TUPPAN CONSULTANTS LLC
Geology Hydrogeology Environmental Consulting

UPDATED TECHNICAL MEMORANDUM

TO:	Benton County Community Development Department	DATE: February 25, 2025
FROM:	Eric Tuppan, R.G., Consultant for Valley Landfills, Inc. (Coffin Butte Landfill)	
RE:	Environmental and Operational Considerations	

This memorandum provides a synopsis of environmental and operational considerations regarding the proposed landfill development south of Coffin Butte Road by Valley Landfills, Inc. (Coffin Butte Landfill). It was modified slightly in response to the comments received by Maul Foster Alongi, dated November 27, 2024, as follows: revised Figures 1 and 4 to name Tampico Ridge; clarified language in the section titled "Waste Quality Monitoring Program"; and revised the reported volume of excavated material consistent with engineering calculations in the section titled "Available Quantity of Soil Cover." The information presented in this Technical Memorandum is based on past investigations that characterized site hydrogeology and geotechnical parameters for the area north of Coffin Butte Road where a landfill has operated since the mid-1970s, as well as recent investigations south of the road. The area south of Coffin Butte Road is currently used for ancillary structures and buildings that support landfill operations. Initially, hydrogeologic and geotechnical characterization occurred in the area south of the road as it related to the construction and operations of two leachate holding ponds and other infrastructure. Characterization in this area includes ongoing water quality sampling of groundwater monitoring wells and a geotechnical evaluation of the proposed development area that was conducted in 2021 and 2022.

As part of the process for developing landfills overseen by Oregon's Department of Environmental Quality (DEQ), permittees are required to characterize the site conditions and then, based on that data, provide design documents for the landfill that must be approved by the DEQ before construction occurs. At Coffin Butte Landfill, consultants have studied the surface soils and subsurface geology of the site, geotechnical parameters of soil, as well as the groundwater hydrogeology and geochemistry over the past forty years. These investigations have provided a substantial historical record for the area north of Coffin Butte Road, where much of the site character for surface soils and for shallow and deep water-bearing zones is known. For the development area south of the road, investigation reports are in preparation for submittal to the DEQ as part of the permitting process.

DEQ's regulatory role in Oregon is to oversee all aspects of landfill development with regard to liner and landfill design, operations, and surface water and groundwater monitoring. This regulatory oversight has authority based on state and federal laws written

eric@tuppanconsultants.com | www.tuppanconsultants.com
460 Second Street, Suite 103, Lake Oswego, Oregon 97034 USA

to provide for the safe development, operations, closure, and post-closure care of solid waste landfills. As part of solid waste permit requirements, Valley Landfills is required to submit workplans and designs that must be approved by the DEQ before landfill construction can begin. Follow-up reports document quality assurance and quality control measured during construction. In addition, the DEQ requires that Valley Landfills maintain a fund for financial assurance that provides for landfill closure, post-closure care and, if required, corrective action.

As noted above, Valley Landfills is in the process of supplementing this technical information for the area south of Coffin Butte Road. We submitted a workplan in July 2021 to the DEQ that described tasks to characterize the hydrogeology and geotechnical properties needed to understand the constructability of the landfill and to protect groundwater resources. Objectives for this study included:

- Update information to satisfy DEQ's Phase I site characterization elements, which focus on regional and area-wide data needs.

- Evaluate the site geology and hydrogeology, including stratigraphic units and the water-bearing zones as part of DEQ's Phase II site characterization. More specifically, this aspect will examine subsurface conditions that include the depth and extent of the water bearing hydrogeologic units, the hydraulic connection between units, the lithologic and hydraulic properties of these units, groundwater flow patterns, and other factors. This evaluation will occur in two phases: the first will include submittal of a site characterization report that reviews existing information and data for the site, the second part will present results of field studies as noted below in the last bullet.

- Acquire geotechnical information about the site to satisfy both a DEQ Phase I and II geotechnical assessment, including design-level data on the distribution of overburden soils (i.e., alluvium and regolith), depth of bedrock, and competency of units in the south development area. This aspect of the study, of which field work was performed in fall 2021 through 2022, included:
    - Characterized the variability, depth, aerial extent and engineering properties of onsite soils and other overburden deposits.
    - Inventoried soils and other overburden deposits suitable for use in construction, and identified a proposed use for these materials.
    - Identified geotechnical considerations (such as settlement and slope stability) which must be addressed in the engineering design.

- In a future phase, Valley Landfills will augment the groundwater monitoring network in the south development area (for the interim, two temporary piezometers were installed along the northern slope of Tampico Ridge as part of the geotechnical study). The purpose of this work is to validate our understanding of the conceptual hydrogeologic model for the site and to begin collecting groundwater depth and water quality data. This will include (1) installing wells upgradient, between the landfill and properties to the south and southeast, (2) installing wells cross- and down-gradient along the perimeter of the landfill footprint to function as compliance wells, (3) decommissioning any wells that are within the planned footprint of the landfill, and (4) conducting hydraulic testing to estimate the hydraulic properties of the bedrock unit.

Given that additional data is forthcoming, our present understanding of the development area is summarized briefly below, knowing that more extensive information specific to DEQ guidance will be available in the near future.

GEOLOGIC FRAMEWORK

Physical Setting and Slopes

The property being developed as a municipal solid waste landfill is approximately 42 acres on the northern slope of what is referred to locally as Tampico Ridge. The northern flank of Tampico Ridge and the southern flank of Coffin Butte, located to the north, create a topographic saddle in which the ground surface dips gently away from the saddle to the east and west. Slopes on the upper part of the basin near the summit of the northern part of Tampico Ridge range from 16 to 20 percent, with hill top elevations over 500 feet above sea level on the southwest part of the hill to over 600 feet above sea level a bit farther south. Farther down the hillside toward Coffin Butte Road, slopes range from 2 to 13 percent.

Current Surface Water Drainage

The northernmost slope of Tampico Ridge forms a basin just east of the saddle with Coffin Butte that drains northerly into an unnamed intermittent drainage. Drainage from areas around the former leachate treatment facility, the existing covered and double-lined leachate holding ponds, and the landfill gas to electricity facility is directed through a culvert under Coffin Butte Road, joins stormwater drainage from the current landfill, and flows into a settlement pond and bioswale. The settlement pond and bioswale are engineered to remove site-related compounds from the stormwater before it discharges to creeks that flow off site. At the downstream edge of the bioswale is a sub-surface flow wetland (SSFW). The SSFW includes an impermeable berm installed across the bioswale that forces water to flow downwards through a media bed at the upstream side of the impermeable berm. The media bed contains a mixture of coarse sand and biochar, which removes site-related compounds. A system of perforated pipes installed at the bottom of the media bed then collects the water and transports it to the downstream side of the impermeable berm, where the water then flows horizontally through a subsurface gravel layer. The gravel extends the remaining length of the SSFW to the existing outlet where the water daylights and is discharged at a sampling point.

Outside of the operations areas, precipitation that falls on the northeastern slopes of Tampico Ridge drains north to a ditch along the south side of Coffin Butte Road, and from there east to Highway 99, where it then flows through a culvert beneath Coffin Butte Road.

Water flows north in the drainage ditch along the west side of Highway 99 to a culvert that conveys water from a wetland and this ditch to a creek on the east side of Highway 99. From there, surface water travels approximately 3 miles to the east-northeast in an unnamed tributary before discharging to Soap Creek, which flows into the Luckiamute River 2.5 miles before the confluence with the Willamette River.

Geology

Tampico Ridge and Coffin Butte are prominent topographic features that comprise volcanic masses flanked by unconsolidated terrace and alluvial deposits. The volcanics are part of the Eocene Siletz River Formation and consist of relatively thick (up to 70 feet) sequences of basalt flows and a much smaller volume of thinly interbedded sedimentary units (individual beds up to 8 feet thick). Basalt flows are characterized by pillow lavas, flow breccias, and minor columnar jointing. The sedimentary portion consists of thinly bedded tuffaceous sandstone, siltstone, and claystone. The upper 5 to 15 feet of the bedrock unit is typically weathered and, in places, decomposed to soil where it is shown on geologic maps as volcanic pediment. With depth, the bedrock generally becomes less weathered to fresh and hard, although fracture and brecciated zones can become altered to clay minerals.

The lower flanks along the northern slope of Tampico Ridge are underlain by water laid sediments (Willamette Silt and alluvial sediments) that range in thickness from less than 10 feet to approximately 20 feet. These deposits consist primarily of clays, silty clays with gravels, or silty sands. Thicker deposits, at least 100 feet thick based on landfill boring log MW-9D (just north of the intersection of Coffin Butte Road and Hwy 99), extend to the east of Highway 99W.

HYDROGEOLOGY

Groundwater Occurrence

In bedrock terrains such as Tampico Ridge and Coffin Butte, shallow groundwater occurs primarily within fractures of weathered and unweathered bedrock, and in the alluvial deposits of the surrounding lowland areas. The local groundwater system is recharged by infiltrating precipitation and surface water from intermittent streams. Fractures provide the primary transport mechanism of groundwater in the bedrock; therefore, the occurrence and amount of groundwater depend on the nature, distribution, and interconnection of the fractures. Lack of interconnection among fractures limits the production available to groundwater wells completed in the basalt bedrock. Shallow bedrock in this area is commonly weathered to a gravel and sand mixture that behaves more uniformly (i.e., isotropic flow). As the bedrock becomes harder with depth and dominated by fractures, the groundwater moves predominantly through the fractures (i.e. anisotropic flow) from the uplands to areas of lower elevation. At that point, groundwater discharges through seeps or into streams, or into deeper alluvial deposits that overlie the bedrock.

Recharge and Flow of Groundwater

In hilly areas, shallow groundwater recharges through infiltration of rainwater. The amount of infiltration depends on the size and geometry of the recharge, or drainage, area that collects the rainwater. In bedrock terrains, groundwater flows through weathered residual soil and fractures. Groundwater flows in the downslope direction from areas of higher elevation to lower elevation with the groundwater surface (i.e., potentiometric surface) generally reflecting the surface topography, although it is typically more subdued. As such, as depicted in Figure 1, the groundwater is generally assumed to flow away from the top of Tampico Ridge to the north, towards the proposed landfill development area, to the east toward Highway 99W (and, in places, discharge through springs at the base of the hill) and to the west and south. Figure 2 illustrates the groundwater flow pattern along the northern slope of Tampico Ridge based on the existing monitoring network for the landfill that includes two piezometers installed near the upslope, southern boundary of the proposed landfill footprint.

Based on the existing topography and recharge areas, it is unlikely that a landfill liner along the northern part of the ridge would reduce infiltration and the quantity of groundwater supplying domestic wells or springs at properties of concern east and south of the northernmost part of the ridge. This is schematically depicted in Figure 1, which illustrates the landfill relative to the groundwater divide along Tampico Ridge and the presumed areal flow direction of groundwater.

Conceptual Hydrogeologic Model

The conceptual hydrogeologic model for the area follows the basic premise described above. Groundwater flow at the site is controlled by the topographic setting where the groundwater surface generally mimics the topography, with groundwater originating in the uplands of Tampico Ridge and Coffin Butte and flowing downgradient along the potentiometric surface. The higher elevation hills and recharge areas create local groundwater divides that separate the basin containing landfill operations from areas north of Coffin Butte and south of Tampico Ridge. Between the two hills, a lower elevation groundwater divide exists near the topographic saddle, where the northern component of groundwater flow from Tampico Ridge meets the southern component of groundwater flow from Coffin Butte. Groundwater then flows towards the east and west generally following the long axes of the valleys. Based on almost 30 years of measurement, the seasonal groundwater flow pattern measured along the northern flanks of Tampico Ridge and at the Coffin Butte Landfill has not changed significantly.

As noted earlier, historical measurements in wells south of Coffin Butte Road, specifically MW-8S, MW-15, and now decommissioned MW-16, depicted groundwater along the northern slope of Tampico Ridge flowing towards the north-northeast as shown in Figure 2. These wells were supplemented with two temporary piezometers installed in 2022 near the upslope, southern boundary of the proposed landfill footprint. Groundwater elevations in these more recent piezometers support the premise that groundwater flow on the northern slope of Tampico Ridge is northerly. On the northwest side of Tampico Ridge, groundwater flow documented by wells P-8, Merril, Phillips, Berkland, and Duplex, is toward the northwest away from Tampico Ridge. These wells, in addition to the newly proposed monitoring wells to be installed as part of site development (see Figure 4 and discussion in the section on water quality monitoring program), will be used to verify this conceptual hydrogeologic model.

Groundwater Supply

Water wells in this area produce primarily from fractured basalt bedrock. Predicting where and at what depth the basalt will be fractured enough to produce water for a supply well is problematic. This is because the lateral and vertical geometry of fractures in the bedrock basalt flows is naturally not uniform. In addition, the basalt is commonly altered to low permeability clays along fractures and in brecciated zones, thus reducing the ability of groundwater to flow within fractures. Domestic wells in this part of Benton County typically produce water from the basalt bedrock (frequently called "Blue- or Black Basalt" on the drillers' logs). As indicated on logs available from the Oregon Water Resources Department, when initially tested by drillers as part of pumping tests from one to four hours long, the water level in the wells draws down significantly, more than half the depth of the well on many of the logs. In terms of production, this means that the recharge of the aquifer to the well cannot keep up with what is being pumped out. This can happen for a number of reasons. For this area, the basalt aquifer has a limited capacity to provide water to wells because of low porosity (storage capacity) of the aquifer and the fractures that provide the water are not extensively connected to each other over long distances. Put another way, the distance away from a well that the well draws water is limited because of the discontinuous nature of the fractures.

Protection of Groundwater Resources

Before 1991 when the U.S. Environmental Protection Agency (EPA) implemented solid waste rules that required owners of new landfills construct composite liners and collection systems for municipal solid waste landfills, many older landfills leaked and as a consequence contaminated groundwater. Since then, the DEQ, which implements the EPA's landfill liner rules, requires that landfills on the west side of the Cascades build double composite liners with secondary collection and leak detection systems as described below. This change in landfill regulation and construction altered the old paradigm that associated dumps with groundwater contamination to one of state-of-the-art engineered landfills with containment and detection systems that protect the environment and underlying groundwater.

Along the same lines, groundwater resources in the area are protected from potential landfill impacts by two conditions: a groundwater divide between the proposed landfill footprint (described in the previous section) and the landfill liner system. With regard to groundwater supply, the landfill will not consume any additional groundwater from the local aquifer to support operations.

Groundwater Divide. As noted above and shown in Figure 1, after rainwater infiltrates uplands along Tampico Ridge, it flows in the subsurface downgradient, following the direction of the slope of the potentiometric surface. This means that groundwater below the landfill footprint on the north slope of Tampico Ridge flows north away from the peak elevation of the hill as depicted in Figure 2. Groundwater will flow downgradient along other aspects of Tampico Ridge in a similar manner, generally following the topography from the high points (from 500 to 600 feet above sea level), to the lower elevations on the east and south. It is this groundwater divide, which subtly mimics the ground surface, that prevents groundwater from one side of the hill to flow to the other.

Landfill Liner System. To protect groundwater resources, federal and state governments require state-of-the-art landfill liner systems for all new landfills. The current design planned for the composite liner system extends below the entire landfill from the upper part of landfill footprint at approximate elevation 380 feet above sea level, to the lower areas of the footprint near the current elevation of Coffin Butte Road at 250 to 270 feet above sea level. The footprint of the liner is shown in Figures 2 and 4 as a dashed green line within the development area. The design of the liner system prevents leachate from infiltrating to groundwater through the base of the landfill. In the western part of the state of Oregon and specifically at Coffin Butte Landfill, this consists of a double-liner composite system that contains five key components as shown in Figure 3. From bottom to top, these are:

- An underdrain layer of sand or gravel (or other possible geosynthetic component) that keeps the groundwater from impinging on the liner.
- A tertiary geomembrane, referred to as a flexible membrane liner (FML), of high density polyethylene (HDPE) that separates the groundwater from lower layers of the liner system.
- A second layer of sand or gravel (or other possible geosynthetic component) that provides for detection and secondary containment of possible leaks. This layer is monitored for volume and water quality as part of the detection monitoring program.
- Two more FML layers (primary and secondary geomembranes separated by a geosynthetic clay liner) to provide containment of leachate and fluids produced within the landfill.
- Leachate collection and removal system designed to collect and remove leachate generated in the landfill and convey the liquid to a pond for treatment; this prevents the accumulation of leachate along the base of the landfill and removes any downward hydraulic pressure that could drive leachate from this layer into the underlying secondary layer and to groundwater.

The liner system design and installation will be approved by the DEQ and construction will be closely monitored, tested and certified by a professional engineer, consistent with a DEQ-approved quality assurance and quality control plan.

Water Quality Monitoring Program. Water quality monitoring is required at the Coffin Butte Landfill by Solid Waste Permit 306, issued by the DEQ. Environmental monitoring has been conducted at Coffin Butte Landfill since 1975 when the DEQ started collecting water quality data from the leachate lagoon and from surface water around the site. Groundwater monitoring began in 1977 and since then, the monitoring network has evolved in response to different monitoring and site characterization needs required by the solid waste permit. The current water quality monitoring network has five components:

- Groundwater monitoring wells, which include compliance and detection wells, and water supply wells
- Observation wells and piezometers used for measuring water levels
- The secondary leachate collection system (also referred to as the leak detection system or LDS)
- Leachate sumps
- Surface water monitoring points

The rationale for the network design and the media monitored can be found in the environmental monitoring plan. As part of landfill development, the groundwater monitoring network will be expanded to include the development area south of Coffin Butte Road. Proposed locations of new monitoring wells associated with this development are shown in Figure 4.

As noted earlier, this expanded monitoring network will include:

- Three upgradient wells along the southern perimeter of the landfill footprint (MW-B, MW-C, and MW-D). Depth-to-water can be measured in these wells to define the potentiometric surface south of the landfill, and the wells will also be tested for water quality parameters. Moreover, these will function as detection monitoring wells between the landfill and properties to the south and southeast.

- One well on the west side (MW-E) and one on east side (MW-A) of the landfill will serve as cross-gradient/compliance wells.

- Existing monitoring wells downgradient of the new cell (e.g., MW-8S/8D and MW-14S/14D) will be designated as compliance boundary wells.

- The leachate ponds will be covered and double-lined with a leak detection layer. Any fluids that might seep through the primary liner into this secondary leak detection layer will be collected and tested for landfill contaminants in a manner similar to the process for monitoring the secondary layer below the landfill. A piezometer (PZ-1) to the southeast of the ponds will monitor the groundwater elevation to define groundwater flow direction and if needed, can be sampled for groundwater quality. The locations and nomenclature for the new sampling points associated with the leachate ponds, and for the wells listed above, will be defined in a workplan to be developed and submitted for approval by the DEQ.

In addition to environmental monitoring specified by the solid waste permit, stormwater samples are collected four times per water year and the results submitted to the DEQ annually under a National Pollutant Discharge Elimination System (NPDES), Industrial Stormwater Discharge Permit No. 1200-Z.

Landfill Operations Water Use. Landfill operations and construction activities use water supplied by Adair Village, not groundwater from onsite wells. The only groundwater used from onsite wells is for the existing office and the scale house. The volume of groundwater consumed at these two locations will not change. Overall, no additional groundwater will be used for the landfill development above current volumes.

GEOTECHNICAL ISSUES AND SEISMIC STABILITY

Geologic hazards and earthquake safety for the Coffin Butte Landfill have been discussed in site development plans and as part of reviewing federal and state location criteria for siting municipal solid waste landfills. These reports found that there were no known Holocene faults within 200 feet of the landfill boundary, and that landfill cells have been, and will continue to be, designed for potential seismic events as defined in federal and state solid waste rules.

The development area will be founded on a firm, competent geologic formation comprised of fresh basalt, weathered basalt, and some thin veneers of alluvium in the flatter downslope areas. In areas of prior landfill construction north of Coffin Butte Road, the only geotechnical constraints at the site were slope stability issues driven by the relative geometries of the bottom liner system, and the height and slope of the final landfill. Moreover, there were no unusual unstable areas or foundation conditions known to exist that would adversely affect landfill development. Detailed geotechnical evaluations are routinely conducted as part of each new cell development and will be part of the South Development Area Design Report, which will be submitted by the landfill design engineer Civil & Environmental Consultants, Inc. (CEC), before the landfill is constructed.

As part of the site characterization efforts, earlier planning and site characterization documents as well as recently conducted field and laboratory testing will be used as a basis to support our understanding for the geologic hazards analysis. Tasks for this element as they relate to the development area include:

- Discuss geologic hazards that could potentially be relevant to the site consistent with DEQ Landfill Guidance Section 2.7, and that includes location restrictions under OAR 340-94-0030 (and 40 CFR, Part 258, Subpart B), to address considerations such as Holocene fault zones, seismic impact areas, and unstable areas.

- Evaluate the earthquake safety of the site, including relative to its seismotectonic setting and seismic history of the area, the potential for the area to be affected by surface rupture, probable response of site to likely earthquakes, including estimated ground motion, maximum ground acceleration, velocity and displacement, the potential for the area to be affected by earthquake-induced landslides or soil liquefaction, and the potential for the area to be affected by regional tectonic deformation (subsidence or uplift). This evaluation will be presented as part of the geotechnical investigation for the site.

The proposed geotechnical scope of work was developed to provide design-level data for relevant engineering analyses. The data will be used to assess the suitability of on-site material for facility construction and the integrity of the soil and underlying material for stability in constructing the landfill. Types of data collected during field tasks included mapping the types and distribution of soils at the site, as well as noting the engineering properties of soil structure in test pits, geotechnical borings, and cone penetration tests.

SOIL DEPTH AND CLASSIFICATION

Reconnaissance mapping by the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) identified the soil series as Witzel-Ritner, very cobbly loam near the top of Tampico Ridge with Jory silty clay loam, Waldo silty clay loam, and Bashaw clay in the drainage basin to the north. Soil characteristics of these soil types as published by the NRCS are:

- Witzel-Ritner – well drained with moderately high to high capacity to transmit water, loamy or clayey colluvium derived from basalt along slopes of 12 to 60 percent.

- Jory – well drained with moderately high capacity to transmit water, loamy colluvium derived from basalt over clayey residuum weathered from basalt along slopes of 2 to 20 percent.

- Bashaw – poorly drained with very low to moderately low capacity to transmit water, clayey alluvium derived from basalt on slopes of 3 to 12 percent.

- Waldo – poorly drained with moderately low to moderately high capacity to transmit water, silty clay loam derived from clayey alluvium on slopes of 0 to 3 percent.

From past field studies, the depth of soil ranged from no soil over hard rocky outcrops in the steeper northern slopes to a depth of 16 feet on intermediate slopes of Tampico Ridge. In the borehole for monitoring well MW-16, located on the north slope of Tampico Ridge near the east leachate pond, clayey silt was present from the surface to a depth of 3 feet, basalt bedrock weathered to silt and clayey gravel from 3 to 16 feet, and hard basaltic bedrock was logged at a depth of 16 feet. Test pits completed in August 2021 found a range of soil types and depths consistent with these past findings. This included soils at the surface to depths that ranged from 2.5 to over 10 feet deep of typically fine-grained clay and silt. The fine grained soils are typically underlain by a sandy gravel interval from 2 to 5 feet thick, which is weathered basalt bedrock. The gravelly interval overlies hard basalt bedrock.

EROSION CONTROL FACTORS

To control potential erosion and reduce the debris and sediment in the stormwater discharge during landfill construction and operations, stormwater management practices will be employed as described in the Erosion and Sediment Control Plan (ESCP) that will be developed for construction and approved by the DEQ.

Implementation of stormwater management practices limit the amount of erosion associated with stormwater runoff. These practices may include structural or nonstructural control measures such as debris and sediment control, stormwater diversion, and preventative maintenance.

Debris and Sediment Control

The extent of construction activities at the landfill will make debris and sediment control critical. The following practices may be used as appropriate to control erosion.

- Temporary seeding and sodding of disturbed areas such as landfill side slopes, stockpile areas, and interim cover areas. Permanently seed areas that have been brought to final grade such as final cover areas, embankments, ditches, and drainage swales.

- Surface roughening of disturbed soil slopes after they are graded and before they are seeded to help establish the vegetative cover, reduce runoff velocity, and allow sediment trapping.

- Mulching and matting to protect soil surfaces from raindrop impact and reduce the velocity of overland flow.

- Plastic sheet cover to provide immediate erosion protection to small temporary soil stockpiles, erosion-troubled soil areas, and slopes and disturbed areas when vegetative cover cannot be established because of soil characteristics, slope steepness, or time of year.

- Buffer zones of natural grassy vegetation will be cultivated and left unmowed along areas of sheet flow runoff.

- Filter fences and straw bale barriers intercept and detain small amounts of sediment from disturbed areas during constructions activity. These will be appropriately installed both below areas of sheet or rill erosion, such as along the toe of graded areas, soil stockpiles, and embankments.

- Sedimentation traps and basins allow for sediment contained in stormwater runoff to settle out and will be installed as needed throughout the development of the landfill.

- Dust control such as road watering, temporary and permanent vegetation, and plastic covering will be used to reduce the amount of soil lost from exposed surfaces.

- Outlet protection including riprap aprons, riprap plunge pools, or energy dissipating devices will be installed at stormwater discharge points to prevent scour and to minimize downstream erosion.

- Riprap may be used as permanent ground cover at outlets, ditches, and toes of slopes to protect soil surfaces from concentrated runoff, slow the runoff velocity, and stabilize slopes with seepage problems.

Stormwater Diversion

Stormwater is diverted away from the landfilled waste areas. The design will call for interceptor dikes and swales to intercept stormwater runoff from drainage areas above unprotected slopes and direct it to a stabilized outlet. Interceptor dikes or swales are placed above sharp grade breaks and soil stockpile areas. In areas within the active landfill operations, temporary stormwater structures divert runoff from equipment maintenance areas, spill areas, exposed waste, and from leachate seep areas so that any surface water that contacts the exposed waste drains internal to the landfill boundary where it can be collected by the leachate collection system. This type of grading and the structures prevent the escape of stormwater runoff that has contacted exposed waste.

Preventative Maintenance

Routine preventive maintenance is crucial to reducing the amount of erosion produced by stormwater runoff. Each month during the rainy season, routine inspections for debris and sediment in the stormwater control structures will be performed. Inspection will be followed by, as needed, cleaning and repairing stormwater control features, structures and facilities including: seeding and planting areas, mulching and matting areas, plastic sheet cover, buffer zones, haul road, filter fences and straw bale barriers, sediment basins, dust control, surface roughening, interceptor dikes and swales, inlet/outlet protection, ditches, and culverts.

COVER MATERIALS

Type of Cover

There are three types of landfill cover based on the phase of landfill development. The first is a daily operations layer (typically a minimum of 6-inches thick) of soil materials spread over the daily lifts of refuse to control odor, disease vectors, fires, blowing litter, and scavenging. Tarps, or other DEQ-approved alternatives can also be used for daily cover. The second is an interim cover, typically 12 inches of soil covered by tarps made of griffolyn that is placed over those parts of the operating cell that have achieved final grade. This cover is placed to reduce infiltrating rainfall until the entire cell has been filled, at which time a final cover is installed. The third type of cover is the final cover for the landfill cell which is constructed after the entire cell has reached final grade. The final cover is generally constructed of both geosynthetic and soil materials, consistent with federal and state solid waste regulations.

Available Quantity of Soil Cover

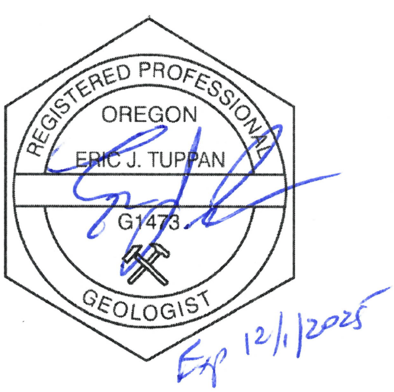
Estimates from the current design show approximately 3,500,000 cubic yards of soil available from the existing parcel for cover material. This soil will likely be removed and stockpiled at an appropriate location near the landfill during the excavation and construction phase until it is needed. Depending on the landfill design and soil characteristics, this soil may be used for daily cover or as the soil component of an interim or final cover.

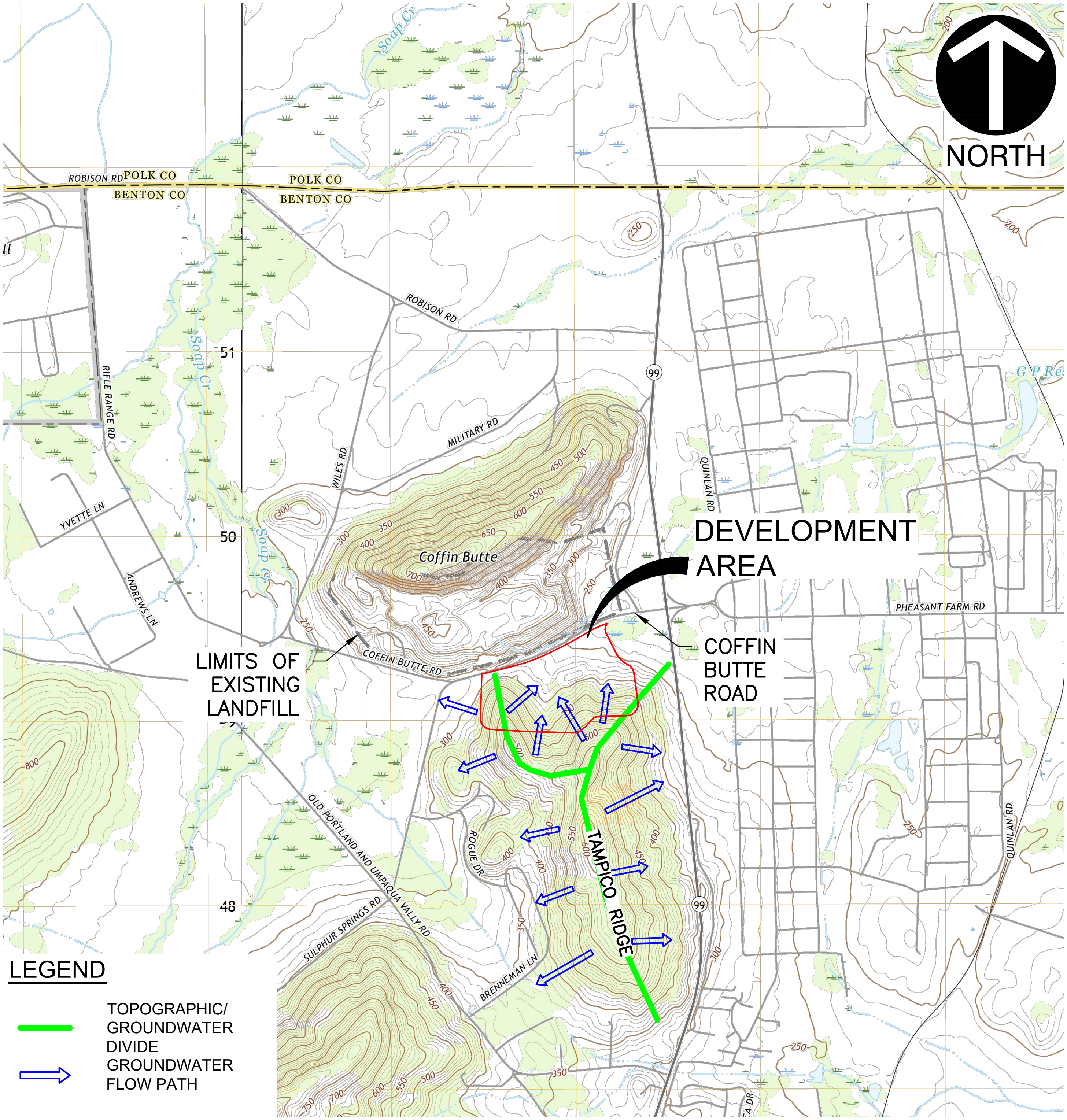
Additional soil cover material may be required depending on the design of the landfill cells. This soil would be borrowed from other parts of the facility property or from other nearby sources.

Transportation of On-Site Soil Materials

Soil and rock materials excavated from on-site will be hauled to designated locations using off-road dump trucks. Soil that is encountered during excavation will most likely be hauled and placed into on-site stockpiles to be used later during cell or final cover construction. Rock that is encountered during excavation will also be stockpiled or hauled to the Knife River Facility for crushing so that it can be used as road base materials or used in the construction of the landfill or final cover systems.

Attachments: Figure 1 – Conceptual Groundwater Divide and Flow Direction
Figure 2 – Groundwater Contours – April 2023
Figure 3 – Landfill Liner Cross Section
Figure 4 – Groundwater Monitoring Network





REFERENCE

1. U.S.G.S. 7.5' TOPOGRAPHIC MAP, LEWISBURG QUADRANGLE, OREGON DATED: 2011.

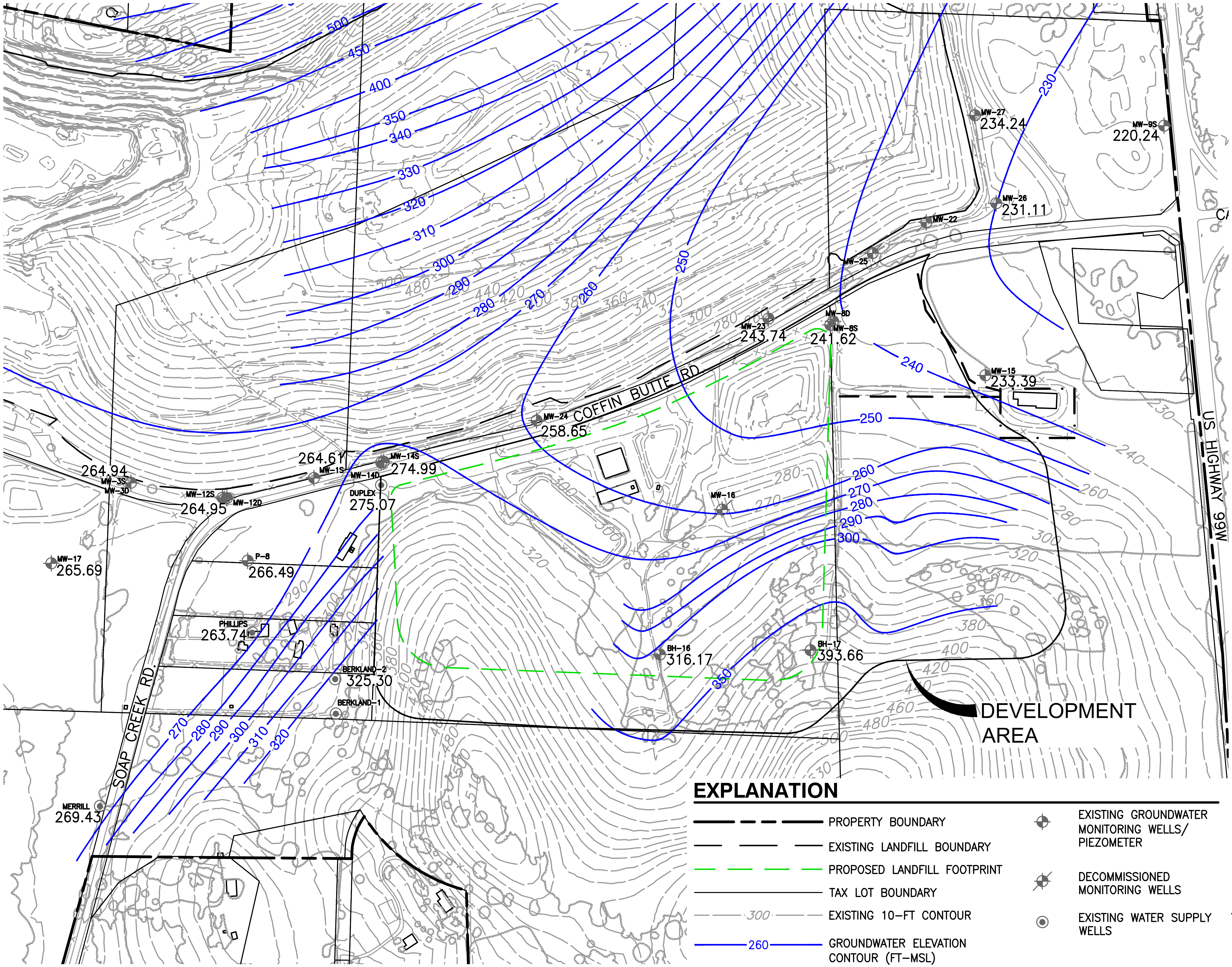
CEC
Civil & Environmental Consultants, Inc.
2356 Gold Meadow Way
Suite 120
Gold River, CA 95670
Ph: 916.503.0050
www.cecinc.com

REPUBLIC SERVICES
COFFIN BUTTE LANDFILL
29175 COFFIN BUTTE ROAD
CORVALLIS, OR 97330

CONDITIONAL USE PERMIT APPLICATION
USGS LEWISBURG TOPOGRAPHY

DRAWN BY:	JS	CHECKED BY:	JAS	APPROVED BY:	JAS	FIGURE NO.:	1
DATE:	JANUARY 2025	DWG SCALE:	1"=2,500'	PROJECT NO:	322-142		

P:\320-000\322-142\-CADD\Dwg\Exhibits\322142-1.1-Site Location Map.dwg{1} LS:(1/30/2025 - dbegell) - LP: 1/31/2025 1:52 PM



EXPLANATION

PROPERTY BOUNDARY

EXISTING LANDFILL BOUNDARY

PROPOSED LANDFILL FOOTPRINT

TAX LOT BOUNDARY

300 EXISTING 10-FT CONTOUR

260 GROUNDWATER ELEVATION CONTOUR (FT-MSL)

EXISTING GROUNDWATER MONITORING WELLS/ PIEZOMETER

DECOMMISSIONED MONITORING WELLS

EXISTING WATER SUPPLY WELLS

NORTH

SCALE IN FEET

0 400 800

REFERENCE

AERIAL TOPOGRAPHY FROM AERIAL SURVEY BY COOPER AERIAL SURVEYS COMPANY; DATE OF TOPOGRAPHY: OCTOBER 07, 2021.

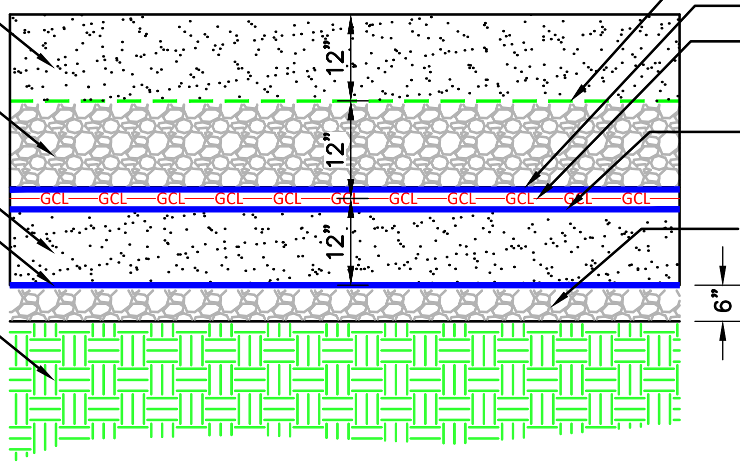
VALLEY LANDFILLS
COFFIN BUTTE LANDFILL
CONDITIONAL USE PERMIT APPLICATION
CORVALLIS, OR 97330

GROUNDWATER CONTOURS - APRIL 2023

Civil & Environmental Consultants, Inc.
2356 Gold Meadow Way
Suite 120
Gold River, CA 95670
Ph: 916.503.0050
www.cecinc.com

DRAWN BY:	JS	CHECKED BY:	JAS	APPROVED BY:	JAS	FIGURE NO.:
DATE:	JANUARY 2025	DWG SCALE:	AS SHOWN	PROJECT NO:	322-142	2

P:\320-000\322-142\-CADD\Dwg\Exhibits\322142-3.8-Groundwater Contours-April 2023.dwg[2] LS:(1/29/2025 - dbegell) - LP: 1/30/2025 8:54 AM



ABBREVIATIONS

PLCRS	PRIMARY LEACHATE COLLECTION AND REMOVAL SYSTEM
SLCRS	SECONDARY LEACHATE COLLECTION AND REMOVAL SYSTEM
GCL	GEOSYNTHETIC CLAY LINER

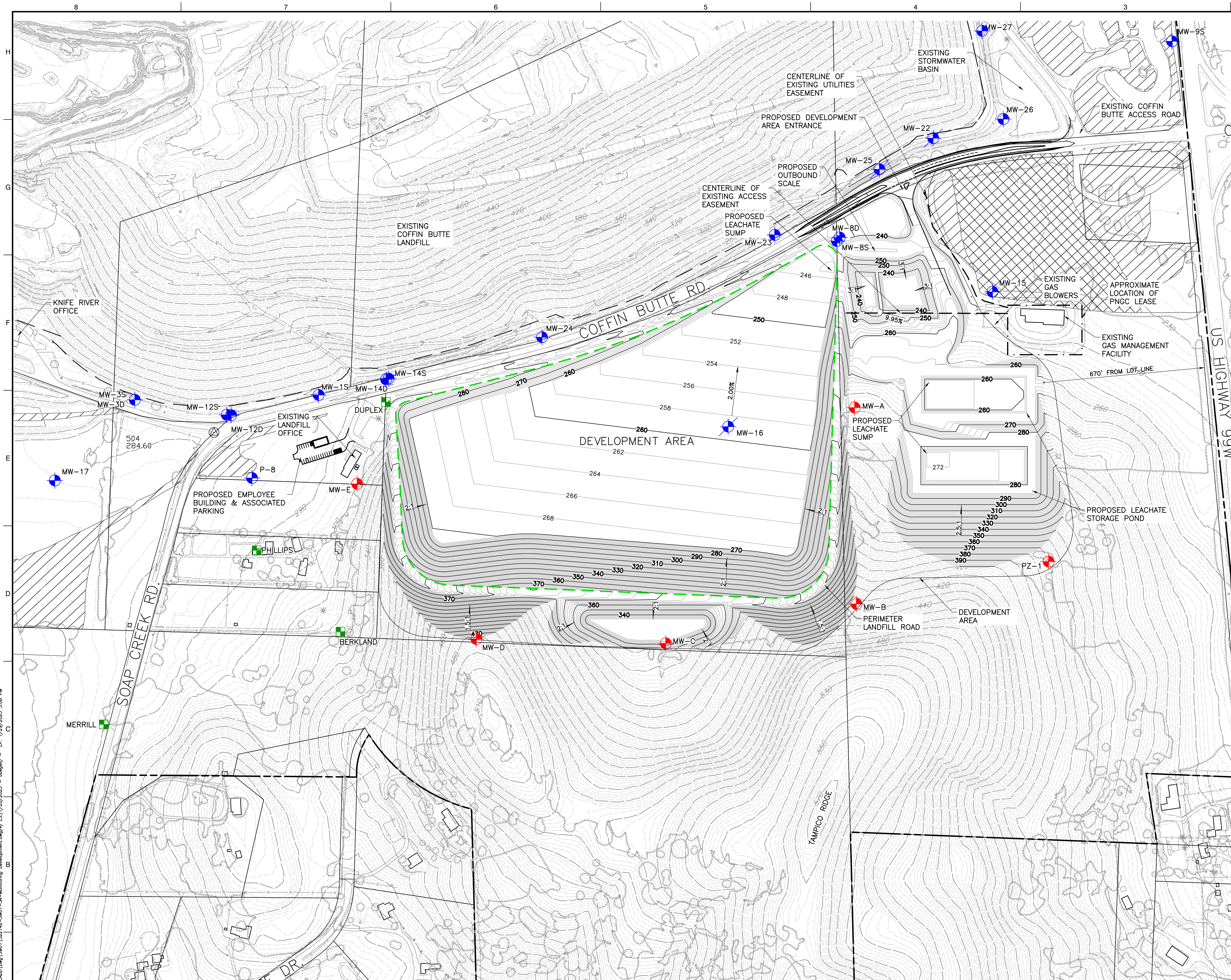
Civil & Environmental Consultants, Inc.
2356 Gold Meadow Way
Suite 120
Gold River, CA 95670
Ph: 916.503.0050
www.cecinc.com

REPUBLIC SERVICES
COFFIN BUTTE LANDFILL
29175 COFFIN BUTTE ROAD
CORVALLIS, OR 97330

CONDITIONAL USE PERMIT APPLICATION
LINER CROSS SECTION

DRAWN BY: JS	CHECKED BY: JAS	APPROVED BY: JAS	FIGURE NO.: 3
DATE: JANUARY 2025	DWG SCALE: N.T.S.	PROJECT NO: 322-142	

P:\320-000\322-142\-CADD\Dwg\Exhibits\322-142-3-Liner Cross Section.dwg{3} LS:(1/29/2025 - dbegell) - LP: 1/30/2025 8:46 AM



LEGEND

- PROPERTY BOUNDARY
- EXISTING LANDFILL BOUNDARY
- TAX LOT BOUNDARY
- 300 EXISTING 10-FT CONTOUR
- EXISTING 2-FT CONTOUR
- EXISTING PALUSTRINE FORESTED WETLAND
- EXISTING PALUSTRINE EMERGENT WETLAND
- -10 ISOPACH 10-FT CUT CONTOUR
- 0 ISOPACH ZERO CUT/ FILL CONTOUR
- 10 ISOPACH 10-FT FILL CONTOUR
- PROPOSED LANDFILL FOOTPRINT
- EXISTING GROUNDWATER MONITORING WELLS/PIEZOMETER
- DECOMMISSIONED MONITORING WELLS
- EXISTING WATER SUPPLY WELLS
- PROPOSED WELLS/PIEZOMETER

NOTES

1. TAX LOT BOUNDARIES FROM BENTON COUNTY ZONING MAP PANEL 41047C0975G, DATED 01/19/2000 (TAX LOT BOUNDARIES MAY DIFFER FROM ZONING DATED 2021).
2. DEVELOPMENT AREA PERIMETER DESIGNED ONLY FOR PICKUP TRUCKS OR SMALLER VEHICLES.

REFERENCE

AERIAL PHOTOGRAPH, TOPOGRAPHIC INFORMATION FROM AERIAL SURVEY AND GRID BY COOPER AERIAL SURVEYS COMPANY; DATE OF PHOTOGRAPHY: OCTOBER 07, 2021.

SUBMITTAL RECORD

NO	DATE	DESCRIPTION

2356 Gold Meadow Way
Suite 120
Gold River, CA 95670
Ph: 916.503.0050
www.cecinc.com

Civil & Environmental Consultants, Inc.

VALLEY LANDFILLS, INC.
COFFIN BUTTE LANDFILL
CONDITIONAL USE PERMIT APPLICATION
CORVALLIS, OR 97330

GROUNDWATER MONITORING NETWORK

DATE:	JANUARY 2025	DRAWN BY:	JS
DWG SCALE:	AS SHOWN	CHECKED BY:	JAS
PROJECT NO:	322-142	APPROVED BY:	JAS

DRAWING NO.: 4

SHEET OF