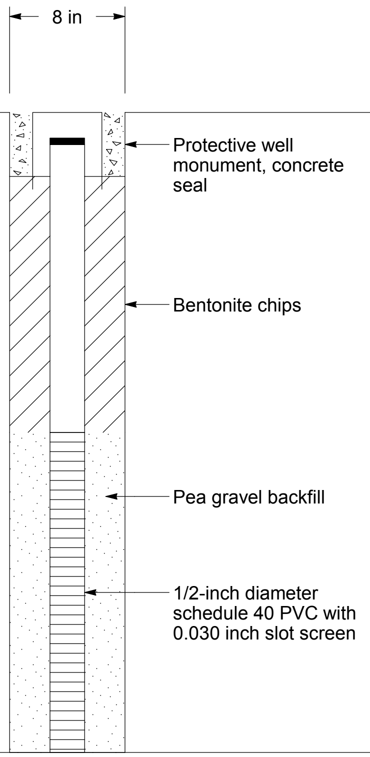
Ground Elevation (ft): 1063.53

Depth (ft)	USCS Symbol	Description
0–6.5	WD	Brown, WOOD debris (fine to coarse size) (dense, damp)
6.5–10	DB	MUNICIPAL SOLID WASTE (hard, damp)

GROUNDWATER

Water Level: Groundwater not encountered.

Monitoring Well Detail
(DOE#: BJY274)



Boring Completed 10/11/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-40

Figure
A-10

GP-41

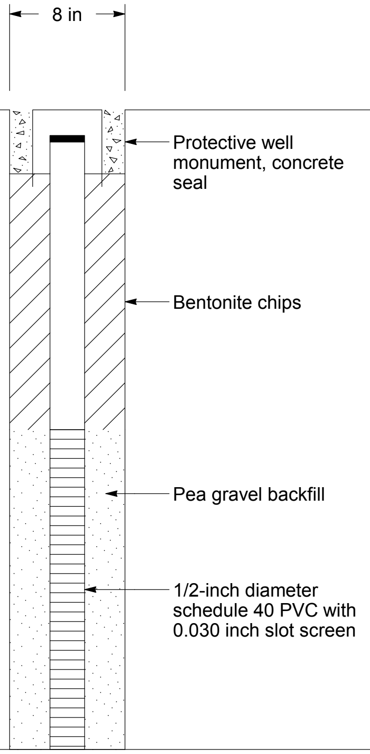
SAMPLE DATA | SOIL PROFILE | GROUNDWATER

Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1063.24

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol		Water Level
0						DB	MUNICIPAL SOLID WASTE (very stiff, damp)	Groundwater not encountered.
4	S-1	a1	21	N = 21				
9	S-2	a1	26	PID=1; N = 26				
10								

Monitoring Well Detail
(DOE#: BJY273)



Boring Completed 10/10/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/10/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-41

Figure
A-11

GP-42

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

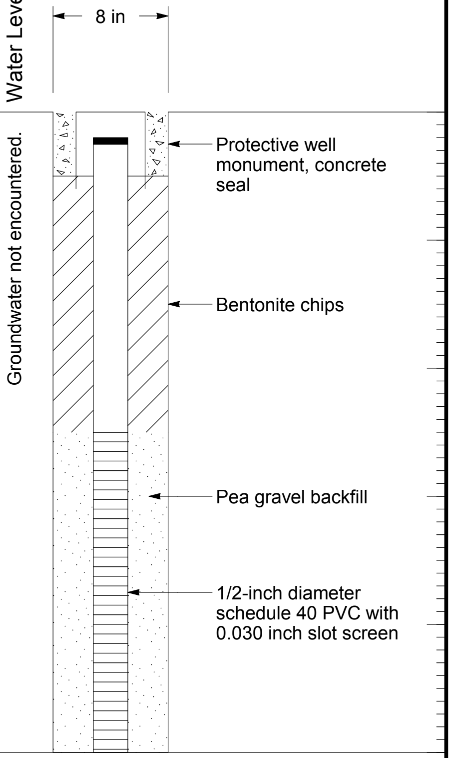
Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1063.03

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	USCS Symbol	Description
0					SM	Brown, SAND with silt and gravel to very silty, fine SAND with wood debris (medium dense, dry)
4.5–6	S-1	a1	11	N = 11		
7					SP-SM	Gray, SAND with silt and gravel (medium dense, damp)
8–9.5	S-2	a1	20	N = 20		
10						

Water Level: Groundwater not encountered.

Monitoring Well Detail
(DOE#: BJY272)

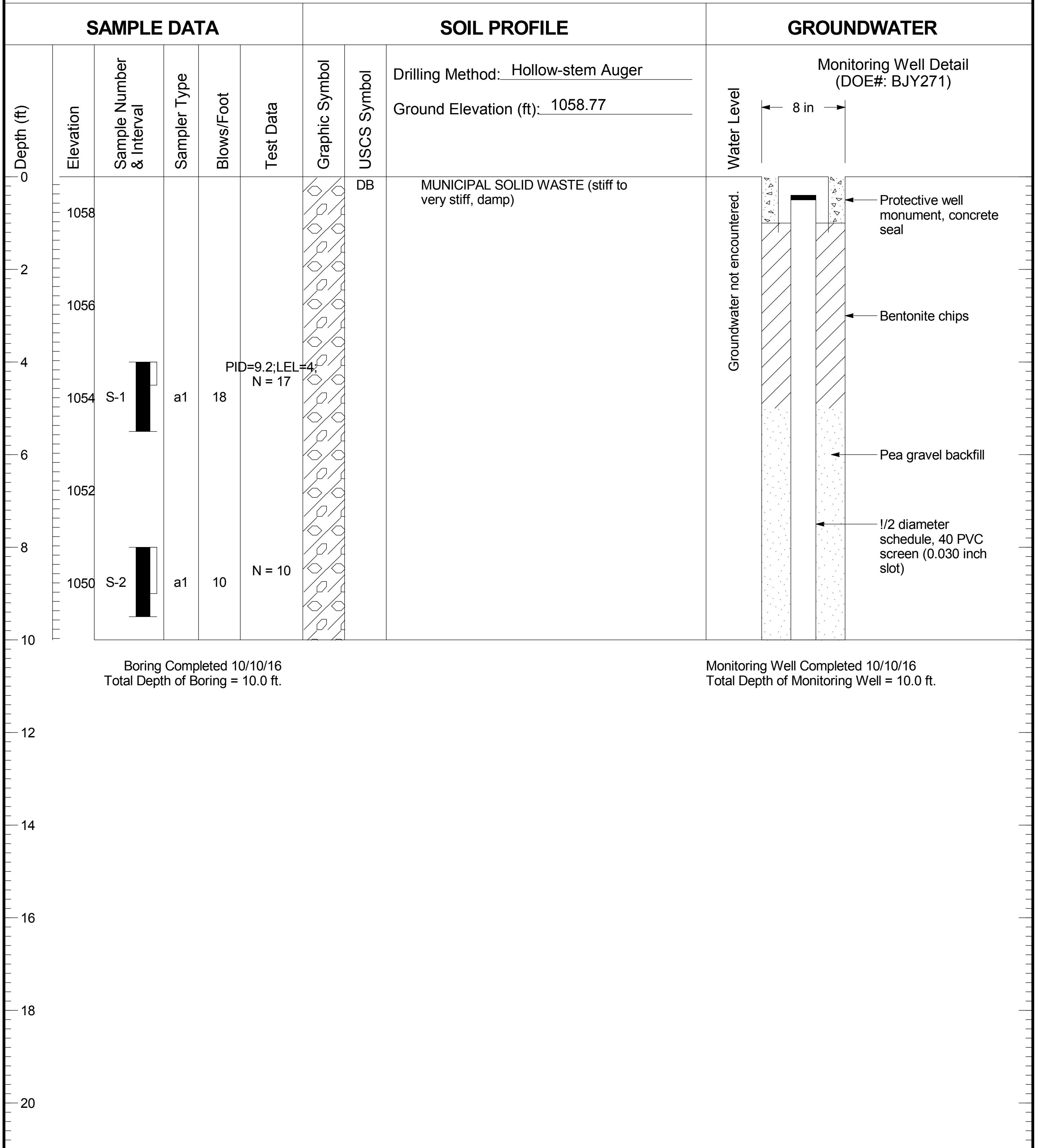


Boring Completed 10/11/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

GP-43



Boring Completed 10/10/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/10/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-43

Figure
A-13

GP-44

SAMPLE DATA

SOIL PROFILE

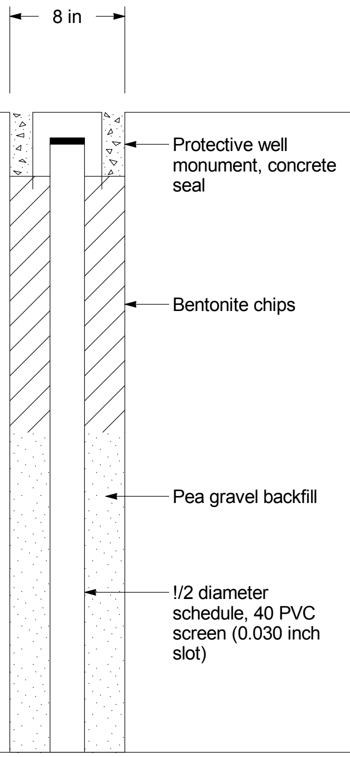
Drilling Method: Hollow-stem Auger

Ground Elevation (ft): 1059.03

GROUNDWATER

Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	USCS Symbol	Description	Water Level
0						SP-SM	Light brown, medium SAND with silt and trace gravel (unable to collect SS samples)	Groundwater not encountered.
	1058							
2								
	1056							
4								
	1054							
6								
	1052							
8								
	1050							
10								
12								
14								
16								
18								
20								

Monitoring Well Detail
(DOE#: BJY283)



Boring Completed 10/12/16
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16
Total Depth of Monitoring Well = 10.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Transportation Corridor Project
Yakima, Washington

Log of Monitoring Well GP-44

Figure
A-14

Previous Explorations

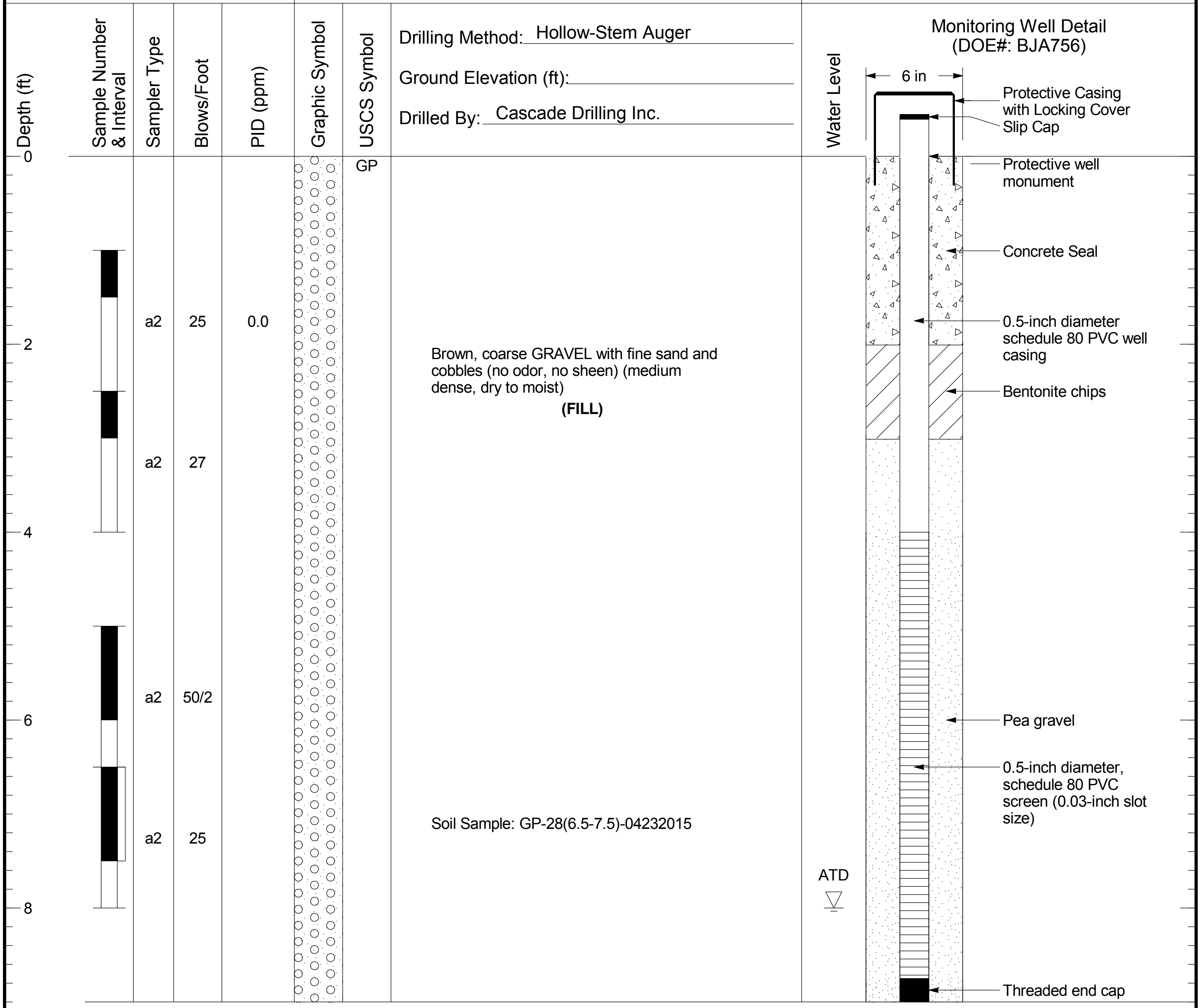
GP-28

SAMPLE DATA				SOIL PROFILE		GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	USCS Symbol	
0					GP	
~2		a2	25	0.0		
~3		a2	27			
~6		a2	50/2			
~7		a2	25			

Drilling Method: Hollow-Stem Auger

Ground Elevation (ft):

Drilled By: Cascade Drilling Inc.



Brown, coarse GRAVEL with fine sand and cobbles (no odor, no sheen) (medium dense, dry to moist)
(FILL)

Soil Sample: GP-28(6.5-7.5)-04232015

Boring Completed 04/23/15
Total Depth of Boring = 9.0 ft.

Monitoring Well Completed 04/23/15
Total Depth of Monitoring Well = 9.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1148008.03 7/29/15 N:\PROJECTS\1148008.030.GPJ WELL LOG

LANDAU ASSOCIATES

Closed City of Yakima Landfill
Yakima, Washington

Log of Monitoring Well GP-28

Figure
A-15

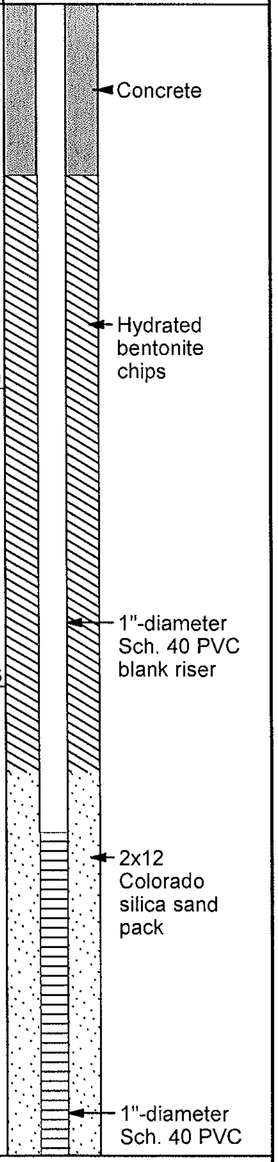
SLR
SLR International Corp
22122 20th Avenue SE
Bothell, Washington 98021
Telephone: 425.402.8800
Fax: 425.402.8488

PROBE NUMBER GP-5

CLIENT City of Yakima
PROJECT NAME Former City of Yakima Landfill
PROJECT NUMBER 001.0221.00004
PROJECT LOCATION Yakima, Washington
DATE STARTED 2/17/09 **COMPLETED** 2/17/09
GROUND ELEVATION 1063.51 ft **HOLE SIZE** 8.5" Diameter
DRILLING DRILLING CONTRACTOR Cascade Drilling
GROUND WATER LEVELS:
DRILLING DRILLING METHOD Hollow Stem Auger
∇ **AT TIME OF DRILLING** 17.0 ft / Elev 1046.5 ft
LOGGED BY B. Robinson **CHECKED BY**
AT END OF ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	INTERVAL	TYPE	NAME	RECOVERY %	BLOW COUNTS PER FOOT (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						SM		**SILTY SAND**, dark brown, some silt, little fine to medium well-rounded gravel, moist, organic, wood waste.	
2.5	☒	D&M		60	21			@ 3.0 feet: Becomes light olive brown, fine-grained, medium-dense sand, no gravel.	
4.5									1059.0
5.0	☒	D&M	GP5-S1	100	11	ML		**SANDY SILT**, olive gray, some fine-grained sand, trace organics, 1/2" lenses of brown organics, stiff.	
7.5								@ 7.0 feet: Becomes moist to wet and grades to SILTY SAND.	
8.0									1055.5
	☒	D&M	GP5-S2	80	39	GW		**SANDY GRAVEL**, olive gray, fine to coarse, rounded to well-rounded, some medium- to coarse-grained sand, dense, damp.	
10.0	☒	D&M	GP5-S3	45	53				
12.5	☒	D&M		20	50/6"			@ 12.5 feet: Broken cobble in sampler, no recovery.	

PROBE DIAGRAM



REMARKS

SS = Samples collected by using an 18-inch-long, 3.0-inch outside diameter Dames & Moore split-barrel sampler driven by a 300 lb. autohammer with a 24-inch drop.

∇ Water level at time of drilling.

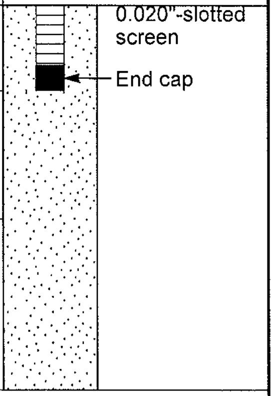
(Continued Next Page)

SLR
SLR International Corp
22122 20th Avenue SE
Bothell, Washington 98021
Telephone: 425.402.8800
Fax: 425.402.8488

PROBE NUMBER GP-5

CLIENT City of Yakima
PROJECT NAME Former City of Yakima Landfill
PROJECT NUMBER 001.0221.00004
PROJECT LOCATION Yakima, Washington

DEPTH (ft)	INTERVAL	TYPE	NAME	RECOVERY %	BLOW COUNTS PER FOOT (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	PROBE DIAGRAM
						GW	14.5	**SANDY GRAVEL**, olive gray, fine to coarse, rounded to well-rounded, some medium- to coarse-grained sand, dense, damp. *(continued)* 1049.0	
15.0	☒	D&M	GP5-S4	90	11	SP	16.0	**SAND**, olive gray, medium-grained, trace coarse-grained sand, trace fine gravel, loose, moist. 1047.5	
17.5						GW	18.0	**SANDY GRAVEL**, light olive brown, fine to coarse, well-rounded, some fine- to coarse-grained sand, very dense, moist. ▽ @ 17.0 feet: Becomes wet. @ 17.5 feet: Broken cobble in sampler, no recovery. 1045.5	
	☒	D&M		90	50/6"				



Boring completed at 18.0 feet.

SOIL VAPOR PROBE COMPLETION DETAILS:

+3.1 to 0 feet: 1"-diameter Sch. 40 PVC blank riser encased in an 8"-diameter protective steel monument set in concrete with three protective concrete-filled steel bollards.
0 to 9.7 feet: 1"-diameter Sch. 40 PVC blank riser.
9.7 to 14.2 feet: 1"-diameter Sch. 40 PVC 0.020"-slotted screen.
14.2 to 14.5 feet: 1"-diameter Sch. 40 PVC end cap.

0 to 2 feet: Concrete.
2 to 9 feet: Hydrated bentonite chips.
9 to 18 feet: 2x12 Colorado silica sand.

REMARKS

SS = Samples collected by using an 18-inch-long, 3.0-inch outside diameter Dames & Moore split-barrel sampler driven by a 300 lb. autohammer with a 24-inch drop.

▽ Water level at time of drilling.

SLR
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Bothell, Washington 98021
Telephone: 425.402.8800
Fax: 425.402.8488

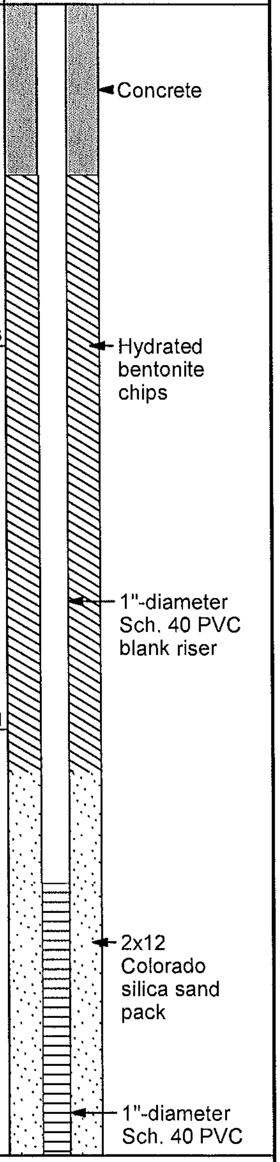
PROBE NUMBER GP-11

CLIENT City of Yakima
PROJECT NAME Former City of Yakima Landfill
PROJECT NUMBER 001.0221.00004
PROJECT LOCATION Yakima, Washington

DATE STARTED 2/19/09 **COMPLETED** 2/19/09
GROUND ELEVATION 1065.58 ft **HOLE SIZE** 8.5" Diameter
DRILLING DRILLING CONTRACTOR Cascade Drilling
GROUND WATER LEVELS:
DRILLING DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING Dry
LOGGED BY B. Robinson **CHECKED BY**
AT END OF ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	INTERVAL	TYPE	NAME	RECOVERY %	BLOW COUNTS PER FOOT (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0								**WOOD WASTE**, bark mulch, some silty sand, little gravel.
2.5								
4.0						SM		**SILTY SAND**, fine- to coarse-grained, some silt, little fine to coarse well-rounded gravel, few wood waste, medium dense, moist. 1061.6
5.0	☒	D&M		90	22			
7.5								
8.5								**WOOD WASTE**, reddish brown, bark mulch and wood chips, moist. 1057.1
10.0	☒	D&M		80	38			
12.5								

PROBE DIAGRAM



REMARKS

SS = Samples collected by using an 18-inch-long, 3.0-inch outside diameter Dames & Moore split-barrel sampler driven by a 300 lb. wireline hammer.

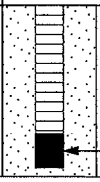
⊻ Water level at time of drilling.

(Continued Next Page)

PROBE NUMBER GP-11

PAGE 2 OF 2

CLIENT City of Yakima
PROJECT NAME Former City of Yakima Landfill
PROJECT NUMBER 001.0221.00004
PROJECT LOCATION Yakima, Washington

DEPTH (ft)	INTERVAL	TYPE	NAME	RECOVERY %	BLOW COUNTS PER FOOT (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	PROBE DIAGRAM
								WOOD WASTE, reddish brown, bark mulch and wood chips, moist. *(continued)*	 0.020"-slotted screen
15.0	☒	D&M			50/5"		15.5	@ 15.0 feet: Piece of wood caught in sampler, no recovery, moist. 1050.1	End cap

Boring completed at 15.5 feet.

SOIL VAPOR PROBE COMPLETION DETAILS:

+2.8 to 0 feet: 1"-diameter Sch. 40 PVC blank riser encased in an 8"-diameter protective steel monument set in concrete with three protective concrete-filled steel bollards.
0 to 10.3 feet: 1"-diameter Sch. 40 PVC blank riser.
10.3 to 15 feet: 1"-diameter Sch. 40 PVC 0.020"-slotted screen.
15 to 15.4 feet: 1"-diameter Sch. 40 PVC end cap.

0 to 2 feet: Concrete.
2 to 9 feet: Hydrated bentonite chips.
9 to 15.5 feet: 2x12 Colorado silica sand.

REMARKS

SS = Samples collected by using an 18-inch-long, 3.0-inch outside diameter Dames & Moore split-barrel sampler driven by a 300 lb. wireline hammer.

$\underline{\nabla}$ Water level at time of drilling.

SLR
SLR International Corp
22122 20th Avenue SE
Bothell, Washington 98021
Telephone: 425.402.8800
Fax: 425.402.8488

PROBE NUMBER GP-18

PAGE 1 OF 2

CLIENT City of Yakima

PROJECT NAME Former City of Yakima Landfill

PROJECT NUMBER 001.0221.00004

PROJECT LOCATION Yakima, Washington

DATE STARTED 4/17/09 **COMPLETED** 4/17/09

GROUND ELEVATION

HOLE SIZE 8.5" Diameter

DRILLING DRILLING CONTRACTOR Cascade Drilling

GROUND WATER LEVELS:

DRILLING DRILLING METHOD Hollow Stem Auger

AT TIME OF DRILLING ---

LOGGED BY C. Lee **CHECKED BY**

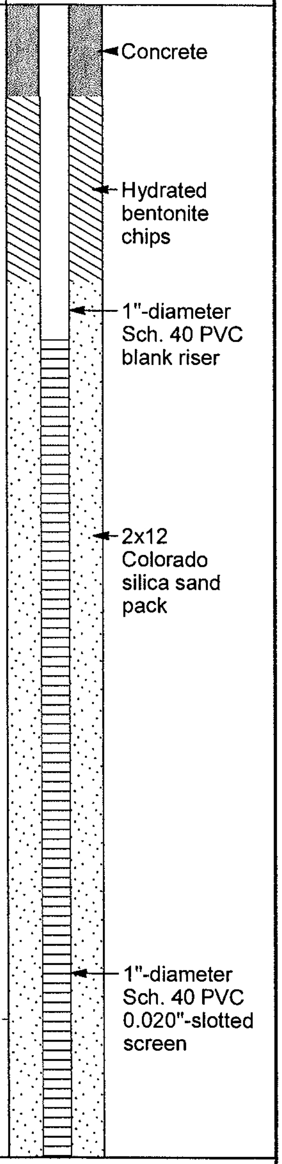
AT END OF ---

NOTES

AFTER DRILLING ---

DEPTH (ft)	INTERVAL	TYPE	NAME	RECOVERY %	BLOW COUNTS PER FOOT (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0						GP		**GRAVEL**, gray, coarse, some cobbles up to 8"-diameter, little fine-grained sand, damp.
2.5	☒	D&M		0	26			@ 1.5 feet: No recovery.
								@ 3.5 feet: Medium to coarse gravel, little fractured cobbles, trace fine- to medium-grained sand, loose.
5.0	☒	D&M		25	16			
								@ 6.5 feet: Some fractured cobbles, few fine- to medium-grained sand, very dense, dry.
7.5	☒	D&M		10	71			
10.0								
11.0						GP		**SANDY GRAVEL**, gray, coarse, some fractured cobbles, little brown fine- to medium-grained sand, medium-dense, damp.
12.5	☒	D&M		80	51			

PROBE DIAGRAM



REMARKS

SS = Samples collected by using an 18-inch-long, 3.0-inch outside diameter Dames & Moore split-barrel sampler driven by a 300 lb. wireline hammer.

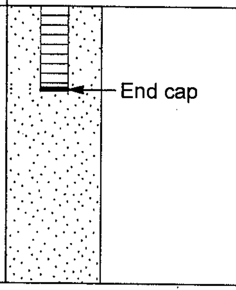
Did not encounter water in boring.

(Continued Next Page)

SLR
SLR International Corp
22122 20th Avenue SE
Bothell, Washington 98021
Telephone: 425.402.8800
Fax: 425.402.8488

PROBE NUMBER GP-18

CLIENT City of Yakima
PROJECT NAME Former City of Yakima Landfill
PROJECT NUMBER 001.0221.00004
PROJECT LOCATION Yakima, Washington

DEPTH (ft)	INTERVAL	TYPE	NAME	RECOVERY %	BLOW COUNTS PER FOOT (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	PROBE DIAGRAM
12.5	☒					GP		**SANDY GRAVEL**, gray, coarse, some fractured cobbles, little brown fine- to medium-grained sand, medium-dense, damp. *(continued)* @ 13.5 feet: Medium to coarse gravel, moist.	
15.0	☒	D&M		50	53		15.5		

Boring completed at 15.5 feet.

SOIL VAPOR PROBE COMPLETION DETAILS:

0 to 3.2 feet: 1"-diameter Sch. 40 PVC blank riser.
3.2 to 13 feet: 1"-diameter Sch. 40 PVC 0.020"-slotted screen.
13 to 13.3 feet: 1"-diameter Sch. 40 PVC end cap.

0 to 1 foot: Concrete.
1 to 2.5 feet: Hydrated bentonite chips.
3 to 15.5 feet: 2x12 Colorado silica sand.

REMARKS

SS = Samples collected by using an 18-inch-long, 3.0-inch outside diameter Dames & Moore split-barrel sampler driven by a 300 lb. wireline hammer.

Did not encounter water in boring.

SLR
SLR International Corp
22122 20th Avenue SE
Bothell, Washington 98021
Telephone: 425.402.8800
Fax: 425.402.8488

PROBE NUMBER GP-19

CLIENT City of Yakima

PROJECT NAME Former City of Yakima Landfill

PROJECT NUMBER 001.0221.00006

PROJECT LOCATION Yakima, Washington

DATE STARTED 11/4/09 **COMPLETED** 11/4/09

GROUND ELEVATION 1060.71 ft **HOLE SIZE** 8.5" Diameter

DRILLING DRILLING CONTRACTOR Cascade Drilling

GROUND WATER LEVELS:

DRILLING DRILLING METHOD Hollow Stem Auger

▽ **AT TIME OF DRILLING** 14.5 ft / Elev 1046.2 ft

LOGGED BY C. Lee **CHECKED BY**

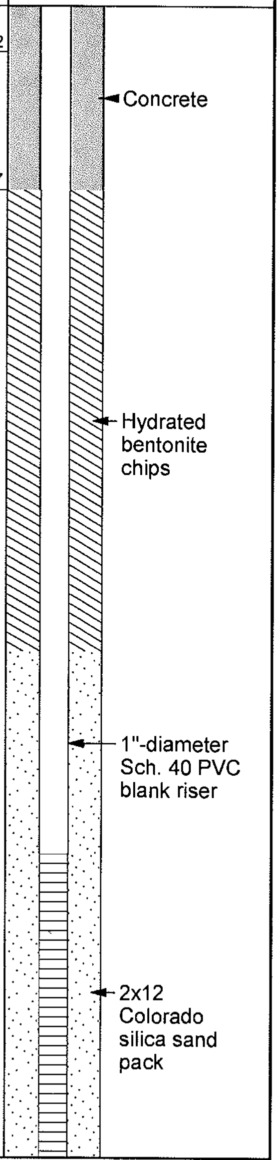
AT END OF ---

NOTES

AFTER DRILLING ---

DEPTH (ft)	INTERVAL	TYPE	NAME	RECOVERY %	BLOW COUNTS PER FOOT (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0						WW		**WOOD WASTE**, sawdust, bark, ash. 0.5 1060.2
						SM		**SILTY SAND**, dark reddish-brown, fine-grained, little fines, few fine gravel, very moist. 2.0 1058.7
						MSW		**MUNICIPAL SOLID WASTE**, medium dense, moist.
2.5	☒	D&M		30	30			@ 2.5 feet: Paper, wood, glass.
5.0	☒	D&M		60	22			@ 5 feet: Fiber, wood, soil/decomposable (50% by volume).
7.5	☒	D&M		60	18			@ 7.5 feet: Paper, plastic, soil/decomposable (20% by volume).
10.0	☒	D&M		50	19			@ 10 feet: Paper, plastic, fiber, soil/decomposable (10% by volume).
12.5								

PROBE DIAGRAM



REMARKS

D&M = Samples collected by using an 18-inch-long, 3.0-inch outside diameter Dames & Moore split-barrel sampler driven by a 300 lb. wireline hammer.

▽ Water level at time of drilling.

(Continued Next Page)

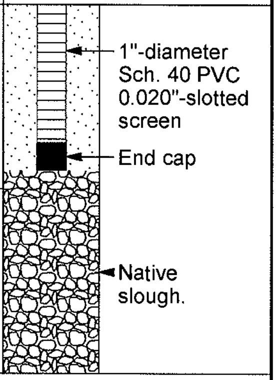
SLR
SLR International Corp
22122 20th Avenue SE
Bothell, Washington 98021
Telephone: 425.402.8800
Fax: 425.402.8488

PROBE NUMBER GP-19

CLIENT City of Yakima
PROJECT NAME Former City of Yakima Landfill
PROJECT NUMBER 001.0221.00006
PROJECT LOCATION Yakima, Washington

DEPTH (ft)	INTERVAL	TYPE	NAME	RECOVERY %	BLOW COUNTS PER FOOT (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
12.5	☒	D&M		70	10	MSW	▩	**MUNICIPAL SOLID WASTE**, medium dense, moist. *(continued)* @ 12.5 feet: Wood, plastic, glass, soil/decomposable (25% by volume).
14.5 ∇								1046.2
15.0	☒	D&M		70	62	SM	▒	**SILTY SAND**, gray, fine-grained, little fines, very dense, wet.
16.5								1044.2

PROBE DIAGRAM



Boring completed at 16.5 feet.

SOIL VAPOR PROBE COMPLETION DETAILS:

+3 to 9.2 feet: 1"-diameter Sch. 40 PVC blank riser.
9.2 to 14 feet: 1"-diameter Sch. 40 PVC 0.020"-slotted screen.
14 to 14.3 feet: 1"-diameter Sch. 40 PVC end cap.

0 to 1.5 feet: Concrete.
1.5 to 7 feet: Hydrated bentonite chips.
7 to 14.3 feet: 2x12 Colorado silica sand.
14.3 to 16.5 feet: Native slough.

REMARKS

D&M = Samples collected by using an 18-inch-long, 3.0-inch outside diameter Dames & Moore split-barrel sampler driven by a 300 lb. wireline hammer.

∇ Water level at time of drilling.

APPENDIX B

Analytical Laboratory Reports

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

LABORATORY REPORT

December 7, 2016

Cody Johnson
Landau Associates, Inc.
130 2nd Ave. South
Edmonds, WA 98020

RE: Transportation Corridor Investigation / 1148009.010.014

Dear Cody:

Enclosed are the results of the samples submitted to our laboratory on November 21, 2016. For your reference, these analyses have been assigned our service request number P1605444.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

Kate Kaneko

By Kate Kaneko at 11:24 am, 12/07/16

Kate Kaneko
Project Manager

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

Client: Landau Associates, Inc. Service Request No: P1605444
Project: Transportation Corridor Investigation / 1148009.010.014

CASE NARRATIVE

The samples were received intact under chain of custody on November 21, 2016 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Fixed Gases Analysis

The samples were analyzed for fixed gases (oxygen, nitrogen, carbon monoxide, methane and carbon dioxide) according to ASTM D1946 (single injection) using a gas chromatograph equipped with a thermal conductivity detector (TCD). This procedure is described in laboratory SOP VOA-EPA3C. This method is included on the laboratory's DoD-ELAP scope of accreditation, however it is not part of the NELAP accreditation.

Sulfur Analysis

The samples were also analyzed for twenty sulfur compounds per ASTM D 5504-12 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan. This method is included on the laboratory's NELAP scope of accreditation, however it is not part of the DoD-ELAP accreditation.

Total Gaseous Non-Methane Organics as Methane Analysis

The samples were also analyzed for total gaseous non-methane organics as methane according to modified EPA Method 25C. The analyses included a single sample injection (method modification) analyzed by gas chromatography using flame ionization detection/total combustion analysis. This method is not included on the laboratory's NELAP or DoD-ELAP scope of accreditation.

Volatile Organic Compound Analysis

The samples were also analyzed for volatile organic compounds in accordance with EPA Method TO-15 from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition (EPA/625/R-96/010b), January, 1999. This procedure is described in laboratory SOP VOA-TO15. The analytical system was comprised of a gas chromatograph / mass spectrometer (GC/MS) interfaced to a whole-air preconcentrator. The method was

Client: Landau Associates, Inc. Service Request No: P1605444
Project: Transportation Corridor Investigation / 1148009.010.014

CASE NARRATIVE

modified to include the use of helium as a diluent gas in place of zero-grade air for container pressurization. When necessary, analytical sample volumes were adjusted by a correction factor for containers pressurized with helium. A summary sheet has been included listing the affected samples. This method is included on the laboratory's NELAP and DoD-ELAP scope of accreditation. Any analytes flagged with an X are not included on the NELAP or DoD-ELAP accreditation.

The containers were cleaned, prior to sampling, down to the method reporting limit (MRL) reported for this project. Please note, projects which require reporting below the MRL could have results between the MRL and method detection limit (MDL) that are biased high.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Arizona DHS	http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home	AZ0694
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Louisiana DEQ (NELAP)	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	05071
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2016036
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	977273
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-003
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
PJLA (DoD ELAP)	http://www.pjlabs.com/search-accredited-labs	65818 (Testing)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-16-7
Utah DOH (NELAP)	http://health.utah.gov/lab/environmental-lab-certification/	CA016272016-6
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Landau Associates, Inc.

Service Request: P1605444

Project ID: Transportation Corridor Investigation / 1148009.010.014

Date Received: 11/21/2016

Time Received: 10:15

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	ASTM D1946-90(2006) - Fxd Gases Can	ASTM D5504-08 - Sulfur Can	25C Modified - TGNMO+ 1X Can	TO-15 - VOC Cans
GP-43-11162016	P1605444-001	Air	11/16/2016	16:24	SSC00302	-1.61	3.31	X	X	X	X
GP-41-11162016	P1605444-002	Air	11/16/2016	16:32	SSC00106	-2.49	3.27	X	X	X	X
Ambient-11162016	P1605444-003	Air	11/16/2016	17:00	SSC00078	0.54	3.47	X	X	X	X
GP-39-11162016	P1605444-004	Air	11/16/2016	16:48	SSC00347	-1.25	3.36	X	X	X	X
GP-38-11162016	P1605444-005	Air	11/16/2016	17:33	SSC00127	-2.22	3.48	X	X	X	X

ALS ENVIRONMENTAL
Sample Volume Correction for Helium Pressurization for SCAN Analysis

Sample ID	Pi	Pf	Sample Volume (L)	Adjusted Volume (L)
P1605444-003	0.54	3.47	0.930	1.00
P1605444-005	-2.22	3.48	0.018	0.0200

Validation Date: 10/13/09
Template Name: MFC_GCF_backfill.xls
Printed: 12/7/16

I:\A-GCMS\Helium pressurization\P1605444_HE Pressurization_SCAN_1611301703_LHakobyan.xls
1 of 1

Air - Chain of Custody Record & Analytical Service Request

Page 1 of 1

ALS
2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10-Day-Standard

ALS Project No. P1605444

ALS Contact:

Company Name & Address (Reporting Information)
LANDAU ASSOCIATES
130 2nd Avenue South
Edmonds, WA 98020

Project Name: Transportation Corridor Investigation

Project Number: 1148009.010.014

Project Manager: Piper Roelen

P.O. # / Billing Information: 1148009.010.014 / ~~City of Yakima Landfill Site Project~~ CLOSED — Invoice through LAI

Phone: (425)778-0907

Fax: —

Email Address for Result Reporting: proelen@landauinc.com; jdavis@landauinc.com

Sampler (Print & Sign): Stephanie Renando

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume	Analysis Method: Total Reduced Sulfur ASTM D-5504	Analysis Method: Fixed gases ASTM D-1945	Analysis Method: NMOC's (EPA 25C)	Analysis Method: VOC's (TO-15)	Comments e.g. Actual Preservative or specific instructions
GP-43-11162016		11/16/16	1624	SSC00302	SFC00113	-29.09	-5	6L	X	X	X	X	methane, CO2, CO, O2, nitrogen
GP-41-11162016		11/16/16	1632	SSC00106	SFC00026	-29.00	-5	6L	X	X	X	X	
Ambient-11162016		11/16/16	1700	SSC00078	SFC00144	-28.94	-7	6L	X	X	X	X	
GP-39-11162016		11/16/16	1648	SSC00347	SFC00135	-29.24	-4	6L	X	X	X	X	
GP-38-11162016		11/16/16	1733	SSC00127	SFC00095	-29.27	-5	6L	X	X	X	X	

Report Tier Levels - please select
Tier I - Results (Default in not specified) ____
Tier II (Results + QC Summaries ____
Tier III (Results + QC & Calibration Summaries) ____
Tier IV (Date Validation Package) 10% Surcharge ____

EDD required YES / No
Type: ____ Units: ____

Chain of Custody Seal: (Circle)
[✓ INTACT] BROKEN ABSENT

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)	Date: 11/17/16	Time: 1615	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature) FEDX	Date:	Time:	Received by: (Signature)	Date: 11/21/16	Time: 10K

Cooler / Blank Temperature ____°C

ALS Environmental

Sample Acceptance Check Form

Client: Landau Associates, Inc. Work order: P1605444

Project: Transportation Corridor Investigation / 1148009.010.014

Sample(s) received on: 11/21/16 Date opened: 11/21/16 by: ADAVID

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	**No**	**N/A**
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Did **sample containers** arrive in good condition?	☒	☐	☐
3	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
4	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
5	Was **sample volume** received adequate for analysis?	☒	☐	☐
6	Are samples within specified holding times?	☒	☐	☐
7	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☒
8	Were **custody seals** on outside of cooler/Box/Container?	☒	☐	☐
	Location of seal(s)? __________ Sealing Lid?	☒	☐	☐
	Were signature and date included?	☒	☐	☐
	Were seals intact?	☒	☐	☐
9	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
10	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
11	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1605444-001.01	6.0 L Silonite Can					
P1605444-002.01	6.0 L Silonite Can					
P1605444-003.01	6.0 L Silonite Can					
P1605444-004.01	6.0 L Silonite Can					
P1605444-005.01	6.0 L Silonite Can					

Explain any discrepancies: (include lab sample ID numbers):

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Landau Associates, Inc.**
Client Sample ID: **GP-43-11162016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444
ALS Sample ID: P1605444-001

Test Code: ASTM D1946
Instrument ID: HP5890 II/GC1/TCD
Analyst: Adam McAfee
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00302

Date Collected: 11/16/16
Date Received: 11/21/16
Date Analyzed: 11/29/16
Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -1.61 Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	Compound	Result %, v/v		MRL %, v/v	Data Qualifier
7782-44-7	**Oxygen***	**7.30**		0.14	
7727-37-9	**Nitrogen**	**26.2**		0.14	
630-08-0	Carbon Monoxide		ND	0.14	
74-82-8	**Methane**	**42.6**		0.14	
124-38-9	**Carbon Dioxide**	**23.9**		0.14	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Landau Associates, Inc.**
Client Sample ID: **GP-41-11162016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444
ALS Sample ID: P1605444-002

Test Code: ASTM D1946
Instrument ID: HP5890 II/GC1/TCD
Analyst: Adam McAfee
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00106

Date Collected: 11/16/16
Date Received: 11/21/16
Date Analyzed: 11/29/16
Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -2.49 Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	Compound	**Result** **%, v/v**	MRL %, v/v	Data Qualifier
7782-44-7	**Oxygen***	**0.254**	0.15	
7727-37-9	**Nitrogen**	**10.2**	0.15	
630-08-0	Carbon Monoxide	ND	0.15	
74-82-8	**Methane**	**57.5**	0.15	
124-38-9	**Carbon Dioxide**	**32.0**	0.15	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Landau Associates, Inc.**

Client Sample ID: **Ambient-11162016**

Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444

ALS Sample ID: P1605444-003

Test Code: ASTM D1946

Instrument ID: HP5890 II/GC1/TCD

Analyst: Adam McAfee

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00078

Date Collected: 11/16/16

Date Received: 11/21/16

Date Analyzed: 11/29/16

Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): 0.54 Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	**Compound**	**Result** %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	**Oxygen***	**22.0**	0.12	
7727-37-9	**Nitrogen**	**77.9**	0.12	
630-08-0	Carbon Monoxide	ND	0.12	
74-82-8	Methane	ND	0.12	
124-38-9	Carbon Dioxide	ND	0.12	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Landau Associates, Inc.**
Client Sample ID: **GP-39-11162016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444
ALS Sample ID: P1605444-004

Test Code: ASTM D1946
Instrument ID: HP5890 II/GC1/TCD
Analyst: Adam McAfee
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00347

Date Collected: 11/16/16
Date Received: 11/21/16
Date Analyzed: 11/29/16
Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -1.25 Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.13	
7727-37-9	**Nitrogen**	**0.668**	0.13	
630-08-0	Carbon Monoxide	ND	0.13	
74-82-8	**Methane**	**64.0**	0.13	
124-38-9	**Carbon Dioxide**	**35.2**	0.13	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates, Inc.**
Client Sample ID: **GP-38-11162016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444
ALS Sample ID: P1605444-005

Test Code: ASTM D1946
Instrument ID: HP5890 II/GC1/TCD
Analyst: Adam McAfee
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00127

Date Collected: 11/16/16
Date Received: 11/21/16
Date Analyzed: 11/29/16
Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -2.22 Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	**Compound**	**Result** **%, v/v**	MRL %, v/v	Data Qualifier
7782-44-7	**Oxygen***	**1.72**	0.15	
7727-37-9	**Nitrogen**	**8.71**	0.15	
630-08-0	Carbon Monoxide	ND	0.15	
74-82-8	**Methane**	**55.1**	0.15	
124-38-9	**Carbon Dioxide**	**34.4**	0.15	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates, Inc.**
Client Sample ID: **Method Blank** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P161129-MB

Test Code: ASTM D1946 Date Collected: NA
Instrument ID: HP5890 II/GC1/TCD Date Received: NA
Analyst: Adam McAfee Date Analyzed: 11/29/16
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.10 ml(s)
Test Notes:

CAS #	**Compound**	**Result** **%, v/v**	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client: **Landau Associates, Inc.**
Client Sample ID: **Lab Control Sample**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444
ALS Sample ID: P161129-LCS

Test Code: ASTM D1946
Instrument ID: HP5890 II/GC1/TCD
Analyst: Adam McAfee
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/29/16
Volume(s) Analyzed: NA ml(s)

CAS #	**Compound**	Spike Amount ppmV	**Result ppmV**	**% Recovery**	ALS Acceptance Limits	Data Qualifier
7782-44-7	Oxygen*	50,000	**52,000**	**104**	97-108	
7727-37-9	Nitrogen	50,000	**51,700**	**103**	89-113	
630-08-0	Carbon Monoxide	50,000	**51,400**	**103**	98-108	
74-82-8	Methane	50,000	**49,600**	**99**	94-111	
124-38-9	Carbon Dioxide	50,000	**49,600**	**99**	94-104	

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**GP-43-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-001

Test Code:	ASTM D 5504-12	Date Collected:	11/16/16
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	16:24
Analyst:	Mike Conejo	Date Received:	11/21/16
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	11/23/16
Test Notes:		Time Analyzed:	07:45
Container ID:	SSC00302	Volume(s) Analyzed:	1.0 ml(s)

Initial Pressure (psig): -1.61 Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**10,000**	9.6	**7,200**	6.9	
463-58-1	Carbonyl Sulfide	ND	17	ND	6.9	
74-93-1	Methyl Mercaptan	**59**	14	**30**	6.9	
75-08-1	Ethyl Mercaptan	**45**	18	**18**	6.9	
75-18-3	Dimethyl Sulfide	**47**	18	**19**	6.9	
75-15-0	Carbon Disulfide	ND	11	ND	3.5	
75-33-2	Isopropyl Mercaptan	ND	21	ND	6.9	
75-66-1	tert-Butyl Mercaptan	ND	25	ND	6.9	
107-03-9	n-Propyl Mercaptan	ND	21	ND	6.9	
624-89-5	Ethyl Methyl Sulfide	ND	21	ND	6.9	
110-02-1	Thiophene	ND	24	ND	6.9	
513-44-0	Isobutyl Mercaptan	ND	25	ND	6.9	
352-93-2	Diethyl Sulfide	ND	25	ND	6.9	
109-79-5	n-Butyl Mercaptan	ND	25	ND	6.9	
624-92-0	Dimethyl Disulfide	ND	13	ND	3.5	
616-44-4	3-Methylthiophene	ND	28	ND	6.9	
110-01-0	Tetrahydrothiophene	ND	25	ND	6.9	
638-02-8	2,5-Dimethylthiophene	ND	32	ND	6.9	
872-55-9	2-Ethylthiophene	ND	32	ND	6.9	
110-81-6	Diethyl Disulfide	ND	17	ND	3.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates, Inc.**
Client Sample ID: **GP-41-11162016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444
ALS Sample ID: P1605444-002

Test Code: ASTM D 5504-12
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00106

Date Collected: 11/16/16
Time Collected: 16:32
Date Received: 11/21/16
Date Analyzed: 11/23/16
Time Analyzed: 07:58
Volume(s) Analyzed: 1.0 ml(s)

Initial Pressure (psig): -2.49 Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	10	ND	7.4	
463-58-1	Carbonyl Sulfide	ND	18	ND	7.4	
74-93-1	Methyl Mercaptan	ND	14	ND	7.4	
75-08-1	Ethyl Mercaptan	ND	19	ND	7.4	
75-18-3	Dimethyl Sulfide	ND	19	ND	7.4	
75-15-0	Carbon Disulfide	ND	11	ND	3.7	
75-33-2	Isopropyl Mercaptan	ND	23	ND	7.4	
75-66-1	tert-Butyl Mercaptan	ND	27	ND	7.4	
107-03-9	n-Propyl Mercaptan	ND	23	ND	7.4	
624-89-5	Ethyl Methyl Sulfide	ND	23	ND	7.4	
110-02-1	Thiophene	ND	25	ND	7.4	
513-44-0	Isobutyl Mercaptan	ND	27	ND	7.4	
352-93-2	Diethyl Sulfide	ND	27	ND	7.4	
109-79-5	n-Butyl Mercaptan	ND	27	ND	7.4	
624-92-0	Dimethyl Disulfide	ND	14	ND	3.7	
616-44-4	3-Methylthiophene	ND	29	ND	7.4	
110-01-0	Tetrahydrothiophene	ND	26	ND	7.4	
638-02-8	2,5-Dimethylthiophene	ND	34	ND	7.4	
872-55-9	2-Ethylthiophene	ND	34	ND	7.4	
110-81-6	Diethyl Disulfide	ND	18	ND	3.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Ambient-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-003

Test Code:	ASTM D 5504-12	Date Collected:	11/16/16
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	17:00
Analyst:	Mike Conejo	Date Received:	11/21/16
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	11/23/16
Test Notes:		Time Analyzed:	08:10
Container ID:	SSC00078	Volume(s) Analyzed:	1.0 ml(s)

Initial Pressure (psig): 0.54 Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	8.3	ND	6.0	
463-58-1	Carbonyl Sulfide	ND	15	ND	6.0	
74-93-1	Methyl Mercaptan	ND	12	ND	6.0	
75-08-1	Ethyl Mercaptan	ND	15	ND	6.0	
75-18-3	Dimethyl Sulfide	ND	15	ND	6.0	
75-15-0	Carbon Disulfide	ND	9.3	ND	3.0	
75-33-2	Isopropyl Mercaptan	ND	19	ND	6.0	
75-66-1	tert-Butyl Mercaptan	ND	22	ND	6.0	
107-03-9	n-Propyl Mercaptan	ND	19	ND	6.0	
624-89-5	Ethyl Methyl Sulfide	ND	19	ND	6.0	
110-02-1	Thiophene	ND	20	ND	6.0	
513-44-0	Isobutyl Mercaptan	ND	22	ND	6.0	
352-93-2	Diethyl Sulfide	ND	22	ND	6.0	
109-79-5	n-Butyl Mercaptan	ND	22	ND	6.0	
624-92-0	Dimethyl Disulfide	ND	11	ND	3.0	
616-44-4	3-Methylthiophene	ND	24	ND	6.0	
110-01-0	Tetrahydrothiophene	ND	21	ND	6.0	
638-02-8	2,5-Dimethylthiophene	ND	27	ND	6.0	
872-55-9	2-Ethylthiophene	ND	27	ND	6.0	
110-81-6	Diethyl Disulfide	ND	15	ND	3.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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Client: **Landau Associates, Inc.**
Client Sample ID: **GP-39-11162016** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-004

Test Code: ASTM D 5504-12
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00347

Date Collected: 11/16/16
Time Collected: 16:48
Date Received: 11/21/16
Date Analyzed: 11/23/16
Time Analyzed: 08:24
Volume(s) Analyzed: 1.0 ml(s)

Initial Pressure (psig): -1.25 Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**14,000**	9.3	**10,000**	6.7	
463-58-1	Carbonyl Sulfide	ND	16	ND	6.7	
74-93-1	Methyl Mercaptan	**37**	13	**19**	6.7	
75-08-1	Ethyl Mercaptan	**39**	17	**15**	6.7	
75-18-3	Dimethyl Sulfide	ND	17	ND	6.7	
75-15-0	Carbon Disulfide	ND	10	ND	3.4	
75-33-2	Isopropyl Mercaptan	ND	21	ND	6.7	
75-66-1	tert-Butyl Mercaptan	ND	25	ND	6.7	
107-03-9	n-Propyl Mercaptan	ND	21	ND	6.7	
624-89-5	Ethyl Methyl Sulfide	ND	21	ND	6.7	
110-02-1	Thiophene	ND	23	ND	6.7	
513-44-0	Isobutyl Mercaptan	ND	25	ND	6.7	
352-93-2	Diethyl Sulfide	ND	25	ND	6.7	
109-79-5	n-Butyl Mercaptan	ND	25	ND	6.7	
624-92-0	Dimethyl Disulfide	ND	13	ND	3.4	
616-44-4	3-Methylthiophene	ND	27	ND	6.7	
110-01-0	Tetrahydrothiophene	ND	24	ND	6.7	
638-02-8	2,5-Dimethylthiophene	ND	31	ND	6.7	
872-55-9	2-Ethylthiophene	ND	31	ND	6.7	
110-81-6	Diethyl Disulfide	ND	17	ND	3.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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Client: **Landau Associates, Inc.**

Client Sample ID: **GP-38-11162016**

Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444

ALS Sample ID: P1605444-005

Test Code: ASTM D 5504-12

Instrument ID: Agilent 6890A/GC13/SCD

Analyst: Mike Conejo

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00127

Date Collected: 11/16/16

Time Collected: 17:33

Date Received: 11/21/16

Date Analyzed: 11/23/16

Time Analyzed: 08:37

Volume(s) Analyzed: 1.0 ml(s)

Initial Pressure (psig): -2.22 Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	**Compound**	**Result** **µg/m³**	MRL µg/m³	**Result** **ppbV**	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	10	ND	7.3	
463-58-1	Carbonyl Sulfide	**63**	18	**26**	7.3	
74-93-1	Methyl Mercaptan	ND	14	ND	7.3	
75-08-1	Ethyl Mercaptan	ND	19	ND	7.3	
75-18-3	Dimethyl Sulfide	ND	19	ND	7.3	
75-15-0	Carbon Disulfide	ND	11	ND	3.7	
75-33-2	Isopropyl Mercaptan	ND	23	ND	7.3	
75-66-1	tert-Butyl Mercaptan	ND	27	ND	7.3	
107-03-9	n-Propyl Mercaptan	ND	23	ND	7.3	
624-89-5	Ethyl Methyl Sulfide	ND	23	ND	7.3	
110-02-1	Thiophene	ND	25	ND	7.3	
513-44-0	Isobutyl Mercaptan	ND	27	ND	7.3	
352-93-2	Diethyl Sulfide	ND	27	ND	7.3	
109-79-5	n-Butyl Mercaptan	ND	27	ND	7.3	
624-92-0	Dimethyl Disulfide	ND	14	ND	3.7	
616-44-4	3-Methylthiophene	ND	29	ND	7.3	
110-01-0	Tetrahydrothiophene	ND	26	ND	7.3	
638-02-8	2,5-Dimethylthiophene	ND	33	ND	7.3	
872-55-9	2-Ethylthiophene	ND	33	ND	7.3	
110-81-6	Diethyl Disulfide	ND	18	ND	3.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161123-MB

Test Code:	ASTM D 5504-12	Date Collected:	NA
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	NA
Analyst:	Mike Conejo	Date Received:	NA
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	11/23/16
Test Notes:		Time Analyzed:	07:26
		Volume(s) Analyzed:	1.0 ml(s)

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
463-58-1	Carbonyl Sulfide	ND	12	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-08-1	Ethyl Mercaptan	ND	13	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
75-15-0	Carbon Disulfide	ND	7.8	ND	2.5	
75-33-2	Isopropyl Mercaptan	ND	16	ND	5.0	
75-66-1	tert-Butyl Mercaptan	ND	18	ND	5.0	
107-03-9	n-Propyl Mercaptan	ND	16	ND	5.0	
624-89-5	Ethyl Methyl Sulfide	ND	16	ND	5.0	
110-02-1	Thiophene	ND	17	ND	5.0	
513-44-0	Isobutyl Mercaptan	ND	18	ND	5.0	
352-93-2	Diethyl Sulfide	ND	18	ND	5.0	
109-79-5	n-Butyl Mercaptan	ND	18	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	
616-44-4	3-Methylthiophene	ND	20	ND	5.0	
110-01-0	Tetrahydrothiophene	ND	18	ND	5.0	
638-02-8	2,5-Dimethylthiophene	ND	23	ND	5.0	
872-55-9	2-Ethylthiophene	ND	23	ND	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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LABORATORY CONTROL SAMPLE SUMMARY

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Client: **Landau Associates, Inc.**
Client Sample ID: **Lab Control Sample**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444
ALS Sample ID: P161123-LCS

Test Code: ASTM D 5504-12
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 11/23/16
Volume(s) Analyzed: NA ml(s)

CAS #	**Compound**	Spike Amount ppbV	**Result ppbV**	**% Recovery**	ALS Acceptance Limits	Data Qualifier
7783-06-4	Hydrogen Sulfide	1,000	**1,080**	**108**	75-148	
463-58-1	Carbonyl Sulfide	1,000	**1,050**	**105**	70-137	
74-93-1	Methyl Mercaptan	1,000	**1,040**	**104**	72-139	

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Client: **Landau Associates, Inc.**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Project ID: P1605444

Total Gaseous Nonmethane Organics (TGNMO) as Methane

Test Code: EPA Method 25C Modified
Instrument ID: HP5890 II/GC1/FID/TCA Date(s) Collected: 11/16/16
Analyst: Adam McAfee Date Received: 11/21/16
Sampling Media: 6.0 L Silonite Canister(s) Date Analyzed: #N/A
Test Notes:

Client Sample ID	ALS Sample ID	Canister Dilution Factor	Injection Volume ml(s)	**Result ppmV**	MRL ppmV	Data Qualifier
GP-43-11162016	P1605444-001	1.38	0.50	**350**	1.4	
GP-41-11162016	P1605444-002	1.47	0.50	**640**	1.5	
Ambient-11162016	P1605444-003	1.19	0.50	ND	1.2	
GP-39-11162016	P1605444-004	1.34	0.50	**630**	1.3	
GP-38-11162016	P1605444-005	1.46	0.50	**220**	1.5	
Method Blank	P161129-MB	1.00	0.50	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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LABORATORY CONTROL SAMPLE SUMMARY

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Client: **Landau Associates, Inc.**

Client Sample ID: **Lab Control Sample**

Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1605444

ALS Sample ID: P161129-LCS

Test Code: EPA Method 25C Modified

Instrument ID: HP5890 II/GC1/FID/TCA

Analyst: Adam McAfee

Sampling Media: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 11/29/16

Volume(s) Analyzed: NA ml(s)

Compound	Spike Amount ppmV	**Result ppmV**	**% Recovery**	ALS Acceptance Limits
Total Gaseous Nonmethane Organics (TGNMO) as Methane	300	**266**	**89**	85-121

Data Qualifier

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates, Inc.**
Client Sample ID: **GP-43-11162016** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-001

Test Code: EPA TO-15 Modified Date Collected: 11/16/16
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 11/21/16
Analyst: Lusine Hakobyan Date Analyzed: 11/30/16
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.010 Liter(s)
Test Notes:
Container ID: SSC00302

Initial Pressure (psig): -1.61 Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	**800**	69	**470**	40	
75-71-8	Dichlorodifluoromethane (CFC 12)	**1,600**	69	**330**	14	
74-87-3	Chloromethane	ND	69	ND	33	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	**980**	69	**140**	9.9	
75-01-4	Vinyl Chloride	**3,900**	69	**1,500**	27	
106-99-0	1,3-Butadiene	ND	69	ND	31	
74-83-9	Bromomethane	ND	69	ND	18	
75-00-3	Chloroethane	ND	69	ND	26	
64-17-5	Ethanol	ND	690	ND	370	
75-05-8	Acetonitrile	ND	69	ND	41	
107-02-8	Acrolein	ND	280	ND	120	
67-64-1	Acetone	**4,200**	690	**1,800**	290	
75-69-4	Trichlorofluoromethane	**510**	69	**91**	12	
67-63-0	2-Propanol (Isopropyl Alcohol)	**1,700**	690	**690**	280	
107-13-1	Acrylonitrile	ND	69	ND	32	
75-35-4	1,1-Dichloroethene	**99**	69	**25**	17	
75-09-2	Methylene Chloride	**110**	69	**32**	20	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	69	ND	22	
76-13-1	Trichlorotrifluoroethane	ND	69	ND	9.0	
75-15-0	Carbon Disulfide	ND	690	ND	220	
156-60-5	trans-1,2-Dichloroethene	**150**	69	**38**	17	
75-34-3	1,1-Dichloroethane	ND	69	ND	17	
1634-04-4	Methyl tert-Butyl Ether	ND	69	ND	19	
108-05-4	Vinyl Acetate	ND	690	ND	200	
78-93-3	2-Butanone (MEK)	**5,500**	690	**1,900**	230	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**GP-43-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-001

Test Code:	EPA TO-15 Modified	Date Collected:	11/16/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	11/21/16
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.010 Liter(s)
Test Notes:			
Container ID:	SSC00302		

Initial Pressure (psig): -1.61 Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	**5,100**	69	**1,300**	17	
141-78-6	Ethyl Acetate	ND	140	ND	38	
110-54-3	n-Hexane	**660**	69	**190**	20	
67-66-3	Chloroform	ND	69	ND	14	
109-99-9	Tetrahydrofuran (THF)	**1,100**	69	**360**	23	
107-06-2	1,2-Dichloroethane	ND	69	ND	17	
71-55-6	1,1,1-Trichloroethane	ND	69	ND	13	
71-43-2	Benzene	**370**	69	**120**	22	
56-23-5	Carbon Tetrachloride	ND	69	ND	11	
110-82-7	Cyclohexane	**580**	140	**170**	40	
78-87-5	1,2-Dichloropropane	ND	69	ND	15	
75-27-4	Bromodichloromethane	ND	69	ND	10	
79-01-6	Trichloroethene	**460**	69	**86**	13	
123-91-1	1,4-Dioxane	ND	69	ND	19	
80-62-6	Methyl Methacrylate	ND	140	ND	34	
142-82-5	n-Heptane	**2,000**	69	**500**	17	
10061-01-5	cis-1,3-Dichloropropene	ND	69	ND	15	
108-10-1	4-Methyl-2-pentanone	**1,000**	69	**240**	17	
10061-02-6	trans-1,3-Dichloropropene	ND	69	ND	15	
79-00-5	1,1,2-Trichloroethane	ND	69	ND	13	
108-88-3	Toluene	**8,400**	69	**2,200**	18	
591-78-6	2-Hexanone	ND	69	ND	17	
124-48-1	Dibromochloromethane	ND	69	ND	8.1	
106-93-4	1,2-Dibromoethane	ND	69	ND	9.0	
123-86-4	n-Butyl Acetate	ND	69	ND	15	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**GP-43-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-001
Test Code:	EPA TO-15 Modified	Date Collected:	11/16/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	11/21/16
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.010 Liter(s)
Test Notes:			
Container ID:	SSC00302		

Initial Pressure (psig): -1.61 Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	**1,800**	69	**380**	15	
127-18-4	Tetrachloroethene	**810**	69	**120**	10	
108-90-7	Chlorobenzene	**96**	69	**21**	15	
100-41-4	Ethylbenzene	**4,500**	69	**1,000**	16	
179601-23-1	m,p-Xylenes	**8,600**	140	**2,000**	32	
75-25-2	Bromoform	ND	69	ND	6.7	
100-42-5	Styrene	**160**	69	**38**	16	
95-47-6	o-Xylene	**2,200**	69	**510**	16	
111-84-2	n-Nonane	**3,200**	69	**610**	13	
79-34-5	1,1,2,2-Tetrachloroethane	ND	69	ND	10	
98-82-8	Cumene	**750**	69	**150**	14	
80-56-8	alpha-Pinene	**4,100**	69	**730**	12	
103-65-1	n-Propylbenzene	**690**	69	**140**	14	
622-96-8	4-Ethyltoluene	**290**	69	**59**	14	
108-67-8	1,3,5-Trimethylbenzene	**550**	69	**110**	14	
95-63-6	1,2,4-Trimethylbenzene	**1,500**	69	**310**	14	
100-44-7	Benzyl Chloride	ND	69	ND	13	
541-73-1	1,3-Dichlorobenzene	ND	69	ND	11	
106-46-7	1,4-Dichlorobenzene	ND	69	ND	11	
95-50-1	1,2-Dichlorobenzene	ND	69	ND	11	
5989-27-5	d-Limonene	**8,000**	69	**1,400**	12	
96-12-8	1,2-Dibromo-3-chloropropane	ND	69	ND	7.1	
120-82-1	1,2,4-Trichlorobenzene	ND	69	ND	9.3	
91-20-3	Naphthalene	ND	69	ND	13	
87-68-3	Hexachlorobutadiene	ND	69	ND	6.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**GP-41-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-002

Test Code:	EPA TO-15 Modified	Date Collected:	11/16/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	11/21/16
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.0050 Liter(s)
Test Notes:			
Container ID:	SSC00106		

Initial Pressure (psig): -2.49 Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	**500**	150	**290**	85	
75-71-8	Dichlorodifluoromethane (CFC 12)	**1,100**	150	**210**	30	
74-87-3	Chloromethane	ND	150	ND	71	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	**980**	150	**140**	21	
75-01-4	Vinyl Chloride	**3,700**	150	**1,500**	58	
106-99-0	1,3-Butadiene	ND	150	ND	66	
74-83-9	Bromomethane	ND	150	ND	38	
75-00-3	Chloroethane	ND	150	ND	56	
64-17-5	Ethanol	ND	1,500	ND	780	
75-05-8	Acetonitrile	ND	150	ND	88	
107-02-8	Acrolein	ND	590	ND	260	
67-64-1	Acetone	ND	1,500	ND	620	
75-69-4	Trichlorofluoromethane	ND	150	ND	26	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	1,500	ND	600	
107-13-1	Acrylonitrile	ND	150	ND	68	
75-35-4	1,1-Dichloroethene	ND	150	ND	37	
75-09-2	Methylene Chloride	ND	150	ND	42	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	150	ND	47	
76-13-1	Trichlorotrifluoroethane	ND	150	ND	19	
75-15-0	Carbon Disulfide	ND	1,500	ND	470	
156-60-5	trans-1,2-Dichloroethene	ND	150	ND	37	
75-34-3	1,1-Dichloroethane	ND	150	ND	36	
1634-04-4	Methyl tert-Butyl Ether	ND	150	ND	41	
108-05-4	Vinyl Acetate	ND	1,500	ND	420	
78-93-3	2-Butanone (MEK)	ND	1,500	ND	500	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
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ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates, Inc.**
Client Sample ID: **GP-41-11162016** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-002

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00106

Date Collected: 11/16/16
Date Received: 11/21/16
Date Analyzed: 11/30/16
Volume(s) Analyzed: 0.0050 Liter(s)

Initial Pressure (psig): -2.49 Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	**970**	150	**250**	37	
141-78-6	Ethyl Acetate	ND	290	ND	82	
110-54-3	n-Hexane	**400**	150	**110**	42	
67-66-3	Chloroform	ND	150	ND	30	
109-99-9	Tetrahydrofuran (THF)	ND	150	ND	50	
107-06-2	1,2-Dichloroethane	ND	150	ND	36	
71-55-6	1,1,1-Trichloroethane	ND	150	ND	27	
71-43-2	Benzene	**220**	150	**69**	46	
56-23-5	Carbon Tetrachloride	ND	150	ND	23	
110-82-7	Cyclohexane	**320**	290	**93**	85	
78-87-5	1,2-Dichloropropane	ND	150	ND	32	
75-27-4	Bromodichloromethane	ND	150	ND	22	
79-01-6	Trichloroethene	ND	150	ND	27	
123-91-1	1,4-Dioxane	ND	150	ND	41	
80-62-6	Methyl Methacrylate	ND	290	ND	72	
142-82-5	n-Heptane	**490**	150	**120**	36	
10061-01-5	cis-1,3-Dichloropropene	ND	150	ND	32	
108-10-1	4-Methyl-2-pentanone	ND	150	ND	36	
10061-02-6	trans-1,3-Dichloropropene	ND	150	ND	32	
79-00-5	1,1,2-Trichloroethane	ND	150	ND	27	
108-88-3	Toluene	**260**	150	**70**	39	
591-78-6	2-Hexanone	ND	150	ND	36	
124-48-1	Dibromochloromethane	ND	150	ND	17	
106-93-4	1,2-Dibromoethane	ND	150	ND	19	
123-86-4	n-Butyl Acetate	ND	150	ND	31	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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Client: **Landau Associates, Inc.**

Client Sample ID: **GP-41-11162016** ALS Project ID: P1605444

Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-002

Test Code: EPA TO-15 Modified Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 11/21/16

Analyst: Lusine Hakobyan Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.0050 Liter(s)

Test Notes:

Container ID: SSC00106

Initial Pressure (psig): -2.49 Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	**320**	150	**69**	31	
127-18-4	Tetrachloroethene	**230**	150	**34**	22	
108-90-7	Chlorobenzene	ND	150	ND	32	
100-41-4	Ethylbenzene	ND	150	ND	34	
179601-23-1	m,p-Xylenes	ND	290	ND	68	
75-25-2	Bromoform	ND	150	ND	14	
100-42-5	Styrene	ND	150	ND	35	
95-47-6	o-Xylene	ND	150	ND	34	
111-84-2	n-Nonane	**480**	150	**91**	28	
79-34-5	1,1,2,2-Tetrachloroethane	ND	150	ND	21	
98-82-8	Cumene	ND	150	ND	30	
80-56-8	alpha-Pinene	ND	150	ND	26	
103-65-1	n-Propylbenzene	ND	150	ND	30	
622-96-8	4-Ethyltoluene	ND	150	ND	30	
108-67-8	1,3,5-Trimethylbenzene	ND	150	ND	30	
95-63-6	1,2,4-Trimethylbenzene	ND	150	ND	30	
100-44-7	Benzyl Chloride	ND	150	ND	28	
541-73-1	1,3-Dichlorobenzene	ND	150	ND	24	
106-46-7	1,4-Dichlorobenzene	ND	150	ND	24	
95-50-1	1,2-Dichlorobenzene	ND	150	ND	24	
5989-27-5	d-Limonene	ND	150	ND	26	
96-12-8	1,2-Dibromo-3-chloropropane	ND	150	ND	15	
120-82-1	1,2,4-Trichlorobenzene	ND	150	ND	20	
91-20-3	Naphthalene	ND	150	ND	28	
87-68-3	Hexachlorobutadiene	ND	150	ND	14	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates, Inc.**
Client Sample ID: **Ambient-11162016** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-003

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00078

Date Collected: 11/16/16
Date Received: 11/21/16
Date Analyzed: 12/5/16
Volume(s) Analyzed: 1.00 Liter(s)

Initial Pressure (psig): 0.54 Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	**1.3**	0.60	**0.78**	0.35	
75-71-8	Dichlorodifluoromethane (CFC 12)	**2.2**	0.60	**0.45**	0.12	
74-87-3	Chloromethane	ND	0.60	ND	0.29	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.60	ND	0.085	
75-01-4	Vinyl Chloride	ND	0.60	ND	0.23	
106-99-0	1,3-Butadiene	ND	0.60	ND	0.27	
74-83-9	Bromomethane	ND	0.60	ND	0.15	
75-00-3	Chloroethane	ND	0.60	ND	0.23	
64-17-5	Ethanol	ND	6.0	ND	3.2	
75-05-8	Acetonitrile	ND	0.60	ND	0.35	
107-02-8	Acrolein	ND	2.4	ND	1.0	
67-64-1	Acetone	ND	6.0	ND	2.5	
75-69-4	Trichlorofluoromethane	**1.1**	0.60	**0.20**	0.11	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	6.0	ND	2.4	
107-13-1	Acrylonitrile	ND	0.60	ND	0.27	
75-35-4	1,1-Dichloroethene	ND	0.60	ND	0.15	
75-09-2	Methylene Chloride	ND	0.60	ND	0.17	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.60	ND	0.19	
76-13-1	Trichlorotrifluoroethane	ND	0.60	ND	0.078	
75-15-0	Carbon Disulfide	ND	6.0	ND	1.9	
156-60-5	trans-1,2-Dichloroethene	ND	0.60	ND	0.15	
75-34-3	1,1-Dichloroethane	ND	0.60	ND	0.15	
1634-04-4	Methyl tert-Butyl Ether	ND	0.60	ND	0.17	
108-05-4	Vinyl Acetate	ND	6.0	ND	1.7	
78-93-3	2-Butanone (MEK)	ND	6.0	ND	2.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Ambient-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-003

Test Code:	EPA TO-15 Modified	Date Collected:	11/16/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	11/21/16
Analyst:	Lusine Hakobyan	Date Analyzed:	12/5/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			
Container ID:	SSC00078		

Initial Pressure (psig): 0.54 Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	ND	0.60	ND	0.15	
141-78-6	Ethyl Acetate	ND	1.2	ND	0.33	
110-54-3	n-Hexane	ND	0.60	ND	0.17	
67-66-3	Chloroform	ND	0.60	ND	0.12	
109-99-9	Tetrahydrofuran (THF)	ND	0.60	ND	0.20	
107-06-2	1,2-Dichloroethane	ND	0.60	ND	0.15	
71-55-6	1,1,1-Trichloroethane	ND	0.60	ND	0.11	
71-43-2	Benzene	**0.60**	0.60	**0.19**	0.19	
56-23-5	Carbon Tetrachloride	ND	0.60	ND	0.095	
110-82-7	Cyclohexane	ND	1.2	ND	0.35	
78-87-5	1,2-Dichloropropane	ND	0.60	ND	0.13	
75-27-4	Bromodichloromethane	ND	0.60	ND	0.089	
79-01-6	Trichloroethene	ND	0.60	ND	0.11	
123-91-1	1,4-Dioxane	ND	0.60	ND	0.17	
80-62-6	Methyl Methacrylate	ND	1.2	ND	0.29	
142-82-5	n-Heptane	ND	0.60	ND	0.15	
10061-01-5	cis-1,3-Dichloropropene	ND	0.60	ND	0.13	
108-10-1	4-Methyl-2-pentanone	ND	0.60	ND	0.15	
10061-02-6	trans-1,3-Dichloropropene	ND	0.60	ND	0.13	
79-00-5	1,1,2-Trichloroethane	ND	0.60	ND	0.11	
108-88-3	Toluene	**2.2**	0.60	**0.59**	0.16	
591-78-6	2-Hexanone	ND	0.60	ND	0.15	
124-48-1	Dibromochloromethane	ND	0.60	ND	0.070	
106-93-4	1,2-Dibromoethane	ND	0.60	ND	0.077	
123-86-4	n-Butyl Acetate	ND	0.60	ND	0.13	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates, Inc.**
Client Sample ID: **Ambient-11162016** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-003

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00078

Date Collected: 11/16/16
Date Received: 11/21/16
Date Analyzed: 12/5/16
Volume(s) Analyzed: 1.00 Liter(s)

Initial Pressure (psig): 0.54 Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.60	ND	0.13	
127-18-4	Tetrachloroethene	ND	0.60	ND	0.088	
108-90-7	Chlorobenzene	ND	0.60	ND	0.13	
100-41-4	Ethylbenzene	ND	0.60	ND	0.14	
179601-23-1	m,p-Xylenes	ND	1.2	ND	0.27	
75-25-2	Bromoform	ND	0.60	ND	0.058	
100-42-5	Styrene	ND	0.60	ND	0.14	
95-47-6	o-Xylene	ND	0.60	ND	0.14	
111-84-2	n-Nonane	ND	0.60	ND	0.11	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.60	ND	0.087	
98-82-8	Cumene	ND	0.60	ND	0.12	
80-56-8	alpha-Pinene	ND	0.60	ND	0.11	
103-65-1	n-Propylbenzene	ND	0.60	ND	0.12	
622-96-8	4-Ethyltoluene	ND	0.60	ND	0.12	
108-67-8	1,3,5-Trimethylbenzene	ND	0.60	ND	0.12	
95-63-6	1,2,4-Trimethylbenzene	ND	0.60	ND	0.12	
100-44-7	Benzyl Chloride	ND	0.60	ND	0.11	
541-73-1	1,3-Dichlorobenzene	ND	0.60	ND	0.099	
106-46-7	1,4-Dichlorobenzene	ND	0.60	ND	0.099	
95-50-1	1,2-Dichlorobenzene	ND	0.60	ND	0.099	
5989-27-5	d-Limonene	ND	0.60	ND	0.11	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.60	ND	0.062	
120-82-1	1,2,4-Trichlorobenzene	ND	0.60	ND	0.080	
91-20-3	Naphthalene	ND	0.60	ND	0.11	
87-68-3	Hexachlorobutadiene	ND	0.60	ND	0.056	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**GP-39-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-004

Test Code:	EPA TO-15 Modified	Date Collected:	11/16/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	11/21/16
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.0040 Liter(s)
Test Notes:			
Container ID:	SSC00347		

Initial Pressure (psig): -1.25 Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	**800**	170	**460**	97	
75-71-8	Dichlorodifluoromethane (CFC 12)	**970**	170	**200**	34	
74-87-3	Chloromethane	ND	170	ND	81	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	**1,100**	170	**150**	24	
75-01-4	Vinyl Chloride	**6,600**	170	**2,600**	66	
106-99-0	1,3-Butadiene	ND	170	ND	76	
74-83-9	Bromomethane	ND	170	ND	43	
75-00-3	Chloroethane	ND	170	ND	64	
64-17-5	Ethanol	ND	1,700	ND	890	
75-05-8	Acetonitrile	ND	170	ND	100	
107-02-8	Acrolein	ND	670	ND	290	
67-64-1	Acetone	ND	1,700	ND	710	
75-69-4	Trichlorofluoromethane	ND	170	ND	30	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	1,700	ND	680	
107-13-1	Acrylonitrile	ND	170	ND	77	
75-35-4	1,1-Dichloroethene	ND	170	ND	42	
75-09-2	Methylene Chloride	ND	170	ND	48	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	170	ND	54	
76-13-1	Trichlorotrifluoroethane	ND	170	ND	22	
75-15-0	Carbon Disulfide	ND	1,700	ND	540	
156-60-5	trans-1,2-Dichloroethene	ND	170	ND	42	
75-34-3	1,1-Dichloroethane	ND	170	ND	41	
1634-04-4	Methyl tert-Butyl Ether	ND	170	ND	46	
108-05-4	Vinyl Acetate	ND	1,700	ND	480	
78-93-3	2-Butanone (MEK)	ND	1,700	ND	570	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates, Inc.**
Client Sample ID: **GP-39-11162016** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-004

Test Code: EPA TO-15 Modified Date Collected: 11/16/16
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 11/21/16
Analyst: Lusine Hakobyan Date Analyzed: 11/30/16
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.0040 Liter(s)
Test Notes:
Container ID: SSC00347

Initial Pressure (psig): -1.25 Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	**1,500**	170	**380**	42	
141-78-6	Ethyl Acetate	ND	340	ND	93	
110-54-3	n-Hexane	**820**	170	**230**	48	
67-66-3	Chloroform	ND	170	ND	34	
109-99-9	Tetrahydrofuran (THF)	ND	170	ND	57	
107-06-2	1,2-Dichloroethane	ND	170	ND	41	
71-55-6	1,1,1-Trichloroethane	ND	170	ND	31	
71-43-2	Benzene	**410**	170	**130**	52	
56-23-5	Carbon Tetrachloride	ND	170	ND	27	
110-82-7	Cyclohexane	**2,800**	340	**820**	97	
78-87-5	1,2-Dichloropropane	ND	170	ND	36	
75-27-4	Bromodichloromethane	ND	170	ND	25	
79-01-6	Trichloroethene	ND	170	ND	31	
123-91-1	1,4-Dioxane	ND	170	ND	46	
80-62-6	Methyl Methacrylate	ND	340	ND	82	
142-82-5	n-Heptane	**2,000**	170	**490**	41	
10061-01-5	cis-1,3-Dichloropropene	ND	170	ND	37	
108-10-1	4-Methyl-2-pentanone	ND	170	ND	41	
10061-02-6	trans-1,3-Dichloropropene	ND	170	ND	37	
79-00-5	1,1,2-Trichloroethane	ND	170	ND	31	
108-88-3	Toluene	**1,900**	170	**500**	44	
591-78-6	2-Hexanone	ND	170	ND	41	
124-48-1	Dibromochloromethane	ND	170	ND	20	
106-93-4	1,2-Dibromoethane	ND	170	ND	22	
123-86-4	n-Butyl Acetate	ND	170	ND	35	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Landau Associates, Inc.**
Client Sample ID: **GP-39-11162016** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-004

Test Code: EPA TO-15 Modified Date Collected: 11/16/16
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 11/21/16
Analyst: Lusine Hakobyan Date Analyzed: 11/30/16
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.0040 Liter(s)
Test Notes:
Container ID: SSC00347

Initial Pressure (psig): -1.25 Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	Compound	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
111-65-9	n-Octane	**1,700**	170	**360**	36	
127-18-4	Tetrachloroethene	ND	170	ND	25	
108-90-7	Chlorobenzene	ND	170	ND	36	
100-41-4	Ethylbenzene	**3,800**	170	**870**	39	
179601-23-1	m,p-Xylenes	**7,600**	340	**1,700**	77	
75-25-2	Bromoform	ND	170	ND	16	
100-42-5	Styrene	ND	170	ND	39	
95-47-6	o-Xylene	**2,800**	170	**640**	39	
111-84-2	n-Nonane	**13,000**	170	**2,500**	32	
79-34-5	1,1,2,2-Tetrachloroethane	ND	170	ND	24	
98-82-8	Cumene	**690**	170	**140**	34	
80-56-8	alpha-Pinene	**1,200**	170	**220**	30	
103-65-1	n-Propylbenzene	**1,000**	170	**210**	34	
622-96-8	4-Ethyltoluene	**470**	170	**95**	34	
108-67-8	1,3,5-Trimethylbenzene	**1,500**	170	**310**	34	
95-63-6	1,2,4-Trimethylbenzene	**3,400**	170	**700**	34	
100-44-7	Benzyl Chloride	ND	170	ND	32	
541-73-1	1,3-Dichlorobenzene	ND	170	ND	28	
106-46-7	1,4-Dichlorobenzene	ND	170	ND	28	
95-50-1	1,2-Dichlorobenzene	ND	170	ND	28	
5989-27-5	d-Limonene	**620**	170	**110**	30	
96-12-8	1,2-Dibromo-3-chloropropane	ND	170	ND	17	
120-82-1	1,2,4-Trichlorobenzene	ND	170	ND	23	
91-20-3	Naphthalene	ND	170	ND	32	
87-68-3	Hexachlorobutadiene	ND	170	ND	16	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates, Inc.**
Client Sample ID: **GP-38-11162016** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1605444-005

Test Code: EPA TO-15 Modified Date Collected: 11/16/16
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 11/21/16
Analyst: Lusine Hakobyan Date Analyzed: 11/30/16
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.020 Liter(s)
Test Notes:
Container ID: SSC00127

Initial Pressure (psig): -2.22 Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	**800**	37	**460**	21	
75-71-8	Dichlorodifluoromethane (CFC 12)	**110**	37	**23**	7.4	
74-87-3	Chloromethane	ND	37	ND	18	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	**1,400**	37	**190**	5.2	
75-01-4	Vinyl Chloride	**90**	37	**35**	14	
106-99-0	1,3-Butadiene	ND	37	ND	17	
74-83-9	Bromomethane	ND	37	ND	9.4	
75-00-3	Chloroethane	ND	37	ND	14	
64-17-5	Ethanol	ND	370	ND	190	
75-05-8	Acetonitrile	ND	37	ND	22	
107-02-8	Acrolein	ND	150	ND	64	
67-64-1	Acetone	ND	370	ND	150	
75-69-4	Trichlorofluoromethane	ND	37	ND	6.5	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	370	ND	150	
107-13-1	Acrylonitrile	ND	37	ND	17	
75-35-4	1,1-Dichloroethene	ND	37	ND	9.2	
75-09-2	Methylene Chloride	ND	37	ND	11	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	37	ND	12	
76-13-1	Trichlorotrifluoroethane	ND	37	ND	4.8	
75-15-0	Carbon Disulfide	ND	370	ND	120	
156-60-5	trans-1,2-Dichloroethene	ND	37	ND	9.2	
75-34-3	1,1-Dichloroethane	ND	37	ND	9.0	
1634-04-4	Methyl tert-Butyl Ether	ND	37	ND	10	
108-05-4	Vinyl Acetate	ND	370	ND	100	
78-93-3	2-Butanone (MEK)	ND	370	ND	120	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Client:	**Landau Associates, Inc.**		
Client Sample ID:	**GP-38-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-005
Test Code:	EPA TO-15 Modified	Date Collected:	11/16/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	11/21/16
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.020 Liter(s)
Test Notes:			
Container ID:	SSC00127		

Initial Pressure (psig): -2.22 Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	ND	37	ND	9.2	
141-78-6	Ethyl Acetate	ND	73	ND	20	
110-54-3	n-Hexane	**830**	37	**240**	10	
67-66-3	Chloroform	ND	37	ND	7.5	
109-99-9	Tetrahydrofuran (THF)	ND	37	ND	12	
107-06-2	1,2-Dichloroethane	ND	37	ND	9.0	
71-55-6	1,1,1-Trichloroethane	ND	37	ND	6.7	
71-43-2	Benzene	**78**	37	**25**	11	
56-23-5	Carbon Tetrachloride	ND	37	ND	5.8	
110-82-7	Cyclohexane	**1,800**	73	**530**	21	
78-87-5	1,2-Dichloropropane	ND	37	ND	7.9	
75-27-4	Bromodichloromethane	ND	37	ND	5.5	
79-01-6	Trichloroethene	ND	37	ND	6.8	
123-91-1	1,4-Dioxane	ND	37	ND	10	
80-62-6	Methyl Methacrylate	ND	73	ND	18	
142-82-5	n-Heptane	**2,200**	37	**540**	8.9	
10061-01-5	cis-1,3-Dichloropropene	ND	37	ND	8.0	
108-10-1	4-Methyl-2-pentanone	ND	37	ND	8.9	
10061-02-6	trans-1,3-Dichloropropene	ND	37	ND	8.0	
79-00-5	1,1,2-Trichloroethane	ND	37	ND	6.7	
108-88-3	Toluene	**110**	37	**30**	9.7	
591-78-6	2-Hexanone	ND	37	ND	8.9	
124-48-1	Dibromochloromethane	ND	37	ND	4.3	
106-93-4	1,2-Dibromoethane	ND	37	ND	4.8	
123-86-4	n-Butyl Acetate	ND	37	ND	7.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**GP-38-11162016**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1605444-005
Test Code:	EPA TO-15 Modified	Date Collected:	11/16/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	11/21/16
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.020 Liter(s)
Test Notes:			
Container ID:	SSC00127		

Initial Pressure (psig): -2.22 Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	**490**	37	**100**	7.8	
127-18-4	Tetrachloroethene	ND	37	ND	5.4	
108-90-7	Chlorobenzene	ND	37	ND	7.9	
100-41-4	Ethylbenzene	**38**	37	**8.8**	8.4	
179601-23-1	m,p-Xylenes	**1,200**	73	**280**	17	
75-25-2	Bromoform	ND	37	ND	3.5	
100-42-5	Styrene	ND	37	ND	8.6	
95-47-6	o-Xylene	**430**	37	**98**	8.4	
111-84-2	n-Nonane	**140**	37	**26**	7.0	
79-34-5	1,1,2,2-Tetrachloroethane	ND	37	ND	5.3	
98-82-8	Cumene	ND	37	ND	7.4	
80-56-8	alpha-Pinene	**110**	37	**21**	6.6	
103-65-1	n-Propylbenzene	ND	37	ND	7.4	
622-96-8	4-Ethyltoluene	**51**	37	**10**	7.4	
108-67-8	1,3,5-Trimethylbenzene	**220**	37	**46**	7.4	
95-63-6	1,2,4-Trimethylbenzene	**260**	37	**53**	7.4	
100-44-7	Benzyl Chloride	ND	37	ND	7.1	
541-73-1	1,3-Dichlorobenzene	ND	37	ND	6.1	
106-46-7	1,4-Dichlorobenzene	**61**	37	**10**	6.1	
95-50-1	1,2-Dichlorobenzene	ND	37	ND	6.1	
5989-27-5	d-Limonene	ND	37	ND	6.6	
96-12-8	1,2-Dibromo-3-chloropropane	ND	37	ND	3.8	
120-82-1	1,2,4-Trichlorobenzene	ND	37	ND	4.9	
91-20-3	Naphthalene	ND	37	ND	7.0	
87-68-3	Hexachlorobutadiene	ND	37	ND	3.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS
Page 1 of 3

Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161130-MB
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS
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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161130-MB
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
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ALS ENVIRONMENTAL

RESULTS OF ANALYSIS
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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161130-MB
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161205-MB
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	12/5/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161205-MB
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	12/5/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result** **µg/m³**	MRL µg/m³	**Result** **ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS
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Client: **Landau Associates, Inc.**
Client Sample ID: **Method Blank** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P161205-MB

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 12/5/16
Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

SURROGATE SPIKE RECOVERY RESULTS

Page 1 of 1

Client: **Landau Associates, Inc.**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**
ALS Project ID: P1605444

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister(s)
Test Notes:

Date(s) Collected: 11/16/16
Date(s) Received: 11/21/16
Date(s) Analyzed: 11/30 - 12/5/16

Client Sample ID	ALS Sample ID	1,2-Dichloroethane-d4 Percent Recovered	Toluene-d8 Percent Recovered	Bromofluorobenzene Percent Recovered	Acceptance Limits	Data Qualifier
Method Blank	P161130-MB	**97**	**103**	**102**	70-130	
Method Blank	P161205-MB	**91**	**104**	**108**	70-130	
Lab Control Sample	P161130-LCS	**93**	**100**	**107**	70-130	
Lab Control Sample	P161205-LCS	**89**	**102**	**112**	70-130	
GP-43-11162016	P1605444-001	**94**	**98**	**108**	70-130	
GP-41-11162016	P1605444-002	**94**	**97**	**106**	70-130	
Ambient-11162016	P1605444-003	**92**	**102**	**111**	70-130	
GP-39-11162016	P1605444-004	**94**	**98**	**107**	70-130	
GP-38-11162016	P1605444-005	**93**	**96**	**104**	70-130	

Surrogate percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly from the on-column percent recovery.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161130-LCS
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.125 Liter(s)
Test Notes:			

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
115-07-1	Propene	210	**191**	**91**	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	**197**	**94**	68-109	
74-87-3	Chloromethane	210	**195**	**93**	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	**188**	**89**	66-114	
75-01-4	Vinyl Chloride	210	**200**	**95**	61-125	
106-99-0	1,3-Butadiene	210	**223**	**106**	62-144	
74-83-9	Bromomethane	210	**204**	**97**	73-123	
75-00-3	Chloroethane	210	**210**	**100**	69-122	
64-17-5	Ethanol	1,060	**996**	**94**	62-124	
75-05-8	Acetonitrile	213	**206**	**97**	57-114	
107-02-8	Acrolein	212	**172**	**81**	62-116	
67-64-1	Acetone	1,060	**967**	**91**	57-117	
75-69-4	Trichlorofluoromethane	210	**191**	**91**	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	**406**	**96**	66-121	
107-13-1	Acrylonitrile	213	**210**	**99**	68-123	
75-35-4	1,1-Dichloroethene	213	**217**	**102**	76-118	
75-09-2	Methylene Chloride	212	**193**	**91**	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	**203**	**96**	65-126	
76-13-1	Trichlorotrifluoroethane	212	**204**	**96**	73-114	
75-15-0	Carbon Disulfide	213	**212**	**100**	57-102	
156-60-5	trans-1,2-Dichloroethene	213	**207**	**97**	74-123	
75-34-3	1,1-Dichloroethane	212	**199**	**94**	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	**195**	**92**	69-113	
108-05-4	Vinyl Acetate	1,060	**1060**	**100**	76-128	
78-93-3	2-Butanone (MEK)	212	**198**	**93**	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client: **Landau Associates, Inc.**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P161130-LCS

Test Code: EPA TO-15 Modified Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: NA
Analyst: Lusine Hakobyan Date Analyzed: 11/30/16
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.125 Liter(s)
Test Notes:

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	212	**200**	**94**	72-117	
141-78-6	Ethyl Acetate	426	**417**	**98**	68-127	
110-54-3	n-Hexane	213	**190**	**89**	55-116	
67-66-3	Chloroform	212	**193**	**91**	70-109	
109-99-9	Tetrahydrofuran (THF)	213	**192**	**90**	72-113	
107-06-2	1,2-Dichloroethane	212	**188**	**89**	69-113	
71-55-6	1,1,1-Trichloroethane	212	**200**	**94**	72-115	
71-43-2	Benzene	212	**180**	**85**	65-107	
56-23-5	Carbon Tetrachloride	213	**208**	**98**	71-113	
110-82-7	Cyclohexane	425	**400**	**94**	71-115	
78-87-5	1,2-Dichloropropane	212	**198**	**93**	71-115	
75-27-4	Bromodichloromethane	214	**214**	**100**	75-118	
79-01-6	Trichloroethene	212	**205**	**97**	68-114	
123-91-1	1,4-Dioxane	213	**200**	**94**	81-131	
80-62-6	Methyl Methacrylate	424	**425**	**100**	72-130	
142-82-5	n-Heptane	213	**194**	**91**	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	**216**	**103**	77-126	
108-10-1	4-Methyl-2-pentanone	213	**212**	**100**	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	**224**	**105**	79-125	
79-00-5	1,1,2-Trichloroethane	212	**207**	**98**	75-119	
108-88-3	Toluene	212	**203**	**96**	59-118	
591-78-6	2-Hexanone	213	**201**	**94**	69-129	
124-48-1	Dibromochloromethane	213	**227**	**107**	74-136	
106-93-4	1,2-Dibromoethane	212	**212**	**100**	73-131	
123-86-4	n-Butyl Acetate	216	**198**	**92**	69-130	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161130-LCS
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	11/30/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.125 Liter(s)
Test Notes:			

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
111-65-9	n-Octane	212	**198**	**93**	66-120	
127-18-4	Tetrachloroethene	213	**208**	**98**	65-130	
108-90-7	Chlorobenzene	212	**201**	**95**	68-120	
100-41-4	Ethylbenzene	212	**197**	**93**	68-122	
179601-23-1	m,p-Xylenes	424	**393**	**93**	68-123	
75-25-2	Bromoform	212	**250**	**118**	69-130	
100-42-5	Styrene	212	**207**	**98**	71-133	
95-47-6	o-Xylene	212	**199**	**94**	68-122	
111-84-2	n-Nonane	212	**192**	**91**	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	**218**	**103**	69-130	
98-82-8	Cumene	212	**211**	**100**	70-123	
80-56-8	alpha-Pinene	213	**204**	**96**	70-128	
103-65-1	n-Propylbenzene	214	**206**	**96**	69-125	
622-96-8	4-Ethyltoluene	212	**206**	**97**	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	**196**	**92**	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	**201**	**95**	67-129	
100-44-7	Benzyl Chloride	212	**244**	**115**	79-138	
541-73-1	1,3-Dichlorobenzene	212	**227**	**107**	65-136	
106-46-7	1,4-Dichlorobenzene	213	**200**	**94**	66-141	
95-50-1	1,2-Dichlorobenzene	212	**214**	**101**	67-136	
5989-27-5	d-Limonene	212	**208**	**98**	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	**259**	**122**	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	**258**	**122**	64-134	
91-20-3	Naphthalene	214	**266**	**124**	62-136	
87-68-3	Hexachlorobutadiene	213	**247**	**116**	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 3

Client: **Landau Associates, Inc.**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P161205-LCS

Test Code: EPA TO-15 Modified Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: NA
Analyst: Lusine Hakobyan Date Analyzed: 12/5/16
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.125 Liter(s)
Test Notes:

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
115-07-1	Propene	210	**179**	**85**	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	**185**	**88**	68-109	
74-87-3	Chloromethane	210	**173**	**82**	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	**184**	**87**	66-114	
75-01-4	Vinyl Chloride	210	**184**	**88**	61-125	
106-99-0	1,3-Butadiene	210	**221**	**105**	62-144	
74-83-9	Bromomethane	210	**203**	**97**	73-123	
75-00-3	Chloroethane	210	**203**	**97**	69-122	
64-17-5	Ethanol	1,060	**930**	**88**	62-124	
75-05-8	Acetonitrile	213	**193**	**91**	57-114	
107-02-8	Acrolein	212	**164**	**77**	62-116	
67-64-1	Acetone	1,060	**908**	**86**	57-117	
75-69-4	Trichlorofluoromethane	210	**181**	**86**	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	**369**	**87**	66-121	
107-13-1	Acrylonitrile	213	**199**	**93**	68-123	
75-35-4	1,1-Dichloroethene	213	**210**	**99**	76-118	
75-09-2	Methylene Chloride	212	**186**	**88**	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	**188**	**89**	65-126	
76-13-1	Trichlorotrifluoroethane	212	**199**	**94**	73-114	
75-15-0	Carbon Disulfide	213	**205**	**96**	57-102	
156-60-5	trans-1,2-Dichloroethene	213	**196**	**92**	74-123	
75-34-3	1,1-Dichloroethane	212	**189**	**89**	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	**187**	**88**	69-113	
108-05-4	Vinyl Acetate	1,060	**1000**	**94**	76-128	
78-93-3	2-Butanone (MEK)	212	**190**	**90**	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 2 of 3

Client: **Landau Associates, Inc.**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1605444
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P161205-LCS

Test Code: EPA TO-15 Modified Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: NA
Analyst: Lusine Hakobyan Date Analyzed: 12/5/16
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.125 Liter(s)
Test Notes:

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	212	**189**	**89**	72-117	
141-78-6	Ethyl Acetate	426	**389**	**91**	68-127	
110-54-3	n-Hexane	213	**176**	**83**	55-116	
67-66-3	Chloroform	212	**184**	**87**	70-109	
109-99-9	Tetrahydrofuran (THF)	213	**184**	**86**	72-113	
107-06-2	1,2-Dichloroethane	212	**175**	**83**	69-113	
71-55-6	1,1,1-Trichloroethane	212	**189**	**89**	72-115	
71-43-2	Benzene	212	**172**	**81**	65-107	
56-23-5	Carbon Tetrachloride	213	**198**	**93**	71-113	
110-82-7	Cyclohexane	425	**385**	**91**	71-115	
78-87-5	1,2-Dichloropropane	212	**189**	**89**	71-115	
75-27-4	Bromodichloromethane	214	**200**	**93**	75-118	
79-01-6	Trichloroethene	212	**201**	**95**	68-114	
123-91-1	1,4-Dioxane	213	**192**	**90**	81-131	
80-62-6	Methyl Methacrylate	424	**408**	**96**	72-130	
142-82-5	n-Heptane	213	**187**	**88**	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	**204**	**97**	77-126	
108-10-1	4-Methyl-2-pentanone	213	**199**	**93**	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	**211**	**99**	79-125	
79-00-5	1,1,2-Trichloroethane	212	**199**	**94**	75-119	
108-88-3	Toluene	212	**198**	**93**	59-118	
591-78-6	2-Hexanone	213	**186**	**87**	69-129	
124-48-1	Dibromochloromethane	213	**224**	**105**	74-136	
106-93-4	1,2-Dibromoethane	212	**208**	**98**	73-131	
123-86-4	n-Butyl Acetate	216	**185**	**86**	69-130	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 3 of 3

Client:	**Landau Associates, Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1605444
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P161205-LCS
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	12/5/16
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.125 Liter(s)
Test Notes:			

CAS #	Compound	Spike Amount µg/m³	Result µg/m³	% Recovery	ALS Acceptance Limits	Data Qualifier
111-65-9	n-Octane	212	**190**	**90**	66-120	
127-18-4	Tetrachloroethene	213	**207**	**97**	65-130	
108-90-7	Chlorobenzene	212	**198**	**93**	68-120	
100-41-4	Ethylbenzene	212	**192**	**91**	68-122	
179601-23-1	m,p-Xylenes	424	**378**	**89**	68-123	
75-25-2	Bromoform	212	**248**	**117**	69-130	
100-42-5	Styrene	212	**203**	**96**	71-133	
95-47-6	o-Xylene	212	**193**	**91**	68-122	
111-84-2	n-Nonane	212	**179**	**84**	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	**210**	**99**	69-130	
98-82-8	Cumene	212	**206**	**97**	70-123	
80-56-8	alpha-Pinene	213	**197**	**92**	70-128	
103-65-1	n-Propylbenzene	214	**198**	**93**	69-125	
622-96-8	4-Ethyltoluene	212	**194**	**92**	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	**187**	**88**	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	**186**	**88**	67-129	
100-44-7	Benzyl Chloride	212	**225**	**106**	79-138	
541-73-1	1,3-Dichlorobenzene	212	**219**	**103**	65-136	
106-46-7	1,4-Dichlorobenzene	213	**195**	**92**	66-141	
95-50-1	1,2-Dichlorobenzene	212	**206**	**97**	67-136	
5989-27-5	d-Limonene	212	**181**	**85**	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	**257**	**121**	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	**256**	**121**	64-134	
91-20-3	Naphthalene	214	**258**	**121**	62-136	
87-68-3	Hexachlorobutadiene	213	**248**	**116**	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

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www.alsglobal.com

LABORATORY REPORT

January 17, 2017

Piper Roelen
Landau Associates,Inc.
130 2nd Ave. South
Edmonds, WA 98020

RE: Transportation Corridor Investigation / 1148009.010.014

Dear Piper:

Enclosed are the results of the samples submitted to our laboratory on January 3, 2017. For your reference, these analyses have been assigned our service request number P1700001.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

Kate Kaneko

By Kate Kaneko at 7:43 am, 01/17/17

Kate Kaneko
Project Manager

Client: Landau Associates,Inc. Service Request No: P1700001
Project: Transportation Corridor Investigation / 1148009.010.014

CASE NARRATIVE

The samples were received intact under chain of custody on January 3, 2017 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Fixed Gases Analysis

The samples were analyzed for fixed gases (oxygen, nitrogen, carbon monoxide, methane and carbon dioxide) according to modified EPA Method 3C (single injection) using a gas chromatograph equipped with a thermal conductivity detector (TCD). This procedure is described in laboratory SOP VOA-EPA3C. This method is included on the laboratory's DoD-ELAP scope of accreditation, however it is not part of the NELAP accreditation.

Sulfur Analysis

The samples were also analyzed for twenty sulfur compounds per ASTM D 5504-12 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan. This method is included on the laboratory's NELAP scope of accreditation, however it is not part of the DoD-ELAP accreditation.

Total Gaseous Non-Methane Organics as Methane Analysis

The samples were also analyzed for total gaseous non-methane organics as methane according to modified EPA Method 25C. The analyses included a single sample injection (method modification) analyzed by gas chromatography using flame ionization detection/total combustion analysis. This method is not included on the laboratory's NELAP or DoD-ELAP scope of accreditation.

Volatile Organic Compound Analysis

The samples were also analyzed for volatile organic compounds in accordance with EPA Method TO-15 from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition (EPA/625/R-96/010b), January, 1999. This procedure is described in laboratory SOP VOA-TO15. The analytical system was comprised of a gas chromatograph / mass spectrometer (GC/MS) interfaced to a whole-air preconcentrator. The method was modified to include the use of helium as a diluent gas in place of zero-grade air for container pressurization. When necessary, analytical sample volumes were adjusted by a correction factor

Client: Landau Associates,Inc. Service Request No: P1700001
Project: Transportation Corridor Investigation / 1148009.010.014

CASE NARRATIVE

for containers pressurized with helium. A summary sheet has been included listing the affected samples. This method is included on the laboratory's NELAP and DoD-ELAP scope of accreditation. Any analytes flagged with an X are not included on the NELAP or DoD-ELAP accreditation.

The containers were cleaned, prior to sampling, down to the method reporting limit (MRL) reported for this project. Please note, projects which require reporting below the MRL could have results between the MRL and method detection limit (MDL) that are biased high.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.

ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Arizona DHS	http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home	AZ0694
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Louisiana DEQ (NELAP)	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	05071
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2016036
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	1177034
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-003
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
PJLA (DoD ELAP)	http://www.pjlabs.com/search-accredited-labs	65818 (Testing)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-16-7
Utah DOH (NELAP)	http://health.utah.gov/lab/environmental-lab-certification/	CA016272016-6
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Landau Associates,Inc.
Service Request: P1700001
Project ID: Transportation Corridor Investigation / 1148009.010.014

Date Received: 1/3/2017
Time Received: 09:15

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	ASTM D1946-90(2006) - Fxd Gases Can	ASTM D 5504-12 - Sulfur Can	25C Modified - TGNMO+ 1X Can	TO-15 Modified - VOC Cans
Ambient-12292016	P1700001-001	Air	12/29/2016	13:07	SSC00151	0.05	3.91	X	X	X	X
GP-38-12292016	P1700001-002	Air	12/29/2016	13:30	SSC00258	0.22	3.92	X	X	X	X
GP-39-12292016	P1700001-003	Air	12/29/2016	14:15	SSC00120	0.04	3.81	X	X	X	X
GP-43-12292016	P1700001-004	Air	12/29/2016	14:30	SSC00277	0.11	4.07	X	X	X	X
GP-41-12292016	P1700001-005	Air	12/29/2016	14:45	SSC00402	-0.33	3.74	X	X	X	X

Air - Chain of Custody Record & Analytical Service Request

Page 1 of 1

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10-Day-Standard

ALS Project No. ~~P1600~~ P1700001

ALS Contact:

Company Name & Address (Reporting Information):
Landau Associates
130 2nd Ave. South
Edmonds, WA 98026

Project Name: Transportation Corridor Investigation

Project Number: 1148009.010.014

Project Manager: Piper Roelen

P.O. # / Billing Information: 1148009.010.014 Closed City of Yakima Landfill Site Project
Invoice through LAI

Phone: (425) 778-0907

Fax: —

Email Address for Result Reporting: proelen@landauinc.com, cjohnson@landauinc.com, sdavis@landauinc.com

Sampler (Print & Sign): Stephanie Renando

Analysis Method

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume	Total Reduced Sulfur ASTM D-5504	Fixed Gases * ASTM D-1945	NMOC's (EPA 25C)	VOC's (TO-15)	Comments e.g. Actual Preservative or specific instructions
Ambient-12292016	①	12/29/16	1307	SSC00151	SFC00105	-17.49	-4	6L	X	X	X	X	*methane, CO2, CO, O2, Nitrogen
GP-38-12292016	②	12/29/16	1330	SSC00258	SFC00095	-17.58	-0.09	6L	X	X	X	X	
GP-39-12292016	③	12/29/16	1415	SSC00120	SFC00144	-17.64	-7	6L	X	X	X	X	
GP-43-12292016	④	12/29/16	1430	SSC00277	SFC00113	-17.64	-0.70	6L	X	X	X	X	
GP-41-12292016	⑤	12/29/16	1445	SSC00402	SFC00161	-17.67	-4	6L	X	X	X	X	

Report Tier Levels - please select
Tier I - Results (Default in not specified) ____
Tier II (Results + QC Summaries ____
Tier III (Results + QC & Calibration Summaries) ____
Tier IV (Date Validation Package) 10% Surcharge ____

EDD required YES / No
Type: ________ Units: ________

Chain of Custody Seal: (Circle)
INTACT BROKEN [✓ ABSENT]

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature) Date: 12/29/16 Time: 1600
Received by: (Signature) Date: Time:

Relinquished by: (Signature) Date: Time:
Received by: (Signature) Date: 1/3/17 Time: 0915

Cooler / Blank Temperature ____°C

ALS Environmental

Sample Acceptance Check Form

Client: Landau Associates, Inc. Work order: P1700001

Project: Transportation Corridor Investigation / 1148009.010.014

Sample(s) received on: 1/3/17 Date opened: 1/3/17 by: ADAVID

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	**No**	**N/A**
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Did **sample containers** arrive in good condition?	☒	☐	☐
3	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
4	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
5	Was **sample volume** received adequate for analysis?	☒	☐	☐
6	Are samples within specified holding times?	☒	☐	☐
7	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☒
8	Were **custody seals** on outside of cooler/Box/Container?	☐	☒	☐
	Location of seal(s)? Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
9	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
10	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
11	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1700001-001.01	6.0 L Silonite Can					
P1700001-002.01	6.0 L Silonite Can					
P1700001-003.01	6.0 L Silonite Can					
P1700001-004.01	6.0 L Silonite Can					
P1700001-005.01	6.0 L Silonite Can					

Explain any discrepancies: (include lab sample ID numbers):

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Ambient-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-001

Test Code:	ASTM D1946	Date Collected:	12/29/16
Instrument ID:	HP5890 II/GC1/TCD	Date Received:	1/3/17
Analyst:	Mike Conejo	Date Analyzed:	1/3/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.10 ml(s)
Test Notes:			
Container ID:	SSC00151		

Canister Dilution Factor: 2.20

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	**Oxygen***	**22.2**	0.22	
7727-37-9	**Nitrogen**	**77.8**	0.22	
630-08-0	Carbon Monoxide	ND	0.22	
74-82-8	Methane	ND	0.22	
124-38-9	Carbon Dioxide	ND	0.22	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-38-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-002

Test Code:	ASTM D1946	Date Collected:	12/29/16
Instrument ID:	HP5890 II/GC1/TCD	Date Received:	1/3/17
Analyst:	Mike Conejo	Date Analyzed:	1/3/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.10 ml(s)
Test Notes:			
Container ID:	SSC00258		

Canister Dilution Factor: 2.16

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	**Oxygen***	**0.286**	0.22	
7727-37-9	**Nitrogen**	**5.76**	0.22	
630-08-0	Carbon Monoxide	ND	0.22	
74-82-8	**Methane**	**57.9**	0.22	
124-38-9	**Carbon Dioxide**	**36.0**	0.22	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-39-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-003

Test Code:	ASTM D1946	Date Collected:	12/29/16
Instrument ID:	HP5890 II/GC1/TCD	Date Received:	1/3/17
Analyst:	Mike Conejo	Date Analyzed:	1/3/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.10 ml(s)
Test Notes:			
Container ID:	SSC00120		

Canister Dilution Factor: 2.19

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.22	
7727-37-9	**Nitrogen**	**1.18**	0.22	
630-08-0	Carbon Monoxide	ND	0.22	
74-82-8	**Methane**	**66.0**	0.22	
124-38-9	**Carbon Dioxide**	**32.6**	0.22	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Landau Associates,Inc.**
Client Sample ID: **GP-43-12292016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P1700001-004

Test Code: ASTM D1946
Instrument ID: HP5890 II/GC1/TCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00277

Date Collected: 12/29/16
Date Received: 1/3/17
Date Analyzed: 1/4/17
Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.21

CAS #	Compound	Result %, v/v		MRL %, v/v	Data Qualifier
7782-44-7	**Oxygen***	**0.380**		0.22	
7727-37-9	**Nitrogen**	**2.82**		0.22	
630-08-0	Carbon Monoxide		ND	0.22	
74-82-8	**Methane**	**65.9**		0.22	
124-38-9	**Carbon Dioxide**	**30.8**		0.22	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-41-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-005

Test Code:	ASTM D1946	Date Collected:	12/29/16
Instrument ID:	HP5890 II/GC1/TCD	Date Received:	1/3/17
Analyst:	Mike Conejo	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.10 ml(s)
Test Notes:			
Container ID:	SSC00402		

Canister Dilution Factor: 2.29

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	**Oxygen***	**0.376**	0.23	
7727-37-9	**Nitrogen**	**4.02**	0.23	
630-08-0	Carbon Monoxide	ND	0.23	
74-82-8	**Methane**	**70.5**	0.23	
124-38-9	**Carbon Dioxide**	**25.1**	0.23	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **Method Blank**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P170103-MB

Test Code: ASTM D1946
Instrument ID: HP5890 II/GC1/TCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 1/03/17
Volume(s) Analyzed: 0.10 ml(s)

CAS #	**Compound**	**Result %, v/v**	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **Method Blank**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P170104-MB

Test Code: ASTM D1946
Instrument ID: HP5890 II/GC1/TCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 1/04/17
Volume(s) Analyzed: 0.10 ml(s)

CAS #	**Compound**	**Result** **%, v/v**	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client: **Landau Associates,Inc.**
Client Sample ID: **Lab Control Sample**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P170103-LCS

Test Code: ASTM D1946
Instrument ID: HP5890 II/GC1/TCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 1/03/17
Volume(s) Analyzed: NA ml(s)

CAS #	**Compound**	Spike Amount ppmV	**Result ppmV**	**% Recovery**	ALS Acceptance Limits	Data Qualifier
7782-44-7	Oxygen*	50,000	**53,000**	**106**	97-108	
7727-37-9	Nitrogen	50,000	**52,900**	**106**	89-113	
630-08-0	Carbon Monoxide	50,000	**52,200**	**104**	98-108	
74-82-8	Methane	50,000	**50,300**	**101**	94-111	
124-38-9	Carbon Dioxide	50,000	**50,200**	**100**	94-104	

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P170104-LCS

Test Code:	ASTM D1946	Date Collected:	NA
Instrument ID:	HP5890 II/GC1/TCD	Date Received:	NA
Analyst:	Mike Conejo	Date Analyzed:	1/04/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	NA ml(s)
Test Notes:			

CAS #	**Compound**	Spike Amount ppmV	**Result ppmV**	**% Recovery**	ALS Acceptance Limits	Data Qualifier
7782-44-7	Oxygen*	50,000	**53,000**	**106**	97-108	
7727-37-9	Nitrogen	50,000	**53,800**	**108**	89-113	
630-08-0	Carbon Monoxide	50,000	**51,800**	**104**	98-108	
74-82-8	Methane	50,000	**50,000**	**100**	94-111	
124-38-9	Carbon Dioxide	50,000	**49,800**	**100**	94-104	

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Ambient-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-001

Test Code:	ASTM D 5504-12	Date Collected:	12/29/16
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	13:07
Analyst:	Mike Conejo	Date Received:	1/3/17
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	1/3/17
Test Notes:		Time Analyzed:	15:18
Container ID:	SSC00151	Volume(s) Analyzed:	1.0 ml(s)

Canister Dilution Factor: 2.20

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	15	ND	11	
463-58-1	Carbonyl Sulfide	ND	27	ND	11	
74-93-1	Methyl Mercaptan	ND	22	ND	11	
75-08-1	Ethyl Mercaptan	ND	28	ND	11	
75-18-3	Dimethyl Sulfide	ND	28	ND	11	
75-15-0	Carbon Disulfide	ND	17	ND	5.5	
75-33-2	Isopropyl Mercaptan	ND	34	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	41	ND	11	
107-03-9	n-Propyl Mercaptan	ND	34	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	34	ND	11	
110-02-1	Thiophene	ND	38	ND	11	
513-44-0	Isobutyl Mercaptan	ND	41	ND	11	
352-93-2	Diethyl Sulfide	ND	41	ND	11	
109-79-5	n-Butyl Mercaptan	ND	41	ND	11	
624-92-0	Dimethyl Disulfide	ND	21	ND	5.5	
616-44-4	3-Methylthiophene	ND	44	ND	11	
110-01-0	Tetrahydrothiophene	ND	40	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	50	ND	11	
872-55-9	2-Ethylthiophene	ND	50	ND	11	
110-81-6	Diethyl Disulfide	ND	27	ND	5.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-38-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-002

Test Code:	ASTM D 5504-12	Date Collected:	12/29/16
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	13:30
Analyst:	Mike Conejo	Date Received:	1/3/17
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	1/3/17
Test Notes:		Time Analyzed:	15:42
Container ID:	SSC00258	Volume(s) Analyzed:	1.0 ml(s)

Canister Dilution Factor: 2.16

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**3,400**	15	**2,400**	11	
463-58-1	Carbonyl Sulfide	ND	27	ND	11	
74-93-1	Methyl Mercaptan	**38**	21	**19**	11	
75-08-1	Ethyl Mercaptan	ND	27	ND	11	
75-18-3	Dimethyl Sulfide	ND	27	ND	11	
75-15-0	Carbon Disulfide	ND	17	ND	5.4	
75-33-2	Isopropyl Mercaptan	ND	34	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	40	ND	11	
107-03-9	n-Propyl Mercaptan	ND	34	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	34	ND	11	
110-02-1	Thiophene	ND	37	ND	11	
513-44-0	Isobutyl Mercaptan	ND	40	ND	11	
352-93-2	Diethyl Sulfide	ND	40	ND	11	
109-79-5	n-Butyl Mercaptan	ND	40	ND	11	
624-92-0	Dimethyl Disulfide	ND	21	ND	5.4	
616-44-4	3-Methylthiophene	ND	43	ND	11	
110-01-0	Tetrahydrothiophene	ND	39	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	50	ND	11	
872-55-9	2-Ethylthiophene	ND	50	ND	11	
110-81-6	Diethyl Disulfide	ND	27	ND	5.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-39-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-003

Test Code:	ASTM D 5504-12	Date Collected:	12/29/16
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	14:15
Analyst:	Mike Conejo	Date Received:	1/3/17
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	1/3/17
Test Notes:		Time Analyzed:	16:00
Container ID:	SSC00120	Volume(s) Analyzed:	1.0 ml(s)

Canister Dilution Factor: 2.19

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**12,000**	15	**8,800**	11	
463-58-1	Carbonyl Sulfide	ND	27	ND	11	
74-93-1	Methyl Mercaptan	ND	22	ND	11	
75-08-1	Ethyl Mercaptan	**28**	28	**11**	11	
75-18-3	Dimethyl Sulfide	ND	28	ND	11	
75-15-0	Carbon Disulfide	ND	17	ND	5.5	
75-33-2	Isopropyl Mercaptan	ND	34	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	40	ND	11	
107-03-9	n-Propyl Mercaptan	ND	34	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	34	ND	11	
110-02-1	Thiophene	ND	38	ND	11	
513-44-0	Isobutyl Mercaptan	ND	40	ND	11	
352-93-2	Diethyl Sulfide	ND	40	ND	11	
109-79-5	n-Butyl Mercaptan	ND	40	ND	11	
624-92-0	Dimethyl Disulfide	ND	21	ND	5.5	
616-44-4	3-Methylthiophene	ND	44	ND	11	
110-01-0	Tetrahydrothiophene	ND	39	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	50	ND	11	
872-55-9	2-Ethylthiophene	ND	50	ND	11	
110-81-6	Diethyl Disulfide	ND	27	ND	5.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **GP-43-12292016**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P1700001-004

Test Code: ASTM D 5504-12
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00277

Date Collected: 12/29/16
Time Collected: 14:30
Date Received: 1/3/17
Date Analyzed: 1/3/17
Time Analyzed: 16:18
Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 2.21

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**5,100**	15	**3,600**	11	
463-58-1	Carbonyl Sulfide	ND	27	ND	11	
74-93-1	Methyl Mercaptan	**30**	22	**15**	11	
75-08-1	Ethyl Mercaptan	ND	28	ND	11	
75-18-3	Dimethyl Sulfide	**110**	28	**42**	11	
75-15-0	Carbon Disulfide	ND	17	ND	5.5	
75-33-2	Isopropyl Mercaptan	ND	34	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	41	ND	11	
107-03-9	n-Propyl Mercaptan	ND	34	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	34	ND	11	
110-02-1	Thiophene	ND	38	ND	11	
513-44-0	Isobutyl Mercaptan	ND	41	ND	11	
352-93-2	Diethyl Sulfide	ND	41	ND	11	
109-79-5	n-Butyl Mercaptan	ND	41	ND	11	
624-92-0	Dimethyl Disulfide	ND	21	ND	5.5	
616-44-4	3-Methylthiophene	ND	44	ND	11	
110-01-0	Tetrahydrothiophene	ND	40	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	51	ND	11	
872-55-9	2-Ethylthiophene	ND	51	ND	11	
110-81-6	Diethyl Disulfide	ND	28	ND	5.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **GP-41-12292016** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1700001-005

Test Code:	ASTM D 5504-12	Date Collected:	12/29/16
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	14:45
Analyst:	Mike Conejo	Date Received:	1/3/17
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	1/3/17
Test Notes:		Time Analyzed:	16:36
Container ID:	SSC00402	Volume(s) Analyzed:	1.0 ml(s)

Canister Dilution Factor: 2.29

CAS #	**Compound**	**Result** **µg/m³**	MRL µg/m³	**Result** **ppbV**	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**640**	16	**460**	11	
463-58-1	Carbonyl Sulfide	ND	28	ND	11	
74-93-1	Methyl Mercaptan	ND	23	ND	11	
75-08-1	Ethyl Mercaptan	ND	29	ND	11	
75-18-3	Dimethyl Sulfide	ND	29	ND	11	
75-15-0	Carbon Disulfide	**110**	18	**34**	5.7	
75-33-2	Isopropyl Mercaptan	ND	36	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	42	ND	11	
107-03-9	n-Propyl Mercaptan	ND	36	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	36	ND	11	
110-02-1	Thiophene	ND	39	ND	11	
513-44-0	Isobutyl Mercaptan	ND	42	ND	11	
352-93-2	Diethyl Sulfide	ND	42	ND	11	
109-79-5	n-Butyl Mercaptan	ND	42	ND	11	
624-92-0	Dimethyl Disulfide	ND	22	ND	5.7	
616-44-4	3-Methylthiophene	ND	46	ND	11	
110-01-0	Tetrahydrothiophene	ND	41	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	53	ND	11	
872-55-9	2-Ethylthiophene	ND	53	ND	11	
110-81-6	Diethyl Disulfide	ND	29	ND	5.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS
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Client: **Landau Associates,Inc.**
Client Sample ID: **Method Blank**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P170103-MB

Test Code: ASTM D 5504-12
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Time Collected: NA
Date Received: NA
Date Analyzed: 1/03/17
Time Analyzed: 08:21
Volume(s) Analyzed: 1.0 ml(s)

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
463-58-1	Carbonyl Sulfide	ND	12	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-08-1	Ethyl Mercaptan	ND	13	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
75-15-0	Carbon Disulfide	ND	7.8	ND	2.5	
75-33-2	Isopropyl Mercaptan	ND	16	ND	5.0	
75-66-1	tert-Butyl Mercaptan	ND	18	ND	5.0	
107-03-9	n-Propyl Mercaptan	ND	16	ND	5.0	
624-89-5	Ethyl Methyl Sulfide	ND	16	ND	5.0	
110-02-1	Thiophene	ND	17	ND	5.0	
513-44-0	Isobutyl Mercaptan	ND	18	ND	5.0	
352-93-2	Diethyl Sulfide	ND	18	ND	5.0	
109-79-5	n-Butyl Mercaptan	ND	18	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	
616-44-4	3-Methylthiophene	ND	20	ND	5.0	
110-01-0	Tetrahydrothiophene	ND	18	ND	5.0	
638-02-8	2,5-Dimethylthiophene	ND	23	ND	5.0	
872-55-9	2-Ethylthiophene	ND	23	ND	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client: **Landau Associates,Inc.**
Client Sample ID: **Lab Control Sample**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P170103-LCS

Test Code: ASTM D 5504-12
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 1/03/17
Volume(s) Analyzed: NA ml(s)

CAS #	**Compound**	Spike Amount ppbV	**Result ppbV**	**% Recovery**	ALS Acceptance Limits	Data Qualifier
7783-06-4	Hydrogen Sulfide	1,000	**1,040**	**104**	75-148	
463-58-1	Carbonyl Sulfide	1,000	**1,060**	**106**	70-137	
74-93-1	Methyl Mercaptan	1,000	**1,050**	**105**	72-139	

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**

Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Project ID: P1700001

Total Gaseous Nonmethane Organics (TGNMO) as Methane

Test Code: EPA Method 25C Modified

Instrument ID: HP5890 II/GC1/FID/TCA Date(s) Collected: 12/29/16

Analyst: Mike Conejo Date Received: 1/3/17

Sampling Media: 6.0 L Silonite Canister(s) Date Analyzed: 1/5/17

Test Notes:

Client Sample ID	ALS Sample ID	Canister Dilution Factor	Injection Volume ml(s)	**Result ppmV**	MRL ppmV	Data Qualifier
Ambient-12292016	P1700001-001	2.20	0.50	ND	2.2	
GP-38-12292016	P1700001-002	2.16	0.50	**250**	2.2	
GP-39-12292016	P1700001-003	2.19	0.50	**600**	2.2	
GP-43-12292016	P1700001-004	2.21	0.50	**230**	2.2	
GP-41-12292016	P1700001-005	2.29	0.50	**310**	2.3	
Method Blank	P170105-MB	1.00	0.50	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client: **Landau Associates,Inc.**

Client Sample ID: **Lab Control Sample**

Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001

ALS Sample ID: P170105-LCS

Test Code: EPA Method 25C Modified

Instrument ID: HP5890 II/GC1/FID/TCA

Analyst: Mike Conejo

Sampling Media: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 1/05/17

Volume(s) Analyzed: NA ml(s)

Compound	Spike Amount ppmV	**Result ppmV**	**% Recovery**	ALS Acceptance Limits	Data Qualifier
Total Gaseous Nonmethane Organics (TGNMO) as Methane	1,000	**902**	**90**	85-121	

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Ambient-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-001
Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			
Container ID:	SSC00151		

Canister Dilution Factor: 2.20

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	**3.4**	1.1	**2.0**	0.64	
75-71-8	Dichlorodifluoromethane (CFC 12)	**2.1**	1.1	**0.42**	0.22	
74-87-3	Chloromethane	ND	1.1	ND	0.53	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	1.1	ND	0.16	
75-01-4	Vinyl Chloride	ND	1.1	ND	0.43	
106-99-0	1,3-Butadiene	ND	1.1	ND	0.50	
74-83-9	Bromomethane	ND	1.1	ND	0.28	
75-00-3	Chloroethane	ND	1.1	ND	0.42	
64-17-5	Ethanol	ND	11	ND	5.8	
75-05-8	Acetonitrile	ND	1.1	ND	0.66	
107-02-8	Acrolein	ND	4.4	ND	1.9	
67-64-1	Acetone	ND	11	ND	4.6	
75-69-4	Trichlorofluoromethane	ND	1.1	ND	0.20	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	11	ND	4.5	
107-13-1	Acrylonitrile	ND	1.1	ND	0.51	
75-35-4	1,1-Dichloroethene	ND	1.1	ND	0.28	
75-09-2	Methylene Chloride	ND	1.1	ND	0.32	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	1.1	ND	0.35	
76-13-1	Trichlorotrifluoroethane	ND	1.1	ND	0.14	
75-15-0	Carbon Disulfide	ND	11	ND	3.5	
156-60-5	trans-1,2-Dichloroethene	ND	1.1	ND	0.28	
75-34-3	1,1-Dichloroethane	ND	1.1	ND	0.27	
1634-04-4	Methyl tert-Butyl Ether	ND	1.1	ND	0.31	
108-05-4	Vinyl Acetate	ND	11	ND	3.1	
78-93-3	2-Butanone (MEK)	ND	11	ND	3.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Ambient-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-001
Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			
Container ID:	SSC00151		

Canister Dilution Factor: 2.20

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	1.1	ND	0.28	
141-78-6	Ethyl Acetate	**3.3**	2.2	**0.92**	0.61	
110-54-3	n-Hexane	ND	1.1	ND	0.31	
67-66-3	Chloroform	ND	1.1	ND	0.23	
109-99-9	Tetrahydrofuran (THF)	ND	1.1	ND	0.37	
107-06-2	1,2-Dichloroethane	ND	1.1	ND	0.27	
71-55-6	1,1,1-Trichloroethane	ND	1.1	ND	0.20	
71-43-2	Benzene	ND	1.1	ND	0.34	
56-23-5	Carbon Tetrachloride	ND	1.1	ND	0.17	
110-82-7	Cyclohexane	ND	2.2	ND	0.64	
78-87-5	1,2-Dichloropropane	ND	1.1	ND	0.24	
75-27-4	Bromodichloromethane	ND	1.1	ND	0.16	
79-01-6	Trichloroethene	ND	1.1	ND	0.20	
123-91-1	1,4-Dioxane	ND	1.1	ND	0.31	
80-62-6	Methyl Methacrylate	ND	2.2	ND	0.54	
142-82-5	n-Heptane	ND	1.1	ND	0.27	
10061-01-5	cis-1,3-Dichloropropene	ND	1.1	ND	0.24	
108-10-1	4-Methyl-2-pentanone	ND	1.1	ND	0.27	
10061-02-6	trans-1,3-Dichloropropene	ND	1.1	ND	0.24	
79-00-5	1,1,2-Trichloroethane	ND	1.1	ND	0.20	
108-88-3	Toluene	ND	1.1	ND	0.29	
591-78-6	2-Hexanone	ND	1.1	ND	0.27	
124-48-1	Dibromochloromethane	ND	1.1	ND	0.13	
106-93-4	1,2-Dibromoethane	ND	1.1	ND	0.14	
123-86-4	n-Butyl Acetate	ND	1.1	ND	0.23	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Ambient-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-001

Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			
Container ID:	SSC00151		

Canister Dilution Factor: 2.20

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	1.1	ND	0.24	
127-18-4	Tetrachloroethene	ND	1.1	ND	0.16	
108-90-7	Chlorobenzene	ND	1.1	ND	0.24	
100-41-4	Ethylbenzene	ND	1.1	ND	0.25	
179601-23-1	m,p-Xylenes	ND	2.2	ND	0.51	
75-25-2	Bromoform	ND	1.1	ND	0.11	
100-42-5	Styrene	ND	1.1	ND	0.26	
95-47-6	o-Xylene	ND	1.1	ND	0.25	
111-84-2	n-Nonane	ND	1.1	ND	0.21	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.1	ND	0.16	
98-82-8	Cumene	ND	1.1	ND	0.22	
80-56-8	alpha-Pinene	ND	1.1	ND	0.20	
103-65-1	n-Propylbenzene	ND	1.1	ND	0.22	
622-96-8	4-Ethyltoluene	ND	1.1	ND	0.22	
108-67-8	1,3,5-Trimethylbenzene	ND	1.1	ND	0.22	
95-63-6	1,2,4-Trimethylbenzene	ND	1.1	ND	0.22	
100-44-7	Benzyl Chloride	ND	1.1	ND	0.21	
541-73-1	1,3-Dichlorobenzene	ND	1.1	ND	0.18	
106-46-7	1,4-Dichlorobenzene	ND	1.1	ND	0.18	
95-50-1	1,2-Dichlorobenzene	ND	1.1	ND	0.18	
5989-27-5	d-Limonene	ND	1.1	ND	0.20	
96-12-8	1,2-Dibromo-3-chloropropane	ND	1.1	ND	0.11	
120-82-1	1,2,4-Trichlorobenzene	ND	1.1	ND	0.15	
91-20-3	Naphthalene	ND	1.1	ND	0.21	
87-68-3	Hexachlorobutadiene	ND	1.1	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-38-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-002
Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/4 - 1/5/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.10 Liter(s)
Test Notes:			0.020 Liter(s)
Container ID:	SSC00258		

Canister Dilution Factor: 2.16

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	**870**	11	**500**	6.3	
75-71-8	Dichlorodifluoromethane (CFC 12)	**53**	11	**11**	2.2	
74-87-3	Chloromethane	ND	11	ND	5.2	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	**1,100**	11	**150**	1.5	
75-01-4	Vinyl Chloride	**78**	11	**30**	4.2	
106-99-0	1,3-Butadiene	ND	11	ND	4.9	
74-83-9	Bromomethane	ND	11	ND	2.8	
75-00-3	Chloroethane	**26**	11	**9.9**	4.1	
64-17-5	Ethanol	ND	110	ND	57	
75-05-8	Acetonitrile	ND	11	ND	6.4	
107-02-8	Acrolein	ND	43	ND	19	
67-64-1	Acetone	ND	110	ND	45	
75-69-4	Trichlorofluoromethane	ND	11	ND	1.9	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	110	ND	44	
107-13-1	Acrylonitrile	ND	11	ND	5.0	
75-35-4	1,1-Dichloroethene	**11**	11	**2.9**	2.7	
75-09-2	Methylene Chloride	ND	11	ND	3.1	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	11	ND	3.5	
76-13-1	Trichlorotrifluoroethane	ND	11	ND	1.4	
75-15-0	Carbon Disulfide	ND	110	ND	35	
156-60-5	trans-1,2-Dichloroethene	ND	11	ND	2.7	
75-34-3	1,1-Dichloroethane	ND	11	ND	2.7	
1634-04-4	Methyl tert-Butyl Ether	ND	11	ND	3.0	
108-05-4	Vinyl Acetate	ND	110	ND	31	
78-93-3	2-Butanone (MEK)	ND	110	ND	37	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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RESULTS OF ANALYSIS
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Client: **Landau Associates,Inc.**
Client Sample ID: **GP-38-12292016** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1700001-002

Test Code: EPA TO-15 Modified Date Collected: 12/29/16
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 1/3/17
Analyst: Lusine Hakobyan Date Analyzed: 1/4 - 1/5/17
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.10 Liter(s)
Test Notes: 0.020 Liter(s)
Container ID: SSC00258

Canister Dilution Factor: 2.16

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	**21**	11	**5.4**	2.7	
141-78-6	Ethyl Acetate	ND	22	ND	6.0	
110-54-3	n-Hexane	**920**	11	**260**	3.1	
67-66-3	Chloroform	ND	11	ND	2.2	
109-99-9	Tetrahydrofuran (THF)	ND	11	ND	3.7	
107-06-2	1,2-Dichloroethane	ND	11	ND	2.7	
71-55-6	1,1,1-Trichloroethane	ND	11	ND	2.0	
71-43-2	Benzene	**70**	11	**22**	3.4	
56-23-5	Carbon Tetrachloride	ND	11	ND	1.7	
110-82-7	Cyclohexane	**2,200**	22	**640**	6.3	
78-87-5	1,2-Dichloropropane	ND	11	ND	2.3	
75-27-4	Bromodichloromethane	ND	11	ND	1.6	
79-01-6	Trichloroethene	**19**	11	**3.4**	2.0	
123-91-1	1,4-Dioxane	ND	11	ND	3.0	
80-62-6	Methyl Methacrylate	ND	22	ND	5.3	
142-82-5	n-Heptane	**3,100**	54	**760**	13	**D**
10061-01-5	cis-1,3-Dichloropropene	ND	11	ND	2.4	
108-10-1	4-Methyl-2-pentanone	ND	11	ND	2.6	
10061-02-6	trans-1,3-Dichloropropene	ND	11	ND	2.4	
79-00-5	1,1,2-Trichloroethane	ND	11	ND	2.0	
108-88-3	Toluene	**54**	11	**14**	2.9	
591-78-6	2-Hexanone	ND	11	ND	2.6	
124-48-1	Dibromochloromethane	ND	11	ND	1.3	
106-93-4	1,2-Dibromoethane	ND	11	ND	1.4	
123-86-4	n-Butyl Acetate	ND	11	ND	2.3	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
D = The reported result is from a dilution.

Client: **Landau Associates,Inc.**
Client Sample ID: **GP-38-12292016** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1700001-002

Test Code: EPA TO-15 Modified Date Collected: 12/29/16
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 1/3/17
Analyst: Lusine Hakobyan Date Analyzed: 1/4 - 1/5/17
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.10 Liter(s)
Test Notes: 0.020 Liter(s)
Container ID: SSC00258

Canister Dilution Factor: 2.16

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
111-65-9	n-Octane	**260**	11	**56**	2.3	
127-18-4	Tetrachloroethene	ND	11	ND	1.6	
108-90-7	Chlorobenzene	**190**	11	**42**	2.3	
100-41-4	Ethylbenzene	**62**	11	**14**	2.5	
179601-23-1	m,p-Xylenes	**440**	22	**100**	5.0	
75-25-2	Bromoform	ND	11	ND	1.0	
100-42-5	Styrene	ND	11	ND	2.5	
95-47-6	o-Xylene	**130**	11	**29**	2.5	
111-84-2	n-Nonane	**200**	11	**38**	2.1	
79-34-5	1,1,2,2-Tetrachloroethane	ND	11	ND	1.6	
98-82-8	Cumene	**300**	11	**62**	2.2	
80-56-8	alpha-Pinene	**65**	11	**12**	1.9	
103-65-1	n-Propylbenzene	**170**	11	**35**	2.2	
622-96-8	4-Ethyltoluene	**28**	11	**5.7**	2.2	
108-67-8	1,3,5-Trimethylbenzene	**110**	11	**23**	2.2	
95-63-6	1,2,4-Trimethylbenzene	**270**	11	**56**	2.2	
100-44-7	Benzyl Chloride	ND	11	ND	2.1	
541-73-1	1,3-Dichlorobenzene	ND	11	ND	1.8	
106-46-7	1,4-Dichlorobenzene	**100**	11	**17**	1.8	
95-50-1	1,2-Dichlorobenzene	**22**	11	**3.6**	1.8	
5989-27-5	d-Limonene	ND	11	ND	1.9	
96-12-8	1,2-Dibromo-3-chloropropane	ND	11	ND	1.1	
120-82-1	1,2,4-Trichlorobenzene	ND	11	ND	1.5	
91-20-3	Naphthalene	ND	11	ND	2.1	
87-68-3	Hexachlorobutadiene	ND	11	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-39-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-003
Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/5/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.020 Liter(s)
Test Notes:			0.010 Liter(s)
Container ID:	SSC00120		

Canister Dilution Factor: 2.19

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	**1,200**	55	**700**	32	
75-71-8	Dichlorodifluoromethane (CFC 12)	**1,100**	55	**210**	11	
74-87-3	Chloromethane	ND	55	ND	27	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	**1,300**	55	**190**	7.8	
75-01-4	Vinyl Chloride	**11,000**	55	**4,200**	21	
106-99-0	1,3-Butadiene	ND	55	ND	25	
74-83-9	Bromomethane	ND	55	ND	14	
75-00-3	Chloroethane	**83**	55	**32**	21	
64-17-5	Ethanol	ND	550	ND	290	
75-05-8	Acetonitrile	ND	55	ND	33	
107-02-8	Acrolein	ND	220	ND	96	
67-64-1	Acetone	ND	550	ND	230	
75-69-4	Trichlorofluoromethane	ND	55	ND	9.7	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	550	ND	220	
107-13-1	Acrylonitrile	ND	55	ND	25	
75-35-4	1,1-Dichloroethene	ND	55	ND	14	
75-09-2	Methylene Chloride	ND	55	ND	16	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	55	ND	17	
76-13-1	Trichlorotrifluoroethane	ND	55	ND	7.1	
75-15-0	Carbon Disulfide	ND	550	ND	180	
156-60-5	trans-1,2-Dichloroethene	ND	55	ND	14	
75-34-3	1,1-Dichloroethane	ND	55	ND	14	
1634-04-4	Methyl tert-Butyl Ether	ND	55	ND	15	
108-05-4	Vinyl Acetate	ND	550	ND	160	
78-93-3	2-Butanone (MEK)	ND	550	ND	190	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

RESULTS OF ANALYSIS

Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-39-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-003
Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/5/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.020 Liter(s)
Test Notes:			0.010 Liter(s)
Container ID:	SSC00120		

Canister Dilution Factor: 2.19

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	**380**	55	**95**	14	
141-78-6	Ethyl Acetate	ND	110	ND	30	
110-54-3	n-Hexane	**840**	55	**240**	16	
67-66-3	Chloroform	ND	55	ND	11	
109-99-9	Tetrahydrofuran (THF)	ND	55	ND	19	
107-06-2	1,2-Dichloroethane	ND	55	ND	14	
71-55-6	1,1,1-Trichloroethane	ND	55	ND	10	
71-43-2	Benzene	**450**	55	**140**	17	
56-23-5	Carbon Tetrachloride	ND	55	ND	8.7	
110-82-7	Cyclohexane	**3,000**	110	**880**	32	
78-87-5	1,2-Dichloropropane	ND	55	ND	12	
75-27-4	Bromodichloromethane	ND	55	ND	8.2	
79-01-6	Trichloroethene	**77**	55	**14**	10	
123-91-1	1,4-Dioxane	ND	55	ND	15	
80-62-6	Methyl Methacrylate	ND	110	ND	27	
142-82-5	n-Heptane	**2,400**	55	**580**	13	
10061-01-5	cis-1,3-Dichloropropene	ND	55	ND	12	
108-10-1	4-Methyl-2-pentanone	**78**	55	**19**	13	
10061-02-6	trans-1,3-Dichloropropene	ND	55	ND	12	
79-00-5	1,1,2-Trichloroethane	ND	55	ND	10	
108-88-3	Toluene	**1,400**	55	**380**	15	
591-78-6	2-Hexanone	ND	55	ND	13	
124-48-1	Dibromochloromethane	ND	55	ND	6.4	
106-93-4	1,2-Dibromoethane	ND	55	ND	7.1	
123-86-4	n-Butyl Acetate	ND	55	ND	12	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-39-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-003
Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/5/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.020 Liter(s)
Test Notes:			0.010 Liter(s)
Container ID:	SSC00120		

Canister Dilution Factor: 2.19

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	**1,900**	55	**400**	12	
127-18-4	Tetrachloroethene	**67**	55	**9.9**	8.1	
108-90-7	Chlorobenzene	ND	55	ND	12	
100-41-4	Ethylbenzene	**4,200**	55	**960**	13	
179601-23-1	m,p-Xylenes	**8,600**	110	**2,000**	25	
75-25-2	Bromoform	ND	55	ND	5.3	
100-42-5	Styrene	ND	55	ND	13	
95-47-6	o-Xylene	**3,200**	55	**730**	13	
111-84-2	n-Nonane	**15,000**	110	**2,900**	21	**D**
79-34-5	1,1,2,2-Tetrachloroethane	ND	55	ND	8.0	
98-82-8	Cumene	**780**	55	**160**	11	
80-56-8	alpha-Pinene	**1,300**	55	**230**	9.8	
103-65-1	n-Propylbenzene	**1,300**	55	**260**	11	
622-96-8	4-Ethyltoluene	**570**	55	**120**	11	
108-67-8	1,3,5-Trimethylbenzene	**1,800**	55	**360**	11	
95-63-6	1,2,4-Trimethylbenzene	**3,800**	55	**780**	11	
100-44-7	Benzyl Chloride	ND	55	ND	11	
541-73-1	1,3-Dichlorobenzene	ND	55	ND	9.1	
106-46-7	1,4-Dichlorobenzene	**69**	55	**11**	9.1	
95-50-1	1,2-Dichlorobenzene	**79**	55	**13**	9.1	
5989-27-5	d-Limonene	**620**	55	**110**	9.8	
96-12-8	1,2-Dibromo-3-chloropropane	ND	55	ND	5.7	
120-82-1	1,2,4-Trichlorobenzene	ND	55	ND	7.4	
91-20-3	Naphthalene	ND	55	ND	10	
87-68-3	Hexachlorobutadiene	ND	55	ND	5.1	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
D = The reported result is from a dilution.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **GP-43-12292016** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1700001-004

Test Code: EPA TO-15 Modified Date Collected: 12/29/16
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: 1/3/17
Analyst: Lusine Hakobyan Date Analyzed: 1/4/17
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.030 Liter(s)
Test Notes:
Container ID: SSC00277

Canister Dilution Factor: 2.21

CAS #	**Compound**	**Result** µg/m^3	MRL µg/m^3	**Result** ppbV	MRL ppbV	**Data Qualifier**
115-07-1	Propene	**1,200**	37	**670**	21	
75-71-8	Dichlorodifluoromethane (CFC 12)	**1,500**	37	**290**	7.5	
74-87-3	Chloromethane	ND	37	ND	18	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	**1,200**	37	**170**	5.3	
75-01-4	Vinyl Chloride	**5,400**	37	**2,100**	14	
106-99-0	1,3-Butadiene	ND	37	ND	17	
74-83-9	Bromomethane	ND	37	ND	9.5	
75-00-3	Chloroethane	ND	37	ND	14	
64-17-5	Ethanol	ND	370	ND	200	
75-05-8	Acetonitrile	ND	37	ND	22	
107-02-8	Acrolein	ND	150	ND	64	
67-64-1	Acetone	**970**	370	**410**	160	
75-69-4	Trichlorofluoromethane	**430**	37	**77**	6.6	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	370	ND	150	
107-13-1	Acrylonitrile	ND	37	ND	17	
75-35-4	1,1-Dichloroethene	**81**	37	**21**	9.3	
75-09-2	Methylene Chloride	**85**	37	**24**	11	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	37	ND	12	
76-13-1	Trichlorotrifluoroethane	ND	37	ND	4.8	
75-15-0	Carbon Disulfide	ND	370	ND	120	
156-60-5	trans-1,2-Dichloroethene	**120**	37	**31**	9.3	
75-34-3	1,1-Dichloroethane	ND	37	ND	9.1	
1634-04-4	Methyl tert-Butyl Ether	ND	37	ND	10	
108-05-4	Vinyl Acetate	ND	370	ND	100	
78-93-3	2-Butanone (MEK)	**1,500**	370	**510**	120	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-43-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-004
Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.030 Liter(s)
Test Notes:			
Container ID:	SSC00277		

Canister Dilution Factor: 2.21

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	**2,800**	37	**710**	9.3	
141-78-6	Ethyl Acetate	ND	74	ND	20	
110-54-3	n-Hexane	**580**	37	**170**	10	
67-66-3	Chloroform	ND	37	ND	7.5	
109-99-9	Tetrahydrofuran (THF)	**910**	37	**310**	12	
107-06-2	1,2-Dichloroethane	ND	37	ND	9.1	
71-55-6	1,1,1-Trichloroethane	ND	37	ND	6.8	
71-43-2	Benzene	**340**	37	**110**	12	
56-23-5	Carbon Tetrachloride	ND	37	ND	5.9	
110-82-7	Cyclohexane	**500**	74	**140**	21	
78-87-5	1,2-Dichloropropane	ND	37	ND	8.0	
75-27-4	Bromodichloromethane	ND	37	ND	5.5	
79-01-6	Trichloroethene	**450**	37	**83**	6.9	
123-91-1	1,4-Dioxane	ND	37	ND	10	
80-62-6	Methyl Methacrylate	ND	74	ND	18	
142-82-5	n-Heptane	**1,900**	37	**470**	9.0	
10061-01-5	cis-1,3-Dichloropropene	ND	37	ND	8.1	
108-10-1	4-Methyl-2-pentanone	**630**	37	**150**	9.0	
10061-02-6	trans-1,3-Dichloropropene	ND	37	ND	8.1	
79-00-5	1,1,2-Trichloroethane	ND	37	ND	6.8	
108-88-3	Toluene	**6,300**	37	**1,700**	9.8	
591-78-6	2-Hexanone	ND	37	ND	9.0	
124-48-1	Dibromochloromethane	ND	37	ND	4.3	
106-93-4	1,2-Dibromoethane	ND	37	ND	4.8	
123-86-4	n-Butyl Acetate	ND	37	ND	7.8	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-43-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-004
Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.030 Liter(s)
Test Notes:			
Container ID:	SSC00277		

Canister Dilution Factor: 2.21

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	**1,500**	37	**310**	7.9	
127-18-4	Tetrachloroethene	**640**	37	**94**	5.4	
108-90-7	Chlorobenzene	ND	37	ND	8.0	
100-41-4	Ethylbenzene	**3,800**	37	**880**	8.5	
179601-23-1	m,p-Xylenes	**7,400**	74	**1,700**	17	
75-25-2	Bromoform	ND	37	ND	3.6	
100-42-5	Styrene	**96**	37	**23**	8.7	
95-47-6	o-Xylene	**1,800**	37	**420**	8.5	
111-84-2	n-Nonane	**3,200**	37	**610**	7.0	
79-34-5	1,1,2,2-Tetrachloroethane	ND	37	ND	5.4	
98-82-8	Cumene	**550**	37	**110**	7.5	
80-56-8	alpha-Pinene	**4,300**	37	**780**	6.6	
103-65-1	n-Propylbenzene	**560**	37	**110**	7.5	
622-96-8	4-Ethyltoluene	**260**	37	**53**	7.5	
108-67-8	1,3,5-Trimethylbenzene	**450**	37	**92**	7.5	
95-63-6	1,2,4-Trimethylbenzene	**1,300**	37	**270**	7.5	
100-44-7	Benzyl Chloride	ND	37	ND	7.1	
541-73-1	1,3-Dichlorobenzene	ND	37	ND	6.1	
106-46-7	1,4-Dichlorobenzene	ND	37	ND	6.1	
95-50-1	1,2-Dichlorobenzene	ND	37	ND	6.1	
5989-27-5	d-Limonene	**6,900**	37	**1,200**	6.6	
96-12-8	1,2-Dibromo-3-chloropropane	ND	37	ND	3.8	
120-82-1	1,2,4-Trichlorobenzene	ND	37	ND	5.0	
91-20-3	Naphthalene	ND	37	ND	7.0	
87-68-3	Hexachlorobutadiene	ND	37	ND	3.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**GP-41-12292016**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P1700001-005
Test Code:	EPA TO-15 Modified	Date Collected:	12/29/16
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	1/3/17
Analyst:	Lusine Hakobyan	Date Analyzed:	1/5/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.020 Liter(s)
Test Notes:			
Container ID:	SSC00402		

Canister Dilution Factor: 2.29

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	**1,500**	57	**880**	33	
75-71-8	Dichlorodifluoromethane (CFC 12)	**4,100**	57	**830**	12	
74-87-3	Chloromethane	ND	57	ND	28	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	**2,900**	57	**410**	8.2	
75-01-4	Vinyl Chloride	**9,400**	57	**3,700**	22	
106-99-0	1,3-Butadiene	ND	57	ND	26	
74-83-9	Bromomethane	ND	57	ND	15	
75-00-3	Chloroethane	ND	57	ND	22	
64-17-5	Ethanol	ND	570	ND	300	
75-05-8	Acetonitrile	ND	57	ND	34	
107-02-8	Acrolein	ND	230	ND	100	
67-64-1	Acetone	ND	570	ND	240	
75-69-4	Trichlorofluoromethane	ND	57	ND	10	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	570	ND	230	
107-13-1	Acrylonitrile	ND	57	ND	26	
75-35-4	1,1-Dichloroethene	ND	57	ND	14	
75-09-2	Methylene Chloride	ND	57	ND	16	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	57	ND	18	
76-13-1	Trichlorotrifluoroethane	ND	57	ND	7.5	
75-15-0	Carbon Disulfide	ND	570	ND	180	
156-60-5	trans-1,2-Dichloroethene	ND	57	ND	14	
75-34-3	1,1-Dichloroethane	ND	57	ND	14	
1634-04-4	Methyl tert-Butyl Ether	ND	57	ND	16	
108-05-4	Vinyl Acetate	ND	570	ND	160	
78-93-3	2-Butanone (MEK)	ND	570	ND	190	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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Client: **Landau Associates,Inc.**
Client Sample ID: **GP-41-12292016** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1700001-005

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00402

Date Collected: 12/29/16
Date Received: 1/3/17
Date Analyzed: 1/5/17
Volume(s) Analyzed: 0.020 Liter(s)

Canister Dilution Factor: 2.29

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	**97**	57	**24**	14	
141-78-6	Ethyl Acetate	ND	110	ND	32	
110-54-3	n-Hexane	**620**	57	**180**	16	
67-66-3	Chloroform	ND	57	ND	12	
109-99-9	Tetrahydrofuran (THF)	ND	57	ND	19	
107-06-2	1,2-Dichloroethane	ND	57	ND	14	
71-55-6	1,1,1-Trichloroethane	ND	57	ND	10	
71-43-2	Benzene	**490**	57	**150**	18	
56-23-5	Carbon Tetrachloride	ND	57	ND	9.1	
110-82-7	Cyclohexane	**410**	110	**120**	33	
78-87-5	1,2-Dichloropropane	ND	57	ND	12	
75-27-4	Bromodichloromethane	ND	57	ND	8.5	
79-01-6	Trichloroethene	ND	57	ND	11	
123-91-1	1,4-Dioxane	ND	57	ND	16	
80-62-6	Methyl Methacrylate	ND	110	ND	28	
142-82-5	n-Heptane	**920**	57	**230**	14	
10061-01-5	cis-1,3-Dichloropropene	ND	57	ND	13	
108-10-1	4-Methyl-2-pentanone	ND	57	ND	14	
10061-02-6	trans-1,3-Dichloropropene	ND	57	ND	13	
79-00-5	1,1,2-Trichloroethane	ND	57	ND	10	
108-88-3	Toluene	**550**	57	**150**	15	
591-78-6	2-Hexanone	ND	57	ND	14	
124-48-1	Dibromochloromethane	ND	57	ND	6.7	
106-93-4	1,2-Dibromoethane	ND	57	ND	7.5	
123-86-4	n-Butyl Acetate	ND	57	ND	12	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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Client: **Landau Associates,Inc.**
Client Sample ID: **GP-41-12292016** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P1700001-005

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Lusine Hakobyan
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00402

Date Collected: 12/29/16
Date Received: 1/3/17
Date Analyzed: 1/5/17
Volume(s) Analyzed: 0.020 Liter(s)

Canister Dilution Factor: 2.29

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
111-65-9	n-Octane	**1,800**	57	**380**	12	
127-18-4	Tetrachloroethene	ND	57	ND	8.4	
108-90-7	Chlorobenzene	ND	57	ND	12	
100-41-4	Ethylbenzene	**910**	57	**210**	13	
179601-23-1	m,p-Xylenes	**2,200**	110	**510**	26	
75-25-2	Bromoform	ND	57	ND	5.5	
100-42-5	Styrene	ND	57	ND	13	
95-47-6	o-Xylene	**910**	57	**210**	13	
111-84-2	n-Nonane	**9,800**	57	**1,900**	11	
79-34-5	1,1,2,2-Tetrachloroethane	ND	57	ND	8.3	
98-82-8	Cumene	**240**	57	**48**	12	
80-56-8	alpha-Pinene	**1,300**	57	**220**	10	
103-65-1	n-Propylbenzene	**240**	57	**48**	12	
622-96-8	4-Ethyltoluene	**91**	57	**19**	12	
108-67-8	1,3,5-Trimethylbenzene	**520**	57	**110**	12	
95-63-6	1,2,4-Trimethylbenzene	**920**	57	**190**	12	
100-44-7	Benzyl Chloride	ND	57	ND	11	
541-73-1	1,3-Dichlorobenzene	ND	57	ND	9.5	
106-46-7	1,4-Dichlorobenzene	ND	57	ND	9.5	
95-50-1	1,2-Dichlorobenzene	**76**	57	**13**	9.5	
5989-27-5	d-Limonene	**90**	57	**16**	10	
96-12-8	1,2-Dibromo-3-chloropropane	ND	57	ND	5.9	
120-82-1	1,2,4-Trichlorobenzene	ND	57	ND	7.7	
91-20-3	Naphthalene	ND	57	ND	11	
87-68-3	Hexachlorobutadiene	ND	57	ND	5.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P170104-MB
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Cory Lewis	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

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RESULTS OF ANALYSIS

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P170104-MB
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Cory Lewis	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Landau Associates,Inc.**
Client Sample ID: **Method Blank**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**

ALS Project ID: P1700001
ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Cory Lewis
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 1/4/17
Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 3

Client: **Landau Associates,Inc.**

Client Sample ID: **Method Blank** ALS Project ID: P1700001

Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: NA

Analyst: Lusine Hakobyan Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Method Blank**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P170104-MB
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	1.00 Liter(s)
Test Notes:			

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS
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Client: **Landau Associates,Inc.**
Client Sample ID: **Method Blank** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: NA
Analyst: Lusine Hakobyan Date Analyzed: 1/4/17
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:

Canister Dilution Factor: 1.00

CAS #	**Compound**	**Result µg/m³**	MRL µg/m³	**Result ppbV**	MRL ppbV	**Data Qualifier**
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

SURROGATE SPIKE RECOVERY RESULTS

Page 1 of 1

Client: **Landau Associates,Inc.**
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014**
ALS Project ID: P1700001

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Cory Lewis
Sample Type: 6.0 L Silonite Canister(s)
Test Notes:

Date(s) Collected: 12/29/16
Date(s) Received: 1/3/17
Date(s) Analyzed: 1/4 - 1/5/17

Client Sample ID	**ALS Sample ID**	**1,2-Dichloroethane-d4** Percent Recovered	**Toluene-d8** Percent Recovered	**Bromofluorobenzene** Percent Recovered	Acceptance Limits	**Data Qualifier**
Method Blank	P170104-MB	**105**	**100**	**91**	70-130	
Method Blank	P170104-MB	**106**	**98**	**93**	70-130	
Lab Control Sample	P170104-LCS	**102**	**97**	**94**	70-130	
Lab Control Sample	P170104-LCS	**106**	**96**	**95**	70-130	
Ambient-12292016	P1700001-001	**107**	**97**	**91**	70-130	
GP-38-12292016	P1700001-002	**105**	**73**	**84**	70-130	
GP-39-12292016	P1700001-003	**105**	**85**	**94**	70-130	
GP-43-12292016	P1700001-004	**106**	**86**	**91**	70-130	
GP-41-12292016	P1700001-005	**108**	**89**	**96**	70-130	

Surrogate percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly from the on-column percent recovery.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 3

Client: **Landau Associates,Inc.**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Cory Lewis
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 1/4/17
Volume(s) Analyzed: 0.125 Liter(s)

CAS #	Compound	Spike Amount µg/m³	Result µg/m³	% Recovery	ALS Acceptance Limits	Data Qualifier
115-07-1	Propene	210	**191**	**91**	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	**188**	**90**	68-109	
74-87-3	Chloromethane	210	**180**	**86**	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	**177**	**84**	66-114	
75-01-4	Vinyl Chloride	210	**215**	**102**	61-125	
106-99-0	1,3-Butadiene	210	**231**	**110**	62-144	
74-83-9	Bromomethane	210	**193**	**92**	73-123	
75-00-3	Chloroethane	210	**206**	**98**	69-122	
64-17-5	Ethanol	1,060	**1050**	**99**	62-124	
75-05-8	Acetonitrile	213	**212**	**100**	57-114	
107-02-8	Acrolein	212	**182**	**86**	62-116	
67-64-1	Acetone	1,060	**1040**	**98**	57-117	
75-69-4	Trichlorofluoromethane	210	**182**	**87**	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	**427**	**101**	66-121	
107-13-1	Acrylonitrile	213	**209**	**98**	68-123	
75-35-4	1,1-Dichloroethene	213	**198**	**93**	76-118	
75-09-2	Methylene Chloride	212	**199**	**94**	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	**217**	**102**	65-126	
76-13-1	Trichlorotrifluoroethane	212	**180**	**85**	73-114	
75-15-0	Carbon Disulfide	213	**206**	**97**	57-102	
156-60-5	trans-1,2-Dichloroethene	213	**204**	**96**	74-123	
75-34-3	1,1-Dichloroethane	212	**199**	**94**	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	**191**	**90**	69-113	
108-05-4	Vinyl Acetate	1,060	**1190**	**112**	76-128	
78-93-3	2-Butanone (MEK)	212	**211**	**100**	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P170104-LCS
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Cory Lewis	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.125 Liter(s)
Test Notes:			

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	212	**202**	**95**	72-117	
141-78-6	Ethyl Acetate	426	**479**	**112**	68-127	
110-54-3	n-Hexane	213	**228**	**107**	55-116	
67-66-3	Chloroform	212	**192**	**91**	70-109	
109-99-9	Tetrahydrofuran (THF)	213	**195**	**92**	72-113	
107-06-2	1,2-Dichloroethane	212	**193**	**91**	69-113	
71-55-6	1,1,1-Trichloroethane	212	**188**	**89**	72-115	
71-43-2	Benzene	212	**194**	**92**	65-107	
56-23-5	Carbon Tetrachloride	213	**193**	**91**	71-113	
110-82-7	Cyclohexane	425	**409**	**96**	71-115	
78-87-5	1,2-Dichloropropane	212	**200**	**94**	71-115	
75-27-4	Bromodichloromethane	214	**206**	**96**	75-118	
79-01-6	Trichloroethene	212	**187**	**88**	68-114	
123-91-1	1,4-Dioxane	213	**208**	**98**	81-131	
80-62-6	Methyl Methacrylate	424	**419**	**99**	72-130	
142-82-5	n-Heptane	213	**205**	**96**	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	**213**	**101**	77-126	
108-10-1	4-Methyl-2-pentanone	213	**214**	**100**	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	**215**	**101**	79-125	
79-00-5	1,1,2-Trichloroethane	212	**198**	**93**	75-119	
108-88-3	Toluene	212	**185**	**87**	59-118	
591-78-6	2-Hexanone	213	**208**	**98**	69-129	
124-48-1	Dibromochloromethane	213	**193**	**91**	74-136	
106-93-4	1,2-Dibromoethane	212	**190**	**90**	73-131	
123-86-4	n-Butyl Acetate	216	**215**	**100**	69-130	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 3 of 3

Client: **Landau Associates,Inc.**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: Cory Lewis
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 1/4/17
Volume(s) Analyzed: 0.125 Liter(s)

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
111-65-9	n-Octane	212	**202**	**95**	66-120	
127-18-4	Tetrachloroethene	213	**179**	**84**	65-130	
108-90-7	Chlorobenzene	212	**184**	**87**	68-120	
100-41-4	Ethylbenzene	212	**197**	**93**	68-122	
179601-23-1	m,p-Xylenes	424	**409**	**96**	68-123	
75-25-2	Bromoform	212	**201**	**95**	69-130	
100-42-5	Styrene	212	**199**	**94**	71-133	
95-47-6	o-Xylene	212	**201**	**95**	68-122	
111-84-2	n-Nonane	212	**206**	**97**	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	**223**	**105**	69-130	
98-82-8	Cumene	212	**193**	**91**	70-123	
80-56-8	alpha-Pinene	213	**199**	**93**	70-128	
103-65-1	n-Propylbenzene	214	**208**	**97**	69-125	
622-96-8	4-Ethyltoluene	212	**214**	**101**	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	**196**	**92**	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	**227**	**107**	67-129	
100-44-7	Benzyl Chloride	212	**245**	**116**	79-138	
541-73-1	1,3-Dichlorobenzene	212	**233**	**110**	65-136	
106-46-7	1,4-Dichlorobenzene	213	**192**	**90**	66-141	
95-50-1	1,2-Dichlorobenzene	212	**211**	**100**	67-136	
5989-27-5	d-Limonene	212	**238**	**112**	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	**212**	**100**	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	**231**	**109**	64-134	
91-20-3	Naphthalene	214	**241**	**113**	62-136	
87-68-3	Hexachlorobutadiene	213	**199**	**93**	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 3

Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P170104-LCS
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.125 Liter(s)
Test Notes:			

CAS #	Compound	Spike Amount µg/m³	Result µg/m³	% Recovery	ALS Acceptance Limits	Data Qualifier
115-07-1	Propene	210	**193**	**92**	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	**189**	**90**	68-109	
74-87-3	Chloromethane	210	**173**	**82**	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	**174**	**82**	66-114	
75-01-4	Vinyl Chloride	210	**213**	**101**	61-125	
106-99-0	1,3-Butadiene	210	**221**	**105**	62-144	
74-83-9	Bromomethane	210	**199**	**95**	73-123	
75-00-3	Chloroethane	210	**209**	**100**	69-122	
64-17-5	Ethanol	1,060	**1060**	**100**	62-124	
75-05-8	Acetonitrile	213	**216**	**101**	57-114	
107-02-8	Acrolein	212	**188**	**89**	62-116	
67-64-1	Acetone	1,060	**1050**	**99**	57-117	
75-69-4	Trichlorofluoromethane	210	**184**	**88**	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	**430**	**101**	66-121	
107-13-1	Acrylonitrile	213	**209**	**98**	68-123	
75-35-4	1,1-Dichloroethene	213	**199**	**93**	76-118	
75-09-2	Methylene Chloride	212	**196**	**92**	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	**219**	**103**	65-126	
76-13-1	Trichlorotrifluoroethane	212	**180**	**85**	73-114	
75-15-0	Carbon Disulfide	213	**205**	**96**	57-102	
156-60-5	trans-1,2-Dichloroethene	213	**208**	**98**	74-123	
75-34-3	1,1-Dichloroethane	212	**201**	**95**	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	**193**	**91**	69-113	
108-05-4	Vinyl Acetate	1,060	**1130**	**107**	76-128	
78-93-3	2-Butanone (MEK)	212	**207**	**98**	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client:	**Landau Associates,Inc.**		
Client Sample ID:	**Lab Control Sample**	ALS Project ID:	P1700001
Client Project ID:	**Transportation Corridor Investigation / 1148009.010.014**	ALS Sample ID:	P170104-LCS
Test Code:	EPA TO-15 Modified	Date Collected:	NA
Instrument ID:	Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16	Date Received:	NA
Analyst:	Lusine Hakobyan	Date Analyzed:	1/4/17
Sample Type:	6.0 L Silonite Canister	Volume(s) Analyzed:	0.125 Liter(s)
Test Notes:			

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
156-59-2	cis-1,2-Dichloroethene	212	**204**	**96**	72-117	
141-78-6	Ethyl Acetate	426	**473**	**111**	68-127	
110-54-3	n-Hexane	213	**226**	**106**	55-116	
67-66-3	Chloroform	212	**193**	**91**	70-109	
109-99-9	Tetrahydrofuran (THF)	213	**194**	**91**	72-113	
107-06-2	1,2-Dichloroethane	212	**197**	**93**	69-113	
71-55-6	1,1,1-Trichloroethane	212	**187**	**88**	72-115	
71-43-2	Benzene	212	**188**	**89**	65-107	
56-23-5	Carbon Tetrachloride	213	**192**	**90**	71-113	
110-82-7	Cyclohexane	425	**398**	**94**	71-115	
78-87-5	1,2-Dichloropropane	212	**198**	**93**	71-115	
75-27-4	Bromodichloromethane	214	**203**	**95**	75-118	
79-01-6	Trichloroethene	212	**183**	**86**	68-114	
123-91-1	1,4-Dioxane	213	**204**	**96**	81-131	
80-62-6	Methyl Methacrylate	424	**405**	**96**	72-130	
142-82-5	n-Heptane	213	**201**	**94**	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	**210**	**100**	77-126	
108-10-1	4-Methyl-2-pentanone	213	**210**	**99**	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	**214**	**100**	79-125	
79-00-5	1,1,2-Trichloroethane	212	**193**	**91**	75-119	
108-88-3	Toluene	212	**175**	**83**	59-118	
591-78-6	2-Hexanone	213	**198**	**93**	69-129	
124-48-1	Dibromochloromethane	213	**185**	**87**	74-136	
106-93-4	1,2-Dibromoethane	212	**181**	**85**	73-131	
123-86-4	n-Butyl Acetate	216	**206**	**95**	69-130	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

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Client: **Landau Associates,Inc.**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1700001
Client Project ID: **Transportation Corridor Investigation / 1148009.010.014** ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16 Date Received: NA
Analyst: Lusine Hakobyan Date Analyzed: 1/4/17
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.125 Liter(s)
Test Notes:

CAS #	**Compound**	Spike Amount µg/m³	**Result µg/m³**	**% Recovery**	ALS Acceptance Limits	**Data Qualifier**
111-65-9	n-Octane	212	**195**	**92**	66-120	
127-18-4	Tetrachloroethene	213	**171**	**80**	65-130	
108-90-7	Chlorobenzene	212	**175**	**83**	68-120	
100-41-4	Ethylbenzene	212	**186**	**88**	68-122	
179601-23-1	m,p-Xylenes	424	**384**	**91**	68-123	
75-25-2	Bromoform	212	**191**	**90**	69-130	
100-42-5	Styrene	212	**187**	**88**	71-133	
95-47-6	o-Xylene	212	**190**	**90**	68-122	
111-84-2	n-Nonane	212	**196**	**92**	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	**208**	**98**	69-130	
98-82-8	Cumene	212	**182**	**86**	70-123	
80-56-8	alpha-Pinene	213	**188**	**88**	70-128	
103-65-1	n-Propylbenzene	214	**194**	**91**	69-125	
622-96-8	4-Ethyltoluene	212	**199**	**94**	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	**183**	**86**	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	**209**	**99**	67-129	
100-44-7	Benzyl Chloride	212	**230**	**108**	79-138	
541-73-1	1,3-Dichlorobenzene	212	**215**	**101**	65-136	
106-46-7	1,4-Dichlorobenzene	213	**178**	**84**	66-141	
95-50-1	1,2-Dichlorobenzene	212	**193**	**91**	67-136	
5989-27-5	d-Limonene	212	**221**	**104**	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	**200**	**94**	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	**219**	**103**	64-134	
91-20-3	Naphthalene	214	**226**	**106**	62-136	
87-68-3	Hexachlorobutadiene	213	**191**	**90**	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

APPENDIX C

LandGEM Model Summary—Scenario 1

Table C-1
Scenario 1: Waste Acceptance - Wood Debris MSW
Transportation Cooridor
Yakima, Washington

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg/year)	(short tons/year)
1920	6.00E+03	6.60E+03	0.00E+00	0.00E+00
1921	6.00E+03	6.60E+03	6.00E+03	6.60E+03
1922	6.00E+03	6.60E+03	1.20E+04	1.32E+04
1923	6.00E+03	6.60E+03	1.80E+04	1.98E+04
1924	6.00E+03	6.60E+03	2.40E+04	2.64E+04
1925	6.00E+03	6.60E+03	3.00E+04	3.30E+04
1926	6.00E+03	6.60E+03	3.60E+04	3.96E+04
1927	6.00E+03	6.60E+03	4.20E+04	4.62E+04
1928	6.00E+03	6.60E+03	4.80E+04	5.28E+04
1929	6.00E+03	6.60E+03	5.40E+04	5.94E+04
1930	6.00E+03	6.60E+03	6.00E+04	6.60E+04
1931	6.00E+03	6.60E+03	6.60E+04	7.26E+04
1932	6.00E+03	6.60E+03	7.20E+04	7.92E+04
1933	6.00E+03	6.60E+03	7.80E+04	8.58E+04
1934	6.00E+03	6.60E+03	8.40E+04	9.24E+04
1935	6.00E+03	6.60E+03	9.00E+04	9.90E+04
1936	6.00E+03	6.60E+03	9.60E+04	1.06E+05
1937	6.00E+03	6.60E+03	1.02E+05	1.12E+05
1938	6.00E+03	6.60E+03	1.08E+05	1.19E+05
1939	6.00E+03	6.60E+03	1.14E+05	1.25E+05
1940	6.00E+03	6.60E+03	1.20E+05	1.32E+05
1941	6.00E+03	6.60E+03	1.26E+05	1.39E+05
1942	6.00E+03	6.60E+03	1.32E+05	1.45E+05
1943	6.00E+03	6.60E+03	1.38E+05	1.52E+05
1944	6.00E+03	6.60E+03	1.44E+05	1.58E+05
1945	6.00E+03	6.60E+03	1.50E+05	1.65E+05
1946	6.00E+03	6.60E+03	1.56E+05	1.72E+05
1947	6.00E+03	6.60E+03	1.62E+05	1.78E+05
1948	6.00E+03	6.60E+03	1.68E+05	1.85E+05
1949	6.00E+03	6.60E+03	1.74E+05	1.91E+05
1950	6.00E+03	6.60E+03	1.80E+05	1.98E+05
1951	6.00E+03	6.60E+03	1.86E+05	2.05E+05
1952	6.00E+03	6.60E+03	1.92E+05	2.11E+05
1953	6.00E+03	6.60E+03	1.98E+05	2.18E+05
1954	6.00E+03	6.60E+03	2.04E+05	2.24E+05
1955	6.00E+03	6.60E+03	2.10E+05	2.31E+05
1956	6.00E+03	6.60E+03	2.16E+05	2.38E+05
1957	6.00E+03	6.60E+03	2.22E+05	2.44E+05
1958	6.00E+03	6.60E+03	2.28E+05	2.51E+05
1959	6.00E+03	6.60E+03	2.34E+05	2.57E+05
1960	6.00E+03	6.60E+03	2.40E+05	2.64E+05
1961	6.00E+03	6.60E+03	2.46E+05	2.71E+05

Table C-1
Scenario 1: Waste Acceptance - Wood Debris MSW
Transportation Cooridor
Yakima, Washington

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg/year)	(short tons/year)
1962	6.00E+03	6.60E+03	2.52E+05	2.77E+05
1963	7.56E+04	8.32E+04	2.58E+05	2.84E+05
1964	7.56E+04	8.32E+04	3.34E+05	3.67E+05
1965	7.56E+04	8.32E+04	4.09E+05	4.50E+05
1966	7.56E+04	8.32E+04	4.85E+05	5.33E+05
1967	7.56E+04	8.32E+04	5.60E+05	6.16E+05
1968	7.56E+04	8.32E+04	6.36E+05	7.00E+05
1969	7.56E+04	8.32E+04	7.12E+05	7.83E+05
1970	7.56E+04	8.32E+04	7.87E+05	8.66E+05
1971	6.00E+03	6.60E+03	8.63E+05	9.49E+05
1972	6.00E+03	6.60E+03	8.69E+05	9.56E+05
1973	6.00E+03	6.60E+03	8.75E+05	9.62E+05
1974	6.00E+03	6.60E+03	8.81E+05	9.69E+05
1975	6.00E+03	6.60E+03	8.87E+05	9.76E+05
1976	6.00E+03	6.60E+03	8.93E+05	9.82E+05
1977	6.00E+03	6.60E+03	8.99E+05	9.89E+05
1978	6.00E+03	6.60E+03	9.05E+05	9.95E+05
1979	6.00E+03	6.60E+03	9.11E+05	1.00E+06
1980	6.00E+03	6.60E+03	9.17E+05	1.01E+06
1981	6.00E+03	6.60E+03	9.23E+05	1.02E+06
1982	6.00E+03	6.60E+03	9.29E+05	1.02E+06
1983	6.00E+03	6.60E+03	9.35E+05	1.03E+06
1984	6.00E+03	6.60E+03	9.41E+05	1.04E+06
1985	6.00E+03	6.60E+03	9.47E+05	1.04E+06
1986	6.00E+03	6.60E+03	9.53E+05	1.05E+06
1987	6.00E+03	6.60E+03	9.59E+05	1.05E+06
1988	6.00E+03	6.60E+03	9.65E+05	1.06E+06
1989	6.00E+03	6.60E+03	9.71E+05	1.07E+06
1990	6.00E+03	6.60E+03	9.77E+05	1.07E+06
1991	6.00E+03	6.60E+03	9.83E+05	1.08E+06
1992	6.00E+03	6.60E+03	9.89E+05	1.09E+06
1993	6.00E+03	6.60E+03	9.95E+05	1.09E+06
1994	6.00E+03	6.60E+03	1.00E+06	1.10E+06
1995	6.00E+03	6.60E+03	1.01E+06	1.11E+06
1996	6.00E+03	6.60E+03	1.01E+06	1.11E+06
1997	6.00E+03	6.60E+03	1.02E+06	1.12E+06
1998	6.00E+03	6.60E+03	1.02E+06	1.13E+06
1999	6.00E+03	6.60E+03	1.03E+06	1.13E+06
2000	6.00E+03	6.60E+03	1.04E+06	1.13E+06
2001	6.00E+03	6.60E+03	1.04E+06	1.14E+06
2002	6.00E+03	6.60E+03	1.05E+06	1.15E+06
2003	6.00E+03	6.60E+03	1.05E+06	1.15E+06

Table C-1
Scenario 1: Waste Acceptance - Wood Debris MSW
Transportation Cooridor
Yakima, Washington

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg/year)	(short tons/year)
2004	6.00E+03	6.60E+03	1.06E+06	1.16E+06
2005	6.00E+03	6.60E+03	1.07E+06	1.17E+06
2006	6.00E+03	6.60E+03	1.04E+06	1.13E+06
2007	6.00E+03	6.60E+03	1.04E+06	1.14E+06
2008	6.00E+03	6.60E+03	1.05E+06	1.15E+06
2009	6.00E+03	6.60E+03	1.05E+06	1.15E+06
2010	6.00E+03	6.60E+03	1.06E+06	1.16E+06
2011	6.00E+03	6.60E+03	1.07E+06	1.17E+06
2012	6.00E+03	6.60E+03	1.07E+06	1.17E+06
2013	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2014	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2015	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2016	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2017	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2018	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2019	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2020	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2021	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2022	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2023	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2024	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2025	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2026	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2027	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2028	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2029	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2030	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2031	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2032	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2033	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2034	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2035	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2036	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2037	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2038	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2039	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2040	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2041	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2042	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2043	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2044	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2045	0.00E+00	0.00E+00	1.08E+06	1.18E+06

Table C-1
Scenario 1: Waste Acceptance - Wood Debris MSW
Transportation Cooridor
Yakima, Washington

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg/year)	(short tons/year)
2046	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2047	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2048	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2049	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2050	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2051	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2052	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2053	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2054	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2055	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2056	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2057	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2058	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2059	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2060	0.00E+00	0.00E+00	1.08E+06	1.18E+06

Table C-2
Scenario 1: Total LFG and Methane Production - Wood Debris MSW
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (Wood Debris & MSW)			Methane (Wood Debris & MSW)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
1920	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1921	3.40E+01	2.84E+04	1.91E+00	7.97E+00	1.19E+04	8.02E-01
1922	6.76E+01	5.66E+04	3.80E+00	1.59E+01	2.38E+04	1.60E+00
1923	1.01E+02	8.45E+04	5.67E+00	2.37E+01	3.55E+04	2.38E+00
1924	1.34E+02	1.12E+05	7.53E+00	3.14E+01	4.71E+04	3.16E+00
1925	1.67E+02	1.39E+05	9.36E+00	3.91E+01	5.85E+04	3.93E+00
1926	1.99E+02	1.66E+05	1.12E+01	4.66E+01	6.99E+04	4.70E+00
1927	2.31E+02	1.93E+05	1.30E+01	5.41E+01	8.11E+04	5.45E+00
1928	2.63E+02	2.20E+05	1.48E+01	6.16E+01	9.23E+04	6.20E+00
1929	2.94E+02	2.46E+05	1.65E+01	6.89E+01	1.03E+05	6.94E+00
1930	3.25E+02	2.72E+05	1.83E+01	7.62E+01	1.14E+05	7.67E+00
1931	3.56E+02	2.98E+05	2.00E+01	8.34E+01	1.25E+05	8.40E+00
1932	3.86E+02	3.23E+05	2.17E+01	9.05E+01	1.36E+05	9.12E+00
1933	4.16E+02	3.48E+05	2.34E+01	9.76E+01	1.46E+05	9.83E+00
1934	4.46E+02	3.73E+05	2.51E+01	1.05E+02	1.57E+05	1.05E+01
1935	4.76E+02	3.98E+05	2.67E+01	1.12E+02	1.67E+05	1.12E+01
1936	5.05E+02	4.23E+05	2.84E+01	1.18E+02	1.77E+05	1.19E+01
1937	5.34E+02	4.47E+05	3.00E+01	1.25E+02	1.88E+05	1.26E+01
1938	5.63E+02	4.71E+05	3.16E+01	1.32E+02	1.98E+05	1.33E+01
1939	5.91E+02	4.94E+05	3.32E+01	1.39E+02	2.08E+05	1.40E+01
1940	6.19E+02	5.18E+05	3.48E+01	1.45E+02	2.18E+05	1.46E+01
1941	6.47E+02	5.41E+05	3.64E+01	1.52E+02	2.27E+05	1.53E+01
1942	6.75E+02	5.64E+05	3.79E+01	1.58E+02	2.37E+05	1.59E+01
1943	7.02E+02	5.87E+05	3.95E+01	1.65E+02	2.47E+05	1.66E+01
1944	7.29E+02	6.10E+05	4.10E+01	1.71E+02	2.56E+05	1.72E+01
1945	7.56E+02	6.32E+05	4.25E+01	1.77E+02	2.65E+05	1.78E+01
1946	7.82E+02	6.54E+05	4.40E+01	1.83E+02	2.75E+05	1.85E+01
1947	8.08E+02	6.76E+05	4.54E+01	1.89E+02	2.84E+05	1.91E+01
1948	8.34E+02	6.98E+05	4.69E+01	1.96E+02	2.93E+05	1.97E+01
1949	8.60E+02	7.19E+05	4.83E+01	2.02E+02	3.02E+05	2.03E+01
1950	8.85E+02	7.41E+05	4.98E+01	2.08E+02	3.11E+05	2.09E+01
1951	9.11E+02	7.62E+05	5.12E+01	2.13E+02	3.20E+05	2.15E+01
1952	9.36E+02	7.83E+05	5.26E+01	2.19E+02	3.29E+05	2.21E+01
1953	9.60E+02	8.03E+05	5.40E+01	2.25E+02	3.37E+05	2.27E+01
1954	9.85E+02	8.24E+05	5.53E+01	2.31E+02	3.46E+05	2.32E+01
1955	1.01E+03	8.44E+05	5.67E+01	2.36E+02	3.54E+05	2.38E+01
1956	1.03E+03	8.64E+05	5.80E+01	2.42E+02	3.63E+05	2.44E+01
1957	1.06E+03	8.84E+05	5.94E+01	2.48E+02	3.71E+05	2.49E+01
1958	1.08E+03	9.03E+05	6.07E+01	2.53E+02	3.79E+05	2.55E+01
1959	1.10E+03	9.23E+05	6.20E+01	2.59E+02	3.88E+05	2.60E+01
1960	1.13E+03	9.42E+05	6.33E+01	2.64E+02	3.96E+05	2.66E+01
1961	1.15E+03	9.61E+05	6.46E+01	2.69E+02	4.04E+05	2.71E+01
1962	1.17E+03	9.80E+05	6.59E+01	2.75E+02	4.12E+05	2.77E+01

Table C-2
Scenario 1: Total LFG and Methane Production - Wood Debris MSW
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (Wood Debris & MSW)			Methane (Wood Debris & MSW)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
1963	1.19E+03	9.99E+05	6.71E+01	2.80E+02	4.19E+05	2.82E+01
1964	1.88E+03	1.58E+06	1.06E+02	4.42E+02	6.62E+05	4.45E+01
1965	2.56E+03	2.14E+06	1.44E+02	6.00E+02	9.00E+05	6.04E+01
1966	3.22E+03	2.70E+06	1.81E+02	7.56E+02	1.13E+06	7.61E+01
1967	3.87E+03	3.24E+06	2.18E+02	9.08E+02	1.36E+06	9.15E+01
1968	4.51E+03	3.77E+06	2.54E+02	1.06E+03	1.59E+06	1.07E+02
1969	5.14E+03	4.30E+06	2.89E+02	1.20E+03	1.80E+06	1.21E+02
1970	5.75E+03	4.81E+06	3.23E+02	1.35E+03	2.02E+06	1.36E+02
1971	6.35E+03	5.31E+06	3.57E+02	1.49E+03	2.23E+06	1.50E+02
1972	6.27E+03	5.25E+06	3.53E+02	1.47E+03	2.20E+06	1.48E+02
1973	6.20E+03	5.18E+06	3.48E+02	1.45E+03	2.18E+06	1.46E+02
1974	6.12E+03	5.12E+06	3.44E+02	1.43E+03	2.15E+06	1.45E+02
1975	6.05E+03	5.06E+06	3.40E+02	1.42E+03	2.13E+06	1.43E+02
1976	5.98E+03	5.00E+06	3.36E+02	1.40E+03	2.10E+06	1.41E+02
1977	5.91E+03	4.94E+06	3.32E+02	1.38E+03	2.08E+06	1.39E+02
1978	5.84E+03	4.88E+06	3.28E+02	1.37E+03	2.05E+06	1.38E+02
1979	5.77E+03	4.83E+06	3.24E+02	1.35E+03	2.03E+06	1.36E+02
1980	5.71E+03	4.77E+06	3.21E+02	1.34E+03	2.00E+06	1.35E+02
1981	5.64E+03	4.72E+06	3.17E+02	1.32E+03	1.98E+06	1.33E+02
1982	5.58E+03	4.67E+06	3.14E+02	1.31E+03	1.96E+06	1.32E+02
1983	5.52E+03	4.62E+06	3.10E+02	1.29E+03	1.94E+06	1.30E+02
1984	5.46E+03	4.57E+06	3.07E+02	1.28E+03	1.92E+06	1.29E+02
1985	5.40E+03	4.52E+06	3.04E+02	1.27E+03	1.90E+06	1.28E+02
1986	5.34E+03	4.47E+06	3.00E+02	1.25E+03	1.88E+06	1.26E+02
1987	5.29E+03	4.42E+06	2.97E+02	1.24E+03	1.86E+06	1.25E+02
1988	5.23E+03	4.38E+06	2.94E+02	1.23E+03	1.84E+06	1.24E+02
1989	5.18E+03	4.33E+06	2.91E+02	1.21E+03	1.82E+06	1.22E+02
1990	5.13E+03	4.29E+06	2.88E+02	1.20E+03	1.80E+06	1.21E+02
1991	5.08E+03	4.25E+06	2.85E+02	1.19E+03	1.78E+06	1.20E+02
1992	5.03E+03	4.21E+06	2.83E+02	1.18E+03	1.77E+06	1.19E+02
1993	4.98E+03	4.17E+06	2.80E+02	1.17E+03	1.75E+06	1.18E+02
1994	4.93E+03	4.13E+06	2.77E+02	1.16E+03	1.73E+06	1.16E+02
1995	4.89E+03	4.09E+06	2.75E+02	1.15E+03	1.72E+06	1.15E+02
1996	4.84E+03	4.05E+06	2.72E+02	1.14E+03	1.70E+06	1.14E+02
1997	4.80E+03	4.01E+06	2.70E+02	1.12E+03	1.69E+06	1.13E+02
1998	4.76E+03	3.98E+06	2.67E+02	1.11E+03	1.67E+06	1.12E+02
1999	4.71E+03	3.94E+06	2.65E+02	1.10E+03	1.66E+06	1.11E+02
2000	4.67E+03	3.91E+06	2.63E+02	1.10E+03	1.64E+06	1.10E+02
2001	4.63E+03	3.88E+06	2.60E+02	1.09E+03	1.63E+06	1.09E+02
2002	4.59E+03	3.84E+06	2.58E+02	1.08E+03	1.61E+06	1.08E+02
2003	4.56E+03	3.81E+06	2.56E+02	1.07E+03	1.60E+06	1.08E+02
2004	4.52E+03	3.78E+06	2.54E+02	1.06E+03	1.59E+06	1.07E+02
2005	4.48E+03	3.75E+06	2.52E+02	1.05E+03	1.57E+06	1.06E+02

Table C-2
Scenario 1: Total LFG and Methane Production - Wood Debris MSW
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (Wood Debris & MSW)			Methane (Wood Debris & MSW)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
2006	4.25E+03	3.55E+06	2.50E+02	9.96E+02	1.49E+06	1.05E+02
2007	4.22E+03	3.53E+06	2.48E+02	9.88E+02	1.48E+06	1.04E+02
2008	4.18E+03	3.50E+06	2.44E+02	9.81E+02	1.47E+06	1.03E+02
2009	4.15E+03	3.47E+06	2.40E+02	9.73E+02	1.46E+06	1.01E+02
2010	4.12E+03	3.45E+06	2.37E+02	9.66E+02	1.45E+06	9.94E+01
2011	4.09E+03	3.42E+06	2.33E+02	9.59E+02	1.44E+06	9.79E+01
2012	4.06E+03	3.40E+06	2.30E+02	9.52E+02	1.43E+06	9.64E+01
2013	4.04E+03	3.38E+06	2.26E+02	9.46E+02	1.42E+06	9.49E+01
2014	3.97E+03	3.32E+06	2.23E+02	9.32E+02	1.40E+06	9.35E+01
2015	3.91E+03	3.27E+06	2.19E+02	9.17E+02	1.38E+06	9.21E+01
2016	3.85E+03	3.22E+06	2.16E+02	9.03E+02	1.35E+06	9.07E+01
2017	3.80E+03	3.18E+06	2.13E+02	8.90E+02	1.33E+06	8.93E+01
2018	3.74E+03	3.13E+06	2.09E+02	8.76E+02	1.31E+06	8.80E+01
2019	3.68E+03	3.08E+06	2.06E+02	8.63E+02	1.29E+06	8.66E+01
2020	3.63E+03	3.03E+06	2.03E+02	8.50E+02	1.27E+06	8.53E+01
2021	3.57E+03	2.99E+06	2.00E+02	8.37E+02	1.26E+06	8.40E+01
2022	3.52E+03	2.94E+06	1.97E+02	8.25E+02	1.24E+06	8.28E+01
2023	3.47E+03	2.90E+06	1.94E+02	8.12E+02	1.22E+06	8.15E+01
2024	3.41E+03	2.86E+06	1.91E+02	8.00E+02	1.20E+06	8.03E+01
2025	3.36E+03	2.81E+06	1.88E+02	7.88E+02	1.18E+06	7.91E+01
2026	3.31E+03	2.77E+06	1.86E+02	7.77E+02	1.16E+06	7.79E+01
2027	3.26E+03	2.73E+06	1.83E+02	7.65E+02	1.15E+06	7.68E+01
2028	3.22E+03	2.69E+06	1.80E+02	7.54E+02	1.13E+06	7.56E+01
2029	3.17E+03	2.65E+06	1.77E+02	7.42E+02	1.11E+06	7.45E+01
2030	3.12E+03	2.61E+06	1.75E+02	7.31E+02	1.10E+06	7.34E+01
2031	3.07E+03	2.57E+06	1.72E+02	7.21E+02	1.08E+06	7.23E+01
2032	3.03E+03	2.53E+06	1.70E+02	7.10E+02	1.06E+06	7.12E+01
2033	2.98E+03	2.50E+06	1.67E+02	7.00E+02	1.05E+06	7.02E+01
2034	2.94E+03	2.46E+06	1.65E+02	6.89E+02	1.03E+06	6.92E+01
2035	2.90E+03	2.42E+06	1.62E+02	6.79E+02	1.02E+06	6.81E+01
2036	2.86E+03	2.39E+06	1.60E+02	6.69E+02	1.00E+06	6.71E+01
2037	2.81E+03	2.35E+06	1.58E+02	6.59E+02	9.88E+05	6.62E+01
2038	2.77E+03	2.32E+06	1.55E+02	6.50E+02	9.74E+05	6.52E+01
2039	2.73E+03	2.29E+06	1.53E+02	6.40E+02	9.60E+05	6.42E+01
2040	2.69E+03	2.25E+06	1.51E+02	6.31E+02	9.46E+05	6.33E+01
2041	2.65E+03	2.22E+06	1.49E+02	6.22E+02	9.32E+05	6.24E+01
2042	2.61E+03	2.19E+06	1.46E+02	6.13E+02	9.18E+05	6.15E+01
2043	2.58E+03	2.16E+06	1.44E+02	6.04E+02	9.05E+05	6.06E+01
2044	2.54E+03	2.12E+06	1.42E+02	5.95E+02	8.92E+05	5.97E+01
2045	2.50E+03	2.09E+06	1.40E+02	5.87E+02	8.79E+05	5.88E+01
2046	2.47E+03	2.06E+06	1.38E+02	5.78E+02	8.66E+05	5.80E+01
2047	2.43E+03	2.03E+06	1.36E+02	5.70E+02	8.54E+05	5.72E+01
2048	2.40E+03	2.00E+06	1.34E+02	5.62E+02	8.42E+05	5.63E+01

Table C-2
Scenario 1: Total LFG and Methane Production - Wood Debris MSW
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (Wood Debris & MSW)			Methane (Wood Debris & MSW)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
2049	2.36E+03	1.98E+06	1.32E+02	5.54E+02	8.30E+05	5.55E+01
2050	2.33E+03	1.95E+06	1.30E+02	5.46E+02	8.18E+05	5.47E+01
2051	2.29E+03	1.92E+06	1.28E+02	5.38E+02	8.06E+05	5.39E+01
2052	2.26E+03	1.89E+06	1.27E+02	5.30E+02	7.95E+05	5.32E+01
2053	2.23E+03	1.86E+06	1.25E+02	5.23E+02	7.83E+05	5.24E+01
2054	2.20E+03	1.84E+06	1.23E+02	5.15E+02	7.72E+05	5.17E+01
2055	2.17E+03	1.81E+06	1.21E+02	5.08E+02	7.61E+05	5.09E+01
2056	2.14E+03	1.79E+06	1.20E+02	5.01E+02	7.50E+05	5.02E+01
2057	2.11E+03	1.76E+06	1.18E+02	4.94E+02	7.40E+05	4.95E+01
2058	2.08E+03	1.74E+06	1.16E+02	4.87E+02	7.29E+05	4.88E+01
2059	2.05E+03	1.71E+06	1.15E+02	4.80E+02	7.19E+05	4.81E+01
2060	2.02E+03	1.69E+06	1.13E+02	4.73E+02	7.09E+05	4.74E+01

Table C-3
Scenario 1: Total LFG and Methane Production - Wood Debris Only
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (Wood Debris)			Methane (Wood Debris)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
1920	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1921	3.40E+01	2.84E+04	1.91E+00	7.97E+00	1.19E+04	8.02E-01
1922	6.76E+01	5.66E+04	3.80E+00	1.59E+01	2.38E+04	1.60E+00
1923	1.01E+02	8.45E+04	5.67E+00	2.37E+01	3.55E+04	2.38E+00
1924	1.34E+02	1.12E+05	7.53E+00	3.14E+01	4.71E+04	3.16E+00
1925	1.67E+02	1.39E+05	9.36E+00	3.91E+01	5.85E+04	3.93E+00
1926	1.99E+02	1.66E+05	1.12E+01	4.66E+01	6.99E+04	4.70E+00
1927	2.31E+02	1.93E+05	1.30E+01	5.41E+01	8.11E+04	5.45E+00
1928	2.63E+02	2.20E+05	1.48E+01	6.16E+01	9.23E+04	6.20E+00
1929	2.94E+02	2.46E+05	1.65E+01	6.89E+01	1.03E+05	6.94E+00
1930	3.25E+02	2.72E+05	1.83E+01	7.62E+01	1.14E+05	7.67E+00
1931	3.56E+02	2.98E+05	2.00E+01	8.34E+01	1.25E+05	8.40E+00
1932	3.86E+02	3.23E+05	2.17E+01	9.05E+01	1.36E+05	9.12E+00
1933	4.16E+02	3.48E+05	2.34E+01	9.76E+01	1.46E+05	9.83E+00
1934	4.46E+02	3.73E+05	2.51E+01	1.05E+02	1.57E+05	1.05E+01
1935	4.76E+02	3.98E+05	2.67E+01	1.12E+02	1.67E+05	1.12E+01
1936	5.05E+02	4.23E+05	2.84E+01	1.18E+02	1.77E+05	1.19E+01
1937	5.34E+02	4.47E+05	3.00E+01	1.25E+02	1.88E+05	1.26E+01
1938	5.63E+02	4.71E+05	3.16E+01	1.32E+02	1.98E+05	1.33E+01
1939	5.91E+02	4.94E+05	3.32E+01	1.39E+02	2.08E+05	1.40E+01
1940	6.19E+02	5.18E+05	3.48E+01	1.45E+02	2.18E+05	1.46E+01
1941	6.47E+02	5.41E+05	3.64E+01	1.52E+02	2.27E+05	1.53E+01
1942	6.75E+02	5.64E+05	3.79E+01	1.58E+02	2.37E+05	1.59E+01
1943	7.02E+02	5.87E+05	3.95E+01	1.65E+02	2.47E+05	1.66E+01
1944	7.29E+02	6.10E+05	4.10E+01	1.71E+02	2.56E+05	1.72E+01
1945	7.56E+02	6.32E+05	4.25E+01	1.77E+02	2.65E+05	1.78E+01
1946	7.82E+02	6.54E+05	4.40E+01	1.83E+02	2.75E+05	1.85E+01
1947	8.08E+02	6.76E+05	4.54E+01	1.89E+02	2.84E+05	1.91E+01
1948	8.34E+02	6.98E+05	4.69E+01	1.96E+02	2.93E+05	1.97E+01
1949	8.60E+02	7.19E+05	4.83E+01	2.02E+02	3.02E+05	2.03E+01
1950	8.85E+02	7.41E+05	4.98E+01	2.08E+02	3.11E+05	2.09E+01
1951	9.11E+02	7.62E+05	5.12E+01	2.13E+02	3.20E+05	2.15E+01
1952	9.36E+02	7.83E+05	5.26E+01	2.19E+02	3.29E+05	2.21E+01
1953	9.60E+02	8.03E+05	5.40E+01	2.25E+02	3.37E+05	2.27E+01
1954	9.85E+02	8.24E+05	5.53E+01	2.31E+02	3.46E+05	2.32E+01
1955	1.01E+03	8.44E+05	5.67E+01	2.36E+02	3.54E+05	2.38E+01
1956	1.03E+03	8.64E+05	5.80E+01	2.42E+02	3.63E+05	2.44E+01
1957	1.06E+03	8.84E+05	5.94E+01	2.48E+02	3.71E+05	2.49E+01
1958	1.08E+03	9.03E+05	6.07E+01	2.53E+02	3.79E+05	2.55E+01
1959	1.10E+03	9.23E+05	6.20E+01	2.59E+02	3.88E+05	2.60E+01
1960	1.13E+03	9.42E+05	6.33E+01	2.64E+02	3.96E+05	2.66E+01
1961	1.15E+03	9.61E+05	6.46E+01	2.69E+02	4.04E+05	2.71E+01
1962	1.17E+03	9.80E+05	6.59E+01	2.75E+02	4.12E+05	2.77E+01

Table C-3
Scenario 1: Total LFG and Methane Production - Wood Debris Only
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (Wood Debris)			Methane (Wood Debris)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
1963	1.19E+03	9.99E+05	6.71E+01	2.80E+02	4.19E+05	2.82E+01
1964	1.22E+03	1.02E+06	6.83E+01	2.85E+02	4.27E+05	2.87E+01
1965	1.24E+03	1.04E+06	6.96E+01	2.90E+02	4.35E+05	2.92E+01
1966	1.26E+03	1.05E+06	7.08E+01	2.95E+02	4.43E+05	2.97E+01
1967	1.28E+03	1.07E+06	7.20E+01	3.00E+02	4.50E+05	3.02E+01
1968	1.30E+03	1.09E+06	7.32E+01	3.05E+02	4.58E+05	3.07E+01
1969	1.32E+03	1.11E+06	7.44E+01	3.10E+02	4.65E+05	3.12E+01
1970	1.34E+03	1.12E+06	7.55E+01	3.15E+02	4.72E+05	3.17E+01
1971	1.36E+03	1.14E+06	7.67E+01	3.20E+02	4.79E+05	3.22E+01
1972	1.39E+03	1.16E+06	7.79E+01	3.25E+02	4.87E+05	3.27E+01
1973	1.41E+03	1.18E+06	7.90E+01	3.29E+02	4.94E+05	3.32E+01
1974	1.43E+03	1.19E+06	8.01E+01	3.34E+02	5.01E+05	3.36E+01
1975	1.45E+03	1.21E+06	8.12E+01	3.39E+02	5.08E+05	3.41E+01
1976	1.46E+03	1.23E+06	8.23E+01	3.43E+02	5.15E+05	3.46E+01
1977	1.48E+03	1.24E+06	8.34E+01	3.48E+02	5.21E+05	3.50E+01
1978	1.50E+03	1.26E+06	8.45E+01	3.52E+02	5.28E+05	3.55E+01
1979	1.52E+03	1.27E+06	8.56E+01	3.57E+02	5.35E+05	3.59E+01
1980	1.54E+03	1.29E+06	8.66E+01	3.61E+02	5.42E+05	3.64E+01
1981	1.56E+03	1.30E+06	8.77E+01	3.66E+02	5.48E+05	3.68E+01
1982	1.58E+03	1.32E+06	8.87E+01	3.70E+02	5.55E+05	3.73E+01
1983	1.60E+03	1.34E+06	8.97E+01	3.74E+02	5.61E+05	3.77E+01
1984	1.61E+03	1.35E+06	9.08E+01	3.79E+02	5.67E+05	3.81E+01
1985	1.63E+03	1.37E+06	9.18E+01	3.83E+02	5.74E+05	3.85E+01
1986	1.65E+03	1.38E+06	9.28E+01	3.87E+02	5.80E+05	3.90E+01
1987	1.67E+03	1.40E+06	9.38E+01	3.91E+02	5.86E+05	3.94E+01
1988	1.69E+03	1.41E+06	9.47E+01	3.95E+02	5.92E+05	3.98E+01
1989	1.70E+03	1.42E+06	9.57E+01	3.99E+02	5.98E+05	4.02E+01
1990	1.72E+03	1.44E+06	9.67E+01	4.03E+02	6.04E+05	4.06E+01
1991	1.74E+03	1.45E+06	9.76E+01	4.07E+02	6.10E+05	4.10E+01
1992	1.75E+03	1.47E+06	9.85E+01	4.11E+02	6.16E+05	4.14E+01
1993	1.77E+03	1.48E+06	9.95E+01	4.15E+02	6.22E+05	4.18E+01
1994	1.79E+03	1.49E+06	1.00E+02	4.19E+02	6.28E+05	4.22E+01
1995	1.80E+03	1.51E+06	1.01E+02	4.22E+02	6.33E+05	4.26E+01
1996	1.82E+03	1.52E+06	1.02E+02	4.26E+02	6.39E+05	4.29E+01
1997	1.83E+03	1.53E+06	1.03E+02	4.30E+02	6.45E+05	4.33E+01
1998	1.85E+03	1.55E+06	1.04E+02	4.34E+02	6.50E+05	4.37E+01
1999	1.87E+03	1.56E+06	1.05E+02	4.37E+02	6.56E+05	4.40E+01
2000	1.88E+03	1.57E+06	1.06E+02	4.41E+02	6.61E+05	4.44E+01
2001	1.90E+03	1.59E+06	1.07E+02	4.45E+02	6.66E+05	4.48E+01
2002	1.91E+03	1.60E+06	1.07E+02	4.48E+02	6.72E+05	4.51E+01
2003	1.93E+03	1.61E+06	1.08E+02	4.52E+02	6.77E+05	4.55E+01
2004	1.94E+03	1.62E+06	1.09E+02	4.55E+02	6.82E+05	4.58E+01
2005	1.96E+03	1.64E+06	1.10E+02	4.58E+02	6.87E+05	4.62E+01

Table C-3
Scenario 1: Total LFG and Methane Production - Wood Debris Only
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (Wood Debris)			Methane (Wood Debris)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
2006	1.97E+03	1.65E+06	1.11E+02	4.62E+02	6.92E+05	4.65E+01
2007	1.99E+03	1.66E+06	1.12E+02	4.65E+02	6.97E+05	4.69E+01
2008	1.97E+03	1.64E+06	1.10E+02	4.61E+02	6.90E+05	4.64E+01
2009	1.95E+03	1.63E+06	1.09E+02	4.56E+02	6.84E+05	4.59E+01
2010	1.93E+03	1.61E+06	1.08E+02	4.52E+02	6.77E+05	4.55E+01
2011	1.91E+03	1.60E+06	1.07E+02	4.47E+02	6.70E+05	4.50E+01
2012	1.89E+03	1.58E+06	1.06E+02	4.43E+02	6.63E+05	4.46E+01
2013	1.87E+03	1.56E+06	1.05E+02	4.38E+02	6.57E+05	4.41E+01
2014	1.85E+03	1.55E+06	1.04E+02	4.34E+02	6.50E+05	4.37E+01
2015	1.83E+03	1.53E+06	1.03E+02	4.29E+02	6.44E+05	4.33E+01
2016	1.81E+03	1.52E+06	1.02E+02	4.25E+02	6.37E+05	4.28E+01
2017	1.80E+03	1.50E+06	1.01E+02	4.21E+02	6.31E+05	4.24E+01
2018	1.78E+03	1.49E+06	9.99E+01	4.17E+02	6.25E+05	4.20E+01
2019	1.76E+03	1.47E+06	9.90E+01	4.13E+02	6.19E+05	4.16E+01
2020	1.74E+03	1.46E+06	9.80E+01	4.09E+02	6.12E+05	4.11E+01
2021	1.73E+03	1.44E+06	9.70E+01	4.04E+02	6.06E+05	4.07E+01
2022	1.71E+03	1.43E+06	9.60E+01	4.00E+02	6.00E+05	4.03E+01
2023	1.69E+03	1.41E+06	9.51E+01	3.96E+02	5.94E+05	3.99E+01
2024	1.67E+03	1.40E+06	9.41E+01	3.93E+02	5.88E+05	3.95E+01
2025	1.66E+03	1.39E+06	9.32E+01	3.89E+02	5.83E+05	3.91E+01
2026	1.64E+03	1.37E+06	9.23E+01	3.85E+02	5.77E+05	3.87E+01
2027	1.63E+03	1.36E+06	9.13E+01	3.81E+02	5.71E+05	3.84E+01
2028	1.61E+03	1.35E+06	9.04E+01	3.77E+02	5.65E+05	3.80E+01
2029	1.59E+03	1.33E+06	8.95E+01	3.73E+02	5.60E+05	3.76E+01
2030	1.58E+03	1.32E+06	8.86E+01	3.70E+02	5.54E+05	3.72E+01
2031	1.56E+03	1.31E+06	8.78E+01	3.66E+02	5.49E+05	3.69E+01
2032	1.55E+03	1.29E+06	8.69E+01	3.62E+02	5.43E+05	3.65E+01
2033	1.53E+03	1.28E+06	8.60E+01	3.59E+02	5.38E+05	3.61E+01
2034	1.52E+03	1.27E+06	8.52E+01	3.55E+02	5.32E+05	3.58E+01
2035	1.50E+03	1.25E+06	8.43E+01	3.52E+02	5.27E+05	3.54E+01
2036	1.49E+03	1.24E+06	8.35E+01	3.48E+02	5.22E+05	3.51E+01
2037	1.47E+03	1.23E+06	8.27E+01	3.45E+02	5.17E+05	3.47E+01
2038	1.46E+03	1.22E+06	8.18E+01	3.41E+02	5.12E+05	3.44E+01
2039	1.44E+03	1.21E+06	8.10E+01	3.38E+02	5.06E+05	3.40E+01
2040	1.43E+03	1.19E+06	8.02E+01	3.34E+02	5.01E+05	3.37E+01
2041	1.41E+03	1.18E+06	7.94E+01	3.31E+02	4.96E+05	3.34E+01
2042	1.40E+03	1.17E+06	7.86E+01	3.28E+02	4.91E+05	3.30E+01
2043	1.38E+03	1.16E+06	7.78E+01	3.25E+02	4.87E+05	3.27E+01
2044	1.37E+03	1.15E+06	7.71E+01	3.21E+02	4.82E+05	3.24E+01
2045	1.36E+03	1.14E+06	7.63E+01	3.18E+02	4.77E+05	3.20E+01
2046	1.34E+03	1.12E+06	7.55E+01	3.15E+02	4.72E+05	3.17E+01
2047	1.33E+03	1.11E+06	7.48E+01	3.12E+02	4.67E+05	3.14E+01
2048	1.32E+03	1.10E+06	7.40E+01	3.09E+02	4.63E+05	3.11E+01

Table C-3
Scenario 1: Total LFG and Methane Production - Wood Debris Only
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (Wood Debris)			Methane (Wood Debris)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
2049	1.30E+03	1.09E+06	7.33E+01	3.06E+02	4.58E+05	3.08E+01
2050	1.29E+03	1.08E+06	7.26E+01	3.03E+02	4.54E+05	3.05E+01
2051	1.28E+03	1.07E+06	7.19E+01	3.00E+02	4.49E+05	3.02E+01
2052	1.27E+03	1.06E+06	7.11E+01	2.97E+02	4.45E+05	2.99E+01
2053	1.25E+03	1.05E+06	7.04E+01	2.94E+02	4.40E+05	2.96E+01
2054	1.24E+03	1.04E+06	6.97E+01	2.91E+02	4.36E+05	2.93E+01
2055	1.23E+03	1.03E+06	6.90E+01	2.88E+02	4.32E+05	2.90E+01
2056	1.22E+03	1.02E+06	6.83E+01	2.85E+02	4.27E+05	2.87E+01
2057	1.20E+03	1.01E+06	6.77E+01	2.82E+02	4.23E+05	2.84E+01
2058	1.19E+03	9.97E+05	6.70E+01	2.79E+02	4.19E+05	2.81E+01
2059	1.18E+03	9.87E+05	6.63E+01	2.77E+02	4.15E+05	2.79E+01
2060	1.17E+03	9.77E+05	6.57E+01	2.74E+02	4.10E+05	2.76E+01

Table C-4
Scenario 1: Total LFG and Methane Production - MSW Only
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (MSW)			Methane (MSW)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
1920	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1921	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1922	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1923	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1924	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1925	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1926	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1927	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1928	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1929	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1930	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1931	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1932	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1933	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1934	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1935	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1936	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1937	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1938	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1939	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1940	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1941	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1942	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1943	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1944	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1945	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1946	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1947	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1948	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1949	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1950	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1951	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1952	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1953	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1954	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1955	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1956	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1957	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1958	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1959	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1960	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1961	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table C-4
Scenario 1: Total LFG and Methane Production - MSW Only
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (MSW)			Methane (MSW)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
1962	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1963	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1964	6.68E+02	5.59E+05	3.75E+01	1.57E+02	2.35E+05	1.58E+01
1965	1.32E+03	1.11E+06	7.43E+01	3.10E+02	4.65E+05	3.12E+01
1966	1.96E+03	1.64E+06	1.10E+02	4.60E+02	6.90E+05	4.64E+01
1967	2.59E+03	2.17E+06	1.46E+02	6.08E+02	9.11E+05	6.12E+01
1968	3.21E+03	2.68E+06	1.80E+02	7.52E+02	1.13E+06	7.58E+01
1969	3.81E+03	3.19E+06	2.14E+02	8.94E+02	1.34E+06	9.00E+01
1970	4.41E+03	3.69E+06	2.48E+02	1.03E+03	1.55E+06	1.04E+02
1971	4.99E+03	4.17E+06	2.80E+02	1.17E+03	1.75E+06	1.18E+02
1972	4.89E+03	4.09E+06	2.75E+02	1.15E+03	1.72E+06	1.15E+02
1973	4.79E+03	4.01E+06	2.69E+02	1.12E+03	1.68E+06	1.13E+02
1974	4.70E+03	3.93E+06	2.64E+02	1.10E+03	1.65E+06	1.11E+02
1975	4.60E+03	3.85E+06	2.59E+02	1.08E+03	1.62E+06	1.09E+02
1976	4.51E+03	3.77E+06	2.54E+02	1.06E+03	1.59E+06	1.07E+02
1977	4.42E+03	3.70E+06	2.49E+02	1.04E+03	1.55E+06	1.04E+02
1978	4.34E+03	3.63E+06	2.44E+02	1.02E+03	1.52E+06	1.02E+02
1979	4.25E+03	3.55E+06	2.39E+02	9.96E+02	1.49E+06	1.00E+02
1980	4.17E+03	3.48E+06	2.34E+02	9.76E+02	1.46E+06	9.83E+01
1981	4.08E+03	3.42E+06	2.29E+02	9.57E+02	1.43E+06	9.64E+01
1982	4.00E+03	3.35E+06	2.25E+02	9.38E+02	1.41E+06	9.45E+01
1983	3.92E+03	3.28E+06	2.20E+02	9.19E+02	1.38E+06	9.26E+01
1984	3.84E+03	3.22E+06	2.16E+02	9.01E+02	1.35E+06	9.08E+01
1985	3.77E+03	3.15E+06	2.12E+02	8.83E+02	1.32E+06	8.90E+01
1986	3.69E+03	3.09E+06	2.08E+02	8.66E+02	1.30E+06	8.72E+01
1987	3.62E+03	3.03E+06	2.04E+02	8.49E+02	1.27E+06	8.55E+01
1988	3.55E+03	2.97E+06	1.99E+02	8.32E+02	1.25E+06	8.38E+01
1989	3.48E+03	2.91E+06	1.96E+02	8.15E+02	1.22E+06	8.21E+01
1990	3.41E+03	2.85E+06	1.92E+02	7.99E+02	1.20E+06	8.05E+01
1991	3.34E+03	2.80E+06	1.88E+02	7.83E+02	1.17E+06	7.89E+01
1992	3.28E+03	2.74E+06	1.84E+02	7.68E+02	1.15E+06	7.73E+01
1993	3.21E+03	2.69E+06	1.81E+02	7.53E+02	1.13E+06	7.58E+01
1994	3.15E+03	2.63E+06	1.77E+02	7.38E+02	1.11E+06	7.43E+01
1995	3.09E+03	2.58E+06	1.73E+02	7.23E+02	1.08E+06	7.28E+01
1996	3.02E+03	2.53E+06	1.70E+02	7.09E+02	1.06E+06	7.14E+01
1997	2.96E+03	2.48E+06	1.67E+02	6.95E+02	1.04E+06	7.00E+01
1998	2.91E+03	2.43E+06	1.63E+02	6.81E+02	1.02E+06	6.86E+01
1999	2.85E+03	2.38E+06	1.60E+02	6.68E+02	1.00E+06	6.72E+01
2000	2.79E+03	2.34E+06	1.57E+02	6.54E+02	9.81E+05	6.59E+01
2001	2.74E+03	2.29E+06	1.54E+02	6.41E+02	9.61E+05	6.46E+01
2002	2.68E+03	2.24E+06	1.51E+02	6.29E+02	9.42E+05	6.33E+01
2003	2.63E+03	2.20E+06	1.48E+02	6.16E+02	9.24E+05	6.21E+01

Table C-4
Scenario 1: Total LFG and Methane Production - MSW Only
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (MSW)			Methane (MSW)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
2004	2.58E+03	2.16E+06	1.45E+02	6.04E+02	9.06E+05	6.08E+01
2005	2.53E+03	2.11E+06	1.42E+02	5.92E+02	8.88E+05	5.96E+01
2006	2.48E+03	2.07E+06	1.39E+02	5.80E+02	8.70E+05	5.85E+01
2007	2.43E+03	2.03E+06	1.36E+02	5.69E+02	8.53E+05	5.73E+01
2008	2.38E+03	1.99E+06	1.34E+02	5.58E+02	8.36E+05	5.62E+01
2009	2.33E+03	1.95E+06	1.31E+02	5.47E+02	8.19E+05	5.51E+01
2010	2.29E+03	1.91E+06	1.28E+02	5.36E+02	8.03E+05	5.40E+01
2011	2.24E+03	1.87E+06	1.26E+02	5.25E+02	7.87E+05	5.29E+01
2012	2.20E+03	1.84E+06	1.23E+02	5.15E+02	7.72E+05	5.18E+01
2013	2.15E+03	1.80E+06	1.21E+02	5.05E+02	7.56E+05	5.08E+01
2014	2.11E+03	1.77E+06	1.19E+02	4.95E+02	7.41E+05	4.98E+01
2015	2.07E+03	1.73E+06	1.16E+02	4.85E+02	7.27E+05	4.88E+01
2016	2.03E+03	1.70E+06	1.14E+02	4.75E+02	7.12E+05	4.79E+01
2017	1.99E+03	1.66E+06	1.12E+02	4.66E+02	6.98E+05	4.69E+01
2018	1.95E+03	1.63E+06	1.09E+02	4.57E+02	6.84E+05	4.60E+01
2019	1.91E+03	1.60E+06	1.07E+02	4.48E+02	6.71E+05	4.51E+01
2020	1.87E+03	1.57E+06	1.05E+02	4.39E+02	6.58E+05	4.42E+01
2021	1.83E+03	1.53E+06	1.03E+02	4.30E+02	6.45E+05	4.33E+01
2022	1.80E+03	1.50E+06	1.01E+02	4.21E+02	6.32E+05	4.24E+01
2023	1.76E+03	1.47E+06	9.91E+01	4.13E+02	6.19E+05	4.16E+01
2024	1.73E+03	1.45E+06	9.71E+01	4.05E+02	6.07E+05	4.08E+01
2025	1.69E+03	1.42E+06	9.52E+01	3.97E+02	5.95E+05	4.00E+01
2026	1.66E+03	1.39E+06	9.33E+01	3.89E+02	5.83E+05	3.92E+01
2027	1.63E+03	1.36E+06	9.14E+01	3.81E+02	5.72E+05	3.84E+01
2028	1.59E+03	1.33E+06	8.96E+01	3.74E+02	5.60E+05	3.76E+01
2029	1.56E+03	1.31E+06	8.79E+01	3.66E+02	5.49E+05	3.69E+01
2030	1.53E+03	1.28E+06	8.61E+01	3.59E+02	5.38E+05	3.62E+01
2031	1.50E+03	1.26E+06	8.44E+01	3.52E+02	5.28E+05	3.55E+01
2032	1.47E+03	1.23E+06	8.27E+01	3.45E+02	5.17E+05	3.48E+01
2033	1.44E+03	1.21E+06	8.11E+01	3.38E+02	5.07E+05	3.41E+01
2034	1.41E+03	1.18E+06	7.95E+01	3.32E+02	4.97E+05	3.34E+01
2035	1.39E+03	1.16E+06	7.79E+01	3.25E+02	4.87E+05	3.27E+01
2036	1.36E+03	1.14E+06	7.64E+01	3.19E+02	4.77E+05	3.21E+01
2037	1.33E+03	1.11E+06	7.49E+01	3.12E+02	4.68E+05	3.14E+01
2038	1.31E+03	1.09E+06	7.34E+01	3.06E+02	4.59E+05	3.08E+01
2039	1.28E+03	1.07E+06	7.19E+01	3.00E+02	4.50E+05	3.02E+01
2040	1.25E+03	1.05E+06	7.05E+01	2.94E+02	4.41E+05	2.96E+01
2041	1.23E+03	1.03E+06	6.91E+01	2.88E+02	4.32E+05	2.90E+01
2042	1.21E+03	1.01E+06	6.77E+01	2.83E+02	4.23E+05	2.85E+01
2043	1.18E+03	9.88E+05	6.64E+01	2.77E+02	4.15E+05	2.79E+01
2044	1.16E+03	9.69E+05	6.51E+01	2.71E+02	4.07E+05	2.73E+01
2045	1.14E+03	9.50E+05	6.38E+01	2.66E+02	3.99E+05	2.68E+01

Table C-4
Scenario 1: Total LFG and Methane Production - MSW Only
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (MSW)			Methane (MSW)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
2046	1.11E+03	9.31E+05	6.25E+01	2.61E+02	3.91E+05	2.63E+01
2047	1.09E+03	9.12E+05	6.13E+01	2.56E+02	3.83E+05	2.57E+01
2048	1.07E+03	8.94E+05	6.01E+01	2.51E+02	3.76E+05	2.52E+01
2049	1.05E+03	8.77E+05	5.89E+01	2.46E+02	3.68E+05	2.47E+01
2050	1.03E+03	8.59E+05	5.77E+01	2.41E+02	3.61E+05	2.42E+01
2051	1.01E+03	8.42E+05	5.66E+01	2.36E+02	3.54E+05	2.38E+01
2052	9.87E+02	8.26E+05	5.55E+01	2.31E+02	3.47E+05	2.33E+01
2053	9.67E+02	8.09E+05	5.44E+01	2.27E+02	3.40E+05	2.28E+01
2054	9.48E+02	7.93E+05	5.33E+01	2.22E+02	3.33E+05	2.24E+01
2055	9.29E+02	7.77E+05	5.22E+01	2.18E+02	3.27E+05	2.19E+01
2056	9.11E+02	7.62E+05	5.12E+01	2.14E+02	3.20E+05	2.15E+01
2057	8.93E+02	7.47E+05	5.02E+01	2.09E+02	3.14E+05	2.11E+01
2058	8.75E+02	7.32E+05	4.92E+01	2.05E+02	3.08E+05	2.07E+01
2059	8.58E+02	7.18E+05	4.82E+01	2.01E+02	3.01E+05	2.03E+01
2060	8.41E+02	7.03E+05	4.73E+01	1.97E+02	2.95E+05	1.99E+01

Table C-5
Scenario 1: Carbon Dioxide and NMOCs Production - Wood Debris & MSW
Transportation Cooridor
Yakima, Washington

Year	Carbon Dioxide			NMOCs		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
1920	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1921	3.02E+01	1.65E+04	1.11E+00	6.83E-03	1.91E+00	1.28E-04
1922	6.01E+01	3.28E+04	2.21E+00	1.36E-02	3.79E+00	2.55E-04
1923	8.97E+01	4.90E+04	3.29E+00	2.03E-02	5.66E+00	3.80E-04
1924	1.19E+02	6.50E+04	4.37E+00	2.69E-02	7.51E+00	5.04E-04
1925	1.48E+02	8.08E+04	5.43E+00	3.35E-02	9.34E+00	6.27E-04
1926	1.77E+02	9.65E+04	6.49E+00	4.00E-02	1.12E+01	7.49E-04
1927	2.05E+02	1.12E+05	7.53E+00	4.64E-02	1.29E+01	8.70E-04
1928	2.33E+02	1.27E+05	8.56E+00	5.28E-02	1.47E+01	9.89E-04
1929	2.61E+02	1.43E+05	9.59E+00	5.91E-02	1.65E+01	1.11E-03
1930	2.89E+02	1.58E+05	1.06E+01	6.53E-02	1.82E+01	1.22E-03
1931	3.16E+02	1.73E+05	1.16E+01	7.15E-02	1.99E+01	1.34E-03
1932	3.43E+02	1.87E+05	1.26E+01	7.76E-02	2.17E+01	1.45E-03
1933	3.70E+02	2.02E+05	1.36E+01	8.37E-02	2.33E+01	1.57E-03
1934	3.96E+02	2.17E+05	1.45E+01	8.97E-02	2.50E+01	1.68E-03
1935	4.23E+02	2.31E+05	1.55E+01	9.56E-02	2.67E+01	1.79E-03
1936	4.49E+02	2.45E+05	1.65E+01	1.01E-01	2.83E+01	1.90E-03
1937	4.74E+02	2.59E+05	1.74E+01	1.07E-01	2.99E+01	2.01E-03
1938	5.00E+02	2.73E+05	1.83E+01	1.13E-01	3.15E+01	2.12E-03
1939	5.25E+02	2.87E+05	1.93E+01	1.19E-01	3.31E+01	2.23E-03
1940	5.50E+02	3.00E+05	2.02E+01	1.24E-01	3.47E+01	2.33E-03
1941	5.75E+02	3.14E+05	2.11E+01	1.30E-01	3.63E+01	2.44E-03
1942	5.99E+02	3.27E+05	2.20E+01	1.36E-01	3.78E+01	2.54E-03
1943	6.23E+02	3.41E+05	2.29E+01	1.41E-01	3.93E+01	2.64E-03
1944	6.47E+02	3.54E+05	2.38E+01	1.46E-01	4.09E+01	2.74E-03
1945	6.71E+02	3.67E+05	2.46E+01	1.52E-01	4.24E+01	2.85E-03
1946	6.95E+02	3.79E+05	2.55E+01	1.57E-01	4.38E+01	2.95E-03
1947	7.18E+02	3.92E+05	2.64E+01	1.62E-01	4.53E+01	3.04E-03
1948	7.41E+02	4.05E+05	2.72E+01	1.68E-01	4.68E+01	3.14E-03
1949	7.64E+02	4.17E+05	2.80E+01	1.73E-01	4.82E+01	3.24E-03
1950	7.86E+02	4.30E+05	2.89E+01	1.78E-01	4.96E+01	3.33E-03
1951	8.09E+02	4.42E+05	2.97E+01	1.83E-01	5.10E+01	3.43E-03
1952	8.31E+02	4.54E+05	3.05E+01	1.88E-01	5.24E+01	3.52E-03
1953	8.53E+02	4.66E+05	3.13E+01	1.93E-01	5.38E+01	3.62E-03
1954	8.74E+02	4.78E+05	3.21E+01	1.98E-01	5.52E+01	3.71E-03
1955	8.96E+02	4.89E+05	3.29E+01	2.03E-01	5.65E+01	3.80E-03
1956	9.17E+02	5.01E+05	3.37E+01	2.07E-01	5.79E+01	3.89E-03
1957	9.38E+02	5.13E+05	3.44E+01	2.12E-01	5.92E+01	3.98E-03
1958	9.59E+02	5.24E+05	3.52E+01	2.17E-01	6.05E+01	4.07E-03
1959	9.80E+02	5.35E+05	3.60E+01	2.22E-01	6.18E+01	4.15E-03
1960	1.00E+03	5.46E+05	3.67E+01	2.26E-01	6.31E+01	4.24E-03
1961	1.02E+03	5.57E+05	3.75E+01	2.31E-01	6.44E+01	4.33E-03
1962	1.04E+03	5.68E+05	3.82E+01	2.35E-01	6.57E+01	4.41E-03

Table C-5
Scenario 1: Carbon Dioxide and NMOCs Production - Wood Debris & MSW
Transportation Cooridor
Yakima, Washington

Year	Carbon Dioxide			NMOCs		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
1963	1.06E+03	5.79E+05	3.89E+01	2.40E-01	6.69E+01	4.50E-03
1964	1.67E+03	9.14E+05	6.14E+01	3.78E-01	1.06E+02	7.09E-03
1965	2.27E+03	1.24E+06	8.35E+01	5.14E-01	1.43E+02	9.64E-03
1966	2.86E+03	1.56E+06	1.05E+02	6.48E-01	1.81E+02	1.21E-02
1967	3.44E+03	1.88E+06	1.26E+02	7.78E-01	2.17E+02	1.46E-02
1968	4.01E+03	2.19E+06	1.47E+02	9.06E-01	2.53E+02	1.70E-02
1969	4.56E+03	2.49E+06	1.67E+02	1.03E+00	2.88E+02	1.93E-02
1970	5.11E+03	2.79E+06	1.87E+02	1.16E+00	3.22E+02	2.17E-02
1971	5.64E+03	3.08E+06	2.07E+02	1.28E+00	3.56E+02	2.39E-02
1972	5.57E+03	3.04E+06	2.04E+02	1.26E+00	3.52E+02	2.36E-02
1973	5.50E+03	3.01E+06	2.02E+02	1.24E+00	3.47E+02	2.33E-02
1974	5.44E+03	2.97E+06	2.00E+02	1.23E+00	3.43E+02	2.31E-02
1975	5.37E+03	2.93E+06	1.97E+02	1.22E+00	3.39E+02	2.28E-02
1976	5.31E+03	2.90E+06	1.95E+02	1.20E+00	3.35E+02	2.25E-02
1977	5.25E+03	2.87E+06	1.93E+02	1.19E+00	3.31E+02	2.22E-02
1978	5.19E+03	2.83E+06	1.90E+02	1.17E+00	3.27E+02	2.20E-02
1979	5.13E+03	2.80E+06	1.88E+02	1.16E+00	3.23E+02	2.17E-02
1980	5.07E+03	2.77E+06	1.86E+02	1.15E+00	3.20E+02	2.15E-02
1981	5.01E+03	2.74E+06	1.84E+02	1.13E+00	3.16E+02	2.12E-02
1982	4.96E+03	2.71E+06	1.82E+02	1.12E+00	3.13E+02	2.10E-02
1983	4.90E+03	2.68E+06	1.80E+02	1.11E+00	3.09E+02	2.08E-02
1984	4.85E+03	2.65E+06	1.78E+02	1.10E+00	3.06E+02	2.06E-02
1985	4.80E+03	2.62E+06	1.76E+02	1.09E+00	3.03E+02	2.03E-02
1986	4.75E+03	2.59E+06	1.74E+02	1.07E+00	3.00E+02	2.01E-02
1987	4.70E+03	2.57E+06	1.72E+02	1.06E+00	2.96E+02	1.99E-02
1988	4.65E+03	2.54E+06	1.71E+02	1.05E+00	2.93E+02	1.97E-02
1989	4.60E+03	2.51E+06	1.69E+02	1.04E+00	2.90E+02	1.95E-02
1990	4.56E+03	2.49E+06	1.67E+02	1.03E+00	2.88E+02	1.93E-02
1991	4.51E+03	2.46E+06	1.66E+02	1.02E+00	2.85E+02	1.91E-02
1992	4.47E+03	2.44E+06	1.64E+02	1.01E+00	2.82E+02	1.89E-02
1993	4.42E+03	2.42E+06	1.62E+02	1.00E+00	2.79E+02	1.88E-02
1994	4.38E+03	2.39E+06	1.61E+02	9.91E-01	2.77E+02	1.86E-02
1995	4.34E+03	2.37E+06	1.59E+02	9.82E-01	2.74E+02	1.84E-02
1996	4.30E+03	2.35E+06	1.58E+02	9.73E-01	2.71E+02	1.82E-02
1997	4.26E+03	2.33E+06	1.56E+02	9.64E-01	2.69E+02	1.81E-02
1998	4.22E+03	2.31E+06	1.55E+02	9.55E-01	2.67E+02	1.79E-02
1999	4.19E+03	2.29E+06	1.54E+02	9.47E-01	2.64E+02	1.78E-02
2000	4.15E+03	2.27E+06	1.52E+02	9.39E-01	2.62E+02	1.76E-02
2001	4.11E+03	2.25E+06	1.51E+02	9.31E-01	2.60E+02	1.74E-02
2002	4.08E+03	2.23E+06	1.50E+02	9.23E-01	2.57E+02	1.73E-02
2003	4.05E+03	2.21E+06	1.49E+02	9.15E-01	2.55E+02	1.72E-02
2004	4.01E+03	2.19E+06	1.47E+02	9.08E-01	2.53E+02	1.70E-02
2005	3.98E+03	2.17E+06	1.46E+02	9.00E-01	2.51E+02	1.69E-02

Table C-5
Scenario 1: Carbon Dioxide and NMOCs Production - Wood Debris & MSW
Transportation Cooridor
Yakima, Washington

Year	Carbon Dioxide			NMOCs		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
2006	3.77E+03	2.06E+06	1.38E+02	8.53E-01	2.38E+02	1.60E-02
2007	3.74E+03	2.05E+06	1.37E+02	8.47E-01	2.36E+02	1.59E-02
2008	3.72E+03	2.03E+06	1.36E+02	8.40E-01	2.34E+02	1.58E-02
2009	3.69E+03	2.01E+06	1.35E+02	8.34E-01	2.33E+02	1.56E-02
2010	3.66E+03	2.00E+06	1.34E+02	8.28E-01	2.31E+02	1.55E-02
2011	3.63E+03	1.99E+06	1.33E+02	8.22E-01	2.29E+02	1.54E-02
2012	3.61E+03	1.97E+06	1.32E+02	8.16E-01	2.28E+02	1.53E-02
2013	3.58E+03	1.96E+06	1.32E+02	8.11E-01	2.26E+02	1.52E-02
2014	3.53E+03	1.93E+06	1.30E+02	7.98E-01	2.23E+02	1.50E-02
2015	3.48E+03	1.90E+06	1.28E+02	7.86E-01	2.19E+02	1.47E-02
2016	3.42E+03	1.87E+06	1.26E+02	7.74E-01	2.16E+02	1.45E-02
2017	3.37E+03	1.84E+06	1.24E+02	7.63E-01	2.13E+02	1.43E-02
2018	3.32E+03	1.81E+06	1.22E+02	7.51E-01	2.10E+02	1.41E-02
2019	3.27E+03	1.79E+06	1.20E+02	7.40E-01	2.06E+02	1.39E-02
2020	3.22E+03	1.76E+06	1.18E+02	7.29E-01	2.03E+02	1.37E-02
2021	3.17E+03	1.73E+06	1.16E+02	7.18E-01	2.00E+02	1.35E-02
2022	3.13E+03	1.71E+06	1.15E+02	7.07E-01	1.97E+02	1.33E-02
2023	3.08E+03	1.68E+06	1.13E+02	6.96E-01	1.94E+02	1.31E-02
2024	3.03E+03	1.66E+06	1.11E+02	6.86E-01	1.91E+02	1.29E-02
2025	2.99E+03	1.63E+06	1.10E+02	6.76E-01	1.89E+02	1.27E-02
2026	2.94E+03	1.61E+06	1.08E+02	6.66E-01	1.86E+02	1.25E-02
2027	2.90E+03	1.58E+06	1.06E+02	6.56E-01	1.83E+02	1.23E-02
2028	2.86E+03	1.56E+06	1.05E+02	6.46E-01	1.80E+02	1.21E-02
2029	2.81E+03	1.54E+06	1.03E+02	6.36E-01	1.78E+02	1.19E-02
2030	2.77E+03	1.51E+06	1.02E+02	6.27E-01	1.75E+02	1.18E-02
2031	2.73E+03	1.49E+06	1.00E+02	6.18E-01	1.72E+02	1.16E-02
2032	2.69E+03	1.47E+06	9.87E+01	6.09E-01	1.70E+02	1.14E-02
2033	2.65E+03	1.45E+06	9.73E+01	6.00E-01	1.67E+02	1.12E-02
2034	2.61E+03	1.43E+06	9.59E+01	5.91E-01	1.65E+02	1.11E-02
2035	2.57E+03	1.41E+06	9.45E+01	5.82E-01	1.62E+02	1.09E-02
2036	2.54E+03	1.39E+06	9.31E+01	5.74E-01	1.60E+02	1.08E-02
2037	2.50E+03	1.36E+06	9.17E+01	5.65E-01	1.58E+02	1.06E-02
2038	2.46E+03	1.34E+06	9.04E+01	5.57E-01	1.55E+02	1.04E-02
2039	2.43E+03	1.33E+06	8.90E+01	5.49E-01	1.53E+02	1.03E-02
2040	2.39E+03	1.31E+06	8.78E+01	5.41E-01	1.51E+02	1.01E-02
2041	2.36E+03	1.29E+06	8.65E+01	5.33E-01	1.49E+02	9.99E-03
2042	2.32E+03	1.27E+06	8.52E+01	5.25E-01	1.47E+02	9.84E-03
2043	2.29E+03	1.25E+06	8.40E+01	5.18E-01	1.44E+02	9.70E-03
2044	2.25E+03	1.23E+06	8.28E+01	5.10E-01	1.42E+02	9.56E-03
2045	2.22E+03	1.21E+06	8.16E+01	5.03E-01	1.40E+02	9.42E-03
2046	2.19E+03	1.20E+06	8.04E+01	4.95E-01	1.38E+02	9.29E-03
2047	2.16E+03	1.18E+06	7.92E+01	4.88E-01	1.36E+02	9.15E-03
2048	2.13E+03	1.16E+06	7.81E+01	4.81E-01	1.34E+02	9.02E-03

Table C-5
Scenario 1: Carbon Dioxide and NMOCs Production - Wood Debris & MSW
Transportation Cooridor
Yakima, Washington

Year	Carbon Dioxide			NMOCs		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
2049	2.10E+03	1.15E+06	7.70E+01	4.74E-01	1.32E+02	8.89E-03
2050	2.07E+03	1.13E+06	7.59E+01	4.68E-01	1.30E+02	8.77E-03
2051	2.04E+03	1.11E+06	7.48E+01	4.61E-01	1.29E+02	8.64E-03
2052	2.01E+03	1.10E+06	7.37E+01	4.54E-01	1.27E+02	8.52E-03
2053	1.98E+03	1.08E+06	7.27E+01	4.48E-01	1.25E+02	8.40E-03
2054	1.95E+03	1.07E+06	7.16E+01	4.42E-01	1.23E+02	8.28E-03
2055	1.92E+03	1.05E+06	7.06E+01	4.35E-01	1.21E+02	8.16E-03
2056	1.90E+03	1.04E+06	6.96E+01	4.29E-01	1.20E+02	8.04E-03
2057	1.87E+03	1.02E+06	6.86E+01	4.23E-01	1.18E+02	7.93E-03
2058	1.84E+03	1.01E+06	6.77E+01	4.17E-01	1.16E+02	7.82E-03
2059	1.82E+03	9.93E+05	6.67E+01	4.11E-01	1.15E+02	7.71E-03
2060	1.79E+03	9.79E+05	6.58E+01	4.05E-01	1.13E+02	7.60E-03

APPENDIX D

LandGEM Model Summary—Scenario 2

Table D-1
Scenario 2: Waste Acceptance - Wood Debris MSW
Transportation Cooridor
Yakima, Washington

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg/year)	(short tons/year)
1920	6.00E+03	6.60E+03	0.00E+00	0.00E+00
1921	6.00E+03	6.60E+03	6.00E+03	6.60E+03
1922	6.00E+03	6.60E+03	1.20E+04	1.32E+04
1923	6.00E+03	6.60E+03	1.80E+04	1.98E+04
1924	6.00E+03	6.60E+03	2.40E+04	2.64E+04
1925	6.00E+03	6.60E+03	3.00E+04	3.30E+04
1926	6.00E+03	6.60E+03	3.60E+04	3.96E+04
1927	6.00E+03	6.60E+03	4.20E+04	4.62E+04
1928	6.00E+03	6.60E+03	4.80E+04	5.28E+04
1929	6.00E+03	6.60E+03	5.40E+04	5.94E+04
1930	6.00E+03	6.60E+03	6.00E+04	6.60E+04
1931	6.00E+03	6.60E+03	6.60E+04	7.26E+04
1932	6.00E+03	6.60E+03	7.20E+04	7.92E+04
1933	6.00E+03	6.60E+03	7.80E+04	8.58E+04
1934	6.00E+03	6.60E+03	8.40E+04	9.24E+04
1935	6.00E+03	6.60E+03	9.00E+04	9.90E+04
1936	6.00E+03	6.60E+03	9.60E+04	1.06E+05
1937	6.00E+03	6.60E+03	1.02E+05	1.12E+05
1938	6.00E+03	6.60E+03	1.08E+05	1.19E+05
1939	6.00E+03	6.60E+03	1.14E+05	1.25E+05
1940	6.00E+03	6.60E+03	1.20E+05	1.32E+05
1941	6.00E+03	6.60E+03	1.26E+05	1.39E+05
1942	6.00E+03	6.60E+03	1.32E+05	1.45E+05
1943	6.00E+03	6.60E+03	1.38E+05	1.52E+05
1944	6.00E+03	6.60E+03	1.44E+05	1.58E+05
1945	6.00E+03	6.60E+03	1.50E+05	1.65E+05
1946	6.00E+03	6.60E+03	1.56E+05	1.72E+05
1947	6.00E+03	6.60E+03	1.62E+05	1.78E+05
1948	6.00E+03	6.60E+03	1.68E+05	1.85E+05
1949	6.00E+03	6.60E+03	1.74E+05	1.91E+05
1950	6.00E+03	6.60E+03	1.80E+05	1.98E+05
1951	6.00E+03	6.60E+03	1.86E+05	2.05E+05
1952	6.00E+03	6.60E+03	1.92E+05	2.11E+05
1953	6.00E+03	6.60E+03	1.98E+05	2.18E+05
1954	6.00E+03	6.60E+03	2.04E+05	2.24E+05
1955	6.00E+03	6.60E+03	2.10E+05	2.31E+05
1956	6.00E+03	6.60E+03	2.16E+05	2.38E+05
1957	6.00E+03	6.60E+03	2.22E+05	2.44E+05
1958	6.00E+03	6.60E+03	2.28E+05	2.51E+05
1959	6.00E+03	6.60E+03	2.34E+05	2.57E+05
1960	6.00E+03	6.60E+03	2.40E+05	2.64E+05
1961	6.00E+03	6.60E+03	2.46E+05	2.71E+05
1962	6.00E+03	6.60E+03	2.52E+05	2.77E+05

Table D-1
Scenario 2: Waste Acceptance - Wood Debris MSW
Transportation Cooridor
Yakima, Washington

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg/year)	(short tons/year)
1963	7.56E+04	8.32E+04	2.58E+05	2.84E+05
1964	7.56E+04	8.32E+04	3.34E+05	3.67E+05
1965	7.56E+04	8.32E+04	4.09E+05	4.50E+05
1966	7.56E+04	8.32E+04	4.85E+05	5.33E+05
1967	7.56E+04	8.32E+04	5.60E+05	6.16E+05
1968	7.56E+04	8.32E+04	6.36E+05	7.00E+05
1969	7.56E+04	8.32E+04	7.12E+05	7.83E+05
1970	7.56E+04	8.32E+04	7.87E+05	8.66E+05
1971	6.00E+03	6.60E+03	8.63E+05	9.49E+05
1972	6.00E+03	6.60E+03	8.69E+05	9.56E+05
1973	6.00E+03	6.60E+03	8.75E+05	9.62E+05
1974	6.00E+03	6.60E+03	8.81E+05	9.69E+05
1975	6.00E+03	6.60E+03	8.87E+05	9.76E+05
1976	6.00E+03	6.60E+03	8.93E+05	9.82E+05
1977	6.00E+03	6.60E+03	8.99E+05	9.89E+05
1978	6.00E+03	6.60E+03	9.05E+05	9.95E+05
1979	6.00E+03	6.60E+03	9.11E+05	1.00E+06
1980	6.00E+03	6.60E+03	9.17E+05	1.01E+06
1981	6.00E+03	6.60E+03	9.23E+05	1.02E+06
1982	6.00E+03	6.60E+03	9.29E+05	1.02E+06
1983	6.00E+03	6.60E+03	9.35E+05	1.03E+06
1984	6.00E+03	6.60E+03	9.41E+05	1.04E+06
1985	6.00E+03	6.60E+03	9.47E+05	1.04E+06
1986	6.00E+03	6.60E+03	9.53E+05	1.05E+06
1987	6.00E+03	6.60E+03	9.59E+05	1.05E+06
1988	6.00E+03	6.60E+03	9.65E+05	1.06E+06
1989	6.00E+03	6.60E+03	9.71E+05	1.07E+06
1990	6.00E+03	6.60E+03	9.77E+05	1.07E+06
1991	6.00E+03	6.60E+03	9.83E+05	1.08E+06
1992	6.00E+03	6.60E+03	9.89E+05	1.09E+06
1993	6.00E+03	6.60E+03	9.95E+05	1.09E+06
1994	6.00E+03	6.60E+03	1.00E+06	1.10E+06
1995	6.00E+03	6.60E+03	1.01E+06	1.11E+06
1996	6.00E+03	6.60E+03	1.01E+06	1.11E+06
1997	6.00E+03	6.60E+03	1.02E+06	1.12E+06
1998	6.00E+03	6.60E+03	1.02E+06	1.13E+06
1999	6.00E+03	6.60E+03	1.03E+06	1.13E+06
2000	0.00E+00	0.00E+00	1.04E+06	1.13E+06
2001	0.00E+00	0.00E+00	1.04E+06	1.13E+06
2002	0.00E+00	0.00E+00	1.04E+06	1.13E+06
2003	0.00E+00	0.00E+00	1.04E+06	1.13E+06
2004	0.00E+00	0.00E+00	1.04E+06	1.13E+06
2005	0.00E+00	0.00E+00	1.04E+06	1.13E+06

Table D-1
Scenario 2: Waste Acceptance - Wood Debris MSW
Transportation Cooridor
Yakima, Washington

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg/year)	(short tons/year)
2006	6.00E+03	6.60E+03	1.04E+06	1.13E+06
2007	6.00E+03	6.60E+03	1.04E+06	1.14E+06
2008	6.00E+03	6.60E+03	1.05E+06	1.15E+06
2009	6.00E+03	6.60E+03	1.05E+06	1.15E+06
2010	6.00E+03	6.60E+03	1.06E+06	1.16E+06
2011	6.00E+03	6.60E+03	1.07E+06	1.17E+06
2012	6.00E+03	6.60E+03	1.07E+06	1.17E+06
2013	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2014	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2015	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2016	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2017	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2018	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2019	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2020	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2021	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2022	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2023	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2024	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2025	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2026	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2027	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2028	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2029	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2030	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2031	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2032	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2033	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2034	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2035	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2036	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2037	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2038	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2039	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2040	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2041	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2042	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2043	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2044	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2045	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2046	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2047	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2048	0.00E+00	0.00E+00	9.01E+05	9.85E+05

Table D-1
Scenario 2: Waste Acceptance - Wood Debris MSW
Transportation Cooridor
Yakima, Washington

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg/year)	(short tons/year)
2049	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2050	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2051	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2052	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2053	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2054	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2055	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2056	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2057	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2058	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2059	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2060	0.00E+00	0.00E+00	9.01E+05	9.85E+05

Table D-2
Scenario 2: Total LFG and Methane Production - Wood Debris & MSW
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas			Methane		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
1920	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1921	3.40E+01	2.84E+04	1.91E+00	7.97E+00	1.19E+04	8.02E-01
1922	6.76E+01	5.66E+04	3.80E+00	1.59E+01	2.38E+04	1.60E+00
1923	1.01E+02	8.45E+04	5.67E+00	2.37E+01	3.55E+04	2.38E+00
1924	1.34E+02	1.12E+05	7.53E+00	3.14E+01	4.71E+04	3.16E+00
1925	1.67E+02	1.39E+05	9.36E+00	3.91E+01	5.85E+04	3.93E+00
1926	1.99E+02	1.66E+05	1.12E+01	4.66E+01	6.99E+04	4.70E+00
1927	2.31E+02	1.93E+05	1.30E+01	5.41E+01	8.11E+04	5.45E+00
1928	2.63E+02	2.20E+05	1.48E+01	6.16E+01	9.23E+04	6.20E+00
1929	2.94E+02	2.46E+05	1.65E+01	6.89E+01	1.03E+05	6.94E+00
1930	3.25E+02	2.72E+05	1.83E+01	7.62E+01	1.14E+05	7.67E+00
1931	3.56E+02	2.98E+05	2.00E+01	8.34E+01	1.25E+05	8.40E+00
1932	3.86E+02	3.23E+05	2.17E+01	9.05E+01	1.36E+05	9.12E+00
1933	4.16E+02	3.48E+05	2.34E+01	9.76E+01	1.46E+05	9.83E+00
1934	4.46E+02	3.73E+05	2.51E+01	1.05E+02	1.57E+05	1.05E+01
1935	4.76E+02	3.98E+05	2.67E+01	1.12E+02	1.67E+05	1.12E+01
1936	5.05E+02	4.23E+05	2.84E+01	1.18E+02	1.77E+05	1.19E+01
1937	5.34E+02	4.47E+05	3.00E+01	1.25E+02	1.88E+05	1.26E+01
1938	5.63E+02	4.71E+05	3.16E+01	1.32E+02	1.98E+05	1.33E+01
1939	5.91E+02	4.94E+05	3.32E+01	1.39E+02	2.08E+05	1.40E+01
1940	6.19E+02	5.18E+05	3.48E+01	1.45E+02	2.18E+05	1.46E+01
1941	6.47E+02	5.41E+05	3.64E+01	1.52E+02	2.27E+05	1.53E+01
1942	6.75E+02	5.64E+05	3.79E+01	1.58E+02	2.37E+05	1.59E+01
1943	7.02E+02	5.87E+05	3.95E+01	1.65E+02	2.47E+05	1.66E+01
1944	7.29E+02	6.10E+05	4.10E+01	1.71E+02	2.56E+05	1.72E+01
1945	7.56E+02	6.32E+05	4.25E+01	1.77E+02	2.65E+05	1.78E+01
1946	7.82E+02	6.54E+05	4.40E+01	1.83E+02	2.75E+05	1.85E+01
1947	8.08E+02	6.76E+05	4.54E+01	1.89E+02	2.84E+05	1.91E+01
1948	8.34E+02	6.98E+05	4.69E+01	1.96E+02	2.93E+05	1.97E+01
1949	8.60E+02	7.19E+05	4.83E+01	2.02E+02	3.02E+05	2.03E+01
1950	8.85E+02	7.41E+05	4.98E+01	2.08E+02	3.11E+05	2.09E+01
1951	9.11E+02	7.62E+05	5.12E+01	2.13E+02	3.20E+05	2.15E+01
1952	9.36E+02	7.83E+05	5.26E+01	2.19E+02	3.29E+05	2.21E+01
1953	9.60E+02	8.03E+05	5.40E+01	2.25E+02	3.37E+05	2.27E+01
1954	9.85E+02	8.24E+05	5.53E+01	2.31E+02	3.46E+05	2.32E+01
1955	1.01E+03	8.44E+05	5.67E+01	2.36E+02	3.54E+05	2.38E+01
1956	1.03E+03	8.64E+05	5.80E+01	2.42E+02	3.63E+05	2.44E+01
1957	1.06E+03	8.84E+05	5.94E+01	2.48E+02	3.71E+05	2.49E+01
1958	1.08E+03	9.03E+05	6.07E+01	2.53E+02	3.79E+05	2.55E+01
1959	1.10E+03	9.23E+05	6.20E+01	2.59E+02	3.88E+05	2.60E+01
1960	1.13E+03	9.42E+05	6.33E+01	2.64E+02	3.96E+05	2.66E+01
1961	1.15E+03	9.61E+05	6.46E+01	2.69E+02	4.04E+05	2.71E+01
1962	1.17E+03	9.80E+05	6.59E+01	2.75E+02	4.12E+05	2.77E+01

Table D-2
Scenario 2: Total LFG and Methane Production - Wood Debris & MSW
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas			Methane		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
1963	1.19E+03	9.99E+05	6.71E+01	2.80E+02	4.19E+05	2.82E+01
1964	1.88E+03	1.58E+06	1.06E+02	4.42E+02	6.62E+05	4.45E+01
1965	2.56E+03	2.14E+06	1.44E+02	6.00E+02	9.00E+05	6.04E+01
1966	3.22E+03	2.70E+06	1.81E+02	7.56E+02	1.13E+06	7.61E+01
1967	3.87E+03	3.24E+06	2.18E+02	9.08E+02	1.36E+06	9.15E+01
1968	4.51E+03	3.77E+06	2.54E+02	1.06E+03	1.59E+06	1.07E+02
1969	5.14E+03	4.30E+06	2.89E+02	1.20E+03	1.80E+06	1.21E+02
1970	5.75E+03	4.81E+06	3.23E+02	1.35E+03	2.02E+06	1.36E+02
1971	6.35E+03	5.31E+06	3.57E+02	1.49E+03	2.23E+06	1.50E+02
1972	6.27E+03	5.25E+06	3.53E+02	1.47E+03	2.20E+06	1.48E+02
1973	6.20E+03	5.18E+06	3.48E+02	1.45E+03	2.18E+06	1.46E+02
1974	6.12E+03	5.12E+06	3.44E+02	1.43E+03	2.15E+06	1.45E+02
1975	6.05E+03	5.06E+06	3.40E+02	1.42E+03	2.13E+06	1.43E+02
1976	5.98E+03	5.00E+06	3.36E+02	1.40E+03	2.10E+06	1.41E+02
1977	5.91E+03	4.94E+06	3.32E+02	1.38E+03	2.08E+06	1.39E+02
1978	5.84E+03	4.88E+06	3.28E+02	1.37E+03	2.05E+06	1.38E+02
1979	5.77E+03	4.83E+06	3.24E+02	1.35E+03	2.03E+06	1.36E+02
1980	5.71E+03	4.77E+06	3.21E+02	1.34E+03	2.00E+06	1.35E+02
1981	5.64E+03	4.72E+06	3.17E+02	1.32E+03	1.98E+06	1.33E+02
1982	5.58E+03	4.67E+06	3.14E+02	1.31E+03	1.96E+06	1.32E+02
1983	5.52E+03	4.62E+06	3.10E+02	1.29E+03	1.94E+06	1.30E+02
1984	5.46E+03	4.57E+06	3.07E+02	1.28E+03	1.92E+06	1.29E+02
1985	5.40E+03	4.52E+06	3.04E+02	1.27E+03	1.90E+06	1.28E+02
1986	5.34E+03	4.47E+06	3.00E+02	1.25E+03	1.88E+06	1.26E+02
1987	5.29E+03	4.42E+06	2.97E+02	1.24E+03	1.86E+06	1.25E+02
1988	5.23E+03	4.38E+06	2.94E+02	1.23E+03	1.84E+06	1.24E+02
1989	5.18E+03	4.33E+06	2.91E+02	1.21E+03	1.82E+06	1.22E+02
1990	5.13E+03	4.29E+06	2.88E+02	1.20E+03	1.80E+06	1.21E+02
1991	5.08E+03	4.25E+06	2.85E+02	1.19E+03	1.78E+06	1.20E+02
1992	5.03E+03	4.21E+06	2.83E+02	1.18E+03	1.77E+06	1.19E+02
1993	4.98E+03	4.17E+06	2.80E+02	1.17E+03	1.75E+06	1.18E+02
1994	4.93E+03	4.13E+06	2.77E+02	1.16E+03	1.73E+06	1.16E+02
1995	4.89E+03	4.09E+06	2.75E+02	1.15E+03	1.72E+06	1.15E+02
1996	4.84E+03	4.05E+06	2.72E+02	1.14E+03	1.70E+06	1.14E+02
1997	4.80E+03	4.01E+06	2.70E+02	1.12E+03	1.69E+06	1.13E+02
1998	4.76E+03	3.98E+06	2.67E+02	1.11E+03	1.67E+06	1.12E+02
1999	4.71E+03	3.94E+06	2.65E+02	1.10E+03	1.66E+06	1.11E+02
2000	4.67E+03	3.91E+06	2.63E+02	1.10E+03	1.64E+06	1.10E+02
2001	4.60E+03	3.85E+06	2.58E+02	1.08E+03	1.62E+06	1.09E+02
2002	4.53E+03	3.79E+06	2.54E+02	1.06E+03	1.59E+06	1.07E+02
2003	4.46E+03	3.73E+06	2.50E+02	1.04E+03	1.57E+06	1.05E+02
2004	4.38E+03	3.67E+06	2.46E+02	1.03E+03	1.54E+06	1.04E+02
2005	4.32E+03	3.61E+06	2.43E+02	1.01E+03	1.52E+06	1.02E+02

Table D-2
Scenario 2: Total LFG and Methane Production - Wood Debris & MSW
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas			Methane		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
2006	4.25E+03	3.55E+06	2.39E+02	9.96E+02	1.49E+06	1.00E+02
2007	4.22E+03	3.53E+06	2.37E+02	9.88E+02	1.48E+06	9.95E+01
2008	4.18E+03	3.50E+06	2.35E+02	9.81E+02	1.47E+06	9.88E+01
2009	4.15E+03	3.47E+06	2.33E+02	9.73E+02	1.46E+06	9.80E+01
2010	4.12E+03	3.45E+06	2.32E+02	9.66E+02	1.45E+06	9.73E+01
2011	4.09E+03	3.42E+06	2.30E+02	9.59E+02	1.44E+06	9.66E+01
2012	4.06E+03	3.40E+06	2.28E+02	9.52E+02	1.43E+06	9.59E+01
2013	4.04E+03	3.38E+06	2.27E+02	9.46E+02	1.42E+06	9.53E+01
2014	3.97E+03	3.32E+06	2.23E+02	9.32E+02	1.40E+06	9.38E+01
2015	3.91E+03	3.27E+06	2.20E+02	9.17E+02	1.38E+06	9.24E+01
2016	3.85E+03	3.22E+06	2.17E+02	9.03E+02	1.35E+06	9.10E+01
2017	3.15E+03	2.64E+06	1.77E+02	7.39E+02	1.11E+06	7.44E+01
2018	3.11E+03	2.60E+06	1.75E+02	7.28E+02	1.09E+06	7.33E+01
2019	3.06E+03	2.56E+06	1.72E+02	7.18E+02	1.08E+06	7.23E+01
2020	3.02E+03	2.53E+06	1.70E+02	7.08E+02	1.06E+06	7.13E+01
2021	2.98E+03	2.49E+06	1.67E+02	6.97E+02	1.05E+06	7.02E+01
2022	2.93E+03	2.45E+06	1.65E+02	6.87E+02	1.03E+06	6.92E+01
2023	2.89E+03	2.42E+06	1.62E+02	6.78E+02	1.02E+06	6.82E+01
2024	2.85E+03	2.38E+06	1.60E+02	6.68E+02	1.00E+06	6.73E+01
2025	2.81E+03	2.35E+06	1.58E+02	6.59E+02	9.87E+05	6.63E+01
2026	2.77E+03	2.32E+06	1.56E+02	6.49E+02	9.73E+05	6.54E+01
2027	2.73E+03	2.28E+06	1.53E+02	6.40E+02	9.59E+05	6.45E+01
2028	2.69E+03	2.25E+06	1.51E+02	6.31E+02	9.46E+05	6.35E+01
2029	2.65E+03	2.22E+06	1.49E+02	6.22E+02	9.32E+05	6.26E+01
2030	2.62E+03	2.19E+06	1.47E+02	6.13E+02	9.19E+05	6.18E+01
2031	2.58E+03	2.16E+06	1.45E+02	6.05E+02	9.06E+05	6.09E+01
2032	2.54E+03	2.13E+06	1.43E+02	5.96E+02	8.94E+05	6.00E+01
2033	2.51E+03	2.10E+06	1.41E+02	5.88E+02	8.81E+05	5.92E+01
2034	2.47E+03	2.07E+06	1.39E+02	5.80E+02	8.69E+05	5.84E+01
2035	2.44E+03	2.04E+06	1.37E+02	5.72E+02	8.57E+05	5.76E+01
2036	2.40E+03	2.01E+06	1.35E+02	5.64E+02	8.45E+05	5.68E+01
2037	2.37E+03	1.98E+06	1.33E+02	5.56E+02	8.33E+05	5.60E+01
2038	2.34E+03	1.96E+06	1.31E+02	5.48E+02	8.21E+05	5.52E+01
2039	2.31E+03	1.93E+06	1.30E+02	5.40E+02	8.10E+05	5.44E+01
2040	2.27E+03	1.90E+06	1.28E+02	5.33E+02	7.99E+05	5.37E+01
2041	2.24E+03	1.88E+06	1.26E+02	5.26E+02	7.88E+05	5.29E+01
2042	2.21E+03	1.85E+06	1.24E+02	5.18E+02	7.77E+05	5.22E+01
2043	2.18E+03	1.82E+06	1.23E+02	5.11E+02	7.66E+05	5.15E+01
2044	2.15E+03	1.80E+06	1.21E+02	5.04E+02	7.56E+05	5.08E+01
2045	2.12E+03	1.77E+06	1.19E+02	4.97E+02	7.45E+05	5.01E+01
2046	2.09E+03	1.75E+06	1.18E+02	4.90E+02	7.35E+05	4.94E+01
2047	2.06E+03	1.73E+06	1.16E+02	4.84E+02	7.25E+05	4.87E+01
2048	2.04E+03	1.70E+06	1.14E+02	4.77E+02	7.15E+05	4.80E+01

Table D-2
Scenario 2: Total LFG and Methane Production - Wood Debris & MSW
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas			Methane		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
2049	2.01E+03	1.68E+06	1.13E+02	4.71E+02	7.05E+05	4.74E+01
2050	1.98E+03	1.66E+06	1.11E+02	4.64E+02	6.96E+05	4.67E+01
2051	1.95E+03	1.63E+06	1.10E+02	4.58E+02	6.86E+05	4.61E+01
2052	1.93E+03	1.61E+06	1.08E+02	4.52E+02	6.77E+05	4.55E+01
2053	1.90E+03	1.59E+06	1.07E+02	4.46E+02	6.68E+05	4.49E+01
2054	1.88E+03	1.57E+06	1.05E+02	4.39E+02	6.59E+05	4.43E+01
2055	1.85E+03	1.55E+06	1.04E+02	4.34E+02	6.50E+05	4.37E+01
2056	1.82E+03	1.53E+06	1.03E+02	4.28E+02	6.41E+05	4.31E+01
2057	1.80E+03	1.51E+06	1.01E+02	4.22E+02	6.32E+05	4.25E+01
2058	1.78E+03	1.49E+06	9.98E+01	4.16E+02	6.24E+05	4.19E+01
2059	1.75E+03	1.47E+06	9.85E+01	4.11E+02	6.16E+05	4.14E+01
2060	1.73E+03	1.45E+06	9.72E+01	4.05E+02	6.07E+05	4.08E+01

Table D-3
Scenario 2: Total LFG and Methane Production - Wood Debris Only
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (Wood Debris)			Methane (Wood Debris)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
1920	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1921	3.40E+01	2.84E+04	1.91E+00	7.97E+00	1.19E+04	8.02E-01
1922	6.76E+01	5.66E+04	3.80E+00	1.59E+01	2.38E+04	1.60E+00
1923	1.01E+02	8.45E+04	5.67E+00	2.37E+01	3.55E+04	2.38E+00
1924	1.34E+02	1.12E+05	7.53E+00	3.14E+01	4.71E+04	3.16E+00
1925	1.67E+02	1.39E+05	9.36E+00	3.91E+01	5.85E+04	3.93E+00
1926	1.99E+02	1.66E+05	1.12E+01	4.66E+01	6.99E+04	4.70E+00
1927	2.31E+02	1.93E+05	1.30E+01	5.41E+01	8.11E+04	5.45E+00
1928	2.63E+02	2.20E+05	1.48E+01	6.16E+01	9.23E+04	6.20E+00
1929	2.94E+02	2.46E+05	1.65E+01	6.89E+01	1.03E+05	6.94E+00
1930	3.25E+02	2.72E+05	1.83E+01	7.62E+01	1.14E+05	7.67E+00
1931	3.56E+02	2.98E+05	2.00E+01	8.34E+01	1.25E+05	8.40E+00
1932	3.86E+02	3.23E+05	2.17E+01	9.05E+01	1.36E+05	9.12E+00
1933	4.16E+02	3.48E+05	2.34E+01	9.76E+01	1.46E+05	9.83E+00
1934	4.46E+02	3.73E+05	2.51E+01	1.05E+02	1.57E+05	1.05E+01
1935	4.76E+02	3.98E+05	2.67E+01	1.12E+02	1.67E+05	1.12E+01
1936	5.05E+02	4.23E+05	2.84E+01	1.18E+02	1.77E+05	1.19E+01
1937	5.34E+02	4.47E+05	3.00E+01	1.25E+02	1.88E+05	1.26E+01
1938	5.63E+02	4.71E+05	3.16E+01	1.32E+02	1.98E+05	1.33E+01
1939	5.91E+02	4.94E+05	3.32E+01	1.39E+02	2.08E+05	1.40E+01
1940	6.19E+02	5.18E+05	3.48E+01	1.45E+02	2.18E+05	1.46E+01
1941	6.47E+02	5.41E+05	3.64E+01	1.52E+02	2.27E+05	1.53E+01
1942	6.75E+02	5.64E+05	3.79E+01	1.58E+02	2.37E+05	1.59E+01
1943	7.02E+02	5.87E+05	3.95E+01	1.65E+02	2.47E+05	1.66E+01
1944	7.29E+02	6.10E+05	4.10E+01	1.71E+02	2.56E+05	1.72E+01
1945	7.56E+02	6.32E+05	4.25E+01	1.77E+02	2.65E+05	1.78E+01
1946	7.82E+02	6.54E+05	4.40E+01	1.83E+02	2.75E+05	1.85E+01
1947	8.08E+02	6.76E+05	4.54E+01	1.89E+02	2.84E+05	1.91E+01
1948	8.34E+02	6.98E+05	4.69E+01	1.96E+02	2.93E+05	1.97E+01
1949	8.60E+02	7.19E+05	4.83E+01	2.02E+02	3.02E+05	2.03E+01
1950	8.85E+02	7.41E+05	4.98E+01	2.08E+02	3.11E+05	2.09E+01
1951	9.11E+02	7.62E+05	5.12E+01	2.13E+02	3.20E+05	2.15E+01
1952	9.36E+02	7.83E+05	5.26E+01	2.19E+02	3.29E+05	2.21E+01
1953	9.60E+02	8.03E+05	5.40E+01	2.25E+02	3.37E+05	2.27E+01
1954	9.85E+02	8.24E+05	5.53E+01	2.31E+02	3.46E+05	2.32E+01
1955	1.01E+03	8.44E+05	5.67E+01	2.36E+02	3.54E+05	2.38E+01
1956	1.03E+03	8.64E+05	5.80E+01	2.42E+02	3.63E+05	2.44E+01
1957	1.06E+03	8.84E+05	5.94E+01	2.48E+02	3.71E+05	2.49E+01
1958	1.08E+03	9.03E+05	6.07E+01	2.53E+02	3.79E+05	2.55E+01
1959	1.10E+03	9.23E+05	6.20E+01	2.59E+02	3.88E+05	2.60E+01
1960	1.13E+03	9.42E+05	6.33E+01	2.64E+02	3.96E+05	2.66E+01
1961	1.15E+03	9.61E+05	6.46E+01	2.69E+02	4.04E+05	2.71E+01
1962	1.17E+03	9.80E+05	6.59E+01	2.75E+02	4.12E+05	2.77E+01

Table D-3
Scenario 2: Total LFG and Methane Production - Wood Debris Only
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (Wood Debris)			Methane (Wood Debris)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
1963	1.19E+03	9.99E+05	6.71E+01	2.80E+02	4.19E+05	2.82E+01
1964	1.22E+03	1.02E+06	6.83E+01	2.85E+02	4.27E+05	2.87E+01
1965	1.24E+03	1.04E+06	6.96E+01	2.90E+02	4.35E+05	2.92E+01
1966	1.26E+03	1.05E+06	7.08E+01	2.95E+02	4.43E+05	2.97E+01
1967	1.28E+03	1.07E+06	7.20E+01	3.00E+02	4.50E+05	3.02E+01
1968	1.30E+03	1.09E+06	7.32E+01	3.05E+02	4.58E+05	3.07E+01
1969	1.32E+03	1.11E+06	7.44E+01	3.10E+02	4.65E+05	3.12E+01
1970	1.34E+03	1.12E+06	7.55E+01	3.15E+02	4.72E+05	3.17E+01
1971	1.36E+03	1.14E+06	7.67E+01	3.20E+02	4.79E+05	3.22E+01
1972	1.39E+03	1.16E+06	7.79E+01	3.25E+02	4.87E+05	3.27E+01
1973	1.41E+03	1.18E+06	7.90E+01	3.29E+02	4.94E+05	3.32E+01
1974	1.43E+03	1.19E+06	8.01E+01	3.34E+02	5.01E+05	3.36E+01
1975	1.45E+03	1.21E+06	8.12E+01	3.39E+02	5.08E+05	3.41E+01
1976	1.46E+03	1.23E+06	8.23E+01	3.43E+02	5.15E+05	3.46E+01
1977	1.48E+03	1.24E+06	8.34E+01	3.48E+02	5.21E+05	3.50E+01
1978	1.50E+03	1.26E+06	8.45E+01	3.52E+02	5.28E+05	3.55E+01
1979	1.52E+03	1.27E+06	8.56E+01	3.57E+02	5.35E+05	3.59E+01
1980	1.54E+03	1.29E+06	8.66E+01	3.61E+02	5.42E+05	3.64E+01
1981	1.56E+03	1.30E+06	8.77E+01	3.66E+02	5.48E+05	3.68E+01
1982	1.58E+03	1.32E+06	8.87E+01	3.70E+02	5.55E+05	3.73E+01
1983	1.60E+03	1.34E+06	8.97E+01	3.74E+02	5.61E+05	3.77E+01
1984	1.61E+03	1.35E+06	9.08E+01	3.79E+02	5.67E+05	3.81E+01
1985	1.63E+03	1.37E+06	9.18E+01	3.83E+02	5.74E+05	3.85E+01
1986	1.65E+03	1.38E+06	9.28E+01	3.87E+02	5.80E+05	3.90E+01
1987	1.67E+03	1.40E+06	9.38E+01	3.91E+02	5.86E+05	3.94E+01
1988	1.69E+03	1.41E+06	9.47E+01	3.95E+02	5.92E+05	3.98E+01
1989	1.70E+03	1.42E+06	9.57E+01	3.99E+02	5.98E+05	4.02E+01
1990	1.72E+03	1.44E+06	9.67E+01	4.03E+02	6.04E+05	4.06E+01
1991	1.74E+03	1.45E+06	9.76E+01	4.07E+02	6.10E+05	4.10E+01
1992	1.75E+03	1.47E+06	9.85E+01	4.11E+02	6.16E+05	4.14E+01
1993	1.77E+03	1.48E+06	9.95E+01	4.15E+02	6.22E+05	4.18E+01
1994	1.79E+03	1.49E+06	1.00E+02	4.19E+02	6.28E+05	4.22E+01
1995	1.80E+03	1.51E+06	1.01E+02	4.22E+02	6.33E+05	4.26E+01
1996	1.82E+03	1.52E+06	1.02E+02	4.26E+02	6.39E+05	4.29E+01
1997	1.83E+03	1.53E+06	1.03E+02	4.30E+02	6.45E+05	4.33E+01
1998	1.85E+03	1.55E+06	1.04E+02	4.34E+02	6.50E+05	4.37E+01
1999	1.87E+03	1.56E+06	1.05E+02	4.37E+02	6.56E+05	4.40E+01
2000	1.88E+03	1.57E+06	1.06E+02	4.41E+02	6.61E+05	4.44E+01
2001	1.90E+03	1.59E+06	1.07E+02	4.45E+02	6.66E+05	4.48E+01
2002	1.91E+03	1.60E+06	1.07E+02	4.48E+02	6.72E+05	4.51E+01
2003	1.93E+03	1.61E+06	1.08E+02	4.52E+02	6.77E+05	4.55E+01
2004	1.94E+03	1.62E+06	1.09E+02	4.55E+02	6.82E+05	4.58E+01
2005	1.96E+03	1.64E+06	1.10E+02	4.58E+02	6.87E+05	4.62E+01

Table D-3
Scenario 2: Total LFG and Methane Production - Wood Debris Only
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (Wood Debris)			Methane (Wood Debris)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
2006	1.77E+03	1.48E+06	9.96E+01	4.15E+02	6.22E+05	4.18E+01
2007	1.79E+03	1.50E+06	1.00E+02	4.19E+02	6.28E+05	4.22E+01
2008	1.80E+03	1.51E+06	1.01E+02	4.23E+02	6.34E+05	4.26E+01
2009	1.82E+03	1.52E+06	1.02E+02	4.27E+02	6.40E+05	4.30E+01
2010	1.84E+03	1.54E+06	1.03E+02	4.30E+02	6.45E+05	4.33E+01
2011	1.85E+03	1.55E+06	1.04E+02	4.34E+02	6.51E+05	4.37E+01
2012	1.87E+03	1.56E+06	1.05E+02	4.38E+02	6.56E+05	4.41E+01
2013	1.88E+03	1.58E+06	1.06E+02	4.41E+02	6.62E+05	4.44E+01
2014	1.86E+03	1.56E+06	1.05E+02	4.37E+02	6.55E+05	4.40E+01
2015	1.85E+03	1.54E+06	1.04E+02	4.33E+02	6.48E+05	4.36E+01
2016	1.83E+03	1.53E+06	1.03E+02	4.28E+02	6.42E+05	4.31E+01
2017	1.74E+03	1.45E+06	9.76E+01	4.07E+02	6.10E+05	4.10E+01
2018	1.72E+03	1.44E+06	9.66E+01	4.03E+02	6.04E+05	4.06E+01
2019	1.70E+03	1.42E+06	9.57E+01	3.99E+02	5.98E+05	4.02E+01
2020	1.69E+03	1.41E+06	9.47E+01	3.95E+02	5.92E+05	3.98E+01
2021	1.67E+03	1.40E+06	9.38E+01	3.91E+02	5.86E+05	3.94E+01
2022	1.65E+03	1.38E+06	9.29E+01	3.87E+02	5.80E+05	3.90E+01
2023	1.64E+03	1.37E+06	9.19E+01	3.83E+02	5.75E+05	3.86E+01
2024	1.62E+03	1.35E+06	9.10E+01	3.80E+02	5.69E+05	3.82E+01
2025	1.60E+03	1.34E+06	9.01E+01	3.76E+02	5.63E+05	3.78E+01
2026	1.59E+03	1.33E+06	8.92E+01	3.72E+02	5.58E+05	3.75E+01
2027	1.57E+03	1.31E+06	8.83E+01	3.68E+02	5.52E+05	3.71E+01
2028	1.56E+03	1.30E+06	8.74E+01	3.65E+02	5.47E+05	3.67E+01
2029	1.54E+03	1.29E+06	8.66E+01	3.61E+02	5.41E+05	3.64E+01
2030	1.53E+03	1.28E+06	8.57E+01	3.57E+02	5.36E+05	3.60E+01
2031	1.51E+03	1.26E+06	8.49E+01	3.54E+02	5.30E+05	3.56E+01
2032	1.49E+03	1.25E+06	8.40E+01	3.50E+02	5.25E+05	3.53E+01
2033	1.48E+03	1.24E+06	8.32E+01	3.47E+02	5.20E+05	3.49E+01
2034	1.47E+03	1.23E+06	8.24E+01	3.43E+02	5.15E+05	3.46E+01
2035	1.45E+03	1.21E+06	8.15E+01	3.40E+02	5.10E+05	3.42E+01
2036	1.44E+03	1.20E+06	8.07E+01	3.37E+02	5.05E+05	3.39E+01
2037	1.42E+03	1.19E+06	7.99E+01	3.33E+02	5.00E+05	3.36E+01
2038	1.41E+03	1.18E+06	7.91E+01	3.30E+02	4.95E+05	3.32E+01
2039	1.39E+03	1.17E+06	7.83E+01	3.27E+02	4.90E+05	3.29E+01
2040	1.38E+03	1.15E+06	7.76E+01	3.23E+02	4.85E+05	3.26E+01
2041	1.37E+03	1.14E+06	7.68E+01	3.20E+02	4.80E+05	3.23E+01
2042	1.35E+03	1.13E+06	7.60E+01	3.17E+02	4.75E+05	3.19E+01
2043	1.34E+03	1.12E+06	7.53E+01	3.14E+02	4.70E+05	3.16E+01
2044	1.33E+03	1.11E+06	7.45E+01	3.11E+02	4.66E+05	3.13E+01
2045	1.31E+03	1.10E+06	7.38E+01	3.08E+02	4.61E+05	3.10E+01
2046	1.30E+03	1.09E+06	7.30E+01	3.05E+02	4.57E+05	3.07E+01
2047	1.29E+03	1.08E+06	7.23E+01	3.02E+02	4.52E+05	3.04E+01
2048	1.27E+03	1.07E+06	7.16E+01	2.99E+02	4.48E+05	3.01E+01

Table D-3
Scenario 2: Total LFG and Methane Production - Wood Debris Only
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (Wood Debris)			Methane (Wood Debris)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
2049	1.26E+03	1.05E+06	7.09E+01	2.96E+02	4.43E+05	2.98E+01
2050	1.25E+03	1.04E+06	7.02E+01	2.93E+02	4.39E+05	2.95E+01
2051	1.24E+03	1.03E+06	6.95E+01	2.90E+02	4.34E+05	2.92E+01
2052	1.22E+03	1.02E+06	6.88E+01	2.87E+02	4.30E+05	2.89E+01
2053	1.21E+03	1.01E+06	6.81E+01	2.84E+02	4.26E+05	2.86E+01
2054	1.20E+03	1.00E+06	6.74E+01	2.81E+02	4.21E+05	2.83E+01
2055	1.19E+03	9.94E+05	6.68E+01	2.78E+02	4.17E+05	2.80E+01
2056	1.18E+03	9.84E+05	6.61E+01	2.76E+02	4.13E+05	2.78E+01
2057	1.16E+03	9.74E+05	6.54E+01	2.73E+02	4.09E+05	2.75E+01
2058	1.15E+03	9.64E+05	6.48E+01	2.70E+02	4.05E+05	2.72E+01
2059	1.14E+03	9.55E+05	6.41E+01	2.67E+02	4.01E+05	2.69E+01
2060	1.13E+03	9.45E+05	6.35E+01	2.65E+02	3.97E+05	2.67E+01

Table D-4
Scenario 2: Total LFG and Methane Production - MSW Only
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (MSW)			Methane (MSW)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
1920	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1921	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1922	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1923	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1924	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1925	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1926	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1927	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1928	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1929	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1930	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1931	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1932	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1933	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1934	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1935	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1936	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1937	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1938	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1939	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1940	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1941	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1942	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1943	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1944	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1945	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1946	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1947	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1948	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1949	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1950	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1951	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1952	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1953	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1954	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1955	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1956	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1957	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1958	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1959	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1960	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1961	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table D-4
Scenario 2: Total LFG and Methane Production - MSW Only
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (MSW)			Methane (MSW)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
1962	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1963	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1964	4.76E+02	3.98E+05	2.67E+01	1.12E+02	1.67E+05	1.12E+01
1965	9.42E+02	7.88E+05	5.29E+01	2.21E+02	3.31E+05	2.22E+01
1966	1.40E+03	1.17E+06	7.86E+01	3.28E+02	4.92E+05	3.30E+01
1967	1.85E+03	1.55E+06	1.04E+02	4.33E+02	6.49E+05	4.36E+01
1968	2.29E+03	1.91E+06	1.29E+02	5.36E+02	8.03E+05	5.40E+01
1969	2.72E+03	2.27E+06	1.53E+02	6.37E+02	9.54E+05	6.41E+01
1970	3.14E+03	2.63E+06	1.76E+02	7.36E+02	1.10E+06	7.41E+01
1971	3.55E+03	2.97E+06	2.00E+02	8.33E+02	1.25E+06	8.39E+01
1972	3.48E+03	2.91E+06	1.96E+02	8.16E+02	1.22E+06	8.22E+01
1973	3.41E+03	2.86E+06	1.92E+02	8.00E+02	1.20E+06	8.06E+01
1974	3.35E+03	2.80E+06	1.88E+02	7.84E+02	1.18E+06	7.90E+01
1975	3.28E+03	2.74E+06	1.84E+02	7.69E+02	1.15E+06	7.74E+01
1976	3.21E+03	2.69E+06	1.81E+02	7.53E+02	1.13E+06	7.59E+01
1977	3.15E+03	2.64E+06	1.77E+02	7.38E+02	1.11E+06	7.44E+01
1978	3.09E+03	2.58E+06	1.74E+02	7.24E+02	1.08E+06	7.29E+01
1979	3.03E+03	2.53E+06	1.70E+02	7.10E+02	1.06E+06	7.15E+01
1980	2.97E+03	2.48E+06	1.67E+02	6.95E+02	1.04E+06	7.00E+01
1981	2.91E+03	2.43E+06	1.63E+02	6.82E+02	1.02E+06	6.87E+01
1982	2.85E+03	2.38E+06	1.60E+02	6.68E+02	1.00E+06	6.73E+01
1983	2.79E+03	2.34E+06	1.57E+02	6.55E+02	9.82E+05	6.60E+01
1984	2.74E+03	2.29E+06	1.54E+02	6.42E+02	9.62E+05	6.47E+01
1985	2.68E+03	2.25E+06	1.51E+02	6.29E+02	9.43E+05	6.34E+01
1986	2.63E+03	2.20E+06	1.48E+02	6.17E+02	9.25E+05	6.21E+01
1987	2.58E+03	2.16E+06	1.45E+02	6.05E+02	9.06E+05	6.09E+01
1988	2.53E+03	2.12E+06	1.42E+02	5.93E+02	8.88E+05	5.97E+01
1989	2.48E+03	2.07E+06	1.39E+02	5.81E+02	8.71E+05	5.85E+01
1990	2.43E+03	2.03E+06	1.37E+02	5.69E+02	8.53E+05	5.73E+01
1991	2.38E+03	1.99E+06	1.34E+02	5.58E+02	8.37E+05	5.62E+01
1992	2.33E+03	1.95E+06	1.31E+02	5.47E+02	8.20E+05	5.51E+01
1993	2.29E+03	1.91E+06	1.29E+02	5.36E+02	8.04E+05	5.40E+01
1994	2.24E+03	1.88E+06	1.26E+02	5.26E+02	7.88E+05	5.29E+01
1995	2.20E+03	1.84E+06	1.24E+02	5.15E+02	7.72E+05	5.19E+01
1996	2.15E+03	1.80E+06	1.21E+02	5.05E+02	7.57E+05	5.09E+01
1997	2.11E+03	1.77E+06	1.19E+02	4.95E+02	7.42E+05	4.99E+01
1998	2.07E+03	1.73E+06	1.16E+02	4.85E+02	7.27E+05	4.89E+01
1999	2.03E+03	1.70E+06	1.14E+02	4.76E+02	7.13E+05	4.79E+01
2000	1.99E+03	1.66E+06	1.12E+02	4.66E+02	6.99E+05	4.70E+01
2001	1.95E+03	1.63E+06	1.10E+02	4.57E+02	6.85E+05	4.60E+01
2002	1.91E+03	1.60E+06	1.07E+02	4.48E+02	6.71E+05	4.51E+01
2003	1.87E+03	1.57E+06	1.05E+02	4.39E+02	6.58E+05	4.42E+01

Table D-4
Scenario 2: Total LFG and Methane Production - MSW Only
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (MSW)			Methane (MSW)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
2004	1.84E+03	1.54E+06	1.03E+02	4.30E+02	6.45E+05	4.33E+01
2005	1.80E+03	1.51E+06	1.01E+02	4.22E+02	6.32E+05	4.25E+01
2006	1.76E+03	1.48E+06	9.91E+01	4.13E+02	6.20E+05	4.16E+01
2007	1.73E+03	1.45E+06	9.72E+01	4.05E+02	6.07E+05	4.08E+01
2008	1.69E+03	1.42E+06	9.53E+01	3.97E+02	5.95E+05	4.00E+01
2009	1.66E+03	1.39E+06	9.34E+01	3.89E+02	5.84E+05	3.92E+01
2010	1.63E+03	1.36E+06	9.15E+01	3.82E+02	5.72E+05	3.84E+01
2011	1.60E+03	1.34E+06	8.97E+01	3.74E+02	5.61E+05	3.77E+01
2012	1.56E+03	1.31E+06	8.79E+01	3.67E+02	5.50E+05	3.69E+01
2013	1.53E+03	1.28E+06	8.62E+01	3.59E+02	5.39E+05	3.62E+01
2014	1.50E+03	1.26E+06	8.45E+01	3.52E+02	5.28E+05	3.55E+01
2015	1.47E+03	1.23E+06	8.28E+01	3.45E+02	5.18E+05	3.48E+01
2016	1.44E+03	1.21E+06	8.12E+01	3.39E+02	5.07E+05	3.41E+01
2017	1.42E+03	1.18E+06	7.96E+01	3.32E+02	4.97E+05	3.34E+01
2018	1.39E+03	1.16E+06	7.80E+01	3.25E+02	4.88E+05	3.28E+01
2019	1.36E+03	1.14E+06	7.64E+01	3.19E+02	4.78E+05	3.21E+01
2020	1.33E+03	1.12E+06	7.49E+01	3.12E+02	4.68E+05	3.15E+01
2021	1.31E+03	1.09E+06	7.34E+01	3.06E+02	4.59E+05	3.08E+01
2022	1.28E+03	1.07E+06	7.20E+01	3.00E+02	4.50E+05	3.02E+01
2023	1.26E+03	1.05E+06	7.06E+01	2.94E+02	4.41E+05	2.96E+01
2024	1.23E+03	1.03E+06	6.92E+01	2.88E+02	4.32E+05	2.91E+01
2025	1.21E+03	1.01E+06	6.78E+01	2.83E+02	4.24E+05	2.85E+01
2026	1.18E+03	9.89E+05	6.65E+01	2.77E+02	4.15E+05	2.79E+01
2027	1.16E+03	9.70E+05	6.51E+01	2.72E+02	4.07E+05	2.74E+01
2028	1.14E+03	9.50E+05	6.39E+01	2.66E+02	3.99E+05	2.68E+01
2029	1.11E+03	9.32E+05	6.26E+01	2.61E+02	3.91E+05	2.63E+01
2030	1.09E+03	9.13E+05	6.14E+01	2.56E+02	3.83E+05	2.58E+01
2031	1.07E+03	8.95E+05	6.01E+01	2.51E+02	3.76E+05	2.53E+01
2032	1.05E+03	8.77E+05	5.89E+01	2.46E+02	3.68E+05	2.48E+01
2033	1.03E+03	8.60E+05	5.78E+01	2.41E+02	3.61E+05	2.43E+01
2034	1.01E+03	8.43E+05	5.66E+01	2.36E+02	3.54E+05	2.38E+01
2035	9.88E+02	8.26E+05	5.55E+01	2.32E+02	3.47E+05	2.33E+01
2036	9.68E+02	8.10E+05	5.44E+01	2.27E+02	3.40E+05	2.29E+01
2037	9.49E+02	7.94E+05	5.33E+01	2.22E+02	3.33E+05	2.24E+01
2038	9.30E+02	7.78E+05	5.23E+01	2.18E+02	3.27E+05	2.20E+01
2039	9.12E+02	7.63E+05	5.12E+01	2.14E+02	3.20E+05	2.15E+01
2040	8.94E+02	7.48E+05	5.02E+01	2.09E+02	3.14E+05	2.11E+01
2041	8.76E+02	7.33E+05	4.92E+01	2.05E+02	3.08E+05	2.07E+01
2042	8.59E+02	7.18E+05	4.83E+01	2.01E+02	3.02E+05	2.03E+01
2043	8.42E+02	7.04E+05	4.73E+01	1.97E+02	2.96E+05	1.99E+01
2044	8.25E+02	6.90E+05	4.64E+01	1.93E+02	2.90E+05	1.95E+01
2045	8.09E+02	6.76E+05	4.54E+01	1.90E+02	2.84E+05	1.91E+01

Table D-4
Scenario 2: Total LFG and Methane Production - MSW Only
Transportation Cooridor
Yakima, Washington

Year	Total landfill gas (MSW)			Methane (MSW)		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
2046	7.93E+02	6.63E+05	4.45E+01	1.86E+02	2.78E+05	1.87E+01
2047	7.77E+02	6.50E+05	4.37E+01	1.82E+02	2.73E+05	1.83E+01
2048	7.62E+02	6.37E+05	4.28E+01	1.78E+02	2.68E+05	1.80E+01
2049	7.46E+02	6.24E+05	4.20E+01	1.75E+02	2.62E+05	1.76E+01
2050	7.32E+02	6.12E+05	4.11E+01	1.72E+02	2.57E+05	1.73E+01
2051	7.17E+02	6.00E+05	4.03E+01	1.68E+02	2.52E+05	1.69E+01
2052	7.03E+02	5.88E+05	3.95E+01	1.65E+02	2.47E+05	1.66E+01
2053	6.89E+02	5.76E+05	3.87E+01	1.62E+02	2.42E+05	1.63E+01
2054	6.75E+02	5.65E+05	3.80E+01	1.58E+02	2.37E+05	1.59E+01
2055	6.62E+02	5.54E+05	3.72E+01	1.55E+02	2.33E+05	1.56E+01
2056	6.49E+02	5.43E+05	3.65E+01	1.52E+02	2.28E+05	1.53E+01
2057	6.36E+02	5.32E+05	3.58E+01	1.49E+02	2.23E+05	1.50E+01
2058	6.24E+02	5.22E+05	3.50E+01	1.46E+02	2.19E+05	1.47E+01
2059	6.11E+02	5.11E+05	3.43E+01	1.43E+02	2.15E+05	1.44E+01
2060	5.99E+02	5.01E+05	3.37E+01	1.40E+02	2.10E+05	1.41E+01

Table D-5
Scenario 2: Carbon Dioxide NMOCs - Wood Debris MSW
Transportation Cooridor
Yakima, Washington

Year	Carbon Dioxide			NMOCs		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
1920	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1921	3.02E+01	1.65E+04	1.11E+00	6.83E-03	1.91E+00	1.28E-04
1922	6.01E+01	3.28E+04	2.21E+00	1.36E-02	3.79E+00	2.55E-04
1923	8.97E+01	4.90E+04	3.29E+00	2.03E-02	5.66E+00	3.80E-04
1924	1.19E+02	6.50E+04	4.37E+00	2.69E-02	7.51E+00	5.04E-04
1925	1.48E+02	8.08E+04	5.43E+00	3.35E-02	9.34E+00	6.27E-04
1926	1.77E+02	9.65E+04	6.49E+00	4.00E-02	1.12E+01	7.49E-04
1927	2.05E+02	1.12E+05	7.53E+00	4.64E-02	1.29E+01	8.70E-04
1928	2.33E+02	1.27E+05	8.56E+00	5.28E-02	1.47E+01	9.89E-04
1929	2.61E+02	1.43E+05	9.59E+00	5.91E-02	1.65E+01	1.11E-03
1930	2.89E+02	1.58E+05	1.06E+01	6.53E-02	1.82E+01	1.22E-03
1931	3.16E+02	1.73E+05	1.16E+01	7.15E-02	1.99E+01	1.34E-03
1932	3.43E+02	1.87E+05	1.26E+01	7.76E-02	2.17E+01	1.45E-03
1933	3.70E+02	2.02E+05	1.36E+01	8.37E-02	2.33E+01	1.57E-03
1934	3.96E+02	2.17E+05	1.45E+01	8.97E-02	2.50E+01	1.68E-03
1935	4.23E+02	2.31E+05	1.55E+01	9.56E-02	2.67E+01	1.79E-03
1936	4.49E+02	2.45E+05	1.65E+01	1.01E-01	2.83E+01	1.90E-03
1937	4.74E+02	2.59E+05	1.74E+01	1.07E-01	2.99E+01	2.01E-03
1938	5.00E+02	2.73E+05	1.83E+01	1.13E-01	3.15E+01	2.12E-03
1939	5.25E+02	2.87E+05	1.93E+01	1.19E-01	3.31E+01	2.23E-03
1940	5.50E+02	3.00E+05	2.02E+01	1.24E-01	3.47E+01	2.33E-03
1941	5.75E+02	3.14E+05	2.11E+01	1.30E-01	3.63E+01	2.44E-03
1942	5.99E+02	3.27E+05	2.20E+01	1.36E-01	3.78E+01	2.54E-03
1943	6.23E+02	3.41E+05	2.29E+01	1.41E-01	3.93E+01	2.64E-03
1944	6.47E+02	3.54E+05	2.38E+01	1.46E-01	4.09E+01	2.74E-03
1945	6.71E+02	3.67E+05	2.46E+01	1.52E-01	4.24E+01	2.85E-03
1946	6.95E+02	3.79E+05	2.55E+01	1.57E-01	4.38E+01	2.95E-03
1947	7.18E+02	3.92E+05	2.64E+01	1.62E-01	4.53E+01	3.04E-03
1948	7.41E+02	4.05E+05	2.72E+01	1.68E-01	4.68E+01	3.14E-03
1949	7.64E+02	4.17E+05	2.80E+01	1.73E-01	4.82E+01	3.24E-03
1950	7.86E+02	4.30E+05	2.89E+01	1.78E-01	4.96E+01	3.33E-03
1951	8.09E+02	4.42E+05	2.97E+01	1.83E-01	5.10E+01	3.43E-03
1952	8.31E+02	4.54E+05	3.05E+01	1.88E-01	5.24E+01	3.52E-03
1953	8.53E+02	4.66E+05	3.13E+01	1.93E-01	5.38E+01	3.62E-03
1954	8.74E+02	4.78E+05	3.21E+01	1.98E-01	5.52E+01	3.71E-03
1955	8.96E+02	4.89E+05	3.29E+01	2.03E-01	5.65E+01	3.80E-03
1956	9.17E+02	5.01E+05	3.37E+01	2.07E-01	5.79E+01	3.89E-03
1957	9.38E+02	5.13E+05	3.44E+01	2.12E-01	5.92E+01	3.98E-03
1958	9.59E+02	5.24E+05	3.52E+01	2.17E-01	6.05E+01	4.07E-03
1959	9.80E+02	5.35E+05	3.60E+01	2.22E-01	6.18E+01	4.15E-03
1960	1.00E+03	5.46E+05	3.67E+01	2.26E-01	6.31E+01	4.24E-03
1961	1.02E+03	5.57E+05	3.75E+01	2.31E-01	6.44E+01	4.33E-03

Table D-5
Scenario 2: Carbon Dioxide NMOCs - Wood Debris MSW
Transportation Cooridor
Yakima, Washington

Year	Carbon Dioxide			NMOCs		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
1962	1.04E+03	5.68E+05	3.82E+01	2.35E-01	6.57E+01	4.41E-03
1963	1.06E+03	5.79E+05	3.89E+01	2.40E-01	6.69E+01	4.50E-03
1964	1.67E+03	9.14E+05	6.14E+01	3.78E-01	1.06E+02	7.09E-03
1965	2.27E+03	1.24E+06	8.35E+01	5.14E-01	1.43E+02	9.64E-03
1966	2.86E+03	1.56E+06	1.05E+02	6.48E-01	1.81E+02	1.21E-02
1967	3.44E+03	1.88E+06	1.26E+02	7.78E-01	2.17E+02	1.46E-02
1968	4.01E+03	2.19E+06	1.47E+02	9.06E-01	2.53E+02	1.70E-02
1969	4.56E+03	2.49E+06	1.67E+02	1.03E+00	2.88E+02	1.93E-02
1970	5.11E+03	2.79E+06	1.87E+02	1.16E+00	3.22E+02	2.17E-02
1971	5.64E+03	3.08E+06	2.07E+02	1.28E+00	3.56E+02	2.39E-02
1972	5.57E+03	3.04E+06	2.04E+02	1.26E+00	3.52E+02	2.36E-02
1973	5.50E+03	3.01E+06	2.02E+02	1.24E+00	3.47E+02	2.33E-02
1974	5.44E+03	2.97E+06	2.00E+02	1.23E+00	3.43E+02	2.31E-02
1975	5.37E+03	2.93E+06	1.97E+02	1.22E+00	3.39E+02	2.28E-02
1976	5.31E+03	2.90E+06	1.95E+02	1.20E+00	3.35E+02	2.25E-02
1977	5.25E+03	2.87E+06	1.93E+02	1.19E+00	3.31E+02	2.22E-02
1978	5.19E+03	2.83E+06	1.90E+02	1.17E+00	3.27E+02	2.20E-02
1979	5.13E+03	2.80E+06	1.88E+02	1.16E+00	3.23E+02	2.17E-02
1980	5.07E+03	2.77E+06	1.86E+02	1.15E+00	3.20E+02	2.15E-02
1981	5.01E+03	2.74E+06	1.84E+02	1.13E+00	3.16E+02	2.12E-02
1982	4.96E+03	2.71E+06	1.82E+02	1.12E+00	3.13E+02	2.10E-02
1983	4.90E+03	2.68E+06	1.80E+02	1.11E+00	3.09E+02	2.08E-02
1984	4.85E+03	2.65E+06	1.78E+02	1.10E+00	3.06E+02	2.06E-02
1985	4.80E+03	2.62E+06	1.76E+02	1.09E+00	3.03E+02	2.03E-02
1986	4.75E+03	2.59E+06	1.74E+02	1.07E+00	3.00E+02	2.01E-02
1987	4.70E+03	2.57E+06	1.72E+02	1.06E+00	2.96E+02	1.99E-02
1988	4.65E+03	2.54E+06	1.71E+02	1.05E+00	3.83E+02	1.97E-02
1989	4.60E+03	2.51E+06	1.69E+02	1.04E+00	2.90E+02	1.95E-02
1990	4.56E+03	2.49E+06	1.67E+02	1.03E+00	2.88E+02	1.93E-02
1991	4.51E+03	2.46E+06	1.66E+02	1.02E+00	2.85E+02	1.91E-02
1992	4.47E+03	2.44E+06	1.64E+02	1.01E+00	2.82E+02	1.89E-02
1993	4.42E+03	2.42E+06	1.62E+02	1.00E+00	2.79E+02	1.88E-02
1994	4.38E+03	2.39E+06	1.61E+02	9.91E-01	2.77E+02	1.86E-02
1995	4.34E+03	2.37E+06	1.59E+02	9.82E-01	2.74E+02	1.84E-02
1996	4.30E+03	2.35E+06	1.63E+02	9.73E-01	2.71E+02	1.82E-02
1997	4.26E+03	2.33E+06	2.03E+02	9.64E-01	2.69E+02	1.81E-02
1998	4.22E+03	2.31E+06	1.93E+02	9.55E-01	2.67E+02	1.79E-02
1999	4.19E+03	2.29E+06	2.43E+02	9.47E-01	2.64E+02	1.78E-02
2000	4.15E+03	2.27E+06	1.52E+02	9.39E-01	2.62E+02	1.76E-02
2001	4.08E+03	2.23E+06	1.50E+02	9.24E-01	2.58E+02	1.73E-02
2002	4.02E+03	2.20E+06	1.48E+02	9.09E-01	2.54E+02	1.70E-02
2003	3.96E+03	2.16E+06	1.45E+02	8.95E-01	2.50E+02	1.68E-02

Table D-5
Scenario 2: Carbon Dioxide NMOCs - Wood Debris MSW
Transportation Cooridor
Yakima, Washington

Year	Carbon Dioxide			NMOCs		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
2004	3.89E+03	2.13E+06	1.43E+02	8.81E-01	2.46E+02	1.65E-02
2005	3.83E+03	2.09E+06	1.41E+02	8.67E-01	2.42E+02	1.63E-02
2006	3.77E+03	2.06E+06	1.38E+02	8.53E-01	2.38E+02	1.60E-02
2007	3.74E+03	2.05E+06	1.37E+02	8.47E-01	2.36E+02	1.59E-02
2008	3.72E+03	2.03E+06	1.36E+02	8.40E-01	2.34E+02	1.58E-02
2009	3.69E+03	2.01E+06	1.35E+02	8.34E-01	2.33E+02	1.56E-02
2010	3.66E+03	2.00E+06	1.34E+02	8.28E-01	2.31E+02	1.55E-02
2011	3.63E+03	1.99E+06	1.33E+02	8.22E-01	2.29E+02	1.54E-02
2012	3.61E+03	1.97E+06	1.32E+02	8.16E-01	2.28E+02	1.53E-02
2013	3.58E+03	1.96E+06	1.32E+02	8.11E-01	2.26E+02	1.52E-02
2014	3.53E+03	1.93E+06	1.30E+02	7.98E-01	2.23E+02	1.50E-02
2015	3.48E+03	1.90E+06	1.28E+02	7.86E-01	2.19E+02	1.47E-02
2016	3.42E+03	1.87E+06	1.26E+02	7.74E-01	2.16E+02	1.45E-02
2017	2.80E+03	1.53E+06	1.03E+02	6.33E-01	1.77E+02	1.19E-02
2018	2.76E+03	1.51E+06	1.01E+02	6.24E-01	1.74E+02	1.17E-02
2019	2.72E+03	1.49E+06	9.98E+01	6.15E-01	1.72E+02	1.15E-02
2020	2.68E+03	1.46E+06	9.84E+01	6.06E-01	1.69E+02	1.14E-02
2021	2.64E+03	1.44E+06	9.70E+01	5.98E-01	1.67E+02	1.12E-02
2022	2.60E+03	1.42E+06	9.56E+01	5.89E-01	1.64E+02	1.10E-02
2023	2.57E+03	1.40E+06	9.42E+01	5.81E-01	1.62E+02	1.09E-02
2024	2.53E+03	1.38E+06	9.29E+01	5.73E-01	1.60E+02	1.07E-02
2025	2.50E+03	1.36E+06	9.16E+01	5.64E-01	1.57E+02	1.06E-02
2026	2.46E+03	1.34E+06	9.03E+01	5.56E-01	1.55E+02	1.04E-02
2027	2.43E+03	1.32E+06	8.90E+01	5.49E-01	1.53E+02	1.03E-02
2028	2.39E+03	1.31E+06	8.78E+01	5.41E-01	1.51E+02	1.01E-02
2029	2.36E+03	1.29E+06	8.65E+01	5.33E-01	1.49E+02	9.99E-03
2030	2.32E+03	1.27E+06	8.53E+01	5.26E-01	1.47E+02	9.85E-03
2031	2.29E+03	1.25E+06	8.41E+01	5.18E-01	1.45E+02	9.71E-03
2032	2.26E+03	1.23E+06	8.29E+01	5.11E-01	1.43E+02	9.58E-03
2033	2.23E+03	1.22E+06	8.18E+01	5.04E-01	1.41E+02	9.44E-03
2034	2.20E+03	1.20E+06	8.06E+01	4.97E-01	1.39E+02	9.31E-03
2035	2.17E+03	1.18E+06	7.95E+01	4.90E-01	1.37E+02	9.18E-03
2036	2.14E+03	1.17E+06	7.84E+01	4.83E-01	1.35E+02	9.05E-03
2037	2.11E+03	1.15E+06	7.73E+01	4.76E-01	1.33E+02	8.93E-03
2038	2.08E+03	1.13E+06	7.62E+01	4.70E-01	1.31E+02	8.80E-03
2039	2.05E+03	1.12E+06	7.52E+01	4.63E-01	1.29E+02	8.68E-03
2040	2.02E+03	1.10E+06	7.41E+01	4.57E-01	1.27E+02	8.56E-03
2041	1.99E+03	1.09E+06	7.31E+01	4.50E-01	1.26E+02	8.44E-03
2042	1.96E+03	1.07E+06	7.21E+01	4.44E-01	1.24E+02	8.33E-03
2043	1.94E+03	1.06E+06	7.11E+01	4.38E-01	1.22E+02	8.21E-03
2044	1.91E+03	1.04E+06	7.01E+01	4.32E-01	1.21E+02	8.10E-03
2045	1.88E+03	1.03E+06	6.92E+01	4.26E-01	1.19E+02	7.99E-03

Table D-5
Scenario 2: Carbon Dioxide NMOCs - Wood Debris MSW
Transportation Cooridor
Yakima, Washington

Year	Carbon Dioxide			NMOCs		
	(Mg/year)	(m3/year)	(av ft^3/min)	(Mg/year)	(m3/year)	(av ft^3/min)
2046	1.86E+03	1.02E+06	6.82E+01	4.20E-01	1.17E+02	7.88E-03
2047	1.83E+03	1.00E+06	6.73E+01	4.15E-01	1.16E+02	7.77E-03
2048	1.81E+03	9.88E+05	6.64E+01	4.09E-01	1.14E+02	7.66E-03
2049	1.78E+03	9.74E+05	6.54E+01	4.03E-01	1.13E+02	7.56E-03
2050	1.76E+03	9.61E+05	6.46E+01	3.98E-01	1.11E+02	7.46E-03
2051	1.73E+03	9.48E+05	6.37E+01	3.92E-01	1.09E+02	7.36E-03
2052	1.71E+03	9.35E+05	6.28E+01	3.87E-01	1.08E+02	7.26E-03
2053	1.69E+03	9.22E+05	6.20E+01	3.82E-01	1.07E+02	7.16E-03
2054	1.67E+03	9.10E+05	6.11E+01	3.77E-01	1.05E+02	7.06E-03
2055	1.64E+03	8.97E+05	6.03E+01	3.72E-01	1.04E+02	6.97E-03
2056	1.62E+03	8.85E+05	5.95E+01	3.67E-01	1.02E+02	6.87E-03
2057	1.60E+03	8.73E+05	5.87E+01	3.62E-01	1.01E+02	6.78E-03
2058	1.58E+03	8.62E+05	5.79E+01	3.57E-01	9.95E+01	6.69E-03
2059	1.56E+03	8.50E+05	5.71E+01	3.52E-01	9.82E+01	6.60E-03
2060	1.54E+03	8.39E+05	5.64E+01	3.47E-01	9.69E+01	6.51E-03

APPENDIX C

Excavated Materials Management Plan

Excavated Materials Management Plan
Roadway Project
Closed City of Yakima Landfill Site
Yakima, Washington

April 26, 2019

Prepared for

City of Yakima

LANDAU
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Excavated Materials Management Plan
Roadway Project
Closed City of Yakima Landfill Site
Yakima, Washington

This document was prepared by, or under the direct supervision of, the technical professionals noted below.

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Project Coordinator:	LJL/TAM

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LIST OF ABBREVIATIONS AND ACRONYMS

ACM	asbestos-containing materials
AHERA	Asbestos Hazard Emergency Response Act
bgs	below ground surface
BMPs	best management practices
CFR	Code of Federal Regulations
City	City of Yakima
DAHP	Department of Archaeology and Historic Preservation
Ecology	Washington State Department of Ecology
EMMP	Excavated Materials Management Plan
eV	electron volt
ft	feet
IAWP	Interim Action Work Plan
LAI	Landau Associates, Inc.
Landfill Site	closed City of Yakima Landfill Site
mm	millimeter
MSW	municipal solid waste
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCP	pentachlorophenol
PID	photoionization detector
ppm	parts per million
RCW	Revised Code of Washington
RI	remedial investigation
SAP	Sampling and Analysis Plan
SVOC	semi-volatile organic compound
SWPPP	stormwater pollution prevention plan
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbons
TPH D/O	TPH diesel range/oil range
VOC	volatile organic compound
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act

1.0 INTRODUCTION

The purpose of this Excavated Materials Management Plan (EMMP) is to outline the approach and procedures for managing known and unanticipated contaminated soil, municipal solid waste (MSW), and wood debris encountered during construction activities, and for management of stormwater and groundwater entering the excavation during activities associated with construction of the roadway corridor at the closed City of Yakima Landfill Site (Landfill Site) located in Yakima, Washington (Figure C-1). The roadway corridor alignment also crosses the southern end of the Boise Cascade Mill Site (Mill Site). The sections of the roadway corridor that cross both the Landfill Site and the Mill Site are collectively referred to as the “Site” in this document (Figure C-2). This EMMP was developed by Landau Associates, Inc. (LAI) for use by the City of Yakima (City) and its contractors during the construction activities. This document addresses recognition of known and unanticipated contamination and characterization of contamination, as well as issues related to excavated materials and stormwater handling and disposal. This EMMP is an appendix to the Interim Action Work Plan (IAWP) and is intended to be used in conjunction with the complete IAWP report and other attachments, not as a standalone document.

2.0 KNOWN AND SUSPSECTED CONTAMINATION

Prior investigations at the Site have identified areas of known and suspected contamination at the Site (Figure C-3). The following sections summarize the contaminants, waste materials, and other debris that may be encountered in soil or groundwater at various areas within the Landfill Site and Mill Site.

It should be clearly understood that decomposing MSW and wood debris at the Site continue to generate methane at the Site at concentrations in and above the explosive limits. The presence of methane (and other landfill gases) is a health and safety risk that must be appropriately managed by the contractor, but is not the focus of this document.

2.1 Landfill Site

Subsurface conditions at the Landfill Site are generally characterized by the presence of MSW deposited during the landfill's active years and buried wood debris (on both the Mill Site and Landfill Site) associated with the historic mill activities, and. These materials have been mixed with Site soil over the years through excavation and regrading.

MSW on the Landfill Site is known to be present to the approximate extent shown on Figure C3 and is present at thicknesses of up to 15 feet (ft), with an average thickness of approximately 10 ft; the top of the MSW occurs from approximately 2 to 12 ft below ground surface (bgs), and the bottom of the MSW occurs from approximately 5 to 19.5 ft bgs. The MSW consists of organic-putrescible material (food, garden, and animal waste), organic non-putrescible waste (paper, wood, textiles, leather, plastic, rubber, paints, and sludge), and inorganic materials (metals, glass, ceramics, soil, ash, concrete, etc.).

Extensive sampling of soil/MSW and groundwater at the Landfill Site indicates that a wide variety of contaminants. Although the main contaminants of concern/indicator hazardous substances at the Site are limited to methane and vinyl chloride in landfill gas, and dissolved metals (arsenic, iron, and manganese in groundwater), other contaminants have been detected at low levels and are potentially present in the MSW including:

- petroleum hydrocarbons
- metals including: arsenic, barium, cadmium, chromium (III), iron, lead, manganese, mercury, silver, and sodium; hexavalent chromium and selenium
- pesticides
- polychlorinated biphenyls (PCBs)
- volatile organic compounds (VOCs)
- semi-volatile organic compounds (SVOCs)
- polycyclic aromatic hydrocarbons (PAHs).

Therefore, it should be expected that low-level contamination is present in the MSW and potentially in soil and wood debris that comes in contact with it. Excavated MSW materials will be treated as a solid waste and sampled, as required by the applicable disposal facility, for waste characterization as described in the Sampling and Analysis Plan (SAP) included as Appendix D of the Interim Action Work Plan.[1]

Discrete contamination or other potential contaminant sources that have more specialized management and disposal requirements (such as free product hydrocarbons or solvents; industrial wastes like drums, tanks, transformers, batteries, and cement kiln dust/lime wastes; chemically treated wood products like creosote treated poles or railroad ties and chemical pressure treated lumber; and/or other regulated materials that may be a health and safety risk like friable asbestos-containing materials [ACM]) have not been encountered or identified in prior explorations at the Landfill Site. Although unlikely, these types of materials may be present and encountered during construction and may require special procedures for identification and management (see Section 3.1).

2.2 Mill Site

Subsurface conditions at the Mill Site are generally characterized by the presence of buried wood debris along the eastern end of the portion of the roadway alignment located on the Mill Site in the historical log pond areas. Excavated wood debris from the Mill Site or Landfill Site may be recycled at an appropriate composting facility, contingent upon sampling results demonstrating that it is not contaminated with Site contaminants of concern. Alternately, wood debris can be managed and disposed in the same manner as MSW.

Other areas of known or suspected contamination at the Mill Site that may require special characterization, management, and disposal include:

- The presence of total petroleum hydrocarbons (TPH) in the diesel and oil range (TPH-D/O) has been identified in shallow soil (within approximately 2 feet of ground surface) within the section of the roadway alignment located proximate to the north of the railroad tracks.
- Chromium (unspeciated) and PAHs have been identified in a limited number of soil samples in the area around the former “Boiler House”; however, the nature and extent have not been determined. PCBs and mineral oil may also be present in this area due to the former presence of electrical capacitors in the Boiler House and other oil-filled transformers in this area.
- Dissolved metals are also present in groundwater at the Mill Site due to reducing conditions associated with groundwater contact with and leaching of organic materials from wood debris located at the Mill Site. Similar to the Landfill Site, the primary metals of concern are arsenic, iron, and manganese. The western portion of the roadway alignment passes through areas of historical wood mill buildings, where some suspected areas of contamination exist related to historical site operations. Additionally, investigations at the former Plywood Mill area of the Mill Site located adjacent to the northwest of the Landfill Site (south of the railroad tracks) have identified groundwater contamination that may have migrated beneath portions of the roadway alignment.
- TPH-D/O have been detected in groundwater in the vicinity of the former plywood mill area; based on groundwater data from monitoring wells, dissolved-phase TPH-D/O may have migrated beneath the roadway corridor in the area east of the former plywood mill of the south of the railroad tracks.

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[1] LAI. 2019. Interim Action Work Plan, Closed City of Yakima Landfill Site, Yakima, Washington. Landau Associates, Inc. March 1.

Discrete contamination or other potential contaminant sources that have more specialized management and disposal requirements (such as petroleum hydrocarbons, solvents, industrial wastes like drums or tanks, chemically treated wood products like creosote-treated poles or railroad ties and chemical pressure-treated lumber, and/or other regulated materials that may be a health and safety risk like friable ACM) have not been encountered or identified in prior explorations at the Mill Site. Although unlikely, these types of materials may be present and encountered during construction and may require special procedures for identification and management (see Section 3.1).

3.0 RECOGNIZING CONTAMINATION

Roadway construction activities are currently planned in areas of known landfill debris (Landfill Site) and former industrial (wood/plywood mill) facilities and operations areas (Mill Site) and could result in discovery of unanticipated contamination associated with previously unknown/undiscovered waste materials. Landfill debris at the Site has been generally characterized as MSW, but there is the potential for industrial wastes to be present and/or hazardous household wastes such as, but not limited to, oils, pesticides, paint thinners, storage drums, transformers, batteries, and asbestos-containing demolition debris. Construction field personnel must be aware of the known contamination associated with MSW and understand how to recognize other potentially contaminated materials at the Site. This EMMP should be implemented during all intrusive work at the Site to maintain work zone health and safety and to mitigate further impact to the environment if known or unanticipated contamination is encountered.

3.1 Unanticipated Contamination

The landfill portion of the Site has generally been found to consist primarily of MSW and wood debris deposition in the former log pond areas as described above. The rest of the Site (Mill Site) consists of former mill facilities and processing areas and wood debris deposition areas in former log pond areas. For the purposes of this EMMP, unanticipated contamination can be determined using knowledge of historical site operations and activities (as documented in the landfill remedial investigation [RI] report and Mill Site RI work plan); physical observations; and field screening equipment and procedures. Physical observations include use of the visual and olfactory senses. Field screening equipment may include instrumentation such explosive gas meters, organic vapor meters, and dust meters. Contamination has previously been associated with the following materials and conditions at the Site:

- **Petroleum Hydrocarbons**: Petroleum hydrocarbon products, such as gasoline, diesel, and motor oil. Low levels of petroleum hydrocarbon contamination are known to be present in MSW at the Site. However, hydrocarbon contamination may be present in soil separate from MSW, and pockets of gross contamination associated with dumped drums or tanks may be present that will require additional characterization and special handling and disposal. Contamination may be present in soil, MSW, or wood debris and typically exhibits one or more of the following characteristics: iridescent sheen; black, oily, tarry, or greasy appearance; petroleum (gas, diesel, motor oil, kerosene) odor; and dark staining in soil.
- **Solvents**: Industrial or commercial chemical solvents have commonly been used in the past for cleaning and degreasing metal parts. No significant solvent contamination has been identified at the Site, but could be encountered in containers or discrete pockets of contamination. Solvent contamination may be present in soil, MSW, or wood debris and is typically exhibits the following characteristics: clear liquid with a sweet chemical odor.
- **Buried Debris**: MSW at the Site contains organic wastes (household refuse) and inorganic materials such as metals, glass, ceramics, soil, ash, and concrete that may be household wastes or construction/demolition debris. Other buried materials may also be encountered in areas of buried wood debris or historical industrial operations areas. While these have not

been encountered in explorations at the Site, construction/demolition/industrial debris could include materials such as metal drums, burnt wood, creosote-impregnated wood piles/poles or railroad ties, chemically pressure treated wood, and/or friable ACM:

  - Creosote-impregnated wood piles/poles or railroad ties exhibit a strong "mothball" odor and are typically darker in color, or possibly having a tar-like coating.
  - Chemically pressure-treated wood often has a greenish coloration and indentation patterns from the pressure treating process. Pentachlorophenol (PCP), a commonly used historic wood-treating insecticide/fungicide, may appear as clear or white to dark grayish-brown solid crystalline beads or flakes with a sweet gasoline- or benzene-like odor.
  - Friable ACM, such as pipe wrap, boiler insulation, and "popcorn" ceiling texture, is often white and fibrous and can be easily reduced to powder by hand when dry.

- **Industrial Wastes**: Waste materials originating from industrial sites/processes have not been encountered in explorations at the Site, but if present could consist of drums or tanks of waste chemicals or petroleum products, PCB-containing transformer reservoirs or debris, PAHs, and/or lime wastes/cement kiln dust. PCB-containing transformers are typically metal and cylindrical with electrical connections, some of which are lined with heat sink plates. Damaged, undrained transformers may leak oils that are dark amber or black in color. PAHs may be encountered in the form of tar, creosote, or other dark stained areas (potentially in discarded containers or associated with treated wood piles/poles or railroad ties). Lime wastes/cement kiln dusts are typically light gray and flaky or powdery and exhibit a slight "fishy" odor. Cement kiln dust may be consolidated in a mass that has the appearance of a light gray/off-white clay material that exhibits a brittle, flaky character when broken up.
- **Other**: The listed items above are not meant to be exhaustive and construction personnel should be diligent in looking for any materials and excavated materials that may be encountered that appear or behave differently from typical MSW, wood debris, and soil. If any chemical or other unidentifiable odors, viscous or odd colored liquids, odd appearing or colored powders/dusts/crystals, or discarded industrial-type equipment or containers are encountered, these materials should be assumed to be potentially contaminated and dealt with cautiously and safely. Potential metals-contaminated soil may also be encountered that may not have any physically observable evidence of contamination and may require special screening techniques or sampling and laboratory analysis (see Section 6.1).

If the materials or conditions noted above are observed during construction activities, work is to be suspended within the affected area and LAI and the City shall be notified immediately. Similar procedures are to be followed if other indications of potential contamination, such as material with an unusual appearance or odor, are observed during excavation activities.

4.0 RECOGNIZING POTENTIALLY CONTAMINATED GROUNDWATER AND STORMWATER

Groundwater at the Site is known to be contaminated with dissolved metals related to leaching of organic materials from MSW and/or the reducing conditions associated with degradation of MSW and wood debris. The depth to groundwater varies, but some areas of excavation will extend to depths that are likely to intersect the groundwater interface. If necessary for excavation activities, groundwater control in these areas may be performed through dewatering well points and/or sumps. Groundwater generated through dewatering will likely require treatment prior to discharge to the City's sanitary or storm sewer system in accordance with applicable permit conditions and requirements.

Stormwater that comes in contact with contaminated soils and/or MSW can become contaminated either by suspension of contaminated particles or by solution of chemicals and, therefore, accumulated or collected stormwater may also be treated as a contaminated material. Procedures for containment, characterization, and disposal of potentially contaminated stormwater will be the same as the procedures listed in Section 6.0 for other potentially contaminated materials.

Implementation of a project-specific stormwater pollution prevention plan (SWPPP) may also be necessary as required under a Construction Stormwater General Permit. Administering stormwater best management practices (BMPs) and erosion and sediment control procedures may be necessary to minimize the accumulation of potentially contaminated stormwater. If necessary, a project-specific SWPPP will be prepared separately by the City or construction contractor in adherence with the applicable construction-related permits and regulations.

5.0 MANAGING KNOWN OR UNANTICIPATED CONTAMINATED MATERIAL

All excavation and associated subsurface activities that place workers in contact with potentially contaminated material should be conducted by workers who have proper Occupational Safety and Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) training and certification for working at a hazardous waste site. All work conducted by the contractor related to the excavation and handling of potentially contaminated materials should be performed under a contractor-prepared Site-specific health and safety plan prepared in accordance with Code of Federal Regulations (CFR) 29.1926.120 and approved by the City.

When unanticipated or unidentified materials (other than general MSW and wood debris) are encountered, the procedures shown on Figure C-4 and detailed below may be used as a guide for decision-making:

1) If the material encountered is unanticipated or unidentified, work will cease in this area, as needed, to avoid disturbing the affected material and the construction contractor will notify the appropriate City personnel. The construction contractor will follow the material handling guidelines listed in Section 6.0.
2) If warranted, the City will notify LAI of the conditions and, if warranted, an environmental professional from LAI will visit the Site to evaluate the environmental conditions and determine appropriate notification procedures to the Washington Department of Ecology (Ecology) or other applicable regulatory agency.
3) LAI will consult with Ecology to determine appropriate next steps for characterization. Based on existing data, field observations, and Ecology approval, LAI will collect analytical samples and submit for appropriate laboratory analysis.
4) Once the nature of the material (e.g., whether it is contaminated by regulated substances) is appropriately identified, the affected material may be stockpiled (if the material is soil, MSW, and/or wood debris) separately from stockpiles of other excavated materials and tested to determine waste profiling at the direction of the City. Affected groundwater or stormwater should be contained in place or in appropriate containers to minimize contamination of other clean materials. If applicable, it may also be routed to the dewatering treatment system for appropriate treatment and discharge.
5) As warranted, an LAI environmental professional will conduct material screening and characterization (Section 6.0), and collect samples for waste characterization purposes, as well as possibly delineate the extent of the affected area within the planned limits of the excavation. The material will be analyzed (as necessary) and results will be reported to the City in a timely manner to minimize work delays.
6) Material (soil, MSW, wood debris, groundwater, or stormwater) that is determined to be uncontaminated (i.e. contaminant concentrations below regulatory screening levels or limits, or does not otherwise represent a risk to human health or the environment) will be left in place or disposed of along with other like excavated materials.

7) Excavated material and/or containerized water that is determined to be contaminated and requires removal will be profiled by LAI on behalf of the City for appropriate disposal at an appropriate waste disposal/treatment facility.

8) Once an appropriate disposal method is determined and the waste profile is accepted by the selected waste disposal/treatment facility, the soil, groundwater, or stormwater can be transported to the selected facility for treatment or disposal under appropriate waste hauling bill of lading or manifest. The facility will be notified in advance of the approximate quantity and type of material being transported. All disposal facilities should provide the City with the appropriate paperwork to document the quantity and type of material received and the disposal method.

9) Once the contaminated material is removed, confirmation samples will be collected, if requested by the City or Ecology, from the previously affected area by an LAI representative to document the soil quality at the limits of the contaminated material excavation.

10) The City will notify the contractor when work can resume in the previously affected area.

6.0 MATERIAL SCREENING AND CHARACTERIZATION

This section describes the procedures that may be used by environmental professionals to field-screen and characterize potentially contaminated materials at the Site.

6.1 Field Screening of Potentially Contaminated Materials

The following field-screening methods may be used by the environmental professional to evaluate potentially contaminated materials:

- Petroleum sheen testing
- Chemical vapor screening with a photoionization detector (PID) or similar equipment
- Comparison of material to previously contaminated materials encountered at the Site, as listed in Section 2.0.

Sheen testing can be conducted on material that exhibits evidence of petroleum hydrocarbon contamination, if encountered. The sheen test is conducted by placing a representative sample of the soil in a clear glass jar with tap water. The jar will be agitated and amount of sheen (light, medium, or heavy) will be observed and recorded. The judgment of the environmental professional will be used to determine if suspect soil is likely contaminated with petroleum hydrocarbons based on sheen testing. Materials exhibiting petroleum sheen will be considered contaminated, unless laboratory testing demonstrates otherwise.

If needed, screening with the PID can be conducted on materials exhibiting a petroleum or chemical odor to determine if VOCs are present. Field screening with a PID is conducted by placing a representative sample of the soil in a sealed plastic bag. The bag and soil will be agitated, allowed to stand for 5 minutes, and then a headspace reading will be taken of vapor in the bag using the PID. A sustained reading above background or ambient conditions will be used as a general indication of potential VOC contamination. The PID will be calibrated on a daily basis using a standard of 100 parts per million (ppm) of isobutylene. The PID will be equipped with a 10.6 electron volt (eV) lamp, which is capable of detecting most common aromatic and aliphatic hydrocarbon compounds. Other field screening equipment, such as explosive gas meters or dust meters will be used as appropriate depending on the observed nature of the contaminant and/or other field screening results.

Areas of known or potential metals-contaminated soil are also present on the Mill Site area (see Figure C-3); these areas may not have any physically observable evidence of contamination and may require special screening techniques, such as field test kits, or sampling and laboratory analysis. Where identified and delineated by the Mill Site RI or as otherwise applicable, this type of screening/sampling during construction will be performed by LAI.

Suspect material screening may be conducted in the area of possible unidentified contamination and used to assist in delineating the extent of contamination to the planned limits of the excavations and to inform stockpiling decisions. Should previously unidentified contaminated material be excavated and stockpiled, the screening will generally be conducted for approximately every 20 loose cubic yards of excavated material from the area. The frequency of field screening may be more or less, as needed, depending on the conditions encountered and whether there are varying material types and levels of impact. Field-screening results will be recorded in a field report.

6.2 Potentially Contaminated Material Characterization

After appropriate identification procedures have been performed as identified above, newly discovered contaminated material should be stockpiled separately from other excavated materials (i.e. MSW, wood debris, and soil) to reduce the potential for cross-contamination. Samples will be collected, as necessary, by the environmental professional to further evaluate and characterize whether potentially contaminated materials oil and/or water, as identified during field screening, should be classified as contaminated and, if contaminated, to profile and determine appropriate disposition of the contaminated material. Sampling will be conducted in accordance with the SAP.

Characterization samples will be tested consistent with the type of potential contamination recognized in the field (e.g., motor oil-range hydrocarbons, paint thinners). The testing protocol will be consistent with the requirements of the destination waste disposal/treatment facility. Samples of potential ACM will be collected only by individuals certified as Asbestos Hazard Emergency Response Act (AHERA) Building Inspectors.

Sample analytical results will be compared with appropriate regulatory criteria to determine whether a material is contaminated and/or requires special handling and disposal.

6.3 Management of Contaminated or Potentially Contaminated Materials

This section provides information about how excavated soil, MSW, and wood debris can be handled by the construction contractor. Guidelines and general information about the handling of excavated soil, MSW, and wood debris are provided in this section.

6.3.1 Plan for Instructing Workers

Excavation supervisors and workers should be provided with training and other information from this EMMP about the nature of hazardous substances in the soil they are excavating and how to identify suspect soil (Section 3.0). These personnel should be provided with the authority to stop excavation operations and request direction and assistance in evaluating materials that appear to be contaminated.

6.3.2 Excavation

Excavation should be conducted with the appropriate hydraulic excavating equipment. A smooth-edged bucket should be used when excavating potentially contaminated materials, as applicable. Based on field measurements in areas where methane is known or likely to be present in MSW and/or wood debris, the excavation may need to be ventilated with fans to prevent a potential accumulation of methane above its lower explosive limit of 5 percent by volume.

Suspect or positively identified ACM should not be disturbed and should be covered in place, immediately upon discovery, with plastic sheeting to prevent a potential fiber release. The material should then be properly contained and disposed as soon as possible by appropriately trained and certified asbestos-mitigation professionals.

6.3.3 Stockpiling

Excavated soil, MSW, and wood debris may be segregated for waste characterization as needed prior to hauling to appropriate disposal facilities. Stockpiled materials that have been determined to be contaminated through field screening or testing should be placed on minimum 10-millimeter (mm) plastic sheeting and bermed around the edges with sand bags or hay bales to prevent run-on and run-off of stormwater. The stockpiles should also be covered with minimum 6-mm plastic sheeting when not being actively worked or loaded. The cover plastic can be weighted or secured by appropriate means and seams sealed to prevent tearing or removal by weather. The environmental professional may need access to stockpiles for sampling or other activities. An inventory of stockpiled materials should be kept by the contractor. Soil in stockpiles will be removed and disposed of or reused based on the results of analytical testing as appropriate. Contaminated soil in stockpiles should be removed from the Site within 90 days of placement.

6.3.4 Waste Characterization

Previous waste characterization sampling for conducted using the toxicity characteristic leaching procedure (TCLP) for metals and VOCs did not indicate that the MSW would be considered a Dangerous Waste under Washington Administrative Code (WAC) 173-303. However, soil/excavated materials containing contaminant concentrations above regulatory limits or exhibiting evidence of contamination, and stockpiled or other potentially contaminated material from anywhere in the Site, may need to be sampled for waste characterization analysis in accordance with applicable regulations, procedures identified in the SAP, and the individual disposal facility acceptance criteria (if different from the SAP) prior to transport and disposal.

6.3.5 Loading

Excavated material will generally be directly loaded into trucks for transport to export destination sites to the extent possible. The moisture and consistency of soil should be monitored to ensure that the loaded soils are in a condition suitable to prevent spills during transit to stockpile locations or other destination areas.

6.3.6 Transport

Excavated material transport to offsite locations should be monitored to ensure that the cargo is fully contained, covered, and protected in transit, in compliance with local, state, and federal transportation requirements. In general, truck and trailer combinations are suitable for this type of hauling operation.

6.3.7 Disposal Facilities

Profiling, manifesting, and testing requirements are generally similar for all solid waste disposal facilities. Sufficient generator information and representative sample analytical data are needed to properly characterize the material. Each facility's permit has site-specific restrictions on the types of waste that can be accepted, which is addressed in the profiling process. Bills of lading are used to document non-dangerous waste disposal. Hazardous waste manifests are used to transport and document dangerous waste disposal.

7.0 NOTIFICATIONS AND REPORTING

If unanticipated environmental conditions are encountered during construction activities, the City should be notified by the contractor immediately; and the findings, resulting actions implemented, and remaining Site conditions documented for the project files, and for reporting to the applicable regulatory agencies, if warranted and required under local, state, and federal regulations.[2] The documentation may be prepared in focused technical memoranda, or other appropriate formats depending on the location of the affected area, the nature and extent of contamination, actions taken, and regulatory requirements.

Although not identified during previous Site investigation activities, if archaeological resources are discovered, work will be stopped immediately and Ecology, the Department of Archaeology and Historic Preservation (DAHP), the City, and the appropriate Tribes' Cultural Resources Department will be notified by the close of business on the day of discovery. A licensed archaeologist will inspect the Site and document the discovery, provide a professionally documented site form, and report to the above-listed parties. In the event of an inadvertent discovery of human remains, work will be immediately halted in the discovery area, the remains will be covered and secured against further disturbance, and the Yakima Police Department and Yakima County Medical Examiner will be immediately contacted, along with the DAHP Physical Anthropologist and authorized Tribal representatives. A treatment plan by a licensed archaeologist would then be developed in consultation with the above-listed parties consistent with Revised Code of Washington (RCW) 27.44 and RCW 27.53 and implemented according to Chapter 25-48 WAC.

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[2] See spill reporting requirements in Washington: https://ecology.wa.gov/About-us/Get-involved/Report-an-environmental-issue/Report-a-spill.

8.0 USE OF THIS PLAN

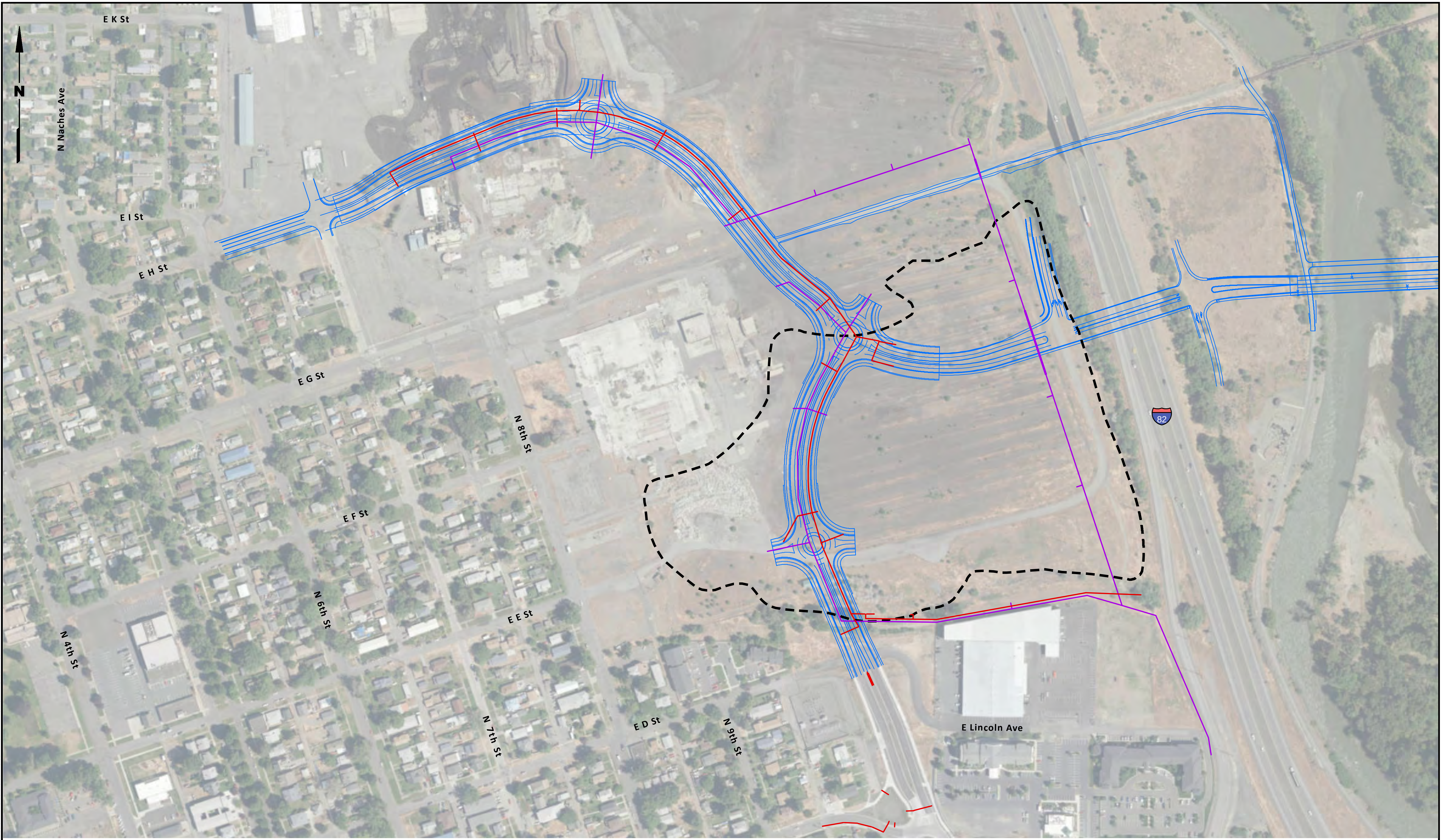
This Excavated Materials Management Plan has been prepared for the exclusive use of the City of Yakima for specific application to the Former Yakima Landfill Site roadway corridor project. Reliance on this report by third parties, or others who do not have a contractual relationship with the City or LAI on this project is at their sole risk. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by LAI, shall be at the user's sole risk. LAI warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

Data Source: Esri 2012

G:\Projects\1148\009\010\014\AWP\FC-1 Vicinity Map.mxd 2/6/2019

Landau Associates

Closed City of Yakima Landfill Site Yakima, Washington	**Vicinity Map**	Figure C-1



Legend

Sanitary Sewer Line

Storm Sewer Line

Approximate Extents of Municipal Solid Waste

Notes

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 300 600

Scale in Feet

Data Source: HLA Engineering and Land Surveying, Inc; Lochner Engineering; Esri World Imagery.

Landau Associates

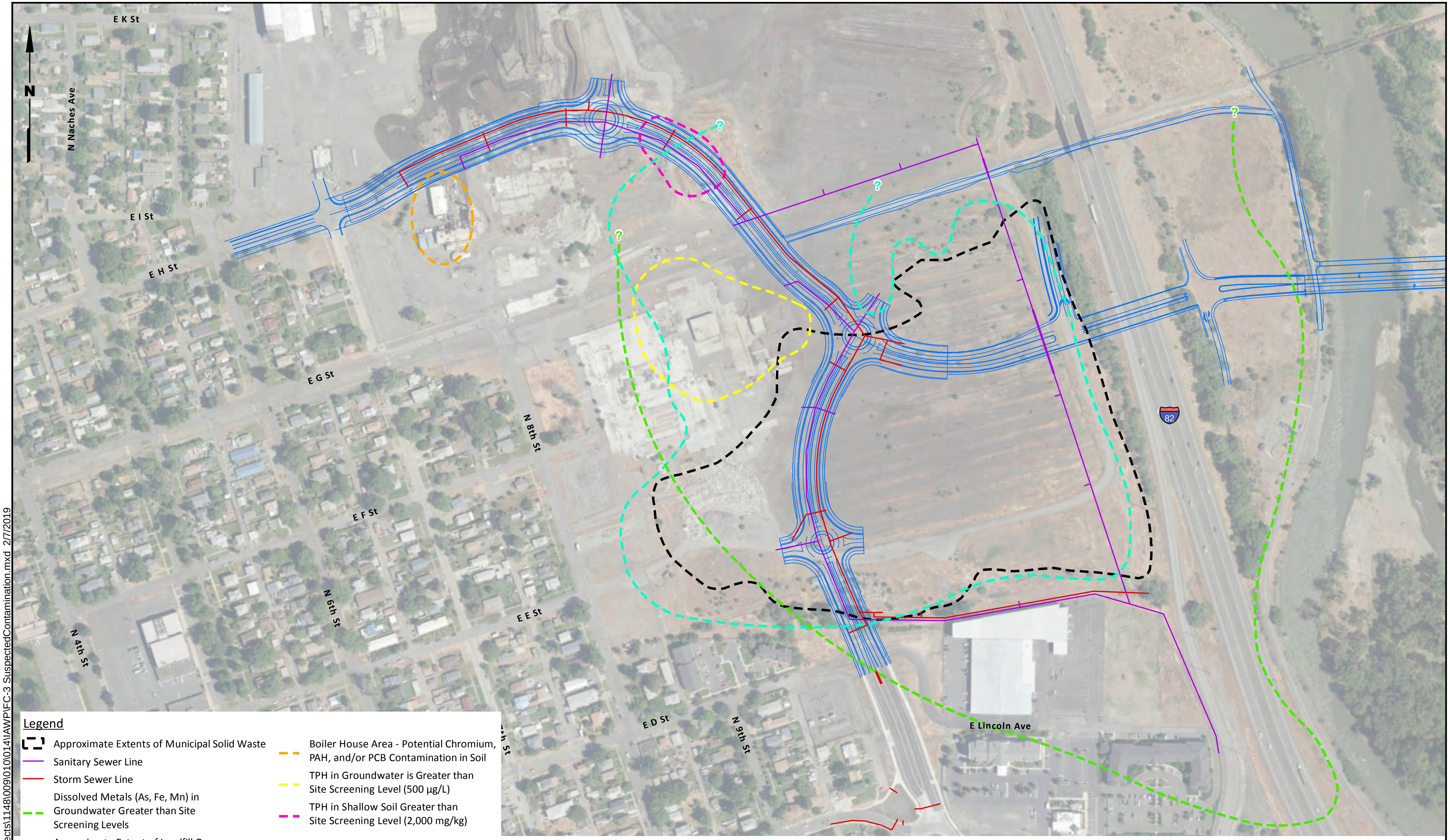
Closed City of Yakima
Landfill Site
Yakima, Washington

Site Plan and Proposed Roadway Alignment

Figure
C-2

G:\Projects\1148\009\010\014\IAWP\FC-2 SitePlan.mxd 2/7/2019

G:\Projects\1148\009\010\014\IAWP\FC-3 SuspectedContamination.mxd 2/7/2019



Legend

⌐¬	Approximate Extents of Municipal Solid Waste
—	Sanitary Sewer Line
—	Storm Sewer Line
- -	Dissolved Metals (As, Fe, Mn) in Groundwater Greater than Site Screening Levels
- -	Approximate Extent of Landfill Gas (Methane >5% by volume)
- -	Boiler House Area - Potential Chromium, PAH, and/or PCB Contamination in Soil
- -	TPH in Groundwater is Greater than Site Screening Level (500 µg/L)
- -	TPH in Shallow Soil Greater than Site Screening Level (2,000 mg/kg)

0 300 600

Scale in Feet

Notes

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Data Source: HLA Engineering and Land Surveying, Inc; Lochner Engineering; Esri World Imagery.

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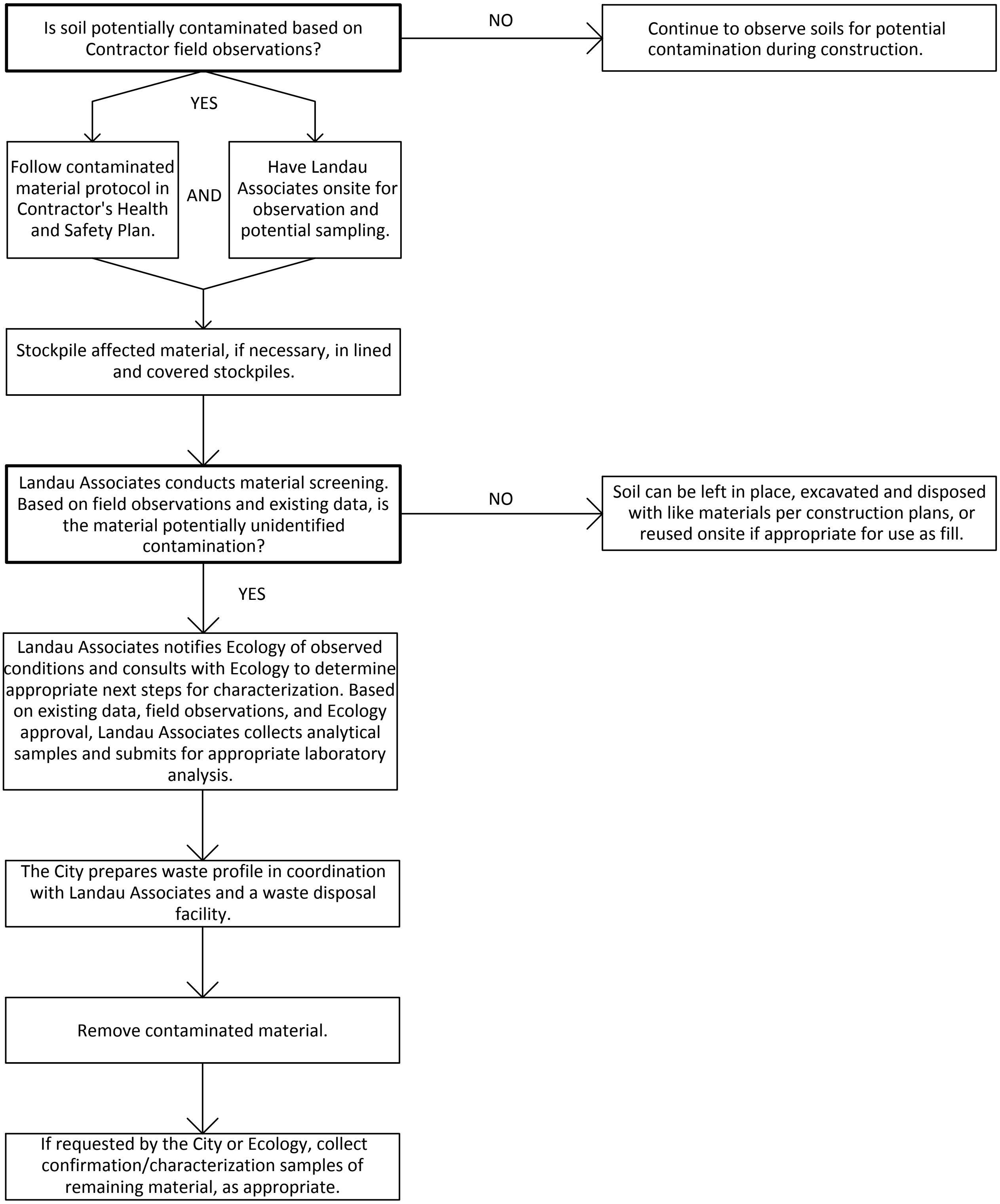
Closed City of Yakima
Landfill Site
Yakima, Washington

Approximate Areas of Known or Suspected Contamination

Figure
C-3



Landau Associates | G:\Projects\1148\009\010\014\AWP\FC-4 SoilManagementFlowChart.dwg | 2/7/2019 7:25 AM

LANDAU ASSOCIATES

Closed City of Yakima
Landfill Site
Yakima, Washington

Soil Management Decision Logic Flow Chart

Figure
C-4

APPENDIX D

Sampling and Analysis Plan

Sampling and Analysis Plan (Revision 1)
Roadway Project
Closed City of Yakima Landfill Site
Yakima, Washington

July 29, 2019

Prepared for

City of Yakima

LANDAU ASSOCIATES

130 2nd Avenue South
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Sampling and Analysis Plan (Revision 1)
Roadway Project
Closed City of Yakima Landfill Site
Yakima, Washington

This document was prepared by, or under the direct supervision of, the technical professionals noted below.

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Senior Engineer

Document reviewed by: ______________________________ Piper Roelen, PE
Principal; Project Manager

Date:	July 29, 2019
Project No.:	1148009.010
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Project Coordinator:	LJL

LANDAU ASSOCIATES

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TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

ACM	asbestos-containing material
AHERA	Asbestos Hazard Emergency Response Act
ASTM	ASTM International
BTU	British thermal unit
City	City of Yakima
CSV	comma-separated value
DAHP	Department of Archaeology and Historic Preservation
Ecology	Washington State Department of Ecology
EPA	US Environmental Protection Agency
IAWP	Interim Action Work Plan
LAI	Landau Associates, Inc.
lb	pound
LCS/LCSD	laboratory control sample/laboratory control sample duplicate
LFG	landfill gas
MS/MSD	matrix spike/matrix spike duplicate
MSW	municipal solid waste
NWTPH-Dx	Northwest total petroleum hydrocarbon diesel-range extended
NWTPH-Gx	Northwest total petroleum hydrocarbon gasoline-range extended
PCB	polychlorinated biphenyl
PQL	practical quantitation limit
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RI	Remedial Investigation
RPD	relative percent difference
SAP	sampling and analysis plan
Landfill Site	closed City of Yakima Landfill Site
SVOC	semivolatile organic compound
TAT	turnaround times
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbon
VOC	volatile organic compound
WAC	Washington Administrative Code

1.0 INTRODUCTION

This sampling and analysis plan (SAP) describes the procedures for conducting performance and confirmation sampling field activities during and following construction of the roadway corridor at the closed City of Yakima (City) Landfill Site (Landfill Site), located at the southern end of the former Boise Cascade Sawmill and Plywood Facility. The roadway corridor alignment also crosses the southern end of the Boise Cascade Mill Site (Mill Site). The sections of the roadway corridor that cross both the Landfill Site and the Mill Site are collectively referred to as the "Site" in this document This SAP is an appendix to the Interim Action Work Plan (IAWP; Landau Associates, Inc. [LAI] 2018) and is intended to be used in conjunction with the complete IAWP report and other attachments, not as a standalone document.

The primary objective of this SAP is to provide sampling and analysis procedures and methodologies consistent with accepted procedures such that the data collected will be adequate and representative for use in:

- Characterizing for disposal soil, wood debris, and municipal solid waste (MSW) excavated for construction of the roadway alignment;
- Conducting landfill gas (LFG) monitoring and sampling to confirm the effectiveness of the LFG mitigation system; and
- Confirming that stormwater and groundwater accumulating in the excavation that is removed for discharge meets the permitted discharge criteria.

This SAP was prepared consistent with the requirements of Washington Administrative Code (WAC) 173-340-820. It provides field, sampling, and analytical procedures to be used during roadway construction, as needed.

Although not identified during previous Site investigation activities, if archaeological resources are discovered, work will be stopped immediately and the Washington State Department of Ecology (Ecology), the Department of Archaeology and Historic Preservation (DAHP), the City, and the appropriate Tribes' Cultural Resources Department will be notified by the close of business on the day of discovery. A licensed archaeologist will inspect the Site and document the discovery, provide a professionally documented site form, and report to the above-listed parties. In the event of an inadvertent discovery of human remains, work will be immediately halted in the discovery area, the remains will be covered and secured against further disturbance, and the Yakima Police Department and Yakima County Medical Examiner will be immediately contacted, along with the DAHP Physical Anthropologist and authorized Tribal representatives. A treatment plan by a licensed archaeologist would then be developed in consultation with the above-listed parties consistent with Revised Code of Washington (RCW) 27.44 and RCW 27.53 and implemented according to Chapter 25-48 WAC.

2.0 SAMPLING PROCEDURES

The following sections describe confirmation and performance monitoring procedures for construction of the roadway alignment. As detailed in Sections 6.1.2 and 6.1.3 of the IAWP, performance monitoring will consist of collection and analysis of samples of stockpiled soil, wood debris, and MSW excavated during construction for the purposes of characterization and/or identification of unanticipated contamination. Confirmation monitoring will consist of monitoring for LFG within soil vapor monitoring wells installed within the roadway prism, and may include air sampling within utility vaults associated with the roadway alignment. Field activities will be performed in accordance with a Site-specific health and safety plan.

2.1 Waste Characterization

Based on current construction design drawings, construction of the roadway alignment will include excavation and removal of all wood debris and MSW below the roadway to the depth of the underlying native material or to the depth required for utility installation, whichever is deeper. Soil overlying or intermingled with the MSW and wood debris will also be removed and disposed of as part of the construction activities. The different media (soil, wood debris, and MSW) may be segregated as needed for management and disposal. Materials may be stockpiled for characterization if unanticipated or unidentified contamination is discovered and/or as otherwise required by the receiving disposal or recycling facilities.

Waste characterization sample analysis results for waste materials that will be disposed offsite will be will be compared against applicable disposal facility acceptance criteria and applicable solid and state/federal dangerous/hazardous waste regulatory criteria to determine applicable waste management and disposal requirements. Where waste materials or potentially contaminated soil are to remain onsite (e.g., at the edge of the roadway excavation limits), characterization results will be compared against applicable Site screening levels, or other applicable Model Toxic Control Act and state and federal requirements. Table 1 includes screening levels and associated practical quantitation limits (PQLs) for contaminants of concern at the Landfill Site that were developed for the Landfill Site remedial investigation (RI). The Mill Site RI Work Plan (Barr/Fulcrum 2019; Exhibit B Table 2 - Quality Assurance Project Plan) provides soil screening criteria and PQLs for contaminants of concern at the Mill Site. Note that these screening levels are preliminary values established for these sites and may not be representative of final approved cleanup levels for the sites.

2.1.1 Stockpile Characterization Sampling

Characterization of stockpile samples to determine appropriate management and disposition requirements will consist of three-point composite samples collected from locations within the pile that are representative of the stockpiled material. Samples will be collected using hand auguring techniques, and will consist of material from within the interior of the stockpile. A description of the material characteristics will be recorded. Logs and other large pieces of wood debris will be separated out from the stockpile and will not be sampled unless field observations indicate the potential presence of wood preservatives (e.g., creosote or pentachlorophenol).

At each composite sub-sample location, a discrete material sample will be collected from the interior of the stockpile. Larger-sized material (gravel/wood/debris greater than approximately ¼- to ½-inch diameter) will be removed by hand sorting and the samples placed in the appropriate laboratory-supplied containers. Material for samples to be analyzed for non-volatile constituents will be placed in a decontaminated stainless steel bowl, composited, and homogenized.

The stockpile samples will be labeled using the following format:

“stockpile number-material (i.e. wood, soil, or MSW)-date (mmddyyyy)”

For example, a sample of MSW taken from stockpile 2 on September 26, 2018 will be labeled “SP2-MSW-09262018”.

The number of composite samples to be collected from a stockpile for characterization purposes is dependent on the size of the stockpile. Field personnel will map the stockpile and record measurements. The table below will be used as a guide to determine sampling frequency.

Cubic Yards	Number of Composite Samples1)
0–100	3
101–500	5
501–1,000	7
1,001–2,000	10
>2,000	10, plus 1 for each additional 500 cubic yards

1) Each composite sample will consist of material collected from three discrete locations within the stockpile.

2.1.2 Excavation Sidewall Sample Collection Procedures

Where contaminant characterization/delineation or confirmation samples need to be taken from within the excavation limits, soil/MSW/wood debris samples will be collected from the base or sidewalls of the roadway excavation at selected locations within the affected area or at the limits of removed material. A shallow hole will be hand-dug at each sample location using decontaminated hand implements, including stainless steel spoons and steel shovels, picks, and similar equipment. The sidewall surface of the hand-dug hole will be scraped to expose a fresh surface for sample collection. Soil will be collected using a decontaminated stainless steel spoon, placed in a decontaminated stainless steel bowl, homogenized, and transferred to the appropriate sample containers. Material larger than approximately ¼ inch will be removed from the sample prior to placing the soil in the sample container. Soil testing for possible volatile organic compound (VOC) or total petroleum hydrocarbon (TPH) contamination will not be homogenized, but rather sampled using US

Environmental Protection Agency (EPA) Method 5035 and placed directly into laboratory-provided vials with appropriate preservatives.

The samples will be labeled using the following format:

> “Approximate stationing/coordinates/location-material (i.e. wood, soil, or MSW)-date (mmddyyyy)”

For example, a sample of soil collected from the western sidewall of the excavation at roadway corridor station 305+25 on September 26, 2018 will be labeled “STA305+25-WSIDEWALL-SOIL-09262018”.

2.1.3 Potential Asbestos Sample Collection Procedures

If necessary, samples of potential asbestos containing material (ACM) will be collected only by individuals certified as Asbestos Hazard Emergency Response Act (AHERA) Building Inspectors. The Building Inspectors will collect samples using a clean knife, chisel, or coring tool to penetrate all layers of the material. At least 1 teaspoon of the material will be collected for analysis and placed in a laboratory-provided bag labeled with the location and sample identification. Prior to sampling potentially friable materials, the Building Inspector will don an air purifying half-face respirator fitted with P-100 cartridges and wet the sampling area with distilled water.

The samples will be labeled using the following format:

> “Approximate stationing/coordinates/location-PACM
> (to connote that the sample is potential ACM)-date (mmddyyyy)”

For example, a sample of material collected from the western sidewall of the excavation at roadway corridor station 305+25 on September 26, 2018 will be labeled “STA305+25-WSIDEWALL-PACM-09262018”.

2.1.4 Water Sample Collection Procedures

Representative water samples will be collected, as needed, to characterize potentially contaminated water encountered during construction activities (e.g., stormwater or surface water runoff within an excavation, groundwater collected from excavations/trenches or from monitoring wells, dewatering fluids). Water samples will be collected into the appropriate laboratory-supplied sample containers directly, using a disposable bailer, or using peristaltic pump and disposable polyethylene tubing, as appropriate. Samples from a dewatering fluids treatment system will be collected from a sample port downstream of the final treatment vessel. Samples collected directly from the excavation for metals analyses will be field-filtered using an in-line 0.45 micron filter, and samples collected for TPH or semivolatile organic compound (SVOC) analysis will be centrifuged at the laboratory prior to testing. Samples collected from a dewatering treatment system will not require filtration.

2.1.5 Waste Laboratory Analysis

If needed, stockpile and other waste characterization samples will be sent to a laboratory for analysis of constituents typically required by waste disposal facilities and for analytes detected in samples collected from locations near the roadway during previous investigations, where available. Wood debris will generally not be analyzed for waste characterization except if necessary for acceptance by a recycling or disposal facility, when intermingled with soil and/or MSW, and/or if field observations indicate the presence of wood preservatives (i.e. creosote) or impacts of other contaminants (e.g., petroleum product).

Each waste characterization sample will be analyzed for the following:

- Toxicity characteristic leaching procedure (TCLP) Resource Conservation and Recovery Act (RCRA) 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) by EPA Method 6010C/7470A.

Samples displaying indications of contamination based on visual or olfactory field observations and/or samples collected from material excavated from areas previously sampled and identified as being contaminated may be analyzed for one or more of the following, depending on field screening (see Sections 3.1 and 6.1 of IAWP Appendix C [Excavated Materials Management Plan]) results:

- Northwest total petroleum hydrocarbon (NWTPH) diesel-range extended (Dx) method;
- NWTPH gasoline-range extended (Gx) method;
- VOCs by EPA Method 8269;
- SVOCs by EPA Method 8270;
- Pesticides/herbicides by EPA Method 8081;
- Polychlorinated biphenyls (PCBs) by EPA Method 8082;
- Asbestos by polarized light microscopy with dispersion staining by EPA Method 600/R-93/116.

Samples found to contain oil-range petroleum hydrocarbons through the NWTPH-Dx analysis will also be analyzed for:

- PCBs by EPA Method 8082.

Select wood debris samples may be analyzed for recycling or other beneficial reuse, such as for use as hog fuel using:

- High heat British thermal unit (BTU/pound [lb]) – Method ASTM International [ASTM] D2015.

The samples will typically be run on 5-day turnaround times (TATs) given sufficient lay-down area for the stockpiles. Faster TATs may be requested if the stockpile(s) removal needs to be expedited.

2.1.6 Stormwater/Groundwater/Dewatering Fluid Laboratory Analysis

If necessary, samples of stormwater, groundwater, or dewatering fluids collected from excavations, trenches, or dewatering systems and/or from the treatment system will be analyzed for constituents specified by the appropriate permit, which is likely to include, but may not be limited to:

- Diesel- and oil-range petroleum hydrocarbons by NWTPH-Dx;
- Gasoline-range extended petroleum hydrocarbons NWTPH-Gx;
- VOCs by EPA Method 8269.

Ecology may also have specific sampling and analysis requirements for groundwater if evidence of a release (e.g., sheet/liquid-phase product in groundwater) is discovered. Additional sampling may also be necessary if stormwater or groundwater is suspected of being contaminated (see Section 4.0 of IAWP Appendix C [Excavated Materials Management Plan]).

2.2 Landfill Gas Monitoring/Sampling

Confirmation sampling will include collecting monitoring data using field instruments from LFG monitoring wells, and potentially in utility vaults, installed within the roadway alignment.

2.2.1 Landfill Gas Measurements

LFG measurements from soil vapor monitoring wells (and possibly utility vaults) installed within the roadway right-of-way will be collected during conditions of falling barometric pressure. Prior to collecting the LFG measurements from a well, field personnel will purge a minimum of 10 casing volumes of soil vapor from the probe using a Landtec GEM 5000 (or similar) LFG analyzer. During well purging, LFG drawn from the well casings will be analyzed for methane, oxygen, carbon dioxide, and balance gases to evaluate for potential migration of LFG into the roadway prism from LFG and/or wood debris remaining outside the limits of excavation. Field personnel will record readings at the time when gas concentrations demonstrate stability after 10 casing volumes are purged. This survey of LFG conditions will occur at each of the newly installed LFG monitoring wells.

The accuracy of the LFG field analyzer will be checked daily and the unit will be calibrated, as necessary. If the readings are outside of the manufacturer’s recommendations, the unit will be calibrated in the field in accordance with the manufacturer’s recommended procedures.

2.2.2 Landfill Gas Sampling

In addition to the data collected using the portable LFG analyzer, samples of LFG will be collected from LFG monitoring wells during sampling events to be conducted one and three months following completion of roadway construction (and potentially as required by Ecology, thereafter, as part of a long-term monitoring plan for the Site associated with a final cleanup action plan). The samples will be collected into certified-clean 6-liter stainless-steel Silonite canisters. The samples will be collected over an 8-hour period using a flow-control valve to prevent overdraw. The duration of sampling will help to capture temporal variability in discharge rates.

The samples will be submitted to an accredited laboratory for analysis of VOCs by EPA Compendium Method TO-15.

3.0 QUALITY ASSURANCE AND QUALITY CONTROL

This section describes the quality assurance/quality control (QA/QC) procedures in support of roadway construction. This section describes the project team organization and responsibilities, the quality assurance objectives, laboratory analytical methods, QA/QC requirements and corrective actions for this project.

3.1 Project Team Organization and Responsibilities

The project team organizational structure was developed based on the requirements of the field and laboratory activities. The key positions/contractors and associated responsibilities are described below.

- Consultant Project Manager (LAI): Responsible for implementation of all aspects of the project plans. Specific responsibilities include overseeing that all technical procedures are followed, reporting of deviations from the project plans to the City, and overseeing that data collected will satisfy the quality assurance objectives.
- Analytical Laboratory: Responsible for providing sample bottles, performing chemical analyses per the SAP, and reporting of data as required by the SAP.
- Field Sampling Personnel (LAI): Responsible for implementing sampling procedures as specified in the project plans, and notifying the consultant project manager of any deviations from the project plans.

3.2 Quality Assurance Objectives

The QA objectives for this project are to develop and implement procedures that will ensure collection of representative data of known, acceptable, and defensible quality. The data quality parameters used to assess the acceptability of the data are representativeness, comparability, precision, accuracy, bias, and completeness, as described below.

- Representativeness expresses the degree to which data accurately and precisely represent an actual condition or characteristic of a population. Representativeness can be achieved by selecting appropriate sampling locations and by using appropriate sampling methods.
- Comparability expresses the confidence with which one data set can be evaluated in relation to another data set. For this work, comparability of data will be established through the use of standard analytical methodologies with analytical limits of quantitation that can meet screening-level criteria to the extent practicable and by using standard reporting formats.
- Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average values. Analytical precision is measured through matrix spike/matrix spike duplicate (MS/MSD) samples and/or through laboratory control sample/laboratory control sample duplicate (LCS/LCSD) samples for organic analysis and through laboratory duplicate samples for inorganic analyses. The quantitative relative percent difference (RPD) for laboratory duplicates, MS/MSD, and field duplicates will be used to assess sampling and analytical precision.

- Accuracy is an expression of the degree to which a measured or computed value represents the true value. Field accuracy is controlled by adherence to sample collection procedures as outlined in this SAP.
- Bias is the systematic or persistent distortion of a measured process that causes errors in one direction. Bias of the laboratory results will be evaluated based on analysis of method blanks and matrix spike samples.
- Completeness is a measure of the proportion of data obtained from a task sampling plan that is determined to be valid. It is calculated as the number of valid data points divided by the total number of data points requested.

3.3 Field and Laboratory Quality Control Procedures

Field and analytical laboratory quality control samples will be collected to evaluate data precision, accuracy, representativeness, completeness, bias, and comparability of the analytical results for the site characterization. The quality control samples and the frequency at which they will be collected and/or analyzed are described below.

3.3.1 Blind Field Duplicates

A blind field duplicate will be collected at a frequency of at least 1 per 20 waste characterization samples per chemical analysis, and not less than one field duplicate. The blind field duplicate will consist of a split sample collected at a single sample location, after homogenization of the sample; blind field duplicates for volatiles samples (if collected) will not be homogenized. Blind field duplicate results will be used to evaluate data precision. Acceptance criteria for blind field duplicate samples are 35 percent RPD for soil.

3.3.2 Field Trip Blanks

A laboratory-supplied trip blank will be analyzed for volatile analyses (if needed) to evaluate whether cross-contamination between samples occurs during sample transport. The trip blank will be stored with all volatile sample containers throughout the field investigation until samples are delivered to the laboratory.

3.3.3 Laboratory Matrix Spike/Matrix Spike Duplicate

A minimum of one laboratory MS/MSD sample will be analyzed per 20 samples, or one MS/MSD sample per batch of samples if fewer than 20 samples will be analyzed. These analyses will be performed to provide information on accuracy and to verify that extraction and concentration levels are acceptable. The laboratory spikes will follow EPA guidance for MS and MSD samples.

3.3.4 Laboratory Duplicates

A minimum of one laboratory duplicate sample per 20 samples, or one laboratory duplicate sample per batch of samples if fewer than 20 samples are contained in a batch, will be analyzed. These analyses will be performed to provide information on the precision of chemical analyses. The laboratory duplicates will follow EPA guidance in the analytical method.

3.3.5 Laboratory Method Blanks

A minimum of one laboratory method blank per 20 samples, one every 12 hours, or one per batch of samples analyzed (if fewer than 20 samples are contained in a batch) will be analyzed for all parameters to assess possible laboratory contamination. Method blanks will contain all reagents used for analysis. The generation and analysis of additional method, reagent, and glassware blanks may be necessary to verify that laboratory procedures do not contaminate samples.

3.3.6 Laboratory Control Sample

A minimum of one LCS per 20 samples, or one LCS per sample batch if fewer than 20 samples are contained in a batch, will be analyzed for all parameters.

3.3.7 Surrogate Spikes

All project samples analyzed for organic compounds will be spiked with appropriate surrogate compounds as defined by the analytical methods.

3.4 Laboratory Quality Assurance/Quality Control

QA/QC for chemical testing includes laboratory instrument and analytical method QA/QC. Instrument QA/QC monitors the performance of the instrument and method QA/QC monitors the performance of sample prepar9ation procedures. The analytical laboratory will be responsible for instrument and method QA/QC.

When an instrument or method control limit is exceeded, the laboratory will contact the project manager immediately. The laboratory will be responsible for correcting the problem and will reanalyze the samples within the sample holding time if sample reanalysis is appropriate.

3.5 Corrective Actions

Corrective actions will be needed for two categories of nonconformance:

- Deviations from the methods or QA requirements established in this document
- Equipment or analytical malfunctions.

Corrective action procedures to be implemented based on detection of unacceptable data are developed on a case-by-case basis. Such actions may include one or more of the following:

- Altering procedures in the field or laboratory
- Using a different batch of sample containers
- Performing an audit of field or laboratory procedures
- Reanalyzing samples (if holding times allow)
- Resampling and analyzing
- Evaluating sampling and analytical procedures to determine possible causes of the discrepancies

- Accepting the data without action, acknowledging the level of uncertainty
- Rejecting the data as unusable.

During field operations and sampling procedures, the field personnel will be responsible for conducting and reporting required corrective actions. A description of any action taken will be entered in the daily field notebook. The project manager will be consulted immediately if field conditions are such that conformance with this SAP is not possible.

During laboratory analysis, the laboratory QA officer will be responsible for taking required corrective actions in response to equipment malfunctions. If an analysis does not meet the data quality objectives outlined, corrective action will follow the guidelines in the noted EPA analytical methods and the EPA guidelines for data validation for organics and inorganics analyses (EPA 1999, 2004). At a minimum, the laboratory will be responsible for monitoring the following:

- Calibration check compounds must be within performance criteria specified in the EPA method or corrective action must be taken prior to initiation of sample analysis. No analyses may be performed until these criteria are met.
- Before processing any samples, the analyst should demonstrate, through analysis of a reagent blank, that interferences from the analytical system, glassware, and reagents are within acceptable limits. Each time a set of samples is extracted or there is a change in reagents, a reagent blank should be processed as a safeguard against chronic laboratory contamination. The blank samples should be carried through all stages of the sample preparation and measurement steps.
- Method blanks should, in general, be below instrument detection limits. If contaminants are present, then the source of contamination must be investigated, corrective action taken and documented, and all samples associated with a contaminated blank reanalyzed. If, upon reanalysis, blanks do not meet these requirements, LAI will be notified immediately to discuss whether analyses may proceed.
- Surrogate spike analysis must be within the specified range for recovery limits for each analytical method used or corrective action must be taken and documented. Corrective action includes: 1) reviewing calculations, 2) checking surrogate solutions, 3) checking internal standards, and 4) checking instrument performance. Subsequent action could include recalculating the data and/or reanalyzing the sample if any of the above-described checks reveal a problem. If the problem is determined to be caused by matrix interference, reanalysis may be waived if so directed following consultation with LAI. If the problem cannot be corrected through reanalysis, the laboratory will notify LAI prior to data submittal so that additional corrective action can be taken, if appropriate.
- If the recovery of a surrogate compound in the method blank is outside the recovery limits, the blank will be reanalyzed along with all samples associated with that blank. If the surrogate recovery is still outside the limits, LAI will be notified immediately to discuss whether analyses may proceed.
- If quantitation limits or matrix spike control limits cannot be met for a sample, LAI will be notified immediately to discuss the corrective action required.

- If holding times are exceeded, all positive and undetected results may need to be qualified as estimated concentrations. If holding times are grossly exceeded, LAI may determine the data to be unusable.

If analytical conditions are such that nonconformance is indicated, LAI will be notified as soon as possible so that any additional corrective actions can be taken. The laboratory project manager will then document the corrective action by a memorandum submitted to LAI. A narrative describing the anomaly; the steps taken to identify and correct the anomaly; and any recalculation, reanalyses, or re-extractions will be submitted with the data package in the form of a cover letter.

3.6 Data Verification and Validation

All site characterization data will be verified and validated to determine whether the results are acceptable and meet the quality objectives. Prior to submitting a laboratory report, the laboratory will verify that all the data are consistent, correct, and complete, with no errors or omissions.

Validation of the data will be performed by LAI following the guidelines in the appropriate sections of the EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review (EPA 1999, 2004) and will include evaluations of the following:

- Chain-of-custody records
- Holding times
- Laboratory method blanks
- Surrogate recoveries
- Laboratory MS/MSD
- Blank spikes/LCS
- Laboratory duplicates
- Corrective action records
- Completeness
- Overall assessment of data quality.

In the event that a portion of the data is outside the data quality objective limits or the EPA guidance (EPA 1999, 2004), or sample collection and/or documentation practices are deficient, corrective action(s) will be initiated. Corrective action will be determined by the field coordinator and LAI's QA officer in consultation with the LAI project/task manager and may include any of the following:

- Rejection of the data and resampling
- Qualification of the data
- Modified field and/or laboratory procedures.

Data qualification arising from data validation activities will be described in the data validation report, rather than in individual corrective action reports.

3.7 Data Management Procedures

All laboratory analytical results, including QC data, will be submitted electronically to LAI. Electronic format will include a scanned PDF of the original laboratory data package and comma-separated value (CSV) files that will be downloaded directly to an Excel® spreadsheet and/or to the project database. The laboratory data package should include a case narrative along with analytical and quality control results. Following validation of the data, any qualifiers will be added to the Excel spreadsheets and project database. All survey data will be provided electronically in a format that can be downloaded into an Excel spreadsheet. All field data will be entered into an Excel spreadsheet and verified to determine all entered data are correct and without omissions and errors.

4.0 EQUIPMENT DECONTAMINATION

The decontamination procedures described below are to be used by field personnel to clean sampling and related field equipment. Deviation from these procedures will be documented in field records.

4.1 Sampling Equipment

Sampling equipment (e.g., stainless-steel bowls, stainless-steel spoons, hand-auger, etc.) will be cleaned using a three-step process, as follows:

1) Scrub surfaces of equipment that would be in contact with the sample with brushes using an Alconox solution.
2) Rinse and scrub equipment with clean tap water.
3) Rinse equipment a final time with deionized water to remove tap water impurities.

Decontamination of reusable sampling devices will occur between each sample collection.

4.2 Heavy Equipment

Excavation equipment should be “dry broomed” to remove the substantial accumulated debris on the excavation bucket between excavations. LFG probe equipment (e.g., the LFG probe rigs and drilling equipment that is used downhole, or that contacts material and equipment going downhole) will be cleansed by a hot water, high-pressure wash before each use and at completion of the project. Potable tap water will be used as the cleansing agent.

5.0 USE OF THIS PLAN

This sampling and analysis plan has been prepared for the exclusive use of the City of Yakima for specific application to the Former Yakima Landfill Site roadway corridor project. Reliance on this report by third parties, or others who do not have a contractual relationship with the City or LAI on this project is at their sole risk. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by LAI, shall be at the user's sole risk. LAI warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

6.0 REFERENCES

Barr/Fulcrum. 2019. Revised Final Remedial Investigation Work Plan, Yakima Mill Site (aka Boiese Cascade Mill Site). January.

EPA. 1999. USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. EPA 540/R-99/008. US Environmental Protection Agency. October.

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LAI. 2018. Draft: Interim Action Work Plan, Remedial Investigation, Closed City of Yakima Landfill Site, Yakima, Washington. Landau Associates, Inc. September 24.

Table 1
Soil Screening Levels
Closed City of Yakima Landfill Site

						ALS Global	
CAS Number	Chemical Name	Screening Level (mg/kg)	Method B Preliminary Soil Cleanup Level (mg/kg)	Background Soil Metals Concentations Statewide (mg/kg) 90 percentile value (a)	Method A Soil Unrestricted Land Use (mg/kg)	Reporting Limit (mg/kg)	Quantitation Limit (mg/kg)
PETROLEUM HYDROCARBONS							
	TPH, diesel-range organics	2,000	--	--	2,000	25	11.8
	TPH, heavy oils	2,000	--	--	2,000	50	22.9
	TPH, mineral oil	4,000	--	--	4,000	50	22.9
	TPH, gasoline-range organics, benzene present	30	--	--	30	3	1.46
	TPH, gasoline-range organics, no detectable benzene	100	--	--	100	3	1.46
METALS							
7440-38-2	arsenic	20	0.26	7.0	20	1	0.730
7440-39-3	barium	824 (b)	824	--	--	0.5	0.140
7440-43-9	cadmium	2.0	0.69	1.0	2.0	0.5	0.225
	calcium	--	--	--	--	50.0	22.4
7440-47-3	chromium (total)	see Cr III or Cr VI	1,000	42	see Cr III or Cr VI	0.5	0.37
16065-83-1	chromium(III)	2,000	120,000	--	2,000	0.5	0.37
18540-29-9	chromium(VI)	19	3.8	--	19	5	2.70
7439-89-6	iron	151 (b)	151	43,100	--	50	33.6
7439-92-1	lead	250	108	17	250	0.5	0.235
	magnesium	--	--	--	--	50	27.9
7439-96-5	manganese	11,000	11,000	1,100	--	0.5	0.290
7440-09-7	potassium	--	--	--	--	50	17.8
7782-49-2	selenium	400	0.52	--	--	5	3.21
7440-22-4	silver	400	0.054	--	--	0.5	0.230
7440-23-5	sodium	--	--	--	--	50	26
7439-97-6	mercury	2.0	0.11	0.070	2.0	0.02	0.00407
CONVENTIONALS							
	chloride	--	--	--	--	1.0	0.92
16984-48-8	fluoride	3,200	3,200	--	--	1	NA
14797-55-8	nitrate	130,000	130,000	--	--	3	NA
14797-65-0	nitrite	8,000	8,000	--	--	1	NA
	sulfate	--	--	--	--	2.0	2.0
7664-41-7	ammonia	--	--	--	--	0.5	0.5
	TOC	--	--	--	--	5	5
	pH	--	--	--	--	1	1

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CHLORINATED PESTICIDES							
319-84-6	hexachlorocyclohexane;alpha	0.16	0.0004	--	--	0.005	0.005
58-89-9	lindane (gamma-BHC)	0.010	0.001	--	0.010	0.005	0.005
319-85-7	hexachlorocyclohexane;beta-	0.56	0.0005	--	--	0.005	0.005
76-44-8	heptachlor	0.22	0.002	--	--	0.005	0.005
319-86-8	hexachlorocyclohexane;delta-	--	--	--	--	0.005	0.005
309-00-2	aldrin	0.059	0.010	--	--	0.005	0.005
1024-57-3	heptachlor epoxide	0.11	0.017	--	--	0.005	0.005
57-74-9	chlordane	2.9	0.21	--	--	0.1	0.1
115-29-7	endosulfan	0.005 (b)	0.003	--	--	0.005	0.005
72-55-9	dde (4,4'-DDE)	2.9	0.017	--	--	0.005	0.005
60-57-1	dieldrin	0.063	0.005	--	--	0.005	0.005
72-20-8	endrin	24	0.002	--	--	0.005	0.005
72-54-8	ddd (4,4'-DDD)	0.009 (b)	0.009	--	--	0.005	0.005
50-29-3	ddt (4,4'-DDT)	3.0	0.14	--	3.0	0.005	0.005
72-43-5	methoxychlor	400	0.048	--	--	0.005	0.005
8001-35-2	toxaphene	0.91	0.91	--	--	0.25	0.25
POLYCHLORINATED BIPHENYLS							
12674-11-2	aroclor 1016	5.6	0.011	--	--	0.01	0.01
11104-28-2	aroclor 1221	--	--	--	--	0.02	0.02
11141-16-5	aroclor 1232	--	--	--	--	0.01	0.01
53469-21-9	aroclor 1242	--	--	--	--	0.01	0.01
12672-29-6	aroclor 1248	--	--	--	--	0.01	0.01
11097-69-1	aroclor 1254	0.50	0.010	--	--	0.01	0.01
11096-82-5	aroclor 1260	0.50	0.23	--	--	0.01	0.01
	pcb mixtures	1.0	0.50	--	1.0	--	--

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VOLATILE ORGANIC COMPOUNDS							
75-71-8	dichlorodifluoromethane	16,000	20	--	--	0.01	0.0011
74-87-3	chloromethane	--	--	--	--	0.01	0.000665
75-01-4	vinyl chloride	0.0002 (b)	0.0002	--	--	0.01	0.0000286
74-83-9	bromomethane (methyl bromide)	110	0.052	--	--	0.01	0.000555
75-00-3	chloroethane	--	--	--	--	0.01	0.000665
56-23-5	carbon tetrachloride	14	0.002	--	--	0.01	0.000699
75-69-4	trichlorofluoromethane	24,000	34	--	--	0.01	0.000585
75-15-0	carbon disulfide	8,000	5.7	--	--	0.01	0.00068
67-64-1	acetone	72,000	29	--	--	0.05	0.00129
75-35-4	dichloroethene;1,1-	4,000	0.0004	--	--	0.01	0.0000297
75-09-2	methylene chloride (dichloromethane)	0.020	0.020	--	0.020	0.02	0.00138
107-13-1	acrylonitrile	1.9	0.0002	--	--	0.05	0.000713
1634-04-4	methyl tert-butyl ether (MTBE)	0.10	560	--	0.10	0.01	0.00069
156-60-5	dichloroethene;1,2-,trans	1,600	0.54	--	--	0.01	0.000661
75-34-3	dichloroethane;1,1-	180	0.042	--	--	0.01	0.000669
78-93-3	methyl ethyl ketone (2-butanone)	48,000	48,000	--	--	0.05	0.000979
156-59-2	dichloroethene;1,2-,cis	160	0.080	--	--	0.01	0.000721
110-54-3	hexane;n-	4,800	4,800	--	--	0.20	0.061800
594-20-7	dichloropropane;2,2-	--	--	--	--	0.01	0.000684
74-97-5	bromochloromethane	--	--	--	--	0.01	0.00119
67-66-3	chloroform	0.008 (b)	0.008	--	--	0.01	0.000685
71-55-6	trichloroethane;1,1,1-	2.0	1.6	--	2.0	0.01	0.000616
563-58-6	dichloropropene;1,1-	--	--	--	--	0.01	0.000616
107-06-2	dichloroethane;1,2-	11	0.002	--	--	0.01	0.0000175
71-43-2	benzene	0.030	0.007	--	0.030	0.005	0.0000222
79-01-6	trichloroethene (TCE)	0.030	0.017	--	0.030	0.01	0.0000478
78-87-5	dichloropropane;1,2-	28	0.003	--	--	0.01	0.000619
74-95-3	dibromomethane	--	--	--	--	0.01	0.000783
75-27-4	bromodichloromethane (dichlorobromomethane)	16	0.0004	--	--	0.01	0.000693

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542-75-6	dichloropropene; 1,3-, trans (1,3-dichloropropene)	10	0.002	--	--	0.01	0.000735
108-10-1	methyl isobutyl ketone (4-methyl-2-pentanone)	6,400	4.2	--	--	0.05	0.000682
108-88-3	toluene	7.0	4.7	--	7.0	0.01	0.000708
10061-01-5	dichloropropene;1,3-, cis	--	--	--	--	0.01	0.000714
79-00-5	trichloroethane;1,1,2-	18	0.003	--	--	0.01	0.000737
591-78-6	hexanone;2-	--	--	--	--	0.05	0.000475
142-28-9	dichloropropane;1,3-	--	--	--	--	0.01	0.000717
127-18-4	tetrachloroethene (PCE)	0.050	0.007	--	0.050	0.01	0.0000458
124-48-1	dibromochloromethane (chlorodibromomethane)	12	0.005	--	--	0.01	0.00106
106-93-4	dibromoethane; 1,2- (EDB)	0.005	0.0001	--	0.005	0.005	0.000023
108-90-7	chlorobenzene	1,600	0.87	--	--	0.01	0.000737
630-20-6	tetrachloroethane;1,1,1,2-	38	0.010	--	--	0.01	0.000573
100-41-4	ethylbenzene	6.0	0.60	--	6.0	0.01	0.000723
108-38-3	xylene;m-	16,000	14	--	--	0.02	0.0013
106-42-3	xylene;p-	16,000	17	--	--	0.02	0.0013
100-42-5	styrene	16,000	2.2	--	--	0.01	0.000558
95-47-6	xylene;o-	16,000	15	--	--	0.01	0.000623
1330-20-7	xylene	9.0	9.1	--	9.0	0.01	0.000623
75-25-2	bromoform	130	0.028	--	--	0.01	0.000793
98-82-8	cumene (isopropylbenzene)	8,000	7.4	--	--	0.01	0.000605
79-34-5	tetrachloroethane;1,1,2,2-	5.0	0.001	--	--	0.01	0.000763
96-18-4	trichloropropane;1,2,3-	0.033	0.0002	--	--	0.01	0.000803
108-86-1	bromobenzene	--	--	--	--	0.01	0.000767
103-65-1	propylbenzene; n-	8,000	8,000	--	--	0.01	0.000737
95-49-8	chlorotoluene, 2-	--	--	--	--	0.01	0.000766
108-67-8	trimethylbenzene; 1,3,5-	800	800	--	--	0.01	0.000552
106-43-4	chlorotoluene, 4-	--	--	--	--	0.01	0.0011
98-06-6	butylbenzene; tert-	8,000	8,000	--	--	0.01	0.000711
95-63-6	trimethylbenzene; 1,2,4-	--	--	--	--	0.01	0.000596
135-98-8	butylbenzene; sec-	8,000	8,000	--	--	0.01	0.000649

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99-87-6	isopropyltoluene, p-	--	--	--	--	0.01	0.000531
541-73-1	dichlorobenzene;1,3-	--	--	--	--	0.01	0.000778
106-46-7	dichlorobenzene;1,4-	190	0.13	--	--	0.01	0.000721
104-51-8	butylbenzene, n-	--	--	--	--	0.01	0.001
95-50-1	dichlorobenzene;1,2-	7,200	4.9	--	--	0.01	0.000776
96-12-8	dibromo-3-chloropropane;1,2-	1.3	0.0005	--	--	0.05	0.000912
120-82-1	trichlorobenzene;1,2,4-	0.056 (b)	0.056	--	--	0.01	0.000676
87-68-3	hexachlorobutadiene	13	0.47	--	--	0.01	0.000802
87-61-6	trichlorobenzene;1,2,3-	--	--	--	--	0.01	0.000723
SEMIVOLATILE ORGANIC COMPOUNDS							
110-86-1	pyridine	80	0.037	--	--	0.1	0.0549
62-75-9	nitrosodimethylamine;N-	0.020	0.020	--	--	0.1	0.0334
108-95-2	phenol	24,000	11	--	--	0.1	0.0495
62-53-3	aniline	180	0.032	--	--	0.1	0.0576
111-44-4	bis(2-chloroethyl)ether	0.91	0.005	--	--	0.25	0.12
95-57-8	chlorophenol;2-	400	0.47	--	--	0.25	0.122
100-51-6	benzyl alcohol	8,000	3.4	--	--	0.1	0.0636
95-48-7	cresol;o- (2-methylphenol)	4,000	2.3	--	--	0.1	0.0422
39638-32-9	bis(2-chloroisopropyl) ether	--	--	--	--	0.25	0.157
	cresol; m- & p- (3&4-Methylphenol) (c)	2.0 (b)	2.0	--	--	0.1	0.0531
621-64-7	nitroso-di-n-propylamine;N-	0.14	0.009	--	--	0.25	0.116
67-72-1	hexachloroethane	25	0.080	--	--	0.1	0.0254
98-95-3	nitrobenzene	160	0.10	--	--	0.1	0.0242
78-59-1	isophorone	1,050	0.041	--	--	0.1	0.0875
88-75-5	nitrophenol, 2-	--	--	--	--	0.1	0.0385
105-67-9	dimethylphenol;2,4-	1,600	1,600	--	--	0.1	0.0798
65-85-0	benzoic acid	320,000	257	--	--	1	0.888
111-91-1	bis(2-chloroethoxy)methane	--	--	--	--	0.25	0.15
120-83-2	dichlorophenol;2,4-	240	0.17	--	--	0.5	0.306

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106-47-8	chloroaniline;p- (4-chloroaniline)	5.0	0.010	--	--	1	0.705
87-65-0	dichlorophenol;2,6-	--	--	--	--	0.25	0.229
59-50-7	methylphenol; 4-chloro-3-	--	--	--	--	0.5	0.402
77-47-4	hexachlorocyclopentadiene	480	160	--	--	0.1	0.0308
88-06-2	trichlorophenol;2,4,6-	80	0.016	--	--	0.1	0.0494
95-95-4	trichlorophenol;2,4,5-	8,000	29	--	--	0.1	0.049
91-58-7	chloronaphthalene, 2-	--	--	--	--	0.1	0.0395
88-74-4	nitroaniline, 2-	800	0.77	--	--	0.1	0.0235
131-11-3	dimethyl phthalate	--	--	--	--	0.1	0.0526
606-20-2	dinitrotoluene;2,6-	0.67	0.010	--	--	0.1	0.0462
99-09-2	nitroaniline, 3-	--	--	--	--	1	0.722
51-28-5	dinitrophenol;2,4-	160	0.13	--	--	0.1	0.0657
100-02-7	nitrophenol, 4-	--	--	--	--	0.1	0.0678
132-64-9	dibenzofuran	80	80	--	--	0.1	0.0402
121-14-2	dinitrotoluene;2,4-	3.2	0.005	--	--	0.1	0.0268
58-90-2	tetrachlorophenol;2,3,4,6-	2,400	2,400	--	--	0.1	0.062
84-66-2	diethyl phthalate	64,000	73	--	--	0.1	0.0524
7005-72-3	phenylether; 4-chlorophenyl-	--	--	--	--	0.1	0.0516
100-01-6	nitroaniline, 4-	--	--	--	--	0.25	0.158
534-52-1	methylphenol; 4,6-dinitro-2-	--	--	--	--	0.1	0.0354
86-30-6	nitrosodiphenylamine;N-	0.10 (b)	0.10	--	--	0.1	0.0424
103-33-3	azobenzene	9.1	9.1	--	--	0.1	0.0548
101-55-3	phenylether; 4-bromophenyl-	--	--	--	--	0.1	0.0453
118-74-1	hexachlorobenzene	0.63	0.016	--	--	0.1	0.0448
86-74-8	carbazole	--	--	--	--	0.25	0.134
84-74-2	di-butyl phthalate (di-n-butyl phthalate)	8,000	57	--	--	0.1	0.0422
85-68-7	butyl benzyl phthalate	530	2.3	--	--	0.1	0.028
91-94-1	dichlorobenzidine;3,3'-	0.213 (b)	0.037	--	--	0.25	0.213
117-81-7	bis(2-ethylhexyl) phthalate	2.6 (b)	2.6	--	--	0.1	0.0274
117-84-0	di-n-octyl phthalate	800	800	--	--	0.1	0.0271

Table 1
Soil Screening Levels
Closed City of Yakima Landfill Site

CAS Number	Chemical Name	Screening Level (mg/kg)	Method B Preliminary Soil Cleanup Level (mg/kg)	Background Soil Metals Concentations Statewide (mg/kg) 90 percentile value (a)	Method A Soil Unrestricted Land Use (mg/kg)	ALS Global	
						Reporting Limit (mg/kg)	Quantitation Limit (mg/kg)
91-20-3	naphthalene	5.0	4.5	--	5.0	0.02	0.00319
91-57-6	methyl naphthalene, 2-	320	320	--	--	0.02	0.00388
90-12-0	methyl naphthalene, 1-	35	35	--	--	0.02	0.00319
208-96-8	acenaphthylene	--	--	--	--	0.02	0.00284
83-32-9	acenaphthene	66 (b)	66	--	--	0.02	0.00264
86-73-7	fluorene	101 (b)	101	--	--	0.02	0.00385
87-86-5	pentachlorophenol	0.0769 (b)	0.004	--	--	0.1	0.0769
85-01-8	phenanthrene	--	--	--	--	0.02	0.00509
120-12-7	anthracene	2,275 (b)	2,275	--	--	0.02	0.00434
206-44-0	fluoranthene	85 (b)	85	--	--	0.02	0.00413
129-00-0	pyrene	655 (b)	655	--	--	0.02	0.00446
56-55-3	benzo[a]anthracene	1.4	0.068	--	--	0.02	0.00329
218-01-9	chrysene	140	0.1	--	--	0.02	0.00448
205-99-2	benzo[b]fluoranthene	0.18 (b)	0.18	--	--	0.02	0.00437
207-08-9	benzo[k]fluoranthene	0.57 (b)	0.57	--	--	0.02	0.00362
50-32-8	benzo[a]pyrene	0.10	0.14	--	0.10	0.02	0.00355
193-39-5	indeno[1,2,3-cd]pyrene	1.4	1.1	--	--	0.02	0.00422
53-70-3	dibenzo[a,h]anthracene	0.14	0.14	--	--	0.02	0.00499
191-24-2	benzo(g,h,i)perylene	--	--	--	--	0.02	0.00563
	cPAH TEQ	0.10	--	--	0.10	--	--

Abbreviations and Acronyms:

BHC = benzene hexachloride
BTEX = Benzene, Toluene, Ethylbenzene, Xylenes
CAS = Chemical Abstracts Service
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
mg/kg = milligram per kilogram
PAH = Polycyclic Aromatic Hydrocarbon
PCB = Polychlorinated biphenyl
SEMI = Semivolatile
TPH = Total Petroleum Hydrocarbon
VOL = Volatile

Notes:

-- = Not Available
(a) PTI. 1989. Background Concentrations of Selected Chemicals in Water, Soil, Sediments, and Air of Washington State, Draft Report. April.
(b) PSL reflects considertion of protection of groundwater criteria based on RI groundwater sample analytical results.
(c) Screening level for m- & p-cresol based on criteria for m-cresol (3-methylphenol), as it is more conservative than the criteria for p-cresol (4-methylphenol).