Final Closure Plan
Fire Mountain Farms, Inc. Storage Units
Kalama, Washington

June 23, 2020

Prepared for:

Emerald Kalama Chemical
Kalama, Washington

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LIST OF ABBREVIATIONS AND ACRONYMS

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
Administrative Order	Administrative Order No. 10938
BMP	best management practice
CFR	Code of Federal Regulations
CY	cubic yards
Ecology	Washington State Department of Ecology
Emerald	Emerald Kalama Chemical, LLC
EPA	US Environmental Protection Agency
FMF	Fire Mountain Farms, Inc.
ft	feet
GCL	geosynthetic clay liner
HDPE	high-density polyethylene
H:V	horizontal to vertical
IWBS	industrial wastewater biological solids
LAI	Landau Associates, Inc.
LCPH	Lewis County Public Health and Social Services
LDR	Land Disposal Restriction
MTCA	Model Toxics Control Act
PDL	preliminary delisting level
Perkins	Perkins Coie, LLP
SWTS	secondary wastewater treatment solids
TCLP	toxicity characteristic leaching procedure
WAC	Washington Administrative Code
WWTP	wastewater treatment plant

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1.0 INTRODUCTION

Landau Associates, Inc. (LAI) was retained by Perkins Coie LLP (Perkins) on behalf of Emerald Kalama Chemical, LLC (Emerald) to provide this closure plan for three storage units owned and operated by Fire Mountain Farms, Inc. (FMF). These storage units are located at FMF's Burnt Ridge facility, FMF's Newaukum Prairie facility, and FMF's Big Hanaford facility. The storage units are used to store mixed material, which is comprised of municipal wastewater treatment plant (WWTP)-derived biosolids (biosolids), cow manure, secondary wastewater treatment solids (SWTS), and industrial wastewater biological solids (IWBS). This mixed material was used on FMF's fields as fertilizer soil amendment. These three storage units contain IWBS generated at Emerald's Kalama, Washington, facility from the treatment of process wastewater, laboratory wastewater, and groundwater containing toluene from historical releases.

Dangerous waste designations made by the Washington State Department of Ecology (Ecology) are documented in Administrative Order 10938 (Administrative Order; Ecology 2014) and the subsequent Agreement for Conditional Compliance with Ecology Administrative Order No 10938 during Judicial Review (Agreement) between Ecology, Emerald, and FMF, dated June 3, 2016 (Ecology 2016). The Agreement required that Emerald and FMF close the three storage units. Ecology subsequently delisted the mixed material, as discussed in Section 1.2. This closure plan is being prepared in accordance with the Agreement and meets the following requirements:

- The delisted mixed material from all three storage units will be removed in accordance with this closure plan. The storage units will be cleaned, decontaminated, and left in place following mixed material removal. Section III.A.4.b of the 2016 agreement between Emerald, FMF, and Ecology describes the conditions under which the storage units may be left in place: 1) removal and storage unit decontamination is performed in accordance with this plan, 2) removal and decontamination is completed "without removing or dismantling" the storage units, and 3) the intact storage units may be used by FMF only for non-dangerous solid waste purposes (Ecology 2016).
- The delisted mixed material generated through the implementation of this closure plan will be disposed of in a Subtitle D landfill and be in compliance with the applicable land disposal restrictions (LDRs).
- To the extent appropriate for a delisted waste, this closure plan addresses the functional closure elements described in Washington Administrative Code (WAC) 173-303-610 for clean closure actions.

The distribution of responsibility for performance of activities identified in this closure plan is described in the April 1, 2019 settlement between FMF and Emerald (Emerald Kalama LLC et al). Emerald and FMF agree to implement this approved plan.

1.1 Background Information

Emerald operates an organic chemical manufacturing plant in Kalama, Washington that produces food and beverage preservatives, flavor and fragrance compounds, intermediate chemicals, and

plasticizers. Emerald operates a biological wastewater treatment plant that treats process wastewater, as well as groundwater, containing contamination from historical spills. As part of that treatment process, the plant generates IWBS. Emerald's IWBS are basically the same material as municipal WWTP biosolids, which are, essentially, the dead and decaying microorganisms used to digest and, thereby, chemically transform the undesirable components present in the wastewater.

Emerald contracted with FMF to land apply their IWBS from October 1995 until April 2014 when Ecology notified Emerald that FMF could no longer accept their IWBS.

FMF is a family owned business that began operation in 1941. The company has three main divisions: agriculture and forestry, management of municipal biosolids, and dredging/handling of municipal, industrial and agricultural wastewater treatment lagoons.

FMF's agricultural and forestry production includes over 700 acres in Lewis County. Primary agricultural products are cattle, hay and silage. Timbered land is managed for forest products. FMF accepts biosolids from municipal wastewater treatment plants and uses it to provide nutrients and improve soil conditions for FMF's crops.

FMF is permitted to conduct agricultural operations in seven Washington counties and has worked on biosolids land application projects in Oregon. FMF is a licensed contractor for wastewater treatment lagoon dredging operations in Washington, Oregon, Idaho and Montana.

1.2 Regulatory Status

Emerald and FMF submitted petitions to Ecology and the U.S. Environmental Protection Agency (EPA) to delist the mixed material in each of the identified storage units and grant Land Disposal Restriction (LDR) treatment variances for disposal of the mixed material. The delisting petitions were prepared in accordance with the requirements in WAC 173-303-910(3) and 40 Code of Federal Regulations (CFR) 260.22 and were submitted to the EPA and Ecology on April 23, 2018. In April 2020, the agencies approved the delisting and treatment variance petitions, conditioned on the performance of verification sampling requirements identified by the agencies in their respective delisting determinations (EPA 2020; Ecology 2020). A plan for verification sampling has been prepared and submitted to the agencies for approval (LAI 2020).

Lewis County Public Health and Social Services (LCPH) has local jurisdiction over solid waste facilities. The material stored at each site has been "delisted" and now technically becomes a "solid waste." However, due to the nature of the material, continued oversight from Ecology, and the limited window of time to complete the closures in 2020, LCPH is not requiring a permit to be obtained, if the following stipulations are followed:

- Lewis County staff shall have full access to the project sites to inspect and verify compliance of WAC 173-350

- If, at any time, the conditions of WAC 173-350 are not being met, LCPH may stop the project and require full solid waste permitting to be completed before the project resumes.
- LCPH will be provided closure reports as specified in Section 4.2 of this Closure Plan.
- Closure must be conducted in accordance with Lewis County Code Chapter 8.15 – Solid Waste Disposal and the solid waste flow control ordinance, which may incorporate additional fees. For example, waste hauled from the site shall be weighed in at a transfer station, where the normal tipping fee for solid waste shall be charged, before transit to the approved Subtitle D landfill. An empty tare weight for the hauling vehicle is advisable to reduce tipping fees.

1.3 Burnt Ridge Storage Unit

The FMF Burnt Ridge facility is located at 856 Burnt Ridge Road, in Onalaska, Washington (Figure 1). The storage unit is contained by an embankment constructed into sloping natural terrain. The storage unit is approximately square, as shown on Figure 2, with approximate dimensions of 220 feet (ft) on each side and a surface area at the top of the storage unit of about 48,000 square ft. The level-top embankment matches existing grades on the north side, with perimeter berms on the south, east, and west sides that extend above surrounding grades. As shown on Figure 3, the storage unit was designed with internal slopes of 3 units horizontal to 1 unit vertical (3H:1V), perimeter berm external slopes of 2H:1V, and a depth of approximately 14 ft (Thode 1998). According to the design drawing, the storage unit is lined with Claymax 600CL geosynthetic clay liner (GCL) material manufactured by Colloid Environmental Technologies Company. For the purposes of volume estimates, LAI assumes that approximately 12 inches of soil ("soil cap") was placed on top of the liner as part of typical manufacturer recommendations for GCL installations. The total storage unit volume including 18 inches of freeboard is approximately 3 million gallons.

The storage unit contains mixed material and accumulated precipitation. LAI took measurements of the depth to the mixed material surface below the water level in October 2017. Measurements were collected in a grid at 23 locations across the storage unit. Based on these measurements, the estimated average mixed material thickness was 2 ft. Given this thickness, the approximate volume of wet mixed material is 3,000 cubic yards (CY).

1.4 Newaukum Prairie Storage Unit

The FMF Newaukum Prairie facility is located at 349 State Route 508, in Chehalis, Washington (Figure 4). The storage unit is approximately square with a constructed berm on each side (Figure 5). According to the 2013 drawing, each side of the storage unit is approximately 220 ft in length with a total depth of 14 ft (Figure 6). The berms are reportedly sloped 3H:1V on the interior and 2H:1V on the exterior of the storage unit and are lined using a dual system consisting of a 60 milliliter (mL) high-density polyethylene (HDPE) primary liner, a geonet leak detection layer, and a 30 mL HDPE secondary liner. The bottom of the storage unit reportedly has dimensions of roughly 148 ft by 148 ft according to the 2013 drawing (Figure 6). Based on these dimensions, the total storage unit has a capacity of approximately 4 million gallons including 2 ft of freeboard. The storage unit contains mixed material

and accumulated precipitation. LAI took measurements of the depth to the mixed material surface below the water level in August 2017. Measurements were collected in a grid at 17 locations across the storage unit. Based on these measurements, the estimated average mixed material thickness was 6 ft. Given this thickness, the approximate volume of wet mixed material is approximately 7,000 CY.

1.5 Big Hanaford Storage Unit

The Big Hanaford facility is located at 307 Big Hanaford Road, in Centralia, Washington (Figure 7). Mixed material is stored at this facility in a roofed concrete storage unit (Figure 8). The roof is metal supported by wooden structural members that are anchored at grade. The floor of the structure is concrete. Concrete panels are used to contain the mixed material. The facility is approximately 100 ft long by 60 ft wide. The concrete panel height is approximately 11.5 ft; the mixed material was observed to be about 2 ft below the top of the panels during the waste characterization sample collection in 2017. The estimated volume of the mixed material is approximately 2,000 CY based on these observations.

2.0 CLOSURE REQUIREMENTS

The closure of the three mixed material storage units will be conducted in accordance with the requirements of WAC 173-303-610(3). As the mixed material has been delisted, mixed material contained in the three storage units will be removed and sent to a Subtitle D landfill in Washington for disposal. Any mixed material disposed, as solid waste, into a Subtitle D landfill must follow all local and state regulations regarding solid waste flow control including, as applicable, Lewis County Code, Chapter 8.15.030 (LCPH 2020). Appropriate construction best management practices (BMPs) will be implemented to control and limit stormwater contact with the mixed material and to minimize track-out on truck tires before leaving the site.

2.1 Designation of the Material

The mixed material stored in the three FMF storage units no longer carries dangerous waste designations, as described in Section 1.2. Analytical data collected for the storage units indicate that this material is not a characteristic dangerous waste, as provided in the delisting petitions and treatment variance petitions. A summary of the most recent mixed material sampling results are provided below for each storage unit facility.

2.1.1 Burnt Ridge Facility

The Burnt Ridge facility was formally designated with EPA Site ID number WAH000047760 as a hazardous waste generator, based on the 2014 listing of the mixed material as a dangerous waste; it is expected that the site designation will be changed to reflect the delisting of the mixed material. The mixed material stored at the facility reportedly includes IWBS from the Emerald facility in addition to domestic sewage sludge, and livestock runoff. In consultation with EPA and Ecology, Emerald contracted with LAI to analyze mixed material in the Burnt Ridge storage unit for those chemicals alleged to represent the greatest potential risk from IWBS generated at the Emerald facility. Samples were collected in October and November 2017 and analyzed for the following chemicals:

- Benzene, toluene, and acetone by EPA Method 8020C
- Methanol by EPA Method 8015C.

The analytical results were compared to the LDRs for non-wastewater. A summary of this comparison is provided in Table 1.

The analytical data demonstrate that the concentrations in the Burnt Ridge mixed material are below the LDR levels for each of these parameters (LAI 2017b). Samples were also analyzed for pH and total solids. Results indicate pH values range from 6.9 to 7.3, which demonstrates that the mixed material does not exhibit the characteristic of corrosivity. Total solids values range from 8.3 to 20 percent.

2.1.2 Newaukum Prairie Facility

The mixed material stored at the Newaukum Prairie facility reportedly includes IWBS from the Emerald facility in addition to biosolids. In consultation with EPA and Ecology, Emerald contracted

with LAI to analyze mixed material in the Newaukum Prairie storage unit for those chemicals alleged to represent the greatest potential risk from IWBS generated at the Emerald facility. Samples were collected on August 28 and 29, 2017 and analyzed for the following chemicals:

- Benzene, toluene, and acetone by EPA Method 8020C
- Methanol by EPA Method 8015C.

The analytical results were compared to the LDRs for non-wastewater. A summary of this comparison is provided in Table 2.

The analytical data demonstrate that the concentrations in the Newaukum Prairie storage unit mixed material are below the LDR levels for each of these parameters (LAI 2017c). Samples were also analyzed for pH and total solids. Results indicate pH values range from 7.3 to 7.8, which demonstrates that the mixed material does not exhibit the characteristic of corrosivity. Total solids values range from 5.6 to 10.5 percent.

2.1.3 Big Hanaford Facility

The mixed material stored at the Big Hanaford facility reportedly includes IWBS from the Emerald facility in addition to biosolids. In consultation with EPA and Ecology, Emerald contracted with LAI to analyze mixed material in the Big Hanaford storage unit for those chemicals alleged to represent the greatest potential risk from IWBS generated at the Emerald facility. Samples were collected on August 30 and 31, 2017 and analyzed for the following chemicals:

- Benzene, toluene, acetone, and acrylonitrile by EPA Method 8020C
- Methanol by EPA Method 8015C
- Semivolatile organic compounds by EPA Method 8270D
- Total and/or Toxic Characteristic Leaching Procedure (TCLP) cobalt by EPA Method 6010C
- Polychlorinated biphenyls by EPA Method 8082A.

The analytical results were compared to the Preliminary Delisting Levels (PDLs) and TCLP-PDLs x 20 for non-wastewater. A summary of this comparison is provided in Table 3.

The analytical data demonstrate that the concentrations in the Big Hanaford storage unit are below the LDR levels for each of these parameters (LAI 2017d). Samples were also analyzed for pH and total solids. Results indicate pH values range from 7.9 to 8.3, which demonstrates that the mixed material does not exhibit the characteristic of corrosivity. Total solids values range from 11.8 to 23.9 percent.

2.2 Closure Performance Standard

Closure of the three storage units will be completed by removing accumulated precipitation and mixed material. If the removal of mixed material results in exposure of a non-soil base of the storage unit (as expected at the Newaukum Prairie and Big Hanaford storage units, which have a synthetic

liner and concrete foundation, respectively, beneath the mixed material), the non-soil base and sides of the storage unit will be cleaned and decontaminated by FMF personnel. If the removal of mixed material results in exposure of a soil base of the storage unit (as expected at Burnt Ridge storage unit, where the geosynthetic liner is overlain with a soil cap), then cleaning and decontamination of the surface is impracticable – instead, the soil cap will be sampled and analyzed to confirm that it does not contain benzene or toluene at concentrations exceeding Model Toxics Control Act (MTCA) cleanup levels. No soil sampling is proposed beneath the Newaukum Prairie storage unit liner or Big Hanaford structure on the basis of prior soil sampling results, which provide evidence that mixed material meets applicable regulatory criteria.

The following sections (2.2.1 through 2.2.3) present the proposed closure standards for each storage unit.

2.2.1 Closure Performance Standard: Burnt Ridge Facility

Benzene and toluene concentrations have been thoroughly evaluated in both soil and mixed material associated with operation of the Burnt Ridge storage unit, including the 2016 soil investigation and the 2017 waste characterization that were performed in accordance with work plans reviewed and approved by Ecology and EPA (LAI 2016, LAI 2017a). These investigation results are summarized in Table 4 and demonstrate that existing concentrations of benzene and toluene in as-applied-to fields and as-stored mixed material comply with MTCA Method A soil cleanup levels protective of unrestricted land use. Because the as-stored mixed material represents the most concentrated source of mixed material at the Burnt Ridge facility – and because it has already been demonstrated to comply with the proposed performance standards – we propose no further sampling, apart from confirmation sampling of the storage unit's soil liner, as part of the post-closure documentation process for the Burnt Ridge facility.

Confirmation sampling will be conducted on the soil cap, if present, above the Burnt Ridge GCL. As stated in Section 1.3, it is assumed that approximately 12 inches of soil was placed above the GCL per typical GCL manufacturer recommendations. Removal of mixed material and decontamination of any exposed liner, if applicable, will be completed in a step-wise manner as follows to maintain and evaluate the condition of the GCL and any overlying soil layer:

1. Excavate to the depth at which the 12-inch soil cap is presumed to be present.
2. Evaluate the condition of the soil cap.
    a. If the soil cap is intact (i.e., the GCL is not exposed), confirmation soil samples will be collected from the top of the soil layer, as described below.
        i. Confirmation samples (11 grab samples) of the soil cap will be collected in randomized locations and analyzed for benzene and toluene. Randomized samples locations, as shown on Figure 9, were determined using the same methods described in the Waste Characterization Plan for sampling mixed material (LAI 2017a). Analytical results will be compared to MTCA Method A

soil cleanup levels (30 micrograms per kilogram [µg/kg] benzene and 7,000 µg/kg toluene) to determine whether closure is complete.

ii. If benzene and toluene concentrations in the intact soil cap demonstrate compliance with MTCA Method A soil cleanup levels, then the closure requirements for the storage unit will be considered complete.

iii. If confirmation results do not comply with MTCA Method A cleanup levels, then further excavation of the soil layer will be completed. Steps 2.a.i and 2.a.ii of this list will be repeated until 1) benzene and toluene concentrations in the intact soil cap demonstrate compliance with MTCA Method A soil cleanup levels, or 2) the soil layer has been removed and exposed the surface of the GCL.

iv. If, based on sampling results, the entire soil layer requires excavation down to the geosynthetic surface of the GCL, then no further confirmation sampling will be conducted beneath the storage unit's liner, and the geosynthetic surface of the GCL will be decontaminated by FMF personnel (as described below).

b. If the soil cap is removed, exposing the surface of the GCL, then the GCL will be evaluated and decontaminated (or removed or repaired) as described below.

3. If the surface of the GCL is exposed, it will be inspected to confirm whether the GCL is intact or whether the clay liner has been compromised and exposed the underlying geosynthetic liner.

   a. If the GCL is intact and in good condition, the clay surface of the GCL will be decontaminated using a pressure washer rinse.

      i. Rinsate will be collected at the sump in the bottom of the Burnt Ridge storage unit and transported to the Emerald Kalama facility for treatment.

      ii. The decontamination process will be verified by collecting a sample of rinsate for analysis of benzene and toluene. If concentrations of benzene or toluene are less than MTCA Method A cleanup levels (5 micrograms per liter [µg/L] benzene and 1,000 µg/L toluene), then the GCL will be considered decontaminated. If not, the pressure washing and rinsate sampling will be repeated until cleanup levels are attained.

   b. If the clay liner of the GCL is not intact, FMF will review the nature of the damage to the GCL and will coordinate with Ecology to reach a decision as to whether the storage unit may be repaired or whether it will be required to be removed or reconstructed.

2.2.2 Closure Performance Standard: Newaukum Prairie Facility

Benzene and toluene concentrations have been thoroughly evaluated in both soil and mixed material associated with operation of the Newaukum Prairie storage unit including the 2016 soil investigation and the 2017 waste characterization that were performed in accordance with work plans reviewed and approved by Ecology and EPA (LAI 2016, LAI 2017a). These investigation results are summarized in Table 4 and demonstrate that existing concentrations of benzene and toluene in as-applied-to fields and as-stored mixed material comply with MTCA Method A soil cleanup levels protective of

unrestricted land use. Because the as-stored mixed material represents the most concentrated source of mixed material at the Newaukum Prairie facility – and because it has already been demonstrated to comply with the proposed performance standards – we propose no further sampling beneath the storage unit's HDPE liner as part of the post-closure documentation process for the Newaukum Prairie facility.

2.2.3 Closure Performance Standard: Big Hanaford Facility

Benzene and toluene concentrations have been thoroughly evaluated in both soil and mixed material associated with operation of the Big Hanaford storage unit, including the 2016 soil investigation and the 2017 waste characterization that were performed in accordance with work plans reviewed and approved by Ecology and EPA (LAI 2016, LAI 2017a). These investigation results are summarized in Table 4 and demonstrate that existing concentrations of benzene and toluene in as-applied-to fields *and* as-stored mixed material comply with MTCA Method A soil cleanup levels protective of unrestricted land use. Because the as-stored mixed material represents the most concentrated source of mixed material at the Big Hanaford facility – and because it has already been demonstrated to comply with the proposed performance standards – we propose no further sampling beneath the storage unit's concrete foundation as part of the post-closure documentation process for the Big Hanaford facility.

Mixed materials were previously visibly released through a seam in the storage unit at its southwest corner; the leaked mixed materials were returned to the storage unit, as directed by Ecology, and the seam in the storage unit was repaired.

FMF has sealed all cracks in the storage unit with an adhesive caulk designed for concrete panels. It has also inspected the storage unit monthly for leaks and none have been found. Notwithstanding that information, it is recognized that less significant releases of mixed materials may have occurred from other seams in the storage unit. Therefore, per Ecology request, this plan requires additional samples to be collected from surface soil outside of the storage unit in areas where mixed material has or may have sloughed onto the ground from gaps or cracks in the concrete storage unit walls. The following paragraphs describe the means and methods for collecting these additional samples.

Within a 10-ft by 10-ft area nearest the southwest corner of the storage unit, three discrete aliquots will be collected from the surrounding soil where evidence of mixed material is apparent. Collected material will be composited into one sample container for analysis of benzene and toluene.

The storage unit will be inspected for visual signs (i.e., staining) of other release points at the time of closure plan implementation. During closure activities, 10 additional sample containers will be brought to Big Hanaford, allowing for the collection of surface soil samples from up to 10 other locations, based on visual evidence of releases. Sampling based on visual evidence of releases will be composites of three discrete locations within a 5-ft by 5-ft area of the exposed soil nearest the visual evidence of historical releases. Locations will be documented in the field using physical measurements relative to the sides of the storage unit.

In the event that surface soil samples exceed MTCA Method A cleanup levels for benzene (30 µg/kg) or toluene (7,000 µg/kg), that soil will be excavated and disposed of with mixed material from the storage unit.

3.0 REMOVAL AND DISPOSAL OF PRECIPITATION AND MIXED MATERIAL

Burnt Ridge and Newaukum Prairie storage units contain mixed material and accumulated precipitation, while Big Hanaford is covered and, therefore, only contains mixed material. It is assumed that access to each storage unit is adequate for truck and equipment traffic.

Sections 3.1 through 3.3 describe the three stages of achieving closure of each storage unit, including 1) removal of accumulated precipitation (applicable only at Burnt Ridge and Newaukum Prairie), 2) removal of mixed material, and 3) removal of post-pumping mixed material residues. The sequencing of the first two stages – removal of accumulated precipitation and the removal of mixed material – may be iterative and will be dependent on storage unit conditions at the time of closure. Although accumulated precipitation will be preferentially removed first, it may not be removed all the way to the phase boundary between accumulated precipitation and mixed material solids. It may be beneficial to leave some volume of accumulated precipitation in the storage unit to enable the pumping of a mixed material slurry from the storage units into a dewatering system.

3.1 Removal, Transportation, and Disposal of Accumulated Precipitation

Accumulated precipitation at Burnt Ridge and Newaukum Prairie storage units will be removed and transported offsite to the Emerald treatment plant for treatment and disposal[1]. A floating surface pump will be used to remove the accumulated precipitation from each storage unit. The water will be conveyed from the surface pump through flexible hoses to onsite tanker trucks. The tanker trucks will be staged on or near the concrete or compacted gravel entrance ramp. The flexible hoses will be positioned and secured so that any leaks will be contained and drain back into the storage unit. Efforts will be made to not disturb the remaining settled mixed material on the bottom of the storage unit during this process.

Tanker trucks will transport the accumulated precipitation to the Emerald treatment plant in Kalama, Washington. The water will be processed through the wastewater treatment plant.

3.2 Removal, Transportation, and Disposal of Mixed Material

Mixed material will be removed from the storage units in a manner that limits damage to storage unit liners or concrete structures. The mixed material will be loaded into transportation containers for disposal at the Republic Services Roosevelt Regional Municipal Solid Waste Landfill, a Subtitle D landfill in Klickitat County, Washington. Mixed material has been verbally approved for disposal at the Roosevelt Landfill subject to profiling requirements. In the event that Roosevelt Landfill's ability to

[1] In the event that unforeseen circumstances preclude the treatment of water by Emerald Kalama's wastewater treatment system, Emerald and FMF will secure a State Waste Discharge Permit to facilitate land application of the water onto FMF's agricultural fields.

receive the mixed material changes between the time of its approval and execution of the closure plan, then Emerald will coordinate with another Subtitle D landfill in Washington State (e.g., Greater Wenatchee Regional Landfill) for disposal. If the mixed material will be disposed at a location other than Roosevelt Landfill, Ecology will be notified of the change within 5 days of the decision and at least 5 days before mixed materials are transported to the alternative Subtitle D landfill.

Before loading, material will be dewatered using a belt filter press, mixed with a drying/bulking material, or loaded "as-is" depending on the moisture content of the mixed material and the most cost effective disposal option available. Generally, the solids content of the mixed material will need to be increased to 10 percent solids, or more, to pass the paint filter test and be disposed of as a solid rather than a liquid. Paint filter testing is performed by the receiving landfill at the time of delivery. Emerald will also perform a paint filter test at least daily on out-going mixed material to verify that the material is dry enough before transporting offsite.

Mixed material from Burnt Ridge and Newaukum Prairie will be most efficiently dewatered by using a belt filter press. Belt filter presses dewater sludge through a series of thickening processes including pressing sludge between two fabric conveyor belts that are squeezed under a series of rollers to force excess water from sludge. Water and polymer are added to the process to aid with sludge thickening. A belt filter press would require influent mixed material be liquid enough to pump. A typical belt press may process up to 150 gallons of mixed material per minute and generates about 65 gallons per minute of wastewater in addition to the produced wastewater from mixed material dewatering. The final specifications and configuration of the belt filter press are subject to final contractor selection following the approval of this closure plan. Specifications and drawings on the belt filter press will be provided to Lewis County Health Department once a contractor has been selected. Figures 10 and 11 show the conceptual configurations of the dewatering equipment and staging areas at Burnt Ridge and Newaukum Prairie, respectively. Added polymer is removed with solids and would not affect filtrate water quality. Filtrate water will be trucked to Emerald Kalama for processing at their water treatment facility. In the event that use of a belt filter press does not result in sufficient dewatering for the mixed material to pass the paint filter test, a bulking agent (e.g., fly ash or hog fuel) may be added to the mixed material prior to disposal.

Mixed material from Big Hanaford is not flowable and, therefore, cannot be pumped through a belt filter press. If Big Hanaford mixed material passes the paint filter test without drying, it may be transported to the landfill as-is. If the paint filter test fails, a drying/bulking agent (e.g., fly ash or hog fuel) will be combined with mixed material until the paint filter test is passed.

To avoid damaging the liner in the Newaukum Prairie storage unit, the last residual volume of mixed materials (approximately 6 to 12 inches in depth) may be pumped into an onsite liquid storage tank for final settling, dewatering, and transportation for disposal.

A designated truck route will be established and a dedicated loading pad will be constructed of compacted gravel or concrete in areas that are not already accessible by truck. Care will be taken to reduce spills of material during loading. Spilled material will be cleaned up with hand tools.

The hauling and transportation process will follow all local and state solid waste rules and regulations (including Lewis County Code 8.15 and Revised Code of Washington 36.58.040). This includes gathering a tare and gross (empty and loaded) weight of each transport vehicle and trailer at the Lewis County Transfer Stations, where the normal tipping fee for solid waste shall be applied.

3.3 Removal of Mixed Material Residues

After removal of the mixed material from storage units, non-soil structure surfaces will be cleaned of mixed material residues as described below,

3.3.1 Burnt Ridge Facility

At the Burnt Ridge facility, the surface of the soil cap (which covers the geosynthetic liner) will be allowed to dry under normal atmospheric conditions. If visible mixed material residues remain on the surface of the soil cap, they will be removed for disposal at Roosevelt Landfill. If a soil cap is left in place over the geosynthetic liner, then removal of mixed material residues will be demonstrated by confirmation sampling as described in Section 2.2.1. Confirmation sampling and additional removal of the soil cap surface will be performed iteratively if necessary (i.e., if confirmation sampling shows that benzene and toluene remain at concentrations above permissible thresholds).

3.3.2 Newaukum Prairie Facility

The storage unit liner at the Newaukum Prairie facility will be rinsed to remove mixed material residues. Overspray is unlikely at Newaukum Prairie, because of the steep storage unit side walls. The sides and bottoms of the storage unit will be cleaned using a pressure washer until visually clean and clear of residue. All rinse water will be contained, collected via sump pump from the bottom of the storage unit, and containerized for disposal. A sample of the rinse water will be collected and analyzed for benzene and toluene to verify that the storage unit has been decontaminated. If concentrations of benzene and toluene are below MTCA Method A cleanup levels (5 µg/L benzene and 1,000 µg/L toluene), then the storage unit will be considered decontaminated. If levels of benzene and toluene are above the MTCA Method A cleanup levels, then another rinse will be completed with associated confirmation sampling of the rinsate; this cycle will be repeated until benzene and toluene concentrations in rinsate are lower than MTCA Method A cleanup levels. Containerized rinse water will be transported to the Emerald wastewater treatment system plant for treatment and disposal.

3.3.3 Big Hanaford Facility

Mixed material in the Big Hanaford storage unit will be removed via heavy equipment and hand tools. All gaps in concrete were filled with an adhesive caulk designed for concrete panels. The caulk seals

will be visually inspected prior to decontamination; any new gaps between concrete panel walls of Big Hanaford will be re-sealed in order to contain wash-water and any mixed material residue within the storage unit. Decontamination will be conducted in a step-wise process as follows:

1. Residual solids on walls and the floor of the storage unit will be cleaned using scrub brushes and then with a pressure washer. The wash water will be transported to Emerald Kalama for disposal.
2. The walls and floors will be subjected to a pressure-wash rinse. The rinsate will be transported to Emerald Kalama for disposal.
3. A sample of the rinsate will be collected and analyzed for benzene and toluene.
4. If benzene and toluene concentrations in the rinsate are less than Method A MTCA Cleanup levels (5 µg/L benzene and 1,000 µg/L toluene) then decontamination will be considered complete.
5. If levels of benzene and/or toluene exceed the MTCA Method A cleanup levels, then Steps 2 through 4 will be repeated until cleanup levels are achieved.

3.4 Documentation

A daily field report will be prepared for each day that closure activities are conducted. The daily field report will include: gallons of accumulated precipitation removed from the site, volume of mixed material removed from the site, number of truck-loads transported offsite, a description of daily activities, and photo documentation. Shipping and disposal records from all disposal facilities used for the project will be obtained and documented.

3.5 Spill Prevention and Response

Care will be taken to prevent spills during handling of materials during closure activities at each facility. Spill kits will be available and remain onsite for the duration of the project, and will be restocked after each use.

Hoses and connections used for pumping and conveying accumulated precipitation from the two storage units into the tanker trucks will be positioned and secured so that any leaks will drain back into the storage unit.

In the event of a spill, the construction activity that caused the spill will be temporarily suspended until appropriate corrective actions are implemented and the spilled material has been cleaned up. Depending on the nature and extent of the spill, it is possible that soil impacted by a spill will also need to be removed for disposal. To minimize the area that may be affected by spills, truck loading will only be conducted in the dedicated gravel loading pad. At project completion, the pad will be removed from the site and transported to a Subtitle D landfill for disposal.

It is anticipated that the contractor(s) selected to conduct cleanup construction activities will be required to prepare and submit a Spill Prevention, Control, and Countermeasure Plan as part of its construction work plan.

4.0 CLOSURE SCHEDULE AND REPORTING

Following Ecology review and approval of this closure plan, Emerald will initiate activities required to implement the clean closure construction activities outlined above.

4.1 Anticipated Construction Schedule

Subject to the timing of Ecology's approval of this closure plan and the availability of resources, Emerald and FMF anticipate commencing closure activities in 2020 and completing closure activities for all three storage units within a year.

Closure activities for the three storage units will be sequenced. Closure activities may be conducted at more than one facility at a given time, but not such that any two facilities are competing for the same resources (e.g., tanker trucks for removal of accumulated precipitation or lined trucks for the hauling of mixed material). The sequence for closure will be dependent upon the weather and the availability of resources.

4.1.1 Big Hanaford Storage Unit

Closure activities for the Big Hanaford storage unit will be targeted to take advantage of the fact that weather poses less of an issue for this unit as compared to the other two. Given that the storage unit is covered, rain, and the potential for rainwater accumulation, is not an issue for closure of this unit.

The Big Hanaford storage unit contains approximately 2,000 CY of mixed material with solids content reportedly ranging between 11.8 and 23.9 percent. Big Hanaford mixed material is anticipated to be dry enough to load into trucks directly. However, if additional drying is required, a bulking agent, such as hog fuel, may be mixed into each truck load in order to dispose as a solid. Other drying means are likely unfeasible for Big Hanaford mixed material. Belt filter presses require influent material to be liquid enough to pump. Mechanical means, such as turning or piling material for exposure to sun or wind are also not feasible because of the Storage Unit's relatively high walls and roof. Assuming hog fuel is used as a bulking agent, the total volume of amended mixed material to be removed from the Big Hanaford facility is estimated to be 2,000 CY.

Closure schedule and duration will be dependent on truck availability, wait time at the transfer station or landfill, and mixed material handling and/or processing (if needed).

4.1.2 Burnt Ridge Storage Unit

Closure activities for the Burnt Ridge storage unit are targeted for months when weather conditions are dry. To facilitate atmospheric drying of the soil cap surface, the mixed material and precipitation accumulation in the storage unit will be targeted for removal prior to July 1. As described in Section 3.1, the water will be transported to Emerald Kalama Chemical for treatment and disposal.

The Burnt Ridge storage unit contains approximately 3,000 CY of mixed material with solids content reportedly ranging between 8.3 and 20.0 percent. The Burnt Ridge mixed material will likely require dewatering prior to transportation for disposal as a solid.

4.1.3 Newaukum Prairie Storage Unit

Closure activities for the Newaukum Prairie storage unit are targeted for months when weather conditions are dry. As described in Section 3.1, the water will be transported to Emerald Kalama Chemical for treatment and disposal.

The Newaukum Prairie storage unit contains approximately 7,000 CY of mixed material with solids content reportedly ranging between 5.6 and 10.5 percent. Because of the low solids content, dewatering would be necessary in order to dispose of Newaukum Prairie mixed material as a solid.

4.2 Closure Completion Reporting

Upon completion of the closure activities and receipt of all material disposal records, a closure report for each facility will be prepared and submitted to Ecology within 60 days.

5.0 LIMITATIONS

This Storage Unit Closure Plan has been prepared for the exclusive use of Perkins Coie LLP and their client Emerald Kalama Chemical, LLC and applicable regulatory agencies for specific application to the Fire Mountain Farms, Inc. Burnt Ridge, Newaukum Prairie, and Big Hanaford facilities. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of Landau Associates. 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 Landau Associates, shall be at the user's sole risk. Landau Associates 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

Ecology. 2017. Letter: Waste Characterization Plan Approval. From Laurie G. Davies, Waste 2 Resources Program, Washington State Department of Ecology, to Jarrod Kocin, Emerald Kalama Chemical LLC. August 8.

Ecology. 2016. Agreement for Conditional Compliance with Ecology Administrative Order No. 10938 During Judicial Review. Washington State Department of Ecology. June 3.

Ecology. 2014. *Administrative Order No. 10938, in the Matter of an Administrative Order against Emerald Kalama Chemical, LLC and Fire Mountain Farms, LLC.* Washington State Department of Ecology. Effective date: September 11.

Ecology. 2020. Fact Sheet for Dangerous Waste Delisting and Treatment Variance Petitions, Emerald Kalama Chemical, LLC, and Fire Mountain Farms, Inc. Washington State Department of Ecology. April 8.

Emerald Kalama Chemical LLC, Fire Mountain Farms Inc, Robert J. Thode, and Martha A. Thode. 2019. Settlement Agreement. April 1

EPA. 2020. Hazardous Waste Management System; Final Exclusion for Identifying and Listing Hazardous Waste. U.S. Environmental Protection Agency. 40 CFR Part 261. 19676-19681. EPA-R10-RCRA-2018-0662; FRL-10006-64-Region 10. April 8.

LAI. 2020. Verification Sampling Plan, Fire Mountain Farms, Mixed Material Storage Units, Lewis County, Washington. April 8.

LAI. 2017a. Waste Characterization Plan, Fire Mountain Farms Mixed Material Storage Units, Lewis County, Washington. Landau Associates, Inc. July 27.

LAI. 2017b. Waste Characterization Report, Fire Mountain Farms Burnt Ridge Storage Unit, Lewis County, Washington. Landau Associates, Inc. November 29.

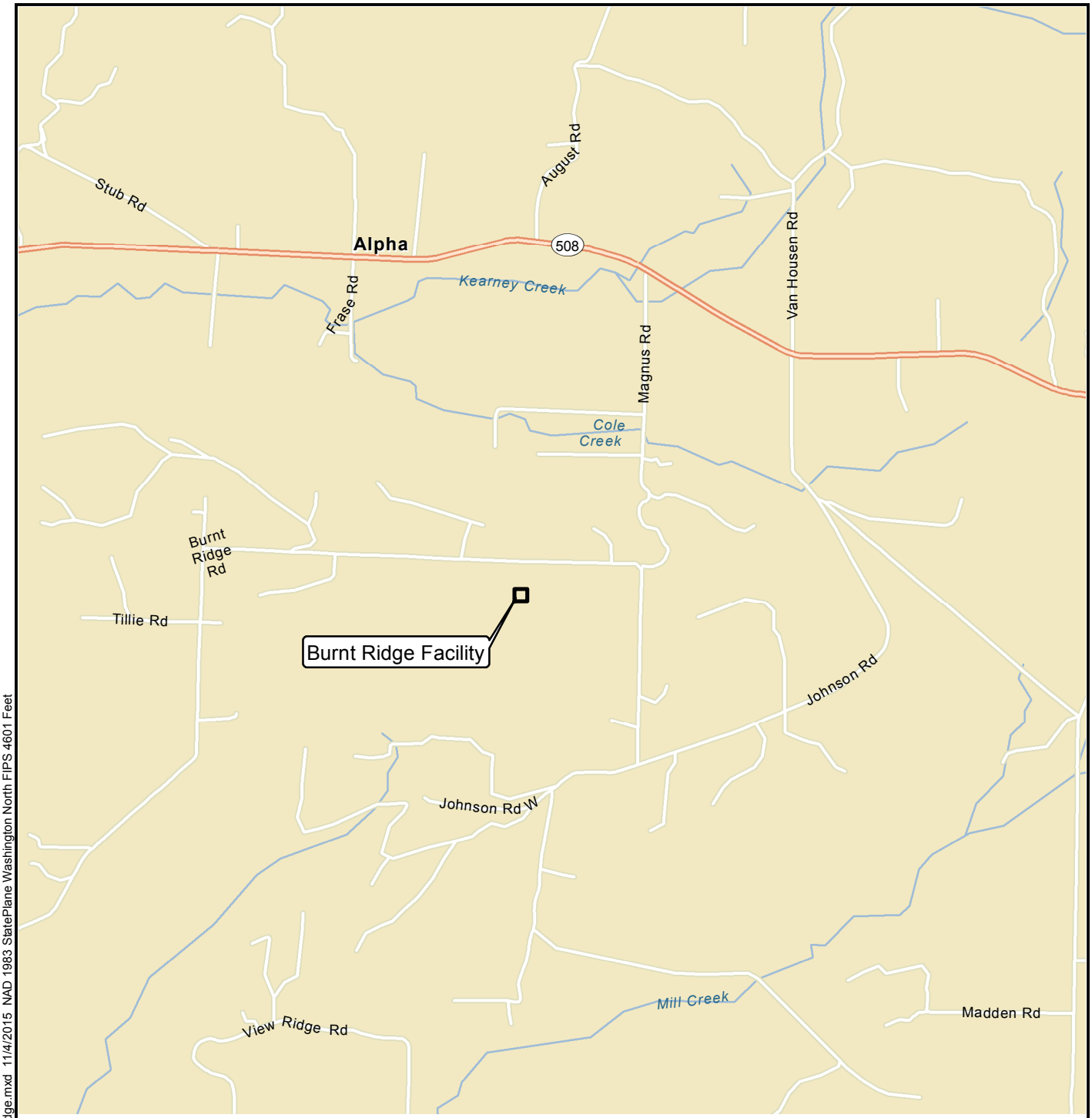
LAI. 2017c. Waste Characterization Report, Fire Mountain Farms Newaukum Prairie Storage Unit, Lewis County, Washington. Landau Associates, Inc. October 12.

LAI. 2017d. Waste Characterization Report, Fire Mountain Farms Big Hanaford Storage Unit, Lewis County, Washington. Landau Associates, Inc. November 27.

LAI. 2016. Soil Characterization Report, Fire Mountain Farms Agricultural Fields, Lewis County, Washington. Landau Associates, Inc. December 22.

LPCH. 2020. Memo re: Review of Draft EKC/FMC Closure Plan dated June 8, 2020. From Bill Teitzel, Lewis County Public Health and Social Services, to Peter Lyon, Washington State Department of Ecology. June 11.

Thode, James. 1998. Fire Mountain Farms Burnt Ridge Lagoon and Newaukum Prairie Lagoon Design Drawings. August.



N

0 0.5 1

Miles

Data Source: Esri 2012

G:\Projects\066\045\010\014\F01 VicinityMap BurntRidge.mxd 11/4/2015 NAD 1983 StatePlane Washington North FIPS 4601 Feet

LANDAU ASSOCIATES

Emerald Kalama Closure Plan	**Burnt Ridge Vicinity Map**	Figure 1

0 100 200

Feet

Data Source: Esri 2012; Esri World Imagery

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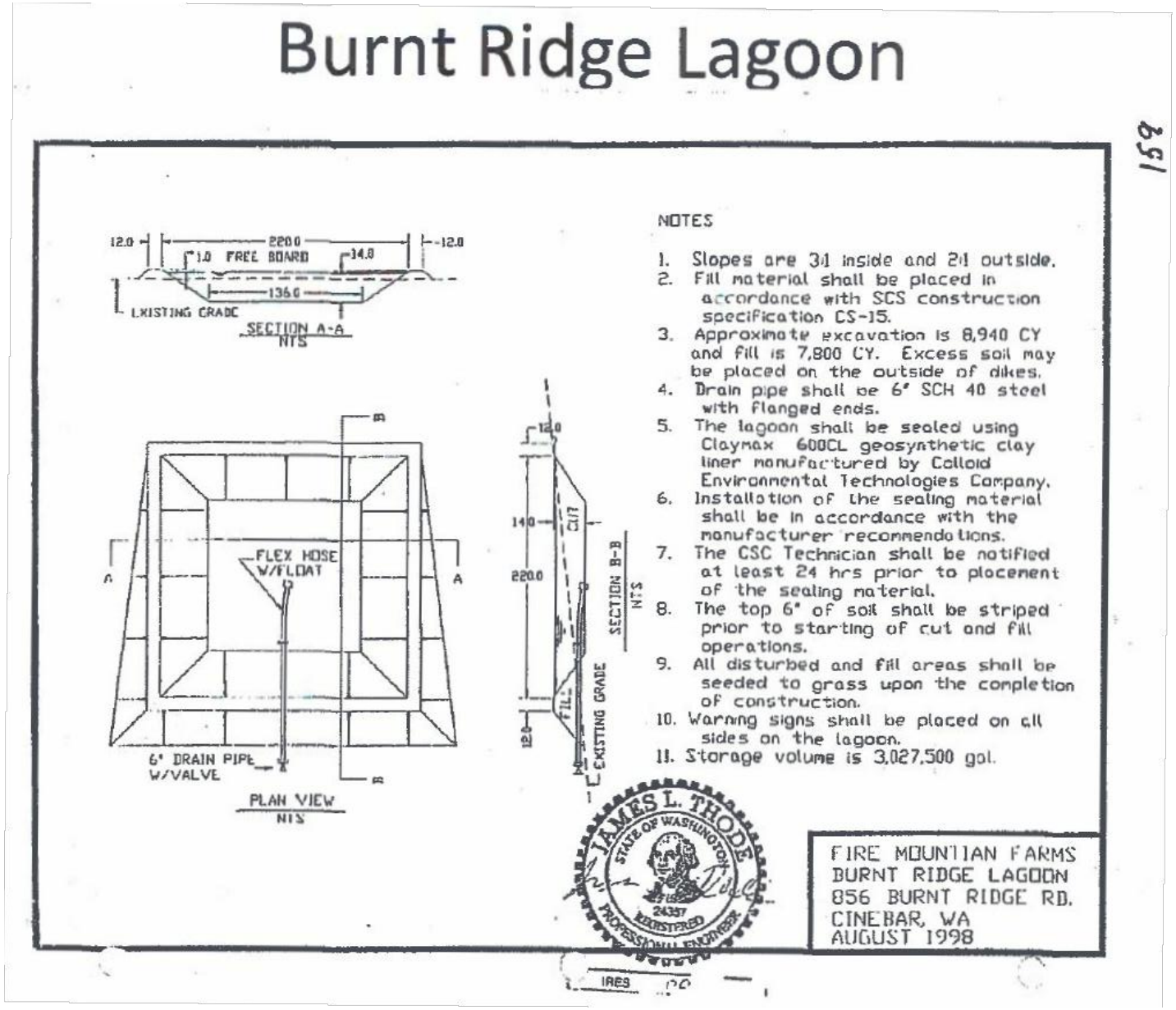
LANDAU ASSOCIATES

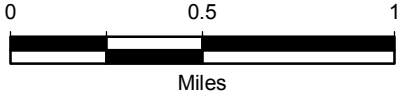
Emerald Kalama Closure Plan	**Burnt Ridge Storage Unit Aerial Photograph**	Figure 2

Burnt Ridge Lagoon



LANDAU ASSOCIATES

Emerald Kalama Closure Plan	**Burnt Ridge Storage Unit Design**	Figure 3



Data Source: Esri 2012

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LANDAU ASSOCIATES

Emerald Kalama Closure Plan	**Newaukum Prairie Vicinity Map**	Figure 4

0 100 200

Feet

Data Source: Esri 2012; Esri World Imagery

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LANDAU ASSOCIATES

Emerald Kalama Closure Plan	**Newaukum Prairie Storage Unit Aerial Photograph**	Figure 5

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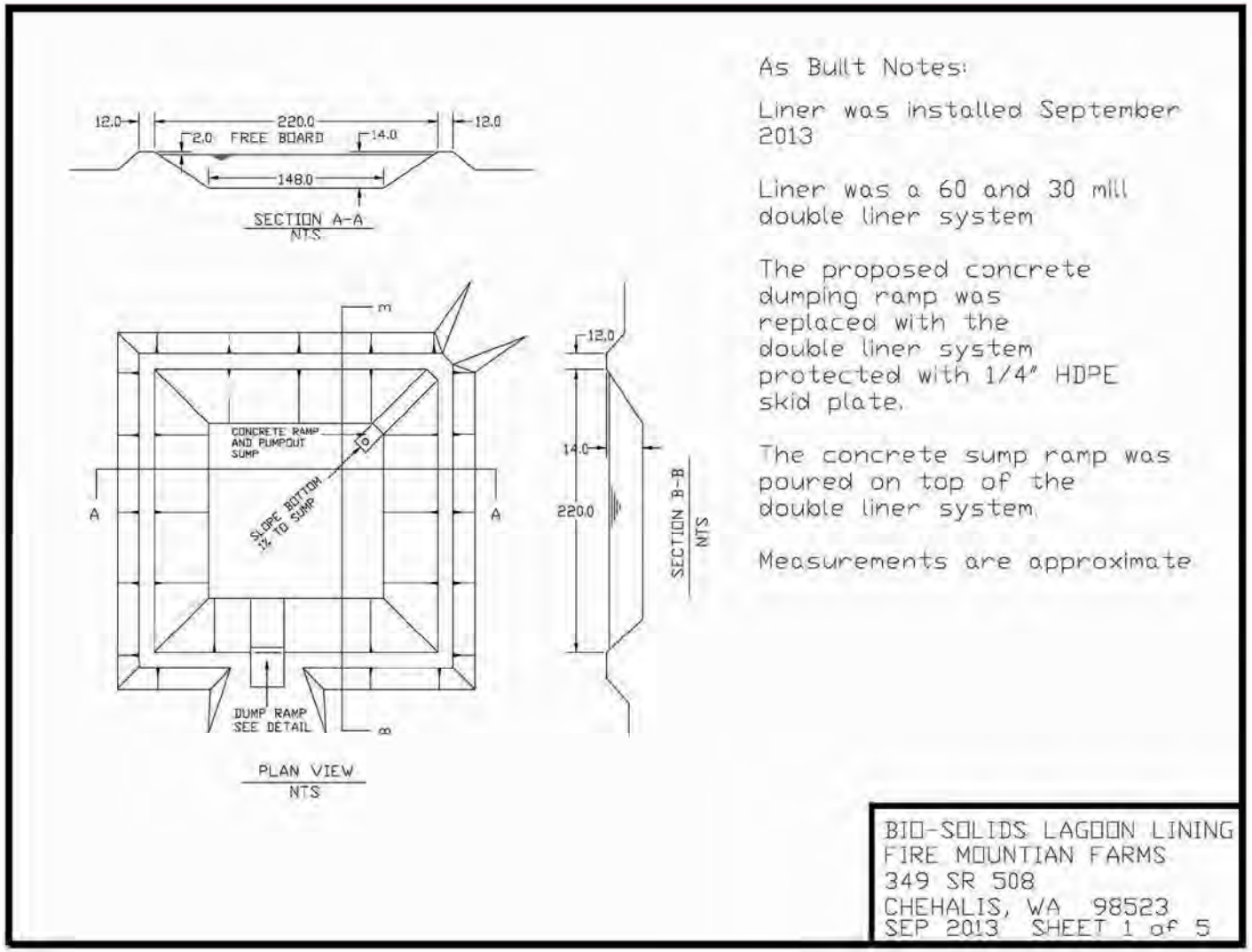
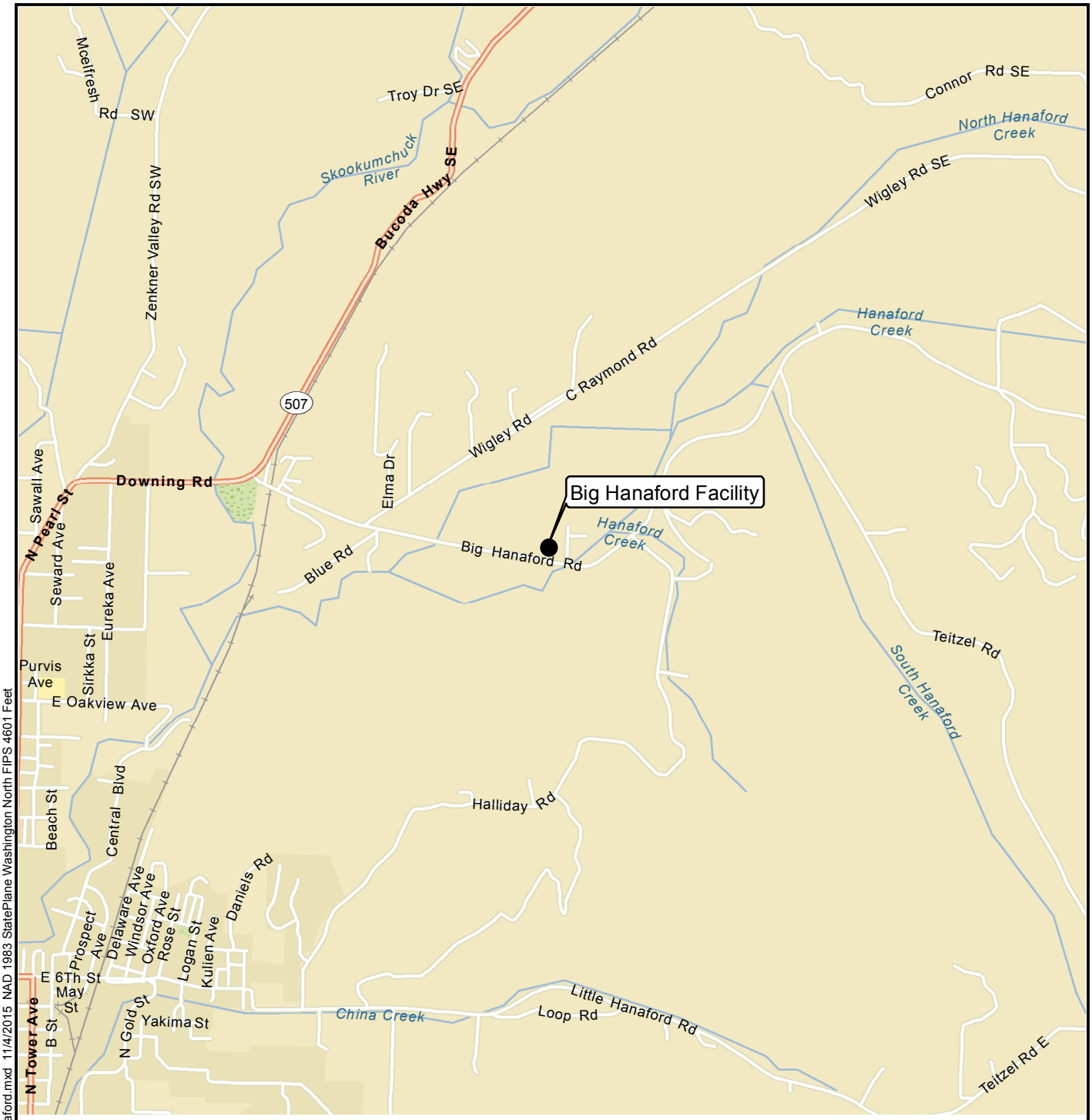


Emerald Kalama Closure Plan	**Newaukum Prairie Storage Unit Design**	Figure 6

LANDAU ASSOCIATES



Data Source: Esri 2012

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LANDAU ASSOCIATES

Emerald Kalama Closure Plan	**Big Hanaford Vicinity Map**	Figure 7

0 150 300

Feet

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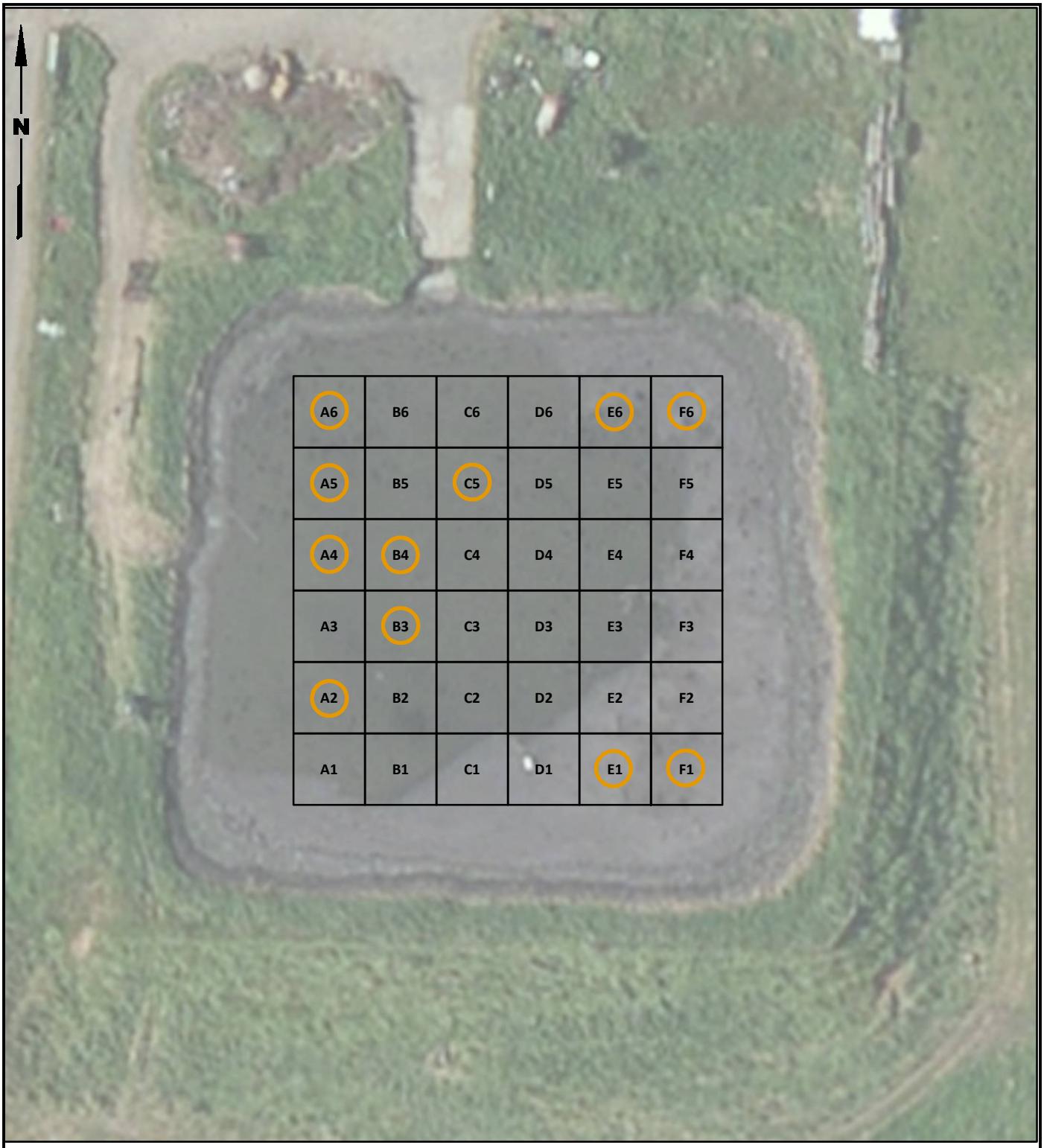
Data Source: Esri 2012; Esri World Imagery

LANDAU ASSOCIATES

Emerald Kalama Closure Plan	**Big Hanaford Storage Unit Aerial Photograph**	Figure 8



Legend

A1 Sampling Grid

Grab Sample Location

0 50 100

Feet

Notes

1. Grab samples will be collected from the surface of the soil cap, if present and in good condition.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Data Source: Esri World Imagery

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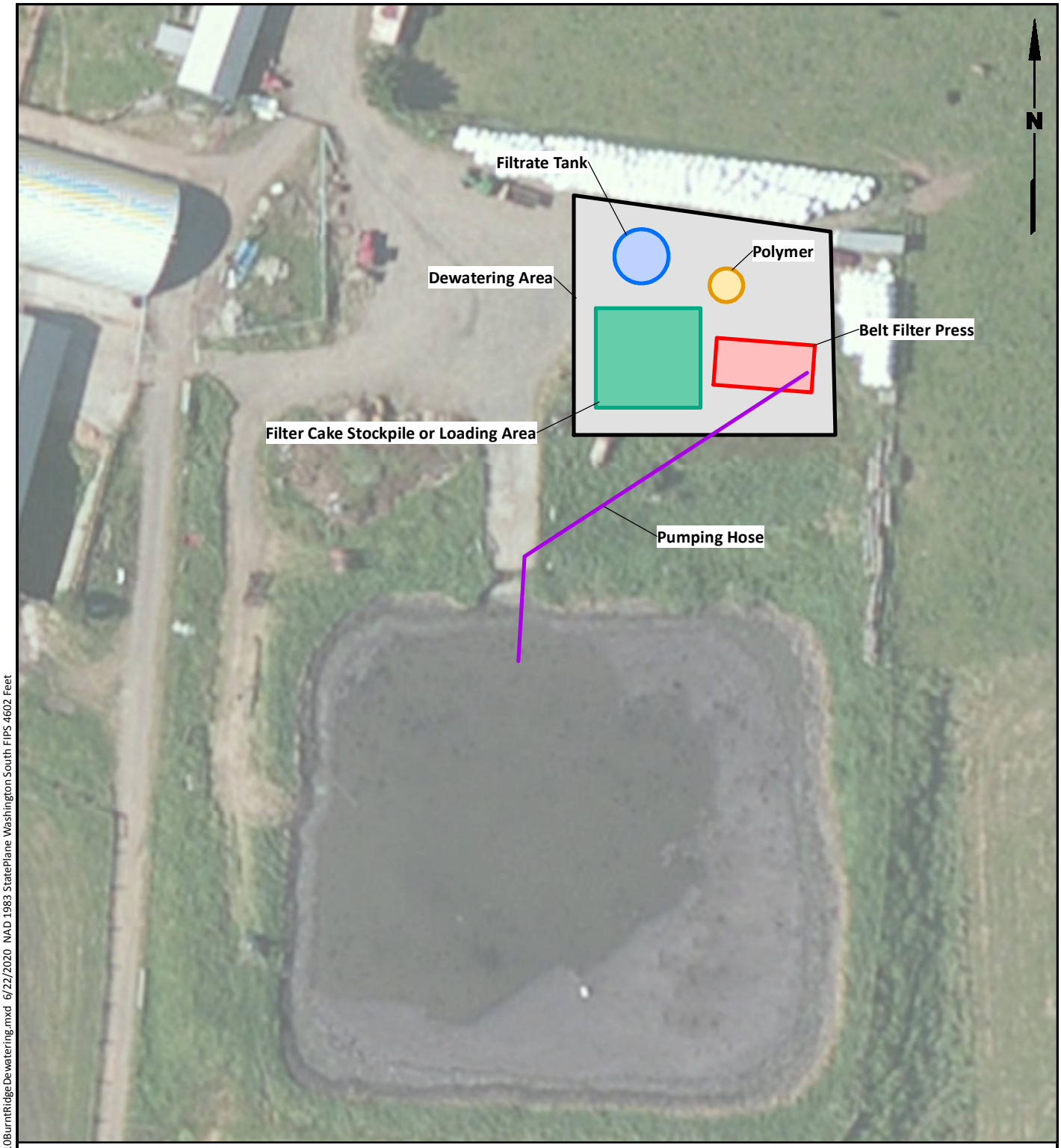
LANDAU ASSOCIATES

Emerald Kalama Closure Plan Fire Mountain Farms Storage Units	**Burnt Ridge Storage Unit Soil Cap Sampling Locations**	Figure 9



Legend

- Pumping Hose
- Dewatering Area
- Belt Filter Press
- Filter Cake Stockpile or Loading Area
- Filtrate Tank
- Polymer

0 60 120

Feet

Notes

1. Locations of features are approximate.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Data Source: Esri World Imagery

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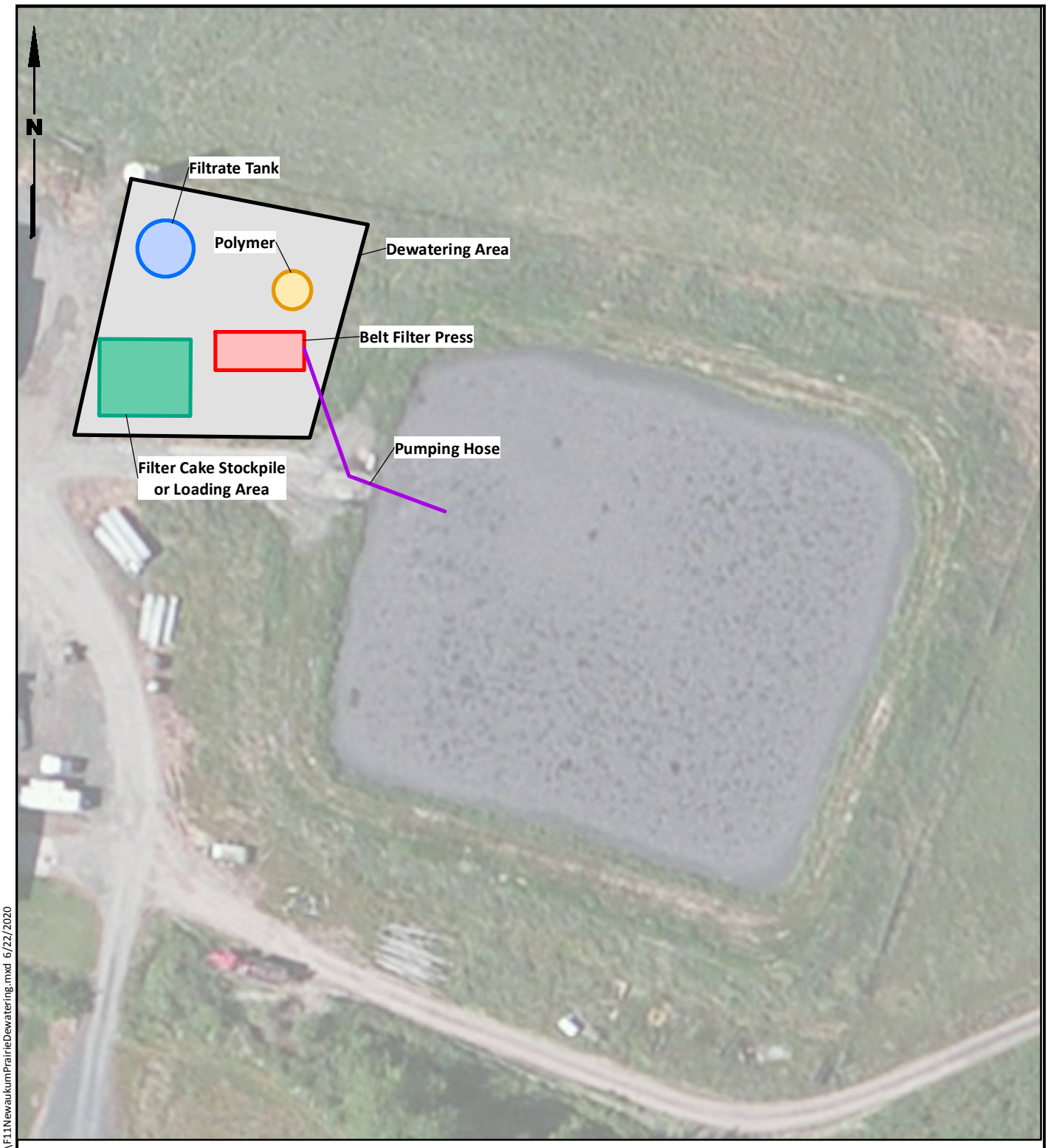
LANDAU ASSOCIATES

Emerald Kalama Closure Plan Fire Mountain Farms Storage Units	**Burnt Ridge Storage Unit Dewatering Conceptual Plan**	Figure 10



Legend

- Pumping Hose
- Dewatering Area
- Belt Filter Press
- Filter Cake Stockpile or Loading Area
- Filtrate Tank
- Polymer

0 60 120

Feet

Data Source: Esri World Imagery.

Notes

1. Locations of features are approximate.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

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LANDAU ASSOCIATES

Emerald Kalama
Closure Plan
Fire Mountain Farms Storage Units

Newaukum Prairie Storage Unit Dewatering Conceptual Plan

Figure 11

Table 1
Waste Characterization Analytical Results
Fire Mountain Farms Burnt Ridge Mixed Material Storage Unit
Lewis County, Washington

Analyte	CAS No.	Land Disposal Restriction Level (non-wastewater)	Land Disposal Restriction Level x 20	Grid Location, Sample Location, Laboratory Sample ID, and Sample Date																			
				Grid A1		Grid A2		Dup of BR-G-A2		Grid B1		Grid B3		Grid C2		Grid D4		Grid D5		Grid E2		Grid E4		Grid E5		Grid E6	
				BR-G-A1		BR-G-A2		BR-G-DUP1		BR-G-B1		BR-G-B3		BR-G-C2		BR-G-D4		BR-G-D5		BR-G-E2		BR-G-E4		BR-G-E5		BR-G-E6	
				17J0506-01		17J0506-02		17J0506-12		17J0506-03		17J0506-04		17J0506-05		17J0506-06		17J0506-07		17J0506-08		17J0506-09		17J0506-10		17J0506-11	
				10/26/2017		10/26/2017		10/26/2017		10/26/2017		10/26/2017		10/26/2017		10/26/2017		10/26/2017		10/26/2017		10/26/2017		10/26/2017		10/26/2017	
Volatile Organic Compounds (ug/kg; EPA Method 8260C)																									
Acetone	67-64-1	160,000	--	**422**		**284**	J	**166**	J	**278**		**116**		**288**		**380**		**201**		**232**		**341**		**251**		**279**	
Benzene	71-43-2	10,000	--	**1.01**		0.87	U	0.98	U	0.97	U	0.90	U	0.86	U	0.96	U	0.97	U	0.93	U	0.96	U	0.98	U	0.99	U
Toluene	108-88-3	10,000	--	**8.93**		**7.05**		**9.11**		**5.99**		**8.47**		**10.1**		**10.3**	J	**5.75**		**7.30**		**10.1**		**13.2**		**6.42**	
Volatile Organic Compounds (mg/kg; EPA Method 8015C)																									
Methanol	67-56-1	0.75 mg/L (a)	15 mg/kg	9.6	U	9.5	U	9.5	U	10.0	U	9.9	U	9.9	U	9.1	U	9.4	U	9.4	U	9.6	U	9.5	U	8.8	U
Conventionals																									
pH (std units; EPA Method 9045D)	--	--	--	**7.26**		**7.28**		**7.17**		**7.16**		**6.89**		**7.26**		**7.22**		**7.26**		**7.12**		**7.22**		**7.28**		**7.23**	
Total Solids (%; SM2540 G-97)	--	--	--	**16.76**		**14.19**		**14.20**		**12.77**		**8.34**		**15.34**		**17.28**		**17.53**		**11.44**		**15.56**		**19.98**		**10.58**	

Notes:

(a) This LDR is a TCLP level; analytical limitations would produce a reporting limit greater than the LDR. The total methanol concentration is compared to the TCLP LDR using the rule of 20.

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

Bold = Detected concentration

-- = not applicable

Abbreviations and Acronyms:

EPA = US Environmental Protection Agency
ID = identification
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
mg/L = milligrams per liter

Table 2
Waste Characterization Analytical Results
Fire Mountain Farms Newaukum Prairie Mixed Material Storage Unit
Lewis County, Washington

Analyte	CAS No.	Land Disposal Restriction Level (non-wastewater)	Land Disposal Restriction Level x 20	Grid Location, Sample Location, Laboratory Sample ID, and Sample Date													
				Grid A2 NP-G-A2 17I0005-05 8/29/2017		Grid B2 NP-G-B2 17I0005-15 8/29/2017		Grid B3 NP-G-B3 17I0005-16 8/29/2017		Grid B6 NP-G-B6 17I0005-17 8/29/2017		Grid C2 NP-G-C2 17I0005-11 8/29/2017		Grid C4 NP-G-C4 17I0005-12 8/29/2017		Grid C5 NP-G-C5 17I0005-13 8/29/2017	
Volatile Organic Compounds (ug/kg; EPA Method 8260C)																	
Acetone	67-64-1	160,000	--	**124**		**37.6**		**93.7**		**32.2**		**88.6**		**37.8**		**38.1**	
Benzene	71-43-2	10,000	--	0.98	U	0.96	U	0.96	U	0.89	U	0.89	U	0.91	U	0.97	U
Toluene	108-88-3	10,000	--	**16.0**		**17.0**		**19.1**		**8.81**		**17.3**		**13.2**		**13.8**	
Volatile Organic Compounds (mg/kg; EPA Method 8015C)																	
Methanol	67-56-1	0.75 mg/L (a)	15 mg/kg	10.0	U	10.0	U	9.1	U	9.9	U	9.6	U	9.8	U	9.7	U
Conventionals																	
pH (std units; EPA Method 9045D)	--	--	--	**7.33**		**7.57**		**7.43**		**7.44**		**7.47**		**7.37**		**7.46**	
Total Solids (%; SM2540 G-97)	--	--	--	**7.75**		**8.29**		**8.04**		**8.60**		**8.39**		**7.88**		**8.16**	

Analyte	Grid Location, Sample Location, Laboratory Sample ID, and Sample Date											
	Grid C6 NP-G-C6 17I0005-14 8/29/2017		Grid D2 NP-G-D2 17I0005-08 8/29/2017		Grid D4 NP-G-D4 17I0005-09 8/29/2017		Grid D5 NP-G-D5 17I0005-10 8/29/2017		Grid E1 NP-G-E1 17I0005-04 8/29/2017	
Volatile Organic Compounds (ug/kg; EPA Method 8260C)										
Acetone	**39.7**		**72.8**		**84.1**		**76.3**		**175**	
Benzene	0.94	U	0.96	U	0.96	U	0.93	U	0.94	U
Toluene	**16.0**		**22.9**		**20.3**		**15.9**		**300**	
Volatile Organic Compounds (mg/kg; EPA Method 8015C)										
Methanol	9.1	U	9.5	U	10.0	U	9.9	U	9.9	U
Conventionals										
pH (std units; EPA Method 9045D)	**7.43**		**7.42**		**7.53**		**7.44**		**7.67**	
Total Solids (%; SM2540 G-97)	**8.65**		**8.61**		**9.71**		**8.05**		**8.64**	

Table 2
Waste Characterization Analytical Results
Fire Mountain Farms Newaukum Prairie Mixed Material Storage Unit
Lewis County, Washington

Analyte	CAS No.	Land Disposal Restriction Level (non-wastewater)	Land Disposal Restriction Level x 20	Grid Location, Sample Location, Laboratory Sample ID, and Sample Date									
				Grid E2		Grid E4		Dup of NP-G-E4		Grid E6		Grid F3		Grid F5	
				NP-G-E2		NP-G-E4		NP-G-DUP1		NP-G-E6		NP-G-F3		NP-G-F5	
				17I0005-01		17I0005-02		17I0005-18		17I0005-03		17I0005-07		17I0005-06	
				8/28/2017		8/28/2017		8/29/2017		8/28/2017		8/29/2017		8/29/2017	
Volatile Organic Compounds (ug/kg; EPA Method 8260C)															
Acetone	67-64-1	160,000	--	**34.0**		**82.9**		**111**		**46.3**		**103**		**78.7**	
Benzene	71-43-2	10,000	--	0.95	U	0.99	U	0.88	U	0.91	U	0.88	U	0.95	U
Toluene	108-88-3	10,000	--	**261**		**25.1**		**36.0**		**17.0**		**127**		**18.6**	
Volatile Organic Compounds (mg/kg; EPA Method 8015C)															
Methanol	67-56-1	0.75 mg/L (a)	15 mg/kg	9.8	U	10.0	U	9.7	U	9.8	U	9.0	U	10.0	U
Conventionals															
pH (std units; EPA Method 9045D)	--	--	--	**7.26**		**7.42**		**7.40**		**7.51**		**7.81**		**7.52**	
Total Solids (%; SM2540 G-97)	--	--	--	**5.55**		**8.85**		**10.46**		**8.57**		**9.07**		**8.78**	

Notes:

(a) This LDR is a TCLP level; analytical limitations would produce a reporting limit greater than the LDR. The total methanol concentration is compared to the TCLP LDR using the rule of 20.
U = Indicates the compound was not detected at the reported concentration.

Bold = Detected concentration
-- = not applicable

Abbreviations and Acronyms:

EPA = US Environmental Protection Agency
ID = identification
ug/kg = micrograms per kilogram
mg/L = milligrams per liter

Table 3
Waste Characterization Analytical Results
Fire Mountain Farms Big Hanaford Mixed Material Storage Unit
Lewis County, Washington

Analyte	CAS No.	Land Disposal Restriction Level (non-wastewater)	Land Disposal Restriction Level x 20	Preliminary Delisting Level	TCLP-Preliminary Delisting Level x20	TCLP-Preliminary Delisting Level	Grid Number, Sample Location, Laboratory Sample ID, and Sample Date								
							Grid A1 BH-G-A1TP 17I0014-18 8/31/2017	Grid A2 BH-G-A2MD 17I0014-17 8/31/2017	Grid A3 BH-G-A3BT 17I0014-16 8/31/2017	Grid A4 BH-G-A4MD 17I0014-15 8/31/2017	Grid A5 BH-G-A5TP 17I0014-14 8/31/2017	Grid A6 BH-G-A6MD 17I0014-13 8/31/2017	Grid A7 BH-G-A7BT 17I0014-12 8/31/2017	Grid A8 BH-G-A8MD 17I0014-11 8/31/2017	Grid B1 BH-G-B1MD 17I0014-01 8/30/2017
Volatile Organic Compounds (µg/kg; EPA Method 8260C)															
Acetone	67-64-1	160,000	--	140,000,000,000	58,800,000	--	**643** J	**1,050**	**887**	**338**	**922**	**904**	**2,170**	**2,270**	**523**
Acrylonitrile	107-13-1	--	--	26,400,000	2,580	--	4.46 UJ	**8.55**	4.82 U	4.76 U	4.56 U	4.85 U	4.42 U	**7.21**	4.86 U
Benzene	71-43-2	10,000	--	241,000,000	23,200	--	0.89 U	**0.94**	0.96 U	0.95 U	0.91 U	**1.04**	**0.92**	0.85 U	**1.15**
Toluene	108-88-3	10,000	--	63,000,000,000	5,120,000	--	**108**	**3,500**	**184**	**7,050**	**6,790**	**642**	**113**	**27.8**	**72.4**
Volatile Organic Compounds (mg/kg; EPA Method 8015C)															
Methanol	67-56-1	0.75 mg/L (a)	15 mg/kg	1,850,000,000	32,600	--	9.6 U	10.0 U	9.9 U	9.4 U	10.0 U	9.5 U	9.6 U	9.2 U	9.6 U
Semivolatile Organic Compounds (µg/kg; EPA Method 8270D)															
2,4-Dinitrotoluene	121-14-2	--	--	342,000,000	1,872	--	298 U	295 U	294 U	299 U	99.6 U	294 U	298 U	296 U	295 U
2,6-Dinitrotoluene	606-20-2	--	--	342,000,000	1,872	--	298 U	295 U	294 U	299 U	99.6 U	294 U	298 U	296 U	295 U
4-Methylphenol	106-44-5	--	--	15,700,000,000	326,000	--	**112,000**	**18,200**	**211,000**	**2,470**	**487**	**21,300**	**35,300**	**126,000**	**20,600**
Naphthalene	91-20-3	--	--	1,360,000,000	3,700	--	59.6 U	59.0 U	58.8 U	59.7 U	19.9 U	58.8 U	59.6 U	59.2 U	58.9 U
Polychlorinated Biphenyls (µg/kg; EPA Method 8082A)															
Aroclor 1016	12674-11-2	--	--	--	--	--	NA	NA	NA	NA	19.6 U	NA	NA	19.9 U	NA
Aroclor 1221	11104-28-2	--	--	--	--	--	NA	NA	NA	NA	19.6 U	NA	NA	19.9 U	NA
Aroclor 1232	11141-16-5	--	--	--	--	--	NA	NA	NA	NA	19.6 U	NA	NA	19.9 U	NA
Aroclor 1242	53469-21-9	--	--	--	--	--	NA	NA	NA	NA	19.6 U	NA	NA	19.9 U	NA
Aroclor 1248	12672-29-6	--	--	--	--	--	NA	NA	NA	NA	19.6 U	NA	NA	19.9 U	NA
Aroclor 1254	11097-69-1	--	--	--	--	--	NA	NA	NA	NA	19.6 U	NA	NA	19.9 U	NA
Aroclor 1260	11096-82-5	--	--	--	--	--	NA	NA	NA	NA	19.6 U	NA	NA	19.9 U	NA
Total PCBs	1336-36-3	--	--	106	22,600,000,000,000	--	NA	NA	NA	NA	19.6 U	NA	NA	19.9 U	NA
Metals															
Total Cobalt (mg/kg; EPA 6010C)	7440-48-4	--	--	15,200	24	--	**12.0**	**3.23**	**0.673**	**6.95**	**0.499**	**1.30**	**0.655**	**0.696**	**4.93 J**
TCLP Cobalt (mg/L; EPA 6010C)	7440-48-4	--	--	--	--	1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conventionals															
pH (std units; EPA Method 9045D)	--	--	--	--	--	--	**7.91**	**8.02**	**8.30**	**8.11**	**7.91**	**8.08**	**8.12**	**8.32**	**8.13**
Total Solids (%; SM2540 G-97)	--	--	--	--	--	--	**15.28**	**12.89**	**22.36**	**15.45**	**11.84**	**17.52**	**18.00**	**20.31**	**16.75**

Table 3
Waste Characterization Analytical Results
Fire Mountain Farms Big Hanaford Mixed Material Storage Unit
Lewis County, Washington

Analyte	CAS No.	Land Disposal Restriction Level (non-wastewater)	Land Disposal Restriction Level x 20	Preliminary Delisting Level	TCLP-Preliminary Delisting Level x20	TCLP-Preliminary Delisting Level	Sample Location, Laboratory Sample ID, and Sample Date									
							Grid B8	Grid C1	Grid C2	Grid C3		Grid C4	Grid C5	Grid C6	Grid C7	Grid C8
							BH-G-B8TP	BH-G-C1BT	BH-G-C2MD	BH-G-C3TP	Dup of BH-G-C3TP BH-G-DUP1	BH-G-C4MD	BH-G-C5BT	BH-G-C6MD	BH-G-C7TP	BH-G-C8MD
							17I0014-10	17I0014-02	17I0014-03	17I0014-04	17I0014-19	17I0014-05	17I0014-06	17I0014-07	17I0014-08	17I0014-09
							8/31/2017	8/30/2017	8/30/2017	8/30/2017	8/30/2017	8/31/2017	8/31/2017	8/31/2017	8/31/2017	8/31/2017
Volatile Organic Compounds (µg/kg; EPA Method 8260C)																
Acetone	67-64-1	160,000	--	140,000,000,000	58,800,000	--	**69.8**	**1,370**	**980**	**110**	**154**	**789**	**309**	**2,390**	**804**	**2,190**
Acrylonitrile	107-13-1	--	--	26,400,000	2,580	--	4.85 U	4.42 U	4.90 U	4.60 U	4.36 U	4.59 U	4.36 U	4.53 U	4.52 U	4.75 U
Benzene	71-43-2	10,000	--	241,000,000	23,200	--	0.97 U	0.88 U	0.98 U	0.92 U	**0.96**	0.92 U	**0.88**	0.91 U	**1.07**	0.95 U
Toluene	108-88-3	10,000	--	63,000,000,000	5,120,000	--	**501**	**336**	**1,200**	**2,820**	**2,550**	**1,940**	**487**	**50.6**	**57.5**	**69.5**
Volatile Organic Compounds (mg/kg; EPA Method 8015C)																
Methanol	67-56-1	0.75 mg/L (a)	15 mg/kg	1,850,000,000	32,600	--	9.9 U	9.5 U	9.4 U	9.1 U	8.8 U	9.2 U	9.6 U	9.6 U	9.7 U	10.0 U
Semivolatile Organic Compounds (µg/kg; EPA Method 8270D)																
2,4-Dinitrotoluene	121-14-2	--	--	342,000,000	1,872	--	298 U	300 U	297 U	300 U	298 U	296 U	294 U	296 U	291 U	293 U
2,6-Dinitrotoluene	606-20-2	--	--	342,000,000	1,872	--	298 U	300 U	297 U	300 U	298 U	296 U	294 U	296 U	291 U	293 U
4-Methylphenol	106-44-5	--	--	15,700,000,000	326,000	--	**658**	**158,000**	**149,000**	**349**	**389**	**104,000**	**3,370**	**154,000**	**25,700**	**129,000**
Naphthalene	91-20-3	--	--	1,360,000,000	3,700	--	59.6 U	59.9 U	59.5 U	60.0 U	59.6 U	59.2 U	58.8 U	59.2 U	58.3 U	58.5 U
Polychlorinated Biphenyls (µg/kg; EPA Method 8082A)																
Aroclor 1016	12674-11-2	--	--	--	--	--	NA	NA	NA	20.0 U	NA	NA	NA	NA	NA	NA
Aroclor 1221	11104-28-2	--	--	--	--	--	NA	NA	NA	20.0 U	NA	NA	NA	NA	NA	NA
Aroclor 1232	11141-16-5	--	--	--	--	--	NA	NA	NA	20.0 U	NA	NA	NA	NA	NA	NA
Aroclor 1242	53469-21-9	--	--	--	--	--	NA	NA	NA	20.0 U	NA	NA	NA	NA	NA	NA
Aroclor 1248	12672-29-6	--	--	--	--	--	NA	NA	NA	20.0 U	NA	NA	NA	NA	NA	NA
Aroclor 1254	11097-69-1	--	--	--	--	--	NA	NA	NA	20.0 U	NA	NA	NA	NA	NA	NA
Aroclor 1260	11096-82-5	--	--	--	--	--	NA	NA	NA	20.0 U	NA	NA	NA	NA	NA	NA
Total PCBs	1336-36-3	--	--	106	22,600,000,000,000	--	NA	NA	NA	20.0 U	NA	NA	NA	NA	NA	NA
Metals																
Total Cobalt (mg/kg; EPA 6010C)	7440-48-4	--	--	15,200	24	--	**42.1**	**66.1**	**3.73**	**15.2**	**12.0**	**2.45**	**1.09**	**1.45**	**3.00**	**0.670**
TCLP Cobalt (mg/L; EPA 6010C)	7440-48-4	--	--	--	--	1.2	NA	**1.10**	NA	NA	NA	NA	NA	NA	NA	NA
Conventionals																
pH (std units; EPA Method 9045D)	--	--	--	--	--	--	**8.04**	**8.32**	**8.15**	**7.98**	**7.91**	**8.21**	**8.26**	**8.17**	**8.07**	**8.22**
Total Solids (%; SM2540 G-97)	--	--	--	--	--	--	**12.39**	**16.06**	**17.60**	**17.19**	**16.12**	**23.86**	**19.15**	**17.50**	**18.20**	**17.81**

Notes:

(a) This LDR is a TCLP level; analytical limitations would produce a reporting limit greater than the LDR. The total methanol concentration is compared to the TCLP LDR using the rule of 20.
U = Indicates the compound was not detected at the reported concentration.

Bold = Detected concentration
-- = not applicable

Abbreviations and Acronyms:

EPA = US Environmental Protection Agency
ID = identification
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
mg/L = milligrams per liter
NA = not analyzed
TCLP = Toxicity Characteristic Leaching Procedure

Table 4
Closure Performace Standards Evaluation
Fire Mountain Farms Mixed Material Storage Units
Lewis County, Washington

Facility	Chemical	MTCA Cleanup Level (a)	Maximum Soil Concentration (µg/kg)	Maximum Mixed Material Concentration (µg/kg)
Burnt Ridge	Benzene	30	ND (<3.32) (b)	1.01 (c)
	Toluene	7,000	15.9 (b)	13.2 (c)
Newaukum Prairie	Benzene	30	ND (<2.31) (b)	ND (<0.99) (d)
	Toluene	7,000	21.7 (b)	300 (d)
Big Hanaford	Benzene	30	ND (<2.96) (b)	1.15 (e)
	Toluene	7,000	20 (b)	7,050 (e,f)

Notes:

(a) MTCA Method A Cleanup Level for Soil for Unrestricted Land Use.

(b) Maximum soil concentrations originally reported in the Soil Characterization Report, Fire Mountain Farms Agricultural Fields, Lewis County, Washington (LAI 2016).

(c) Maximum mixed material concentrations as reported in the Waste Characterization Report, Fire Mountain Farms Burnt Ridge Storage Unit, Lewis County, Washington (LAI 2017b).

(d) Maximum mixed material concentrations as reported in the Waste Characterization Report, Fire Mountain Farms Newaukum Prairie Storage Unit, Lewis County, Washington (LAI 2017c).

(e) Maximum mixed material concentrations as reported in the Waste Characterization Report, Fire Mountain Farms Big Hanaford Storage Unit, Lewis County, Washington (LAI 2017d).

(f) Although the maximum detected concentration of toluene in mixed material exceeds the MTCA Method A cleanup level by a factor of 1.01 times, the collective concentration data for toluene in mixed material at the Big Hanaford storage unit demonstrate compliance with the MTCA cleanup level in accordance with WAC 173-340-740(7)(e).

Abbreviations and Acronyms:

µg/kg = microgram per kilogram
MTCA = Model Toxics Control Act
ND = not detected