



Whiterock LTF Bioremediation cell Soil Sampling Report

Client: Sealaska

Date: 8/21/14

Weather: Cloudy 62 degree

Site Observations:

Prior to beginning soil sampling of site field technician performed a visual observation of the existing bioremediation cell. During the visual inspection it was noted that the existing cell was approximately 90' long by 20' wide and approximately 18" deep. The existing surface of the bioremediation cell did not have an impermeable line covering it, however the R&M inspector did notice that the impermeable liner below the cell did appear to be intact. In general the material in the cell consisted primarily of woody waste products (chipped up bark and small fragments of wood) consist with what would be encountered on the ground surface of a log sorting yard. Finally based on our field observations it there appeared to be a low spot in the middle of the cell where all the surface water would collect.

Sampling Procedures and Locations:

Upon completion of the field inspection R&M's technician performed the soil sampling. As per the approved soil sampling plan the cell was broken up into three approximalty equal parts or sub-cells and began sampling. The sampling consisted of taking three PID meter readings at various depth in each of the test holes, one soil sample for laboratory analysis from each test hole, and a duplicate sample for analysis form the test hole where the PID meter readings were the highest.

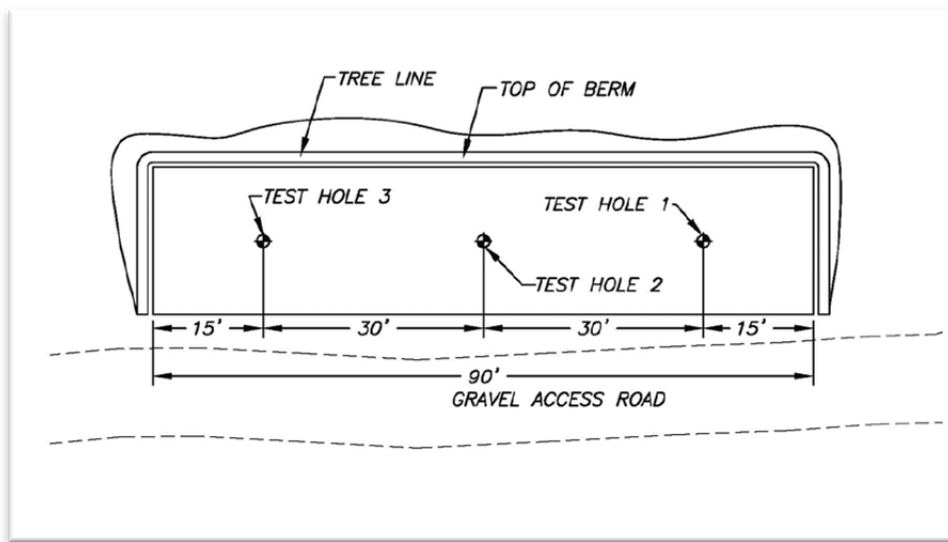
The PID meter readings were taken by collecting a small sample of soil in a ziplock bag, which was then sealed and placed in a bowl of warm water in order to heat the soil up to temperature conducive to sampling with a PID meter. Once the soil was sufficiently warmed the testing tube of the PID meter was then placed inside the plastic baggie and sealed and the measurement was then performed for approximately 45 seconds or until the meter reading no longer increased. The results from the PID tests are below.

Field PID Meter Readings

Sub-cell #	Depth (in)	Soil Temperature (°F)	PID Reading (ppm)
1	8	72	0.5
1	12	73	1.1
1	18	72	1.7
1	16	73	1.8
2	3	68	1.6

2	6	67	1.4
2	9	67	2.8
Sub-cell #	Depth (in)	Soil Temperature (°F)	PID Reading (ppm)
2	12	68	2.7
3	3	70	1.5
3	6	66	2.8
3	9	67	2.8
3	12	67	2.5

Test Hole Location Map:



Site Photos:

	<p><u>Description</u> Edge of Berm with Liner showing</p>
	<p><u>Description</u> Berm and liner</p>

	<p><u>Description</u> Berm and liner at end of cell</p>
	<p><u>Description</u> Longitudinal berm with liner shown</p>

	<p>Description Stakes with Ribbons show test hole locations</p>
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Test Sample Analysis Results

Sample ID#	Test Hole #	Sample Depth	Lab Results (DRO mg/kg)
1	1	18"	65
2	2	16"	230
2-Duplicate	2	16"	520
3	1	12"	65

Note: Allowable Contamination Concentration Limit 200 mg/kg.

Conclusions and Recommendations:

Based on our review of the attached soil analysis report it appears that a large amount of the contaminated soil has been successfully remediated to contamination levels below the ACEC accepted limit of 200 mg/kg. However in the area where test hole 2 was located the contamination levels were still higher than the accepted limits. Therefore it is our recommendation some additional bioremediation be performed on the material. This can be accomplished by tilling, turning, and mixing nitrogen and phosphorus rich fertilizer into the existing material in the bioremediation cell. Base off an assumed average hydrocarbon concentration of 130 mg/kg, an approximate unit weight of the existing soil of approximately 120 lb/cy, the addition of (3) 90 lb bags of nitrogen rich fertilizer thoroughly mixed into the existing soils will be sufficient to achieve the recommended 100carbon:100nitrogen:1 phosphorus ration in the existing soil. Once the fertilizer is mixed into the contaminated soil and the material is evenly spread along the bottom liner,

this pipe should then be covered with a minimum 4mil impervious membrane to ensure no runoff water is allowed to mix in the with the contaminated soil.

Sincerely,
R&M Engineering-Ketchikan, Inc.

Robert Badgett

Robert K. Badgett, P.E.