FORMER CHIGNIK LAGOON CANNERY
LANDFARM WORK PLAN
ADEC File No. 2532.38.004
Hazard ID #26488

Prepared for:

WARDS COVE PACKING COMPANY, LLC
P.O. Box 5030
Seattle, WA 98105

Prepared by

Travis/Peterson
Environmental Consulting, Inc.

TRAVIS/PETERSON ENVIRONMENTAL CONSULTING, INC.

3305 Arctic Blvd., Suite 102
Anchorage, Alaska 99503

329 2nd Street
Fairbanks, Alaska 99701

1028-18
August 2018

Approving Official	Printed Name	Signature
TPECI Project Manager	Michael Travis, P.E. Principal	
Wards Cove Packing Company, LLC	Doug Brindle, President	
Alaska Department of Environmental Conservation Project Manager	Erin Gleason Environmental Program Specialist III	

Table of Contents

Tables

Appendices

Acronyms and Abbreviations

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
BMP	Best Management Practices
BTEX	Benzene, toluene, ethylbenzene, and total xylenes
COC	Contaminants of Concern
DRO	Diesel Range Organics
EPA	Environmental Protection Agency
GPS	Global Positioning System
GRO	Gasoline Range Organics
LF3	Landfarm #3
LLF	Lower Landfarm
PAH	Polycyclic Aromatic Hydrocarbons
PID	Photo-Ionization Detector
PPE	Personal Protective Equipment
ppm	Parts per Million
QA/QC	Quality Assurance/Quality Control
RRO	Residual Range Organics
SOP	Standard Operating Procedure
TPECI	Travis/Peterson Environmental Consulting, Inc.
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
ULF	Upper Landfarm

VOC	Volatile Organic Compound
VPH	Volatile Petroleum Hydrocarbons

1.0 INTRODUCTION

On behalf of Wards Cove Packing Company, LLC, and its predecessor Wards Cove Packing Company, Inc. (collectively "Wards Cove"), Travis/Peterson Environmental Consulting, Inc. (TPECI) prepared this work plan. This work plan was developed in response to the June 12, 2017 ADEC letter requesting that Wards Cove Packing Company, LLC develop a work plan providing information related to the maintenance and treatment of soils within the landfarms as well as sampling methods for landfarm completion/closure. This work plan details the proposed landfarm treatment operations as well as landfarm treatment assessment sampling, screening, laboratory analysis, and reporting of petroleum-contaminated landfarmed soils at the Chignik Lagoon Cannery facility near Chignik Lagoon, Alaska (the Site, a part of which is located on real property currently owned by Top Notching Holdings, LLC (the Property)). The Site location is shown in Figure 1.

TPECI developed this plan to meet the requirements of 18 AAC 75.325. The purpose of this work plan is to describe the methods and procedures through which action will be taken under regulatory oversight to complete the landfarm treatment of petroleum contaminated soils to numeric and practicable cleanup levels defined in 18 AAC 75.

2.0 OBJECTIVES

The objectives of this work plan are to present:

- The site description and background;
- Landfarm maintenance and treatment plans;
- A field screening and sampling plan;
- The sample collection methods;
- Field quality control measures;
- Field documentation to be used;
- The analytical methods to be employed;
- Field decontamination methods; and
- Conclusions and recommendations.

The objectives of the proposed work include the completion of the following tasks:

1. Conduct routine maintenance and tilling of landfarmed soils for treatment to below project cleanup levels defined in Section 4.0; and

2. Annual collection of soil samples from the landfarms for field screening and laboratory analysis to determine treatment status.

3.0 SITE DESCRIPTION AND BACKGROUND

The Property on which the former Chignik Lagoon Cannery sits is located across the lagoon from the village of Chignik Lagoon in the Lake and Peninsula Borough, Alaska (Figure 1). The Property is U.S. Survey 2715 (USS 2715). The Property covers 15.5 acres.

The Property position is approximately 56.3145° North latitude, -158.6029° West longitude. The Parcel is located in Section 2, Township 45 South, Range 60 West, Seward Meridian, United States Geological Survey Chignik Quadrangle. The former Chignik Lagoon Cannery is listed in the ADEC Contaminated Sites Database under the ADEC file number 2532.38.004.

In 1968, CWC Fisheries, Inc. acquired title in the Property. CWC Fisheries was a joint venture between Wards Cove and Bumble Bee Seafoods (formerly known as Columbia River Packers Association and a subsidiary of Castle and Cooke, Inc.). CWC Fisheries leased the Property and the canning facility to an operator called Columbia Wards Fisheries, also a joint venture of Wards Cove and Bumble Bee Seafoods. In about 1983, Wards Cove acquired Bumble Bee's interest in the joint venture entities and operations, and by 1987 owned the Property. The fishing support operation was terminated in the 1990s.

The Property can be accessed by boat from the village of Chignik Lagoon and is situated on an unnamed creek (Figure 2). The creek bisects the Property and the cannery facility was built into the surrounding hillside. The topography of the Property consists of steep hillsides with structures set into the hillside. Significant excavation and grading occurred at the time of construction. The Property and surrounding area are densely vegetated.

The Property has numerous derelict buildings and other structures associated with the commercial cannery that operated for many years. The Property has been largely abandoned since commercial operations at the site ceased in the early 1990s.

In 2008, the Property was conveyed to Top Notch, a real property holding company affiliated with Wards Cove. The Property is currently not actively being supported for any development or use. Though the Property has a caretaker, significant vandalism has occurred causing damage to many of the buildings and structures on the property.

3.1 August 2014 Environmental Site Investigation

In August 2014, TPECI conducted an Environmental Site Investigation of the Property and the relevant surrounding areas. The investigation consisted of an onsite assessment of the Property and facility structures to determine potential environmental liability associated with the Site. TPECI prepared the subsequent *Chignik Lagoon Cannery Environmental Site Investigation Report* in December 2015 and submitted it to ADEC. The report detailed the findings of the investigation at the Site.

The investigation identified two primary areas of the concern:

- Hydrocarbon contamination was identified at the “New” and “Old” Fuel Tank Farms (Figure 2) and at the fueling headers and dock fuel tank. Numerous fuel and oil spills likely occurred at the Site during the operation of the cannery. The tank farm sites are likely the main areas of contamination. Additional contamination may be present along fuel pipeline corridors on the property. Releases could be impacting groundwater.
- Solid waste was a significant problem at the Site. The landfill was not on the Property (Figure 2). It was unpermitted and contained a large volume of refuse. Additional refuse

and debris was present throughout the Site. Some debris was the result of trespassers and vandals. Other debris came from of historic canning facility operations. Seasonal, local residents continued to use the site and contribute to solid waste issues for some time after commercial activities had ceased.

TPECI collected soil samples from the New and Old Tank Farms during the 2014 Environmental Site Investigation. Soil samples were analyzed for Diesel Range Organics (DRO), Residual Range Organics (RRO), Gasoline Range Organics (GRO), and Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX).

The Old Tank Farm has been in existence since at least 1963. The New Tank Farm has been in existence since at least 1981. Both tank farms were known to contain diesel fuel. Based on facility operations, it is unlikely that any other fuels were stored in the tank farms. Active operation ceased in the early 1990s. Therefore, hydrocarbon contamination found in these areas likely resulted from historic releases of fuels used at the Property.

New Tank Farm

Soil samples collected from the New Tank Farm identified several areas of hydrocarbon contamination. Soil samples NT-1 through NT-3 were all collected within the containment area of the tank farm facility. TPECI personnel were not able to determine if the containment area was lined. No liner was identified in small excavations of approximately 12-inches below ground surface (a liner was found during future work at a greater depth). Samples were collected near pipeline joints within the tank farm.

Soil samples were all found to have DRO concentrations significantly higher than the ADEC Method Two cleanup level of 230 mg/Kg for migration to groundwater. Sample NT-2 had the highest DRO concentration at 21,900 mg/Kg.

Old Tank Farm

Soil samples were also collected at the Old Tank Farm. The samples identified numerous areas of hydrocarbon contamination. All soil samples were collected from soil immediately beneath the tanks and their cribbing. The pipelines within the tank farm were cracked or otherwise heavily damaged. Many of the tanks contained rust or puncture holes.

Soil samples OT-1, OT-2, and OT-3 all had DRO concentrations significantly higher than ADEC Method Two cleanup level of 230 mg/Kg for migration to groundwater. OT-2 had the highest DRO concentration at 97,700 mg/kg.

The soil samples collected confirmed the presence of DRO contamination at the New and Old Tank Farms.

3.2 October 2016 Site Remediation Work

In the fall of 2016, TPECI and Paradigm Marine (Wards Cove's remediation contractor) conducted site investigation and cleanup activities. Using known areas of contamination, TPECI had planned to conduct a concurrent characterization and remediation of the areas of significant concern. The planned remediation approach included soil screening, excavating contaminated soils, landfarming soils, and collecting confirmation samples.

To ensure that investigation and remediation activities could occur efficiently, significant site clearing and re-establishment was conducted. Since the Property was abandoned in 1991, major erosion and vegetation had deteriorated all roads and pathways. Major road repair was needed. A bridge over the unnamed creek had deteriorated and required replacement to allow access to the tank farm areas.

Heavy equipment was brought to the site prior to remediation activities in September 2016. Access was provided through re-establishing road corridors, clearing vegetation and other debris from the roadways as well as re-grading other pathways and access corridors. Wards Cove also cleared and graded several areas near the tank farms on the Property. These locations were utilized to construct landfarm cells for treatment of the excavated soils.

Upon completion of civil site work, Wards Cove removed the fuel tanks from the tank farm sites. No tanks located in the Old Tank Farm contained any fluid.

Nearly all of the fuel tanks in the New Tank Farm contained varying fluid volumes. Upon inspection each tank was found to hold approximately 500 to 2,000 gallons of water. All of this water was mixed with small quantities of fuel resulting in a heavy sheen. TPECI personnel directed the draining of the tanks. All water was treated through a 55-gallon water scrubber at a manufacturer recommended maximum flow rate of five gallons per minute. Discharged water flowed via natural drainage channels, infiltrated through vegetation, and flowed into the unnamed creek on the property.

Once all tanks were fully drained and cleaned, tank valves were closed. TPECI directed the demolition of tank farm piping. All pipelines were inspected for fuel prior to demolition and drained into 55-gallon drums if necessary. Drained and sealed tanks were lifted out of the tank farms using an excavator and staged elsewhere on the property. The staged tanks do not pose a risk of contaminating additional areas on the site. The long-term disposal of the tanks will be determined by Wards Cove.

Wards Cove removed cribbing and other tank farm structures at both the New and Old Tank Farms. Wards Cove did not disturb any soils within areas of identified petroleum contamination during initial site work, unless under the direction and guidance of TPECI personnel. TPECI personnel were on site during the work to identify access areas, aid in the design and construction of landfarms, delineate clearing areas around the tank farms, and to record site observations for the excavations as needed.

Two separate, excavations were conducted at the facility. Excavation of petroleum-contaminated soils occurred at both the New and Old Tank Farms. The footprint of each tank farm was the primary focus at each site.

3.2.1 Landfarms

Landfarms were located near the two existing tank farms in a partial clearing. Site excavation and development was necessary to construct several flat areas near the tank farms large enough to accommodate the proposed landfarms. Due to the steep terrain at the site, it was more practical to develop multiple, smaller landfarms than a single, large, cell. These landfarms were developed in accordance with the March 2011 ADEC Technical Memorandum *Landfarming at Sites in Alaska.*

A total of three landfarm cells were developed at the Property. Each of the landfarm cells are shown in Figure 2 (Appendix A). Two landfarm cells were constructed on the hilltop adjacent to the Old Tank Farm. These two landfarms are identified as Upper Landfarm (ULF) and Lower Landfarm (LLF). They were established on two benched tiers cut into the hillside. A third landfarm cell was constructed immediately to the northwest of the New Tank Farm. This landfarm was identified as Landfarm #3 (LF3). The landfarms are described in Table 1 below.

Table 1: Landfarm Information

Name	Date of Construction	Soil Volume	Soil Thickness	GPS Coordinates
Upper Landfarm (ULF)	October, 2016	123 yd^3	18 Inches	56.3136ºN, -158.6041ºW
Lower Landfarm (LLF)	October, 2016	123 yd^3	18 Inches	56.3137 ºN, -158.6039 ºW
Landfarm #3 (LF3)	October, 2016	630 yd^3	30 Inches	56.3140 ºN, -158.6048 ºW

The soils throughout the property, including beneath the tank farms and at the landfarm sites, consisted of silty sands with discontinuous clay lenses. Small pockets of gravel and cobble were also observed in some areas.

ULF and LLF are both approximately 180 feet from Chignik Lagoon and approximately 260 feet from the unnamed creek on the property. LF3 is approximately 104 feet from the unnamed creek on the property. The depth to groundwater beneath the landfarms was not measured during the 2016 site work. However, the depth to groundwater measured in nearby temporary groundwater monitoring wells ranged from six to nine feet below ground surface. It is reasonable to assume that the depth to groundwater in the landfarm areas is similar.

Contaminated soils excavated at the Site were transported to the landfarm via the re-cleared roadways. All excavated soils from the site were immediately transported to the landfarms. Due to steep slopes and challenging terrain, some soils were temporarily stockpiled at the location of each excavation to facilitate staging and movement of equipment. In these situations, temporarily stockpiles existed for a period of less than one day. All excavated/stockpiled soil characterization samples were collected from these soils after they were placed into the landfarms.

Landfarm cells were constructed in a manner as to segregate the soils from the individual tank farm excavations. Soils from the Old Tank Farm excavated were placed into ULF and LLF. Soils from the New Tank Farm were placed into LF3. Excavation at each tank farm stopped when landfarm space was exhausted.

3.2.2 Old Tank Farm

Once site access was established and the Old Tank Farm demolished, excavation of petroleum-contaminated soils began (Figure 2, Appendix A). No bermed containment area had been constructed at the site. All tanks had been placed on elevated cribbing above a semi-level ground surface. The tank farm was located at the top of a hill. The tank farm did not appear to have a liner, and no documentation existed suggesting alternative containment measures. The footprint of the tank farm and the immediate surrounding area was the focus of the excavation. During the excavation process, TPECI discovered contaminated soils following storm water flow pathways and ravines traveling from the hill downgradient towards the northwest unnamed creek and southeast to Chignik Lagoon. Contamination was found to be significantly more extensive than anticipated.

For excavated areas, TPECI personnel directed the excavation work using field screening results as well as visual and olfactory clues to determine the location, and the vertical and horizontal extents of potentially contaminated soils. All material that exhibited screening results or other characteristics of contamination (staining and/or odor) were segregated and transported via tracked dump truck to onsite landfarms. The excavation of the site was to be limited by project constraints (i.e. excavated to the point where the project can no longer move forward, such as bedrock or continuous boulder or cobble impractical to excavate, or the depth of the contamination extends beyond the reach of the excavator) or to where it appeared there was no residual contamination, whichever event came first.

Based on the 2014 Environmental Site Investigation, TPECI identified surface contamination of soils from diesel spills, leaking fuel lines, and tank overfills. During the 2014 site visit, TPECI was not able to assess the depth of the contamination, limited only to hand tools. Based on the topography, TPECI determined that shallow bedrock formations at the site were possible, limiting contaminated soils.

The October 2016 excavation determined that bedrock at the site was likely near sea level elevation, greater than 40 feet below the Old Tank Farm site. Thus, the vertical extent of the contaminated soils was limited only by the volume of diesel fuel spilled during the facilities operation. Wards Cove and TPECI were prepared to manage a maximum of 1,000 cubic yards of soil combined from the New and Old Tank Farm site remediation activities. The extent of contaminated soil at the Old Tank Farm was likely far greater.

At the Old Tank Farm, the depth of contamination encountered exceeded the reach of the excavator to safely operate. Due to lack of appropriate equipment to safely continue excavation and lack of adequate disposal options for excavated contaminated soil, Wards Cove and TPECI suspended action on this excavation after removing approximately 246 cubic yards of contaminated soil. Significant quantities of contaminated soils remained in the ground at the site. As the extents of the contamination were not determined, no confirmation samples were collected for field screening or laboratory analysis. However, characterization samples were collected from the excavated/stockpiled soils within the landfarms for field screening and laboratory analysis. These samples were collected to determine an approximate magnitude of contaminant concentrations present at the site and as a baseline for treatment objectives.

Soil samples collected from excavated/stockpiled soils placed into the landfarms ULF and LLF found DRO and GRO concentrations well above ADEC cleanup levels. BTEX concentrations were also found to be above ADEC Method Two cleanup levels. The nature of the contaminants encountered indicates that both diesel and gasoline had impacted the soil beneath and surrounding the Old Tank farm. The total volume of fuels spilled or leaked at the site is unknown. However, contaminant concentrations present in the soil in addition to observed contaminant extents indicate that the total volume was significant.

As the excavation was advanced, the extents of the contamination were not encountered, and contaminant concentrations did not dissipate at greater depths. At a depth of approximately 20 feet below ground surface, continued excavation was no longer safe or feasible with the equipment available on site. Perched groundwater was encountered at varying depths, typically greater than six feet below ground surface. Given the excavation location at the top of a hill, a static water level was not observed.

As continued excavation was not feasible, TPECI and Wards Cove suspended operations at the Old Tank Farm site. The excavation was graded and sloped, with steep excavation walls collapsed so the site does not pose a risk to trespassers. Significant volumes of contaminated soils remained in the ground at the Old Tank Farm location.

3.2.3 New Tank Farm

Once site access was established and the necessary tank farm demolition was completed, excavation of petroleum-contaminated soils began at the New Tank Farm (Figure 2, Appendix A). The New Tank Farm consisted of a bermed containment area with tanks resting on treated timbers. Standing water with a hydrocarbon sheen was present throughout the containment area. Vegetation was also present within the containment area.

During the 2014 Environmental Site Investigation, TPECI had not determined if the New Tank Farm utilized a liner. At least two feet of soil was present in sampling locations inside the bermed area. Following the removal of the tanks and associated infrastructure in 2016, a HDPE liner was identified buried beneath one to three feet of soil. The welded, multi-piece liner fully contained the bermed area and was found to be intact.

TPECI directed the excavation of all soils within the containment liner. These soils were observed to be contaminated with diesel fuel, exhibiting strong visual and olfactory indicator. All soils from within the containment liner were placed into a treatment landfarm adjacent to the site. Generally, soils beneath the liner were not found to be impacted by hydrocarbon contaminants.

For excavated areas, TPECI personnel directed the excavation work using field screening results as well as visual and olfactory clues to determine the location, and the vertical and horizontal extents of potentially contaminated soils. All material that exhibited screening results or other characteristics of contamination (staining and/or odor) were segregated and transported via tracked dump truck to onsite landfarms. The excavation of the site was to be limited by project constraints (i.e. excavated to the point where the project can no longer move forward, such as bedrock or continuous boulder or cobble impractical to excavate, or the depth of the contamination extends beyond the reach of the excavator) or to where it appeared there was no residual contamination, whichever event came first. The horizontal and vertical extents of contamination were reached (based on field screening) within the majority of the New Tank Farm.

A concrete sump was located at the northeast corner of the New Tank Farm containment cell. A drain pipe with a gate valve extended from the sump to a drainage ditch outside of the tank farm, ultimately flowing into the unnamed creek. During excavation, TPECI noted that the containment liner was not connected to the sump, thus, contaminated storm water and fuel were able to freely seep around the sump basin. Contaminated soils were discovered beneath the sump and spread throughout the northeast corner of the containment cell beneath the liner. Contaminated soils were also identified at the outlet of the drainage pipe. The horizontal and vertical extents of contamination were not reached in this area.

Wards Cove and TPECI suspended action on this excavation after removing approximately 630 cubic yards of contaminated soil from the New Tank Farm. No additional landfarm space was available on the Property, thus there was a lack of adequate disposal options for excavated contaminated soil. Significant quantities of contaminated soil remain in the ground at the site. Confirmation samples for field screening and laboratory analysis were collected from the New Tank Farm site, excluding the northeast corner, where contamination persists.

Soil samples collected from excavated/stockpiled soils placed into the landfarm LF3 found DRO and GRO concentrations well above ADEC cleanup levels. The nature of the contaminants encountered indicated that diesel fuel had impacted the soil beneath and surrounding the new Tank farm. It did not appear that gasoline was stored in the New Tank Farm nor did it directly impact the soils around it.

The presence of an intact liner in the New Tank Farm significantly reduced the total volume of impacted soils. However, a soil layer several feet thick on top of the tank farm liner was removed and required treatment. The New Tank Farm was measured to be 106 feet by 50 feet. Thus, the contractor removed a large volume of contaminated soils from the impoundment.

Several pinholes or damaged locations in the tank farm liner did result in additional spot cleanup of soil beneath the liner material. Generally, the depth of this contamination was minimal and contaminated soils were removed as the soil confirmation sampling results indicated. However, several confirmation soil samples did indicate the presence of DRO contamination remaining above ADEC cleanup levels. These samples appear to be isolated spots, as they were surrounded by “clean” samples. Additional excavation will likely be required at these locations.

A concrete sump was located at the northeast corner of the New Tank Farm containment cell. A drain pipe with a gate valve extended from the sump to a drainage ditch outside of the tank farm, ultimately flowing into the unnamed creek. During excavation, TPECI noted that the containment liner was not connected to the sump. Thus, contaminated storm water and fuel were able to freely seep around the sump basin. Contaminated soils were discovered beneath the sump and spread throughout the northeast corner of the containment cell beneath the liner. Contaminated soils were also identified at the outlet of the drainage pipe.

Wards Cove and TPECI suspended action on this excavation once no additional landfarm space was available on the Property. A lack of adequate disposal options for excavated contaminated soil prevented further site work at the time. Significant quantities of contaminated soil remained in the ground at the site. Confirmation samples indicated that contaminated soils at the New Tank Farm have been mostly removed, excluding the northeast corner, where contamination persists. Where necessary surrounding the sump in the northeast corner, the excavation was graded and sloped, so the site would not pose a risk to trespassers.

The contamination remaining at the New Tank Farm was primarily located in the northeast corner, at the site of the sump. Additional contamination was identified at the outlet of the tank farm drainage pipe. Test pits in these areas found contamination traveling downgradient to the north, towards the unnamed creek. An existing drainage ditch flowed directly from the northeast corner of the tank farm into the creek. Subsurface, groundwater flow appeared to move along the same pathway. Test pits dug along the ditch and immediately adjacent to the unnamed creek contained contaminated soils. An estimated area of the New Tank Farm contaminant plume is shown in Figure 5 in Appendix A, based on where contamination was identified in test pits. This area encompasses approximately 9,400 square feet. The vertical extent of the contamination was unknown.

3.2.4 Request for Additional Work

Approximately 876 cubic yards of petroleum contaminated soils remain in the three landfarms on the property associated with the New and Old Tank Farms. The ADEC requested that these landfarms be actively maintained and soils treated to below the applicable soil cleanup levels. A June 12, 2017 letter requested that Wards Cove Packing Company, LLC develop a work plan providing information related to the maintenance and treatment of soils within the landfarms as well as sampling methods for landfarm completion/closure. This work plan describes that work.

4.0 POTENTIAL CONTAMINANTS OF POTENTIAL CONCERN

The contaminant of concern (COC) within the landfarms is diesel fuel. Analytical laboratory samples will be collected for DRO, RRO, GRO, Volatile Organic Compounds (VOCs) including BTEX and Polycyclic Aromatic Hydrocarbons (PAH) in areas where hydrocarbon contaminants are suspected.

During landfarm treatment assessments, soil samples will be submitted to SGS Environmental Laboratories, Inc. in Anchorage, Alaska for laboratory analysis. The qualified sampler will also perform field screening using a photo-ionization detector (PID) to screen soils for volatile organic compounds. If necessary where severely weathered hydrocarbons are encountered, the qualified sampler will also perform field screening using PetroFlag® to screen soils for Total Petroleum Hydrocarbons (TPH).

The project target soil cleanup levels shown in Table 1 below were established from ADEC Title 18, Alaska Administrative Code, Section 75.341 (December 2017), Table B1, Method Two – Soil Cleanup Levels, Over 40 Inch Zone, Migration to Groundwater as shown in Table 2 below. All non-BTEX VOC project cleanup levels are as listed in Table B1, Method Two.

Table 2: Project Soil Cleanup Levels

Analyte	Units	Cleanup Level
DRO	mg/Kg	230
RRO	mg/Kg	9,700
GRO	mg/Kg	260
Benzene	mg/Kg	0.022
Ethylbenzene	mg/Kg	0.13
Total Xylenes	mg/Kg	1.5
Toluene	mg/Kg	6.7
1-Methylnaphthalene	mg/Kg	0.41
2-Methylnaphthalene	mg/Kg	1.3
Acenaphthene	mg/Kg	37
Acenaphthylene	mg/Kg	18
Anthracene	mg/Kg	390
Benzo(a)anthracene	mg/Kg	0.28
Benzo[a]pyrene	mg/Kg	0.27
Benzo[b]fluoranthene	mg/Kg	2.7
Benzo[g,h,i]perylene	mg/Kg	15,000
Benzo[k]fluoranthene	mg/Kg	27
Chrysene	mg/Kg	82
Dibenz[a,h]anthracene	mg/Kg	0.87
Fluoranthene	mg/Kg	590
Fluorene	mg/Kg	36
Indeno[1,2,3-c,d]pyrene	mg/Kg	8.8
Naphthalene	mg/Kg	0.038
Phenanthrene	mg/Kg	39
Pyrene	mg/Kg	87

However, if during future site characterization efforts alternate site cleanup levels are established those cleanup levels may be utilized for landfarm cleanup standards as well. Until that determination is made, the above-listed Method Two cleanup levels will remain applicable.

5.0 LANDFARM OPERATIONS

5.1 2016 Landfarm Design and Construction

Given the remoteness of the Site, the preferred remediation technology was a landfarm(s) on the Property to treat the petroleum-contaminated soils. The use of landfarm treatment limited soil treatment volumes based on available land space on the property. The design, construction, and operation of the landfarm(s) in October 2016 was based on the March 2011 ADEC Division of Spill Prevention and Response Contaminated Sites Program Technical Memorandum *Landfarming at Sites in Alaska*.

The landfarms constructed at the site do not have a liner. The omission of the liner was reasonable due to the remote location of the site. The cost and logistics of transporting the liner to the site were extreme and challenging while the benefits to be gained from having the liner were negligible. The risk of leachate from the landfarm was minimal due to the nature of the diesel fuel contaminant. To the extent there was any risk of leachate, the remoteness of the site reduced the risk of exposures.

Prior to placement of contaminated soils, baseline soil samples were collected for laboratory analysis as outlined in the ADEC-approved work plan. Baseline samples were analyzed for GRO by method AK101, BTEX by EPA Method 8021B, and DRO and RRO by method AK102. At least one sample from each landfarm site was also analyzed for PAH by EPA Method 8270D to comply with the ADEC requirement of 10%+ sampling of PAH for Diesel contamination (ADEC March 2016 Field Sampling Guidance Appendix F). This baseline data was necessary to ensure that the Site will be restored to preexisting conditions at the completion of the landfarm activities. The collection locations of landfarm baseline samples were described in November 2016 *Chignik Lagoon Cannery Investigation and Remediation Report.*

The landfarms were constructed with a grade of less than 1% to allow soils to drain towards a single corner, preventing saturated conditions within all soils which could prolong the treatment process. No internal piping, sump, or other water collection system was installed within the landfarms. Any precipitation falling on the landfarm soils evaporates.

A compacted soil berm was constructed surrounding each landfarm. The berm was designed to contain hydrocarbon-contaminated soils, to contain water from precipitation, and to discourage access to the landfarm by trespassers. Each berm was constructed with clean soil available from the site. The exact height of the berms was based on the volume of soil available and its compactability. Typically, berms extended six to 12 inches above the landfarm soils they contained.

The hydrocarbon-contaminated soils were placed into the constructed landfarm at a maximum depth of 18 inches. Ideally, soils were spread to a minimum depth to allow for greater exposure to oxygen, resulting in higher rates of biodegradation of hydrocarbons and a more rapid treatment process. Soils in LF3 were spread to a depth greater than 18 inches due to the total volume of soil excavated. An additional stockpile was placed on top of the layer at the east end of the landfarm as well. Due to increased soil depth in this landfarm may require increased tilling frequencies, a longer treatment period, or it may be necessary to reduce soil depth to 18 inches or less to allow for property treatment.

A total of 876 cubic yards of contaminated soil was placed into the three landfarms. Wards Cove maximized all currently available level and semi-level ground for the construction of these landfarms. The construction of any additional landfarm cells would require significant earth work and the demolition of buildings at the site due to the steep terrain and topography. No additional landfarms are planned at this time.

5.2 Landfarm Maintenance and Treatment

Maintenance and operation of the three existing landfarms at the Property will be conducted in accordance with the January 2018 ADEC Division of Spill Prevention and Response Contaminated Sites Program Technical Memorandum *Landfarming at Sites in Alaska*.

Routine and frequent tilling of the landfarm is required to allow for active soil treatment. The more frequently the landfarm is tilled, the more rapidly the contaminant concentrations will be reduced. Due to the remote nature of the Property and the lack of any onsite personnel, the landfarm will be tilled once per week during the months of May, June, July, August, and September to promote release of volatile organics. If seasonal conditions allow, the maintenance season may be extended. Wards Cove or its contractor shall maintain a log documenting each date of tilling along with any pertinent observations. These observations shall include photographs of all sides of each landfarm during each tilling event. Additionally, any runoff from the landfarms should be documented. Photographs shall also be taken at the beginning and end of each maintenance season.

Tilling shall be conducted using available equipment. At this time, specific equipment has not been determined. Wards Cove and its contractors may use tractors with a tow-behind tiller, a backhoe, trackhoe, or grader, an ATV with a tow-behind tiller, or any other mechanical implement capable of tilling to the base of the impacted soils.

Care will be taken during the tilling process to note excavate and intermix underlying soils with overlying impacted soils while also maintaining the gradient established during construction. It is necessary to completely mix all soils within the landfarm cells to ensure maximum treatment efficiency.

Potential seasonal precipitation and proximity to Chignik Lagoon and the Pacific Ocean necessitate careful management of landfarmed soils and tilling operations. Soil disturbance will be minimized wherever possible and care will be taken to not track contaminated soils from the landfarm areas. Wards Cove will utilize storm water best management practices (BMPs) throughout the course of the project. BMPs may be installed along landfarm perimeters or access routes to prevent sediment transport as needed.

Soils in LF3 are currently spread to a depth of approximately 2.5 feet. To meet treatment objectives (applicable soil cleanup levels listed in Section 4.0), it may be necessary to reduce soil depth in this landfarm. If treatment objectives are not being met with tilling of soils at the current depths, or treatment is taking longer than anticipated, soils could be removed and placed into an alternate landfarm when space becomes available, or soils could be transported off site for treatment disposal. If Wards Cove determines that soils must be transported off site for treatment and disposal, the ADEC will be notified and an ADEC *Transport, Treatment, & Disposal Approval Form for Contaminated Media* will be completed prior to soil removal.

Significant quantities of contaminated soils remain in the ground at the site. Additional landfarms or alternative methods may be required to manage those soils if additional excavation or site remediation work is necessary.

6.0 SAMPLING PLAN

The three landfarms will be re-sampled by a Qualified Environmental Professional at the end of each growing season (approximately early September) to track remediation progress and ultimately confirm that ADEC cleanup levels have been achieved. This work will be conducted in accordance with the *ADEC 18 AAC 75 Oil and Other Hazardous Substances Pollution Control (revised December 2017)*. Where applicable, the sample collection and analysis will be modeled after procedures described in the *ADEC Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites (March 2017)*. Sampling efforts will be conducted in accordance with the *ADEC Field Sampling Guidance (August 2017)* unless otherwise specified within this document.

TPECI personnel meet the ADEC definition of “Qualified Environmental Professional” in accordance with 18 AAC 75.333. TPECI personnel assigned to this project have not been determined at this time. Resumes for all TPECI are available in Appendix B. While on site, TPECI personnel may be aided by Wards Cove Packing Company, LLC personnel and third-party contractors. However, all sample collection and site work will be conducted by or under the direction supervision of TPECI personnel.

6.1 Annual Landfarm Sampling

TPECI personnel will coordinate with Wards Cove personnel and third-party contractors as necessary to conduct soil sampling in the three landfarms at the end of each summer season, typically in late September.

TPECI personnel will collect soil samples using a hand auger, shovel, or trowel and clean sampling spoons from varying depths (six to 18 inches in ULF and LLF and six to 30 inches in LF3) within each landfarm. Generally, field screening samples for volatiles will be collected at least 18 inches below the exposed surface. However, since the landfarms are generally only 18 inches deep and actively tilled, it is necessary to collect samples at varying depths to accurately represent soil contaminant heterogeneity. Some soil samples will be collected near the base of the landfarm.

The ULF and LLF each contain approximately 123 cubic yards of contaminated soils. TPECI will collect 15 samples for field screening from each ULF and LLF in a grid pattern. LF3 contains approximately 630 cubic yards of contaminated soils. TPECI will collect 30 samples for field screening from LF3 in a grid pattern. These field screening sample collection frequencies exceed those specified in the August 2017 ADEC *Field Sampling Guidance* Table 2A: Excavated Soil Sample Collection Guide. The sample locations will be recorded and documented in field notes and site maps. TPECI may elect to collect additional field screening samples based on variations in soil types within the landfarm, visible soil staining, or other areas of concern identified.

TPECI will use a PID and an elevated field screening threshold to screen landfarm soils as described in Section 6.1.1. If applicable, or if non-volatile hydrocarbon contaminants appear to be present, a Dexsil® PetroFlag® testing kit and an elevated field screening threshold may be utilized. However, due to the nature of the COC, and observed presence of volatile contaminants during 2016 site work, it is unlikely that a PetroFlag® test kit will be necessary for field screening. TPECI will also use an analytical sampling kit on site to verify the treatment status of the landfarmed soils.

6.1.1 Field Screening

The following describes the sampling protocols that TPECI field personnel will follow to screen and collect soil samples within soil borings. Field screening will occur first to characterize the presence (if any) of hydrocarbon contamination within the soil borings. A MiniRAE™ Systems 3000 PID will be the primary equipment utilized for field screening. A Dexsil® PetroFlag® test kit will also be utilized. However, its use will be secondary to PID screenings and will only be applicable if extremely weathered (non-volatile) contaminants are encountered.

TPECI personnel will field screen soils with a PID or PetroFlag® test kit in accordance with the ADEC *August 2017 Field Sampling Guidance*, Section 3.0 Soil Sampling.

6.1.1.1 PID Calibration and Use

The PID will be calibrated according to the manufacturer’s specifications in the field using a fresh-air charcoal blank and 100-ppm isobutylene calibration span gas. A re-sealable polyethylene bag with a total capacity not less than eight ounces (approximately 250mL) will be filled one-third to one-half full of soil from the screening sample. The soil, sealed in the bag, will be allowed to warm up to 40 degrees Fahrenheit where it shall be held for at least 10 minutes, but no longer than 60 minutes. The tip of the calibrated PID will then be placed inside the bag for thirty seconds or until the reading stabilizes.

6.1.1.2 Dexsil® PetroFlag® Calibration and Use

The PetroFlag® analyzer test kit will be calibrated in the field in accordance to the manufacturer’s specifications. This process involves using a blank standard and a known standard with a TPH concentration of 1,000ppm. The PetroFlag® test kit may require calibration at two temperatures as results via chemical reaction are dependent on the ambient air temperature. If the ambient temperature range varies more than 10 degrees Celsius throughout the period of work, two temperature calibrations will be performed. Should this be necessary, both calibrations will be stored and either can be used accordingly. The appropriate response factor for unidentified petroleum contamination is "7" and shall be programmed in the analyzer prior to field screening being conducted. The field calibration methodology shall follow the PetroFlag® *User's Manual April 1, 2009*. The field screening methodology shall also follow the procedures described in the PetroFlag® *User's Manual April 1, 2009.*

6.1.2 Collection of Samples for Laboratory Analysis

TPECI personnel will collect at least five soil samples for laboratory analysis from each ULF and LLF. TPECI personnel will collect at least eight soil samples for laboratory analysis from LF3. These laboratory sample collection frequencies exceed those specified in the August 2017 ADEC *Field Sampling Guidance* Table 2A: Excavated Soil Sample Collection Guide. The field screening samples which exhibited the highest reading on the PID will be chosen for laboratory analysis. Additionally, some soil samples could be collected from locations of concern or significantly differing soil types at TPECI's discretion. In these cases, the sampling location may not have exhibited the highest PID readings.

Samples collected for laboratory analysis shall be analyzed in accordance with Section 6.1.3.

6.1.3 Soil Laboratory Methods

All laboratory soil samples will be analyzed for GRO compounds by method AK101, VOCs by EPA Method 8260C, and DRO by method AK102, RRO by method AK103. For each source area, PAH analysis shall be performed on a sufficient percentage of the samples of the most likely contaminated locations based on field screenings and site observations to determine if PAHs are contaminants of concern. One sample for every 10 laboratory samples for each source area will be analyzed for PAH by EPA Method 8270D SIM to comply with the ADEC requirement for PAH sampling for diesel contamination (ADEC August 2017 Field Sampling Guidance Appendix F). Samples exhibiting the highest field screening results will be selected for PAH analysis.

Table 3: Laboratory Analytical Methods for Soils

Method	Matrix	Container (jars)	Preservative	Hold time
8260C (VOCs)	Soil	1 4-oz amber wide mouth jar with septa lid	MeOH and 0-6° C.	14 days
AK101 (GRO)	Soil	1 4-oz amber wide mouth jar with septa lid	MeOH and 0-6° C.	14 days
AK102 (DRO)	Soil	1 4oz amber wide mouth jar	0-6° C.	14 days
AK103 (RRO)	Soil	1 4oz amber wide mouth jar	0-6° C.	14 days
8270D SIM (PAH)	Soil	1 4oz amber wide mouth jar	0-6° C.	14 days

Soil samples destined for volatile analysis will be collected first, follow by samples collected for non-volatile analysis. Pre-weighed and pre-labeled soil sample containers will be filled to a volume (mass) ranging from 25 to 50 grams of soil (approximately 1/3rd container volume) and will be immediately preserved by pouring methanol over the soil and promptly securing the Teflon-lined container lid. Care will be taken to ensure soils are completely covered with preservative provided by the analytical laboratory in pre-measured 25mL portions. Should more than 25mL of preservative be required for a given sample, documentation of total preservative volume will be recorded in the field notes and on the laboratory Chain-of-Custody.

Sample Field Preparation
Sampling shall be performed in accordance with the applicable regulations:

- All samples will be collected using disposable or cleaned and decontaminated sampling equipment;
- Field personnel shall wear disposable gloves, safety goggles, steel toed boots, hard hat, reflective vest, and other appropriate Class D personal protective equipment (PPE). Gloves and sampling devices will be changed between samples;
- Samples will be collected as quickly as possible and placed in laboratory supplied containers;
- Soil for analytical sample testing will not be obtained from field screening *sample* material;
- All samples will be labeled; and
- All samples will be preserved in accordance with laboratory specifications and cooled to a temperature of 0 to 6 degrees Celsius.

6.2 Landfarm Closure Sampling

When TPECI determines that landfarm soils are below applicable cleanup levels, TPECI personnel will coordinate with Wards Cove personnel and third-party contractors as necessary to conduct soil sampling within the native soils beneath each landfarm to verify contaminants have not leached. TPECI personnel will collect soil samples using a hand auger, shove, or trowel and clean samplings spoons. Samples will be collected at the native ground surface (below landfarm soils) at depths of zero to four inches bgs. Landfarm soils in ULF and LLF are 18 inches thick, so effective sampling depth shall be 18 to 22 inches. Landfarm soils in LF3 are 30 inches thick, so effective sampling depth shall be 30 to 34 inches.

TPECI will collect five samples from each the ULF and LLF in approximately the same baseline locations sampled in 2016. TPECI will collect eight samples from LF3 in approximately the same baseline locations sampled in 2016.

Soil sample collection, field screening methods, collection of samples for laboratory analysis, and laboratory analytical methods, and sample preparation shall be conducted as described in Section 6.1.1 through Section 6.1.3.

These results of these samples will be compared to the baseline samples collected in October 2016. It is likely that contaminant concentrations within these soils will have increased since the baseline sampling due to minor leaching of contaminants or mixing of soils due to tilling.

However, so long as these soils are found to be below applicable soil cleanup levels, no additional remediation efforts are necessary.

7.0 FIELD AND SAMPLING PROTOCOLS

7.1 Standard Operating Procedures

The standard operating procedures (SOP) for this project fall into two categories, field SOP and laboratory SOP. Throughout the sampling effort, laboratory hold-times and sample temperatures shall be maintained. The laboratory SGS Quality Assurance Project Plan is filed at the laboratory and at TPECI. Thus, the SOP contained herein refers to generic field sampling and sample preparation.

7.1.1 Field Sampling SOPs

Field personnel shall keep detailed notes that include:

- Project name/Site ID/Client/Page Number;
- Date;
- Weather, site conditions, and other salient observations;
- Full name of onsite personnel, affiliations and project title e.g., team leader (including all visitors);
- Daily objectives;
- Time and location of activities;
- Field observations and comments;
- Deviations from the ADEC Contaminated Sites Program site-specific approved work plan;
- Photographic log (photographic name, roll or frame number, description of photograph, date, and time);
- Site sketches with reference to north direction, sample and field screening locations and depths, and onsite groundwater flow direction;
- Survey and location (latitude and longitude coordinates when possible);
- All field measurements (e.g. leak check results, geochemical parameters, field screening results);
- Daily equipment calibrations and maintenance;
- Sample record (sample identification, date, time, media, number of samples, and location);
- Cleanup or remediation activities (system performance, system calibration or maintenance record, excavation activities and volume of material removed); and
- Waste tracking (when, how much, destination).

Site drawings shall be included within the field notes as part of the field investigations. Site drawings should include a north arrow, and, if applicable, at least one permanent identifying feature (such as a building). All samples collected (screening and analytical) should be noted on the figure. Alternatively, sample locations may be indicated on a field copy of Figure 6 (Appendix A) where applicable.

All laboratory sampling locations shall be documented on Figure 6 (Appendix A) or within separate plan view site drawings within the field notes. If applicable, the sampling location cross-sectional view may be drawn. Any unusual characteristics of the sampling location and any problems encountered during sample collection shall also be recorded for each sample location. GPS coordinates of each sample location shall be documented within the field notes.

Field notes will be collected in an all-weather notebook. The notebook utilized will not be dedicated solely to this project, but only information relevant to the project will be included on pages assigned. Combined project field notebooks reduce project costs and minimize waste generation.

Filed notes will be written in pen, pencil, or water-resistant marker. When field conditions result in illegible content due to dirt, precipitation, or poor penmanship, field notes will be recopied immediately after field activities.

7.1.2 Field Sample Preparation SOP

All samples will be prepared in accordance with laboratory instructions. At a minimum, the following information will be included on the sample label:

- Client name;
- Date and time of sample collection;
- Sampler;
- Sample location;
- Preservative, and
- Analytical test(s) to be run.

In addition, the above information will be recorded in the field notes. Chain of custody records will be maintained for each sample. Samples will be kept between zero (0) and six (6) degrees centigrade (°C). The field technician will place custody seals on all coolers to determine if the samples may have been tampered while being transported to the laboratory. The laboratory will notify TPECI in such an event so that a decision can be made on whether or not re-sampling is necessary.

7.1.3 Field Decontamination Procedures

Decontamination procedures for equipment and personnel are described in the following sections.

7.1.3.1 Equipment

After working in an area of contamination (as determined by field screening) and before moving equipment to another area, equipment and tools shall be decontaminated to remove soil that may contain contamination. Buckets, blades, augers of equipment shall be sprayed with a solution of Alconox or Citrisol and wiped down with paper towels or rags until all soil is removed. Cleaning solution shall be applied such that it does not drip or run off of the equipment, but is absorbed by paper towels or rags used to wipe the equipment. All decontamination shall be conducted immediately adjacent to the known area of contamination. Additionally, decontamination of small hand tools including the washing of sampling spoons/trowels in Alconox or CitriSol shall be conducted in this location. All decontamination waste from the site shall be placed in a drum, contractor trash bag, or other appropriate container for proper disposal as described in Section 9.0.

7.1.3.2 Personnel

In the presence of petroleum contaminated soils or groundwater, all personal may elect to don disposable coveralls, booties, and gloves. Disposable nitrile gloves shall be worn by the Qualified Environmental Professional during the collection and handling of all soil and water samples for field screening and laboratory analysis. All worn disposable PPE must be collected at the end of the day and disposed in accordance with Section 9.0 Investigation Derived Waste.

7.2 Field and Laboratory Calibration Methods

All field and laboratory procedures requiring instrument calibration will be conducted according to the applicable EPA methods, the ADEC methods, and standard operating procedures. TPECI shall calibrate the PetroFlag® test kit daily or when significant changes to ambient air temperature occur. The manufacturer certified dealer calibrates the PID annually. The PID will also be calibrated with fresh air and a 100 ppm isobutylene calibration standard daily before it is potentially used. The EPA checks the calibrations traceable quality control standards for the laboratory.

7.3 Routine and Periodic Quality Control Activities

SGS Laboratory, an ADEC-approved laboratory, will be used for all project analyses. This section describes the methods used for determining the quality of laboratory results.

7.3.1 Field Quality Control Samples

Field personnel will take two types of field quality control samples. These are sample duplicates and trip blanks. The objective and frequency of these samples are discussed below.

Due to the remote location, and logistical challenges associated with this location, TPECI will not collect field blanks or equipment blanks. TPECI will rely on field duplicates and trip blanks for quality control and determination of artificially introduced contamination.

7.3.1.1 Field Duplicates

Field duplicates are samples collected simultaneously from the same sampling locations. Field personnel will use identical sampling methods to retrieve one duplicate for every 10 samples for each sample matrix and analyte, at each source area, on each day. Field duplicate samples will be collected from screening locations exhibiting the highest PID heated headspace screening results. Field personnel will split one sample for duplicate analysis from the excavation or stockpile and will follow the same QA/QC methods for collecting, packaging, recording, and shipping the duplicate samples as all other samples.

7.3.1.2 Trip Blank

Trip blanks are samples prepared from sterile media at the laboratory and shipped with the sample containers. Trip blanks remain with the samples after collection and are analyzed for volatile compounds. This analysis determines if any cross-contamination occurred during shipping. Field personnel will never open the trip blank containers during the entire sampling process. Field personnel will use one trip blank per cooler. If the laboratory finds any contamination within the trip blank, the results will be used to evaluate any possible impacts to associated samples.

7.3.1.3 Field Blank

TPECI will not collect field blanks for this project.

7.3.1.4 Equipment Blank

TPECI will not collect equipment blanks for this project. The volume of analyte-free water required cannot be estimated prior to beginning site activities. The remote location and the logistical challenges associated with transporting an unknown (and potentially large volume) of analyte-free (de-ionized) water to the site would result in a significant economic and operational burden. TPECI will conduct thorough field decontamination procedures as described in Section 11.1.3.

7.3.2 Laboratory Quality Control Samples

The project laboratory will use matrix-spiked samples, spiked duplicates, surrogates, method blanks, duplicates, and laboratory control samples to measure data quality. Matrix spiked samples and laboratory control samples assess sample matrix interference and analytical errors and accuracy. Surrogates evaluate accuracy of an analytical measurement. Method blanks check for laboratory contamination and instrument bias. Duplicates measure the precision of the analysis.

The laboratory will use one method blank per sample period and use one laboratory control sample. The laboratory will use a surrogate spike for every sample, standard, and blank. The laboratory will use one matrix spike per sample period.

7.4 Data Reduction, Validation and Reporting

Data reduction is conducted by the analyst. All calculations are made as specified by the particular analytical method. Units are reported as mg/Kg, μg/Kg, or as otherwise called for in the method. Analytical data reports will include:

- Client name;
- Date and time of sample collection;
- Sample location;
- Date and time samples received at the laboratory;
- Date analysis completed;
- Laboratory sample ID number;
- A list of parameters analyzed;

- The analytical method number for each parameter; and
- Concentration of each parameter.

The laboratory will forward a copy of the completed analytical results to TPECI. Upon receipt of the analytical laboratory report, TPECI will review the data and complete the ADEC Laboratory Data Review Checklist.

8.0 SITE SPECIFIC SAFETY

The elements of personnel safety for this project are outlined in the following sections. Wards Cove maintains a company health and safety plan. An Activity Hazard Analysis shall be completed prior to the start of all site activities to ensure property safety precautions are in place for each task. TPECI personnel and all third-party contractors shall abide by all Wards Cove safety guidelines while operating on the site. The third-party contractor may implement additional safety guidelines while operating on the site.

8.1 Hazard Assessment

Project hazards include typical construction hazards (noise, heavy equipment, excavations, slips trips and falls, etc.) and potential exposure to petroleum products.

The project will generally consist of work outside which is well ventilated and windy; the complete pathways associated with inhalation of outdoor and indoor air are not considered a risk at this time. If any indoor work does occur, appropriate ventilation or respiratory protection through the use of personal protective equipment should be considered.

8.2 Site Control

Workers and the public shall be protected from construction and chemical hazards associated with excavation within a potentially contaminated area through marking, fencing, and placing barriers between public areas, work areas, and soil borings.

8.3 Monitoring

No air quality monitoring is proposed.

8.4 Personal Protective Equipment

All workers who have contact with the soil in potentially contaminated areas may elect to wear disposable coveralls, booties, and gloves (in addition to typical worksite PPE including safety-toe shoes, safety glasses, high visibility clothing, hardhat, and hearing protection). Workers may wear respiratory protection in accordance with Occupational Safety and Health Administration requirements and comply with the contractor’s respiratory protection program.

9.0 INVESTIGATION DERIVED WASTE

Decontamination waste, disposable PPE, disposable sampling equipment, and all other investigative derived solid or liquid waste shall be placed in labeled drums, 5-gallon buckets, contractor trash bags, or other appropriate containers. After project completion, TPECI will provide Wards Cove with the labeled drums, buckets, contractor trash bags, or other appropriate containers containing the investigative derived waste. Solid wastes shall be disposed in a permitted landfill. Ultimate disposal of the investigative derived waste is the responsibility of Wards Cove.

10.0 PROJECT SCHEDULE

Proposed landfarm maintenance and tilling are planned to begin during the summer of 2018. Actual start date is dependent on weather and site access. However, all site work is dependent on approval and funding by Wards Cove's insurers and their representatives. The first, annual sampling of landfarm soils is planned for September 2019.

After each landfarm sampling, the development of a written report on site activities shall occur following the receipt of laboratory data. Currently, laboratory turn-around times range from approximate two to six weeks. The development of a complete report is estimated to be completed within two weeks following receipt of laboratory data. Additionally, Wards Cove's insurers and their representatives will require review of the report prior to submittal to the ADEC. This review process will likely take four to six weeks.

TPECI will notify the ADEC project manager by phone and email at least 10 calendar days prior to beginning landfarm sampling each year.

11.0 DELIVERABLES

During sampling, TPECI will document daily operations within the project field notes. The daily summary will include notes regarding weather, site activities, QC activities, safety issues, include a general summary of work completed, observed the extents of contamination, identification of additional contamination or alternate contaminant sources (if any), and any other information pertinent to daily activities. All field notes and daily summaries will be provided to the ADEC project manager with the final written report at the completion of the project.

The data deliverables for the project shall include at the completion of the project a written report summarizing field activities, results, and conclusions. The report shall specifically address the following information:

- Site investigation overview;
- Laboratory results summary for soil samples;
- Laboratory results;
- Data Validation and Completion of ADEC Laboratory Data Review Checklist;
- Field observations;

- Wards Cove/Contractor Tilling Log;
- Investigation findings; and
- Recommendations for landfarm closure.

12.0 CONCLUSIONS

A written report summarizing field activities and discussing landfarm treatment status will be submitted upon receiving laboratory results annually. The report will propose continued treatment efforts or landfarm closure measures and address the final disposal of any contaminated media.

13.0 LITERATURE CITED

DEC, 2009. *Laboratory Data and Quality Assurance Policy – Technical Memorandum*. State of Alaska, Department of Environmental Conservation, Juneau, Alaska.

DEC, 2010a. *Laboratory Data Review Checklist.* State of Alaska, Department of Environmental Conservation, Juneau, Alaska. Available at dec.alaska.gov/spar/csp/guidance_forms.

DEC, 2011. *Landfarming at Sites in Alaska – Technical Memorandum.* State of Alaska, Department of Environmental Conservation, Juneau, Alaska.

DEC, 2014. *Transport, Treatment, & Disposal Approval Form for Contaminated Media.* State of Alaska, Department of Environmental Conservation, Juneau, Alaska. Available at dec.alaska.gov/spar/csp/guidance_forms

DEC, 2017. *Field Sampling Guidance.* State of Alaska, Department of Environmental Conservation, Juneau, Alaska.

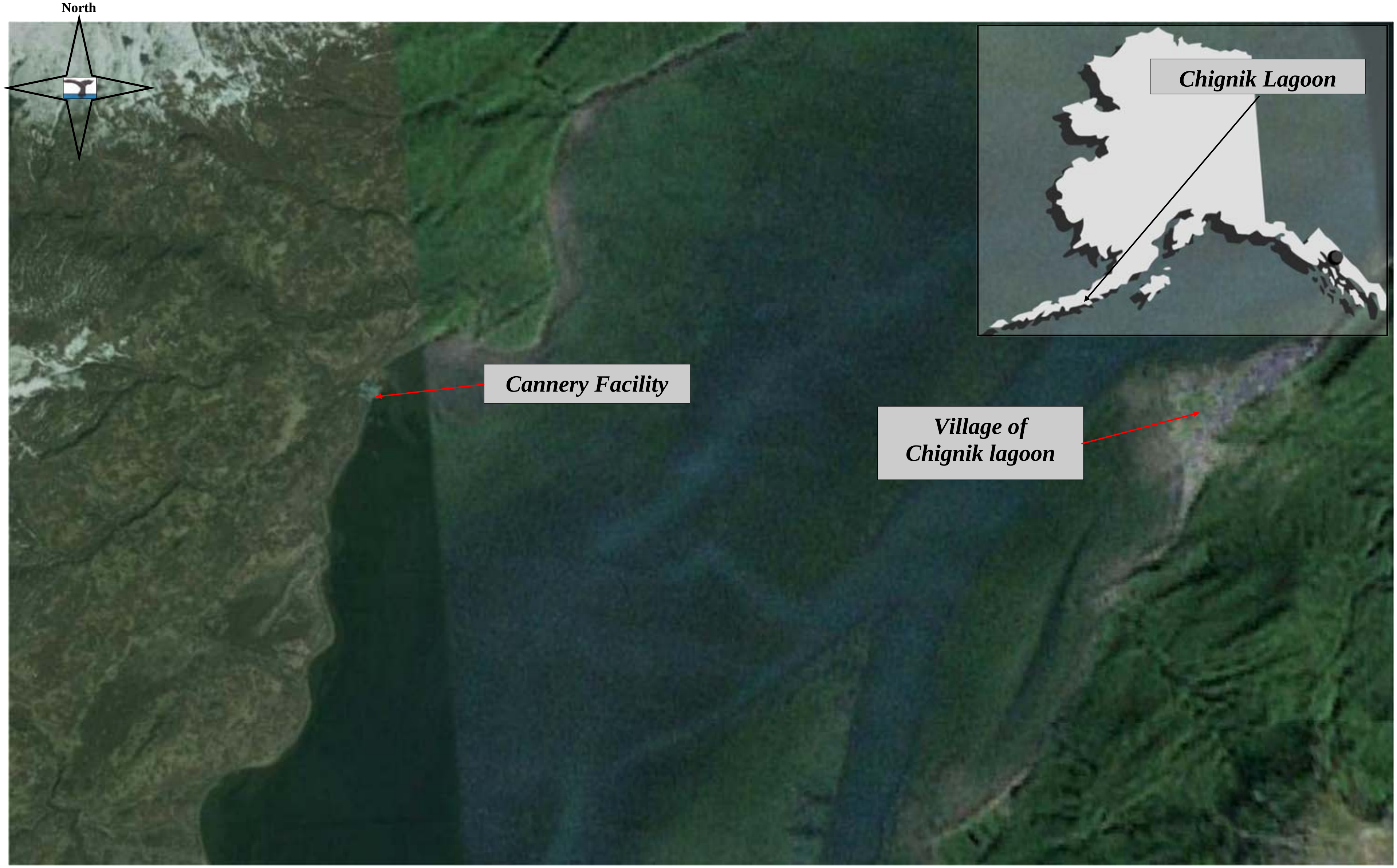
DEC, 2017. *Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites.* State of Alaska, Department of Environmental Conservation, Juneau, Alaska.

DEC, 2018. *Landfarming at Sites in Alaska – Technical Memorandum.* State of Alaska, Department of Environmental Conservation, Juneau, Alaska.

Hart Crowser, Inc., 2007. *Limited Phase I Environmental Site Assessment. Columbia Ward Fisheries Facility, Dumpsite, and "License to Enter" Properties, Chignik Lagoon, Alaska.* State of Alaska, Department of Environmental Conservation, Juneau, Alaska.

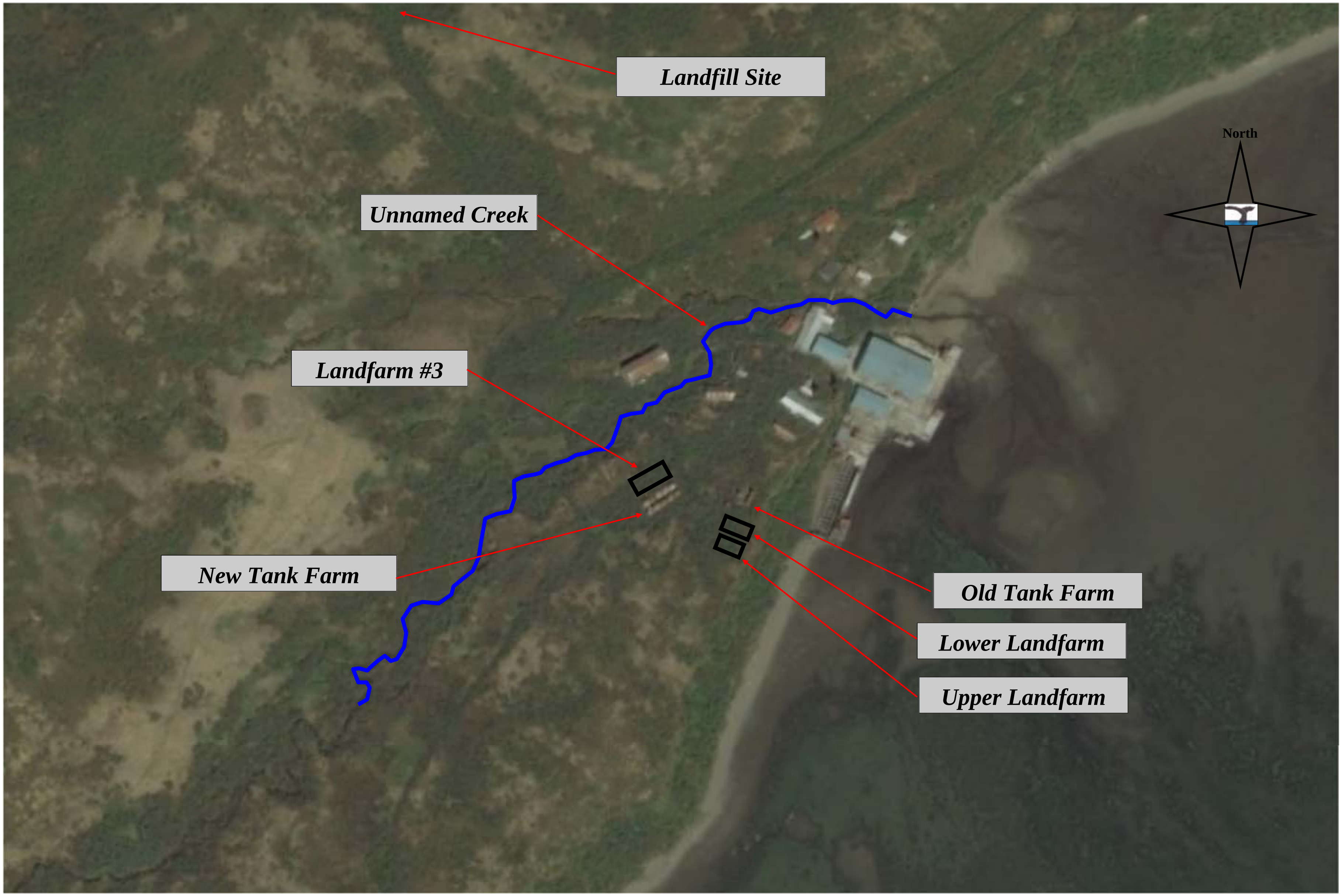
18 AAC 75 *Oil and Other Hazardous Substances Pollution Control, Revised as of December, 2017*. State of Alaska, Department of Environmental Conservation, Juneau, Alaska.

APPENDIX A:
Figures



Travis/Peterson Environmental Consulting, Inc. 3305 Arctic Boulevard, Suite 102 Anchorage, AK 99503 907-522-4337	**Chignik Lagoon Cannery Landfarm** **Work Plan** **Chignik Lagoon, Alaska**	**General Location Map** **Figure #1**

Project No: 1028-18	**File: Jupiter\backup\Erik\1028-17\Figures**	**Date: 6/19/2018**	**Scale: None**



Travis/Peterson Environmental Consulting, Inc. 3305 Arctic Boulevard, Suite 102 Anchorage, AK 99503 907-522-4337	**Chignik Lagoon Cannery Landfarm Work Plan** **Chignik Lagoon, Alaska**	**Site Map** **Figure #2**

Project No: 1028-18	**File: Jupiter\backup\Erik\1028-18\Figures**	**Date: 6/19/2018**	**Scale: None**

APPENDIX B:
TPECI Personnel Resumes

Michael D. Travis, P. E.

Environmental Engineer

Mike has over 37 years of experience in Environmental projects in Alaska. He manages National Environmental Policy Act (NEPA) documents throughout Alaska. His vast experience with State agencies, Federal laws and statutes, and working with local communities enables him to effectively manage a wide variety of projects He is a registered civil engineer in Alaska. Relevant projects include Spenard Road Contaminated Sites Study – Municipality of Anchorage and the Spenard Road, Hillcrest to Minnesota Drive Categorical Exclusion – DOT&PF.

Work Experience

Principal, Travis/Peterson Environmental Consulting, Inc.

Responsibilities: Co-Owner and Principal of an environmental engineering consulting firm. Provided a wide range of environmental and engineering services for private and governmental agencies. Performed environmental impact analysis for new and expanded utilities, highways, airports, mines, and power plants. Impact analysis involved air and noise modeling, storm water planning, public involvement, and social-economic analysis.

Chief of Professional Services, Alaska Department of Transportation and Public Facilities (DOT&PF)

Responsibilities: Supervised the contracting and negotiating of engineering and construction projects within the Central Region of the Department. Assisted in the final design of the Whittier Tunnel Access project. Provided environmental expertise for DOT&PF defense of a lawsuit within the Ninth Circuit Court of Appeals.

Vice President, AGRA Earth and Environmental, Inc.

Responsibilities: Managed geotechnical and environmental engineering offices in Fairbanks and Anchorage, Alaska. Reviewed final work products before submitting them to clients. Designed hazardous waste remediation systems. Developed corrective action plans for spill sites. Designed water treatment systems for remote canneries. Performed Environmental Assessments to fulfill requirements of the NEPA for construction projects throughout Alaska. Environmental Manager for the Whittier Tunnel EIS. Supervised 30 employees.

Education

University of Alaska Fairbanks

B.S. Biology

M.S. Environmental Quality Science

Certifications

Hazardous Waste Operations and Emergency Response Certification, Supervisors Course

Registered Civil Engineer in Alaska. Registration number CE 8048

Affiliations

International Right Of Way Association

Erik D. Mundahl, P.E.
Environmental Engineer
Travis/Peterson Environmental Consulting, Inc.
3305 Arctic Boulevard, Suite 102
Anchorage, Alaska 99503

Telephone (907) 522-4337
Fax (907) 522-4313
EMundahl@tpeci.com

EDUCATION

B.S. Environmental Engineering
Michigan Technological University
Houghton, Michigan

REPRESENTATIVE EXPERIENCE

Environmental Engineer

Travis/Peterson Environmental Consulting, Inc., (Alaska), 5/2009 - Present

Senior Environmental Engineer for an environmental consulting and engineering firm. General duties include writing complex environmental documents, design and construction oversight of water and wastewater treatment systems, conducting baseline environmental research, site characterization and remediation, biological assessments and species data collection, writing scientific reports, managing projects, and interfacing with regulatory agencies and clients. Other duties include performing environmental records reviews, site assessments, biological analysis, soil sampling, wetlands delineations, and site reconnaissance. These duties require field work in remote areas throughout Alaska while working in inclement weather.

As an Environmental Engineer, he has 9 years of experience in Alaska. Assignments have required close familiarity with designing and implementing remediation plans, hazardous waste management, and performing Environmental Site Assessments and Facility Compliance Audits. Additional assignments have included wetland delineation and restoration work. Mr. Mundahl has designed, permitted, and provided construction supervision for watershed restoration programs including water quality monitoring and analysis. Mr. Mundahl also has a significant background in aquatic biology including fish collection and identification, stream/river habitat assessments, GPS based wildlife monitoring, and aquatic invertebrate collection, sorting, and identification.

Environmental Engineer Intern

Restoration Science and Engineering, (Alaska), 5/2008 – 8/2008

Worked as an engineering intern throughout Alaska including remote project sites. Conducted contaminated site remediation and routine groundwater contaminate modeling. Work also included Phase I and II Environmental Site Assessments and watershed hydraulic analysis for river and stream systems throughout southcentral Alaska.

Environmental Engineer Intern

Oasis Environmental, (Montana), 5/2007 – 8/2007

Worked as an engineering intern in Montana specializing in stream habitat restoration, wetland mitigation, and aquatic biological surveys. Performed wetland mitigation workout throughout

Montana with work ranging from design to construction. Work also included stream hydraulic analysis and restoration design returning agriculturally affected stream channels to natural habitats. Conducted fish and invertebrates population surveys including in-depth studies on the endangered West Slope Cutthroat Trout.

CERTIFICATIONS

State of Alaska	Registered Professional Engineer EV14420
AGC of Alaska	Certified Erosion & Sediment Control Lead #AGC-16-0040
NANA Training Systems	HAZWOPER 40-hr. Course, 2009
Environmental Management, Inc.	HAZWOPER 8-hr. Refresher, 5/10, 5/11, 5/12, 5/13, 4/14, 3/15, 2/16, 2/17
Satori Group, Inc.	HAZWOPER 8-hr. Refresher, 2/18
State of Alaska	Certified Sanitary Survey Inspector
Richard Chinn Training	U.S. Army Corps of Engineers Wetland Delineation Training
American Red Cross	CPR & First Aid Certified
Wilderness Medicine Institute	Wilderness First Responder
North Slope Training Cooperative	NSTC

<u>Ryan Kingsbery</u> - Staff Scientist

Travis/Peterson Environmental Consulting, Inc.
3305 Arctic Boulevard, Suite 102
Anchorage, Alaska 99503
Telephone: (907) 522-4337
Fax: (907) 522-4313
rkingsbery@tpeci.com

EDUCATION

Alaska Pacific University	MSc: Environmental Science
Principia College	BA: Environmental Studies

REPRESENTATIVE EXPERIENCE

Staff Environmental Scientist
Travis/Peterson Environmental Consulting, Inc.

Staff Environmental Scientist for an environmental consulting and engineering firm. General duties include project management, site inspections, field operations, report writing, baseline environmental research, site characterization, site remediation, biological assessments, species data collection, and regulatory agency coordination. Other duties include performing environmental records reviews, Phase 1 site assessments, wetland delineation, biological analysis, soil sampling, and spill response.

Biological Science Technician
U.S. Geological Survey, Alaska Science Center

Biological Science Technician duties included field technician supervision, field logistics, vegetation plot sampling, North Slope bird nesting surveys and capture effort, data entry and data analysis. Additional duties included field logistics preparations and assistance in a large-scale marine mammal tagging effort on the Chukchi Sea coast.

Alaska Pacific University
Master of Science, Environmental Science

Successfully defended my thesis in May 2012. Thesis pertained to northern fur seal marine debris entanglement on St. George Island, Alaska. Documentation included five years of observations throughout the summer season from 2005-2010. Satellite work involved northern fur seal tagging, Steller sea lion entanglement monitoring and near-shore killer whale monitoring.

CERTIFICATIONS

Environmental Management, Inc.	*HAZWOPER 40-hr. Initial Course, 4/2014*
Environmental Management, Inc.	*HAZWOPER 8-hr. Refresher, 4/2015*
Satori Group	*HAZWOPER 8-hr. Refresher, 2016, 2017*
The Associated General Contractors (ACG)	*Alaska Certified Erosion & Sediment Control Lead, Certified since: 5/2014*
Richard Chinn Environmental Training, Inc.	*38-hr. Army Corps of Engineers Wetland Delineation Training Program, Certified since: 5/2018*

EMPLOYMENT RECORD

3/2014 – Present	Travis/Peterson Environmental Consulting, Inc.
1/2013 – 10/2013	U.S. Geological Survey, Alaska Science Center

Wade A. Collins **Staff Scientist**

Travis/Peterson Environmental Consulting, Inc.
3305 Arctic Boulevard, Suite 102
Anchorage, Alaska 99503

Telephone (907) 522-4337
Fax (907) 522-4313
wade@tpeci.com

EDUCATION

Alaska Pacific University — Bachelor's Degree, Environmental Science
Anchorage, Alaska

REPRESENTATIVE EXPERIENCE

Staff Scientist

Travis/Peterson Environmental Consulting, Inc.

Staff Scientist for an environmental consulting and engineering firm. General duties include writing complex environmental documents, conducting baseline environmental research, site characterization and remediation, biological assessments and data collection, writing scientific reports, managing projects, and interfacing with regulatory agencies and clients. Other duties include performing environmental records reviews, site assessments, biological analysis, soil sampling, wetlands delineations, and site reconnaissance.

Specific duties include writing plans including Health & Safety Plans, Spill Prevention Control & Countermeasures Plans, ADEC Oil Discharge Prevention and Contingency Plans, EPA Emergency Response Action Plans, USCG Facility Response Plans, and USCG Operations Manuals. Write ADEC Corrective Action Plans, Site Visit Reports, Sampling & Analysis Plans, and submit ADEC Laboratory Data Reports. Complete wetland delineations and submit USACE Individual and Nationwide Applications. Complete stream assessments and submit ADF&G Fish Habitat Permits. Write construction and multi-sector Storm Water Pollution Prevention Plans and Hazardous Materials Control Plans. Assist clients with ADEC Construction General Permit and Multi-Sector General Permit applications, SWPPP maintenance, amendments, discharge sampling, and site storm water management. Survey and write Migratory Bird Nesting Surveys for vegetation clearing.

Municipal Arborist, Grant Writer

Municipality of Anchorage, Parks & Recreation

Responsibilities: Forest health grant program administration included report writing, staff supervision, project logistics, bark beetle surveys, migratory bird and nesting surveys, purchasing, and partnership development. Invasive weed grant program administration included report writing, volunteer coordination, public outreach and education, species identification and sampling, data collection and inventories, and partnership development. Municipal Arborist related duties included conducting a GIS/GPS landscape tree inventory, managing park projects, forest management, trail improvement projects, park and greenbelt maintenance, public meeting presentations, public outreach, and communication.

CERTIFICATIONS

AGC of Alaska	Certified Erosion & Sediment Control Lead #AGC-16-0434
AGC of Alaska	How to Write a SWPPP Course, 2012
Richard Chinn Environmental Training, Inc.	38 Hour Army Corps of Engineers Wetland Delineation Training Program #6937
NANA Training Systems	HAZWOPER 40-hr. Course, 2010
Environmental Management, Inc.	HAZWOPER 8-hr. Refresher, February 2018
American Red Cross	First Aid & CPR 2/17

EMPLOYMENT RECORD

3/2010 – Present	Travis/Peterson Environmental Consulting, Inc.
5/2006 – 3/2010	Municipality of Anchorage, Parks & Recreation

APPENDIX C:
ADEC Landfarming Checklist

Attachment A-Landfarming Checklist

Project Name_____________________________

____ Workplan with detailed specifications for the landfarming project (18 AAC 78.250(e)(3)).

____ Adequate site characterization data that identifies contaminants of concern and target cleanup levels.

____ Design plan that will provide prevention of contamination migration to previously unaffected areas unless otherwise approved by the department in a corrective action plan (18 AAC 78.250(e)(4)).

____ Workplan schedule for conducting field work, monitoring, corrective action performance, and submittal of interim and final corrective action reports (18 AAC 78.250(e)(1)).

____ Site control plan (18 AAC 78.250(e)(8)).

____ Wastewater discharge permit for any discharge of regulated wastewater (18 AAC 72).

____ Project complies with air quality standards and requirements (18 AAC 78.250(e)(9) and 18 AAC 50).

____ Nondomestic wastewater system plan approval for the construction, alteration, installation, modification, or operation of any nondomestic wastewater treatment works or disposal system under 18 AAC 72.600 (18 AAC 78.250(e)(11) and 18 AAC 72).

____ Project maintains appropriate separation distance from surface water, water supply wells, and groundwater

(18 AAC 78.274(a)(2)).

____ If applicable, description of cultured microbes, any additives, breakdown products, and oxygen source with their rate of application and biodegration (18 AAC 78.250(e)(12)(E)).

____ If landfarm is constructed off-site, department approval before moving contaminated soil to the treatment site (18 AAC 78.274(b)).

____ If applicable, compliance with the treatment facility requirements (18 AAC 78.273).

____ Information submitted that addresses leachate (18 AAC 78.250(e)(12)(A)).

____ Post-treatment sampling to ensure cleanup standards have been met (18 AAC 78.605(b)).

____ Cleanup standards achieved (18 AAC 78.600 - 18 AAC 78.625).

____ Treated soils returned to original site or disposed of properly in accordance with department approval (18 AAC 78.274(b)).

I certify that I have personally reviewed the above checklist and that all information noted is contained in the attached report.

Name___________________________________ Signature_____________________________________

Title____________________________________ Date____