# **FINAL CLEAN-UP REPORT Petersburg Falls Creek Property**



**Prepared By:** 

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**Prepared For:** 

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State of Alaska Department of Environmental Conservation Contaminated Sites 410 Willoughby Avenue Juneau, AK 99801

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## **EXECUTIVE SUMMARY**

The final Clean-up Report was prepared and written by Dan McNair-DMC Technologies. Mr. McNair is recognized as a qualified professional able to perform and oversee sight remediation. The final report is presented as follows:

This report is prefaced with an executive summary, and a listing of final clean-up report requirements. The body of report is divided into five sections including background information, previous environmental conclusions, excavation results, and treatment results. The report concludes with various appendices including: Appendix A – Proposal and Remedial Work Plan, Appendix B – Sampling and Analyses Results and Appendix C - Photographic Log.

The Petersburg Falls Creek site was occupied from 1963 until 1990 by two separate timber operations. During this time undesirable housekeeping practices caused soil in the site area to become contaminated. MHTLO acquired the property in 1998 and then sold it in 2000. After contamination was discovered title was turned back to DNR. Two separate environmental assessments were performed indicating concentrations of DRO and RRO above ADEC approved limits near the north end of the shop. Approximately 330 CY of contaminated soil was estimated to be present at maximum TPH concentrations exceeding 50,000 ppm and average concentrations of 30,000 ppm TPH. Clean-up limits for the site were established at 1,360 ppm DRO and 8,300 ppm RRO.

DMC Technologies, Inc. was contracted to remediate the soil contamination. Excavation was performed and 15 confirmation samples collected analyzed confirming that contaminated soil was successfully removed. Contamination was found to be more widespread than anticipated including:

- 730 CY of contaminated soil
- 84 CY of scrap metal including 18 crushed drums and 4 crushed tanks removed and disposed in the City of Petersburg landfill.
- 7 lead-acid batteries removed and placed in the City of Petersburg recycling center for off-site shipment.
- 63 CY of contaminated and graded shot rock fill was also delivered to the site by the City of Petersburg for treatment.
- 6 empty drums collected and placed in the shop.
- 3 truck bodies relocated to northwest side and front of the shop.

DMC Technologies Inc. treated all contaminated soil at the site using a proprietary biochemical treatment process. Treatment results were achieved over a period of approximately 60 days. Confirmation sampling results and corresponding statistical analyses indicate that the DRO concentration of the site is 641 ppm (95% UCL) and the RRO concentration is 3,225 ppm (95% UCL) as represented in 15 samples. City of Petersburg soils were treated to a DRO concentration of 224 ppm. Following ADEC approval, treated soils were used to backfill excavations. The site is now considered clean and closure letter pending.

### FINAL REPORT REQUIRMENTS (18 AAC 75.380)

This final report meets the following requirements:

(a) A responsible person shall submit a written final cleanup report to the department for each site undergoing cleanup under the site cleanup rules. The report must be prepared by a qualified person.

(b) The written report required by (a) of this section must contain, as applicable,

(1) the date and time of the discharge or release;

(2) the location of the discharge or release, including latitude and longitude coordinates;

(3) the name and physical address of the site, facility, or operation;

(4) the name, mailing address, and telephone number of the owner and of the operator of the site, facility, or operation;

(5) the type and amount of each hazardous substance discharged or released;

(6) a description of environmental damage caused by the discharge, release, or containment, to the extent the damage can be identified;

(7) a demonstration that the free product was recovered in compliance with 18 AAC  $\underline{75.325(f)}$  (1)(B) and that provides, at a minimum, the following information:

(A) the estimated amount, type, and thickness of free product observed or measured in wells, boreholes, and excavations;

(B) the type of free product recovery system used;

(*C*) whether a discharge or release has occurred or will occur at the site or offsite during the recovery operation and where the discharge or release occurred or will occur;

(D) the type of treatment applied to, and the effluent quality resulting or expected from, any substance that has been discharged or released or will be discharged or released;

(E) whether a discharge or other permit was required under local, state, or federal law and if each required permit was obtained;

(F) the date, location, and method of disposal of the recovered free product, dissolved phase product, or contaminated soil; and

(G) whether free product remains at the site, and, if so, the estimated quantity;

(8) a summary of each applicable soil and groundwater cleanup level approved under the site cleanup rules and a description of the factors used in determining each applicable cleanup level;

(9) a description of cleanup actions taken, including:

(A) a demonstration that cleanup was conducted in accordance with the elements, including modifications to the elements, approved under 18 AAC <u>75.360;</u>

(B) sampling reports and a description of the soil and groundwater sampling protocol and sampling locations;

(C) a summary of the laboratory reports for the final verification samples collected at the site; the laboratory or a responsible person shall keep those reports and make them available to the department upon request for at least 10 years after submission of the summary to the department;

(D) a detailed explanation of what was done if a sample exceeded the applicable required cleanup level;

(E) a demonstration that contaminated soil and groundwater were stored, treated, and disposed of in an approved manner;

(*F*) an estimate of the extent of any remaining residual contamination, above and below the applicable cleanup levels;

(G) a demonstration that surface soil staining was evaluated and that a cleanup of that staining was performed;

(*H*) whether permits were required under local, state, or federal law and if each required permit was obtained;

(I) confirmation that any hazardous waste generated was stored, treated, or disposed of in compliance with 42 U.S.C. 6901 - 6992k (Solid Waste Disposal Act, as amended by Resource Conservation Recovery Act), as amended through October 1, 1998 and adopted by reference; and

(J) other information requested by the department, as the department determines necessary to ensure protection of human health, safety, or welfare, or of the environment;

(10) a demonstration of compliance with applicable institutional control requirements under 18 AAC <u>75.375.</u>

(c) The department will determine final compliance with the:

(1) applicable soil cleanup levels, based on sampling results from onsite contaminated soil and from contaminated soil moved offsite for treatment or disposal, and based on the maximum concentrations detected, unless the department approves an appropriate statistical method, in which case compliance will be based on the mean soil concentration at the 95th percent upper confidence limit; approval of a statistical method will be based on:

(A) the number and location of samples taken;

(B) whether large variations in hazardous substance concentrations relative to the mean concentration exist; and

(C) whether a large percentage of concentrations are below the method detection limit; and

(2) groundwater cleanup levels, based on an analysis of unfiltered groundwater samples unless a responsible person demonstrates that a filtered sample provides a more representative measure of groundwater quality; the department will determine compliance based on the maximum concentrations of a hazardous substance detected in the final confirmation samples; before closure, the size of the dissolved plume must be steady state or shrinking and concentrations of the hazardous substance must be decreasing.

(d) After reviewing the final cleanup report submitted under this section, if the department determines that:

(1) a site has been adequately characterized under 18 AAC <u>75.335</u> and has achieved the applicable requirements under the site cleanup rules, the department will issue a written determination that the cleanup is complete, subject to a future department determination that the cleanup is not protective of human health, safety, or welfare, or of the environment; or

(2) the cleanup and applicable institutional controls are not protective of human health, safety, or welfare, or of the environment, the department will, as necessary to ensure protection of human health, safety, or welfare, or of the environment, require a responsible person to conduct additional actions that meet the requirements of the site cleanup rules.

### **REGIONAL GEOLOGY**

The general area surrounding Petersburg parallels the Coastal Range. A northwest trending anticlinorum is present along the west side of the island with a synclinorium occurring along the east side. Devonian Rocks are exposed along the Anticlinorium and Jurassic/Cretaceous rocks occupy the Synclinorium. Several zones of northeast trending folds and faults cut across the regional structure. The geography of the site is dominated by outcroppings composed of thin bedded to banded slate, siltstone, greywacke, and phyllite. Inter bedded materials vary in thickness and are clearly graded in grain size. The finest grained material is dark gray to black with lighter colors in the greywacke.

### LOCAL HYDROLOGY

Undulations in the surface topography have filled with poorly developed soils as a result of natural forest decay. Deeper depressions are often wet and contain blue gray claylike deposits indicative of a muskeg type environment with high total organic carbon content. Numerous small rivulets and streams cut down hillsides. Crude sands and gravels can be found in developed steams. It should be noted that the decomposition of organic material produces naturally occurring leachate which contains tannin, pinene, terpene, ect. These compounds can create a sheen often mistaken for petroleum contamination. This "woodwaste" leacheate has been recorded to have low enough Ph levels for the solubilization of metals trapped in mineral deposits. It is hypothesized that this natural mechanism is most likely the source of some heavy metal concentrations at this particular site. The Falls Creek property resides in close proximity to muskegy soils.

# LOCATION

The parcel is locate on the Falls Creek Road Within Section 11, Township 60 South, Range 79 East Copper River Meridian near mile 11.5 of the Mitkof highway Near Petersburg AK. The specific location of the site is noted below:



A site plat has been prepared and is illustrated below:

Final Clean-up Report Falls Creek



A small ephemeral drainage channel is apparent north and west of the shop building which flows towards Falls Creek to the northeast. Much of the debris disposed from historic operations was placed near this drainage channel. Oil staining was apparent in the channel. The former tank pad and wood waste fill is also noted west of the building. The tank pad location is suspect of causing soil contamination from leakage and spills.

## **HISTORY AND DESCRIPTION**

The site is an approximate 2.2 acre man-made plot with centrally located shot rack pad. A concrete slab covers the pad on which a metal and wood framed shop has been constructed. The northwest portion of the lot has been cleared and grubbed and formerly contained a trailer lot with a small entrance road. The northeast portion of the lot lies adjacent to muskeg draining into Falls Creek feeder streams. About ½ acre of muskeg underlies the northwest and northeast ends of the shot rock pad. The remaining under layers are natural soil.

The State took title on the property in 1963. The property was then leased to J&H logging in 1964. J&H logging sold their interest to Mitkof Lumber Company in 1984. Mitkof Lumber continued operation on site until 1990. Fuel contamination problems were reported in 1994 during close-out.

MHTLO obtained the property in 1998 and sold the property in 2000. The purchasers discovered and reported contamination after the sale. A phase I\II Environmental Assessment of the property was completed by 2002 and recommended the removal and treatment of 330 CY of soil. The property was signed back to DNR in 2003. DNR has determined that the contamination must be removed. They surmised that DMC Technologies had the most efficient and cost effective method to eliminate the contaminated soils.

### **PREVIOUS ENVIRONMENTAL CONCLUSIONS**

Phase I\II assessments indicate this site has had a history of undesirable waste management and housekeeping practices. Assessments identify surface and subsurface soil concentrations of monoaromatic compounds (B,T,X) and petroleum hydrocarbons (DRO,RRO) exceeding ADEC clean-up levels.

There are no reported release details associated with the site. However, it is evident that former waste management practices resulted in numerous spills. Based on all available data and observations it is concluded that there is no measurable free product on site. High levels of arsenic and chromium detected in soil samples are most likely naturally occurring and therefore not of concern. It should be noted that collected data implies no impact to Falls Creek feeder streams and ponds and no groundwater contamination concerns.

Because of high total organic carbon content in the soils, a method 3 clean-up limit for DRO was calculated at 1,360 ppm. A method 2 clean-up limit for RRO was assigned at 8,300 ppm. These limits apply to both clean-up and treatment.

## **EXCAVATION RESULTS**

Excavation of the contaminated soils began on 5\18\05 and ended on 5\20\05. A small Kolbelco excavator and 10-wheeler dump truck were used to remove contamination from identified areas of concern. Soils were placed into a small onsite treatment area constructed with 2ft. to 4ft. high berms surrounding the perimeter. Higher berms were placed at the bottom of sloped areas to eliminate run-off potential towards Falls Creek. Approval was granted by ADEC allowing for no liner as well as no cover of soils placed in the treatment area. Excavation activities commenced in areas that had been previously reported to be contaminated or which were visually contaminated.

Field screening was utilized to direct excavation work. Field measurements included photoionization detection (PID) equipment with contact and head space measurements, sheen tests, visual observations and subjective olfactory indicators. PID readings exceeding 10 ppm benzene equivalent, slight sheen, moderate odor and gray discoloration indicated the presence of contamination requiring removal. At the conclusion of excavation 15 confirmation samples were collected from both sidewall and excavation bottoms for laboratory analyses to assess the success of clean-up relative to ADEC clean-up limits.

The extent of contamination was found to be significantly greater than previously estimated at 330 CY. Excavation included:

- 730 CY of contaminated soils. Excavation in contaminated areas proceeded to the water table located at approximately 30" to 32" below the ground surface. Excavated soils were typically composed of manmade fill (shot rock and sediment) to the water table table. A layer of puncheon was noticeable at the water table denoting the original clearing and grubbing at the time the property was developed. The water table denoted a transition from man made fill to natural soils including dark brown organic matter, peat and bluish clay. The very surface of the muskeg layer had a characteristic organic odor of both natural organic decay and traces of petroleum. Excavations to 60" were required in two locations including a downgradient area from the former tank pad and the terminal end of the drainage channel. Soils in thee areas were more contaminated likely due to "pooling" on natural topographic depressions.
- 84 CY of scrap metal were collected form the excavations including truck parts, oil filters, wire rope, crushed drums (18), crushed tanks (2) and other assorted metal debris. This material was removed with the thumb on the excavator, shaken free of dirt and loaded into 10-wheeler trucks for disposal at the City of Petersburg Landfill.
- 7 lead-acid batteries were collected during the excavation. Batteries were typically intact and were collected, placed on wood pallets in the shop and later picked-up by the City of Petersburg for staging at the landfill before off-site shipment to a recycling facility.

• The city of Petersburg delivered 63 CY of minus 3/4" graded shot rock contaminated with diesel fuel into the treatment area from the Landfill. Care was taken to keep this material separate from the other soils by placing it on a liner.

The following table identifies each of the confirmation samples collected during excavation. A map follows the table denoting individual sample locations. Each sample was collected randomly as a grab sample.

				Limits =	1360 ppm	8300 ppm			
Date	<u>Time</u>		Sample #	Depth (in)	DRO(ppm)	RRO(ppm)	PID Field	PID Bag	<u>Sheen</u>
5/21/2005	945	1	P01	SW 28"	1,170	2,530	0.5	23.5	L
5/21/2005	940	2	P02	BT 44"	232	598	0	10.7	Ν
5/21/2005	935	3	P03	BT 32"	29	92	0	11.6	Ν
5/21/2005	930	4	P04	BT 16"	123	605	0	12.3	N-L
5/21/2005	925	5	P05	BT 24"	119	297	0	14.5	Ν
5/21/2005	920	6	P06	BT 38"	307	1,590	0	7.6	Ν
5/21/2005	915	7	P07	SW 36"	410	1,630	0	7.8	Ν
5/21/2005	910	8	P08	SW 24"	929	2,660	0.5	15.8	L
5/21/2005	905	9	P09	SW 18"	186	684	0	8.5	N-L
5/21/2005	900	10	P10	BT 42"	334	637	0	10.2	N-L
5/21/2005	950	11	P11	BT 36"	3,130	5,970	2	53	L-M
5/21/2005	955	12	P12	BT 24"	2,350	5,220	2	49	L-M
5/21/2005	1000	13	P13	BT 16"	1,130	3,250	1	22.1	L
5/21/2005	1005	14	P14	SW 18"	536	1,890	0	6.6	Ν
5/21/2005	1010	15	Dp1 (P11)	BT 36"	951	2,690	0.5	16.1	L
5/21/2005	1015	16	Dp2 (P12)	BT 24"	928	2,890	0.5	15.9	L
				Avg.	804	2,077		Ν	None
				SD	721	1,588		N-L	None-Light
								L	Light
								L-M	Light-Medium
								М	Medium

A typical soil profile is also illustrated and discussed below:

### Soil Profile at P01, P11, P12, P13



A thin layer of organic material composed of both biogenic compoinents and petroleum (waste oil and fuel traces) exists on the upper surface of the muskeg below the shot rock. This is also the water table level at most times. The system has no smear band other than this thin layer. The layer is not discolored but does exhibit a PID reading and sheening. A grab sample from the this 1" thin layer reads high in DRO. A duplicate sample that includes a 4" grab both above, in and below this layer does not exhibit a high DRO value. The statistical average of the samples is well below the clean-up limit. A recommendation is made to designate ther excavation complete.

Samples P11 and P12 were intentionally collected from a 1" thick area at the muskeg interface on the water table surface. These readings were higher than the clean-up limit. However, a 3" composite as duplicates from the same sample location yielded clean samples.



Excavated soils were spread into an 18" thick layer across the defined treatment area.

### TREATMENT RESULTS

In accordance with the approved Remedial Work Plan, a biochemical treatment process was applied to excavated soils placed in the treatment area to reduce contamination levels.

### **Biological Treatment**

Microbial culturing commenced on 5/18 and completed on 5/21 when microbes in the tank reached a concentration of  $1XE^9$  microbes/ml as determined by vacuum agar tube testing. Air, Ph and temperature were carefully controlled in the tank for four days. Microbes were originally fed a solution of sugars and salt, but were quickly weaned to a carbon source of pure diesel fuel. A natural blend of 9 microbial strains (B1 microbes), bacteria extracted from contaminated soils in and around the site and bacteria from Falls Creek feeder stream sediments were collected cultured in a 500 gallon tank.

### Chemical Treatment

Chemical Pentanonic was added to the microbial tank on 5/22 and just prior to solution application. The chemical has no effect on microbe concentration. 800 lbs of oleophillic N1 bionutrient was first spread across the 16,000 SF surface of the contaminated soil prior to inoculation. The solution of microbes and chemical were then sprayed onto the contaminated soil in the treatment area. 500 gallons of concentrate was applied to 770 CY of soil. The inoculated soil was immediately aerated and mixed using the track hoe.

The treated soils were allowed to remain uncovered and exposed to the weather until 7/23 and for a period of 62 days. On 7/23, fifteen random grab samples were collected across the treated soil area for confirmation analyses to determine treatment effectiveness. Sample results indicate contamination levels well below the established treatment limits.

The following map and table and map provide all critical sampling information.

Date	Time		Sample #	Depth (in)	DRO(ppm)	RRO(ppm)	PID Field	PID Bag	Sheen	Location
7/23/2005	900	1	PC-01	6"-12"	BK	BK	0	0	n	City Pile
7/23/2005	905	2	PC-02	6"-12"	65.7	154.0	0	0	n	City Pile
7/23/2005	910	3	PC-03	6"-12"	BK	BK	0	0	n	City Pile
7/23/2005	915	4	PC-04	6"-12"	1,080.0	4,530.0	1	2.4	n	Falls Creek Stockpile
7/23/2005	920	5	PC-05	6"-12"	BK	BK	1	2.1	n	Falls Creek Stockpile
7/23/2005	925	6	PC-06	6"-12"	752.0	3,660.0	0.5	1	n	Falls Creek Stockpile
7/23/2005	930	7	PC-07	6"-12"	366.0	1,610.0	0.3	0.9	n	Falls Creek Stockpile
7/23/2005	935	8	PC-08	6"-12"	652.0	2,650.0	0.4	1.2	n	Falls Creek Stockpile
7/23/2005	940	9	PC-09	6"-12"	2,200.0	7,620.0	2.5	5.4		Falls Creek Stockpile
7/23/2005	945	10	PC-10	6"-12"	3,110.0	8,850.0	3.1	6.2		Falls Creek Stockpile
7/23/2005	950	11	PC-11	6"-12"	1,040.0	3,900.0	1.6	2.4	n-l	Falls Creek Stockpile
7/23/2005	955	12	PC-12	6"-12"	819.0	2,920.0	0.5	1.7	n	Falls Creek Stockpile
7/23/2005	1000	13	PC-13	6"-12"	1,110.0	5,110.0	0.9	2.9	n	Falls Creek Stockpile
7/23/2005	1005	14	PC-14	6"-12"	210.0	960.0	0.2	0.6	n	Falls Creek Stockpile
7/23/2005	1010	15	PC-15	6"-12"	360.0	1,810.0	0.3	0.7	n	Falls Creek Stockpile
7/23/2005	1015	16	PC-16 Dup of PC-09	6"-12"	25.3	101.0	0	0	n	Falls Creek Stockpile
7/23/2005	1020	17	PC-17 Dup of PC-10	6"-12"	ND	ND	0	0	n	Falls Creek Stockpile
7/23/2005	1025	18	PC-18 Bkg	6"-12"	270.0	1,790.0	0.4	0.6	n	Falls Creek Stockpile
7/23/2005	900	19	Composite A	6"-12"	307.0	1,140.0	0.6	0.9	n	Falls Creek Stockpile
7/23/2005	900	20	Composite B	6"-12"	297.0	1,180.0	0.8	1.1	n	Falls Creek Stockpile
7/23/2005	900	21	Composite C	6"-12"	318.0	1,180.0	0.7	1	n	Falls Creek Stockpile
				Limits	1,360.0	8,300.0			•	
			Overall Analysis	Avg.	618	2,341			She	en Coding
			-	SD	652	2.188		n	None	

#### PETERSBURG TREATMENT CONFIRMATION SAMPLES

#### NOTES

Samples PC-01 and PC-03 were broken in transit and would have had results similar to PC-02, all being from the City stockpile. Sample PC-05 was also broken. All three broken samples were composited to form three new samples - Composites A , B and C; used to replace the broken samples. A single background sample was collected for comparative purposes demonstrating the presence of biogenics (likely from peat). Two duplicates were collected with PC-09 and PC-10 to illustrate the differences between peat samples and shot rock samples. PC-09 and PC-10 contained predominantly peat. PC-16 and PC-17 from the same grid contained shot rock.

Sheen Coding					
n	None				
n-l	None to Light				
I	Light				
I-m	Light to Medium				
m	Medium				

Sample PC-18-BKG was collected in a non-impacted area of the site from muskeg soils. The sample is predominantly peat. Data from the sample indicates that natural biogenics are present in treated soils in significant concentrations: 270 ppm DRO and 1,790 ppm RRO. Samples PC-08 and PC-09 exceeded the clean-up limit, but were noted to contain high levels of peat. Duplicates from the same area (PC-16 and PC-17) containing only sediment indicated the absence of contamination.

Randomly selected treatment confirmation sample locations are noted below:



Confirmation samples from the City of Petersburg soils indicate complete treatment with an average DRO concentration of only 224 ppm. This concentration is likely far less, but two of the three samples were broken in transit and were combined with a broken sample from the general treatment area to form three composite samples, which were analyzed. This likely increased the contamination level actually present in the City stockpile.

Statistical analyses of the treatment confirmation samples were performed to determine the upper confidence limit of statistical mean at 95% in accordance with ADEC guidance. These results are noted below:

### PETERSBURG DNR FALLS CREEK TREATED STOCKPILE - DRO ANALYSES

#### **Original Data Set**

#### Duplicate Adjusted Data Set

Sample	Units	Result	Detection
PC-01	mg/kg	0	25
PC-02	mg/kg	65.7	25
PC-03	mg/kg	0	25
PC-04	mg/kg	1080	141
PC-05	mg/kg	0	25
PC-06	mg/kg	752	100
PC-07	mg/kg	366	50
PC-08	mg/kg	652	100
PC-09	mg/kg	2200	279
PC-10	mg/kg	3110	250
PC-11	mg/kg	1040	116
PC-12	mg/kg	819	50
PC-13	mg/kg	1110	100
PC-14	mg/kg	210	56.6
PC-15	mg/kg	360	100
PC-16-Dup	mg/kg	25.3	25
PC-17-Dup	mg/kg	0	25
PC-18-Bkg	mg/kg	270	125
Comp. A (01,03,05)	mg/kg	307	50
Comp. B (01,03,05)	mg/kg	297	50
Comp. C (01,03,05)	mg/kg	318	50

Field DQOs Lab DQOs NDs Changed High Dupes Out Broken Replaced

#### **Calculations Methodology**

- Ref. (a) EPA Statistical Method Publication SW-846, Volume II, Part III, Chapter 9
- Ref. (b) ADEC Draft Statistical Methods for Determining the Mean Soil Concentration - 8/16/2001 (SPAR\CS\STP\02-001)

#### Treatment Data

Higher of duplicates eliminated NDs replaced with 1/2 LOD value Broken replaced with composites

Met

Met

0

2

3

High DRO Treated	30,000
Avg. DRO Treated	10,000

Start Treatment	5/22/2205
Test Treatment	7/23/2005
Days Treated	62

Г	Not Trar	sformed	Trans	formed	
	х	x2	ln(x)	[ln(x)]2	
1	307	94249	5.73	32.80	
1	65.7	4316.49	4.19	17.52	
1	298	88804	5.70	32.46	
1	1080	1166400	6.98	48.79	
1	318	101124	5.76	33.20	
1	108	11664	4.68	21.92	
1	366	133956	5.90	34.84	
1	652	425104	6.48	41.99	
1	25.3	640.09	3.23	10.44	
1	12.5	156.25	2.53	6.38	
1	1040	1081600	6.95	48.26	
1	819	670761	6.71	45.00	
1	1110	1232100	7.01	49.17	
1	210	44100	5.35	28.59	
1	360	129600	5.89	34.65	
15	5184574.83 485.99				
	87.50% Log Normal Distribution Probability				

86.69% Normal Distribution Probability

15	Samples	15	Samples
14	Deg. Frdm.	14	Deg. Frdm.
451.43	Mean	5.54	Mean
84.17	Detect Limit	4.43	Detect Limit
318	Median	5.76	Median
151978.14	Variance	1.85	Variance
389.84	Std. Dev.	1.36	Std. Dev.
100.66	Std. Error	0.35	Std. Error
1.74	T-test Value	1.86	H-test Value
626.58	UCL	641.28	UCL
276.29	LCL	100.27	LCL

#### ADEC Regulatory Limits

No additional treatment required	<1,360 ppm
Free release as clean soil	<1,360 ppm
All VOCs Detected Under Published Limits	Yes

93.59%	reduction in	62 days
770 CY	1,309 Tons	

Background not subtracted

### PETRERSBURG DNR FALLS CREEK TREATED STOCKPILE - RRO ANALYSES

#### **Original Data Set**

Duplica	ate Adjuste	d Data Set
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Sample	Units	Result	Detection
PC-01	mg/kg	0	50
PC-02	mg/kg	154	50
PC-03	mg/kg	0	50
PC-04	mg/kg	4530	281
PC-05	mg/kg	0	50
PC-06	mg/kg	3660	200
PC-07	mg/kg	1610	100
PC-08	mg/kg	2650	200
PC-09	mg/kg	7620	558
PC-10	mg/kg	8850	500
PC-11	mg/kg	3900	232
PC-12	mg/kg	2920	100
PC-13	mg/kg	5110	200
PC-14	mg/kg	960	113
PC-15	mg/kg	1810	200
PC-16-Dup	mg/kg	101	50
PC-17-Dup	mg/kg	0	25
PC-18-Bkg	mg/kg	1790	250
Comp. A (01,03,05)	mg/kg	1140	100
Comp. B (01,03,05)	mg/kg	1180	100
Comp. C (01,03,05)	mg/kg	1180	100



Higher of duplicates eliminated NDs replaced with 1/2 LOD value Broken replaced with composites

> Met Met 0 2 3

Field DQOs	
Lab DQOs	
NDs Changed	
High Dupes Out	
Broken Replaced	

#### **Calculations Methodology**

Ref. (a)	EPA Statistical Method - Publication SW-846,
( )	Volume II, Part III, Chapter 9

Ref. (b) ADEC Draft Statistical Methods for Determining the Mean Soil Concentration - 8/16/2001 (SPAR\CS\STP\02-001)

#### **Treatment Data**

High DRO Treated	50,000
Avg. DRO Treated	20,000
	- /

Start Treatment	5/22/2005
Test Treatment	7/23/2004
Days Treated	62

	Not Transformed		Transformed	
	x	x2	ln(x)	[ln(x)]2
1	1140	1299600	7.04	49.54
1	154	23716	5.04	25.37
1	1180	1392400	7.07	50.03
1	4530	20520900	8.42	70.87
1	1180	1392400	7.07	50.03
1	108	11664	4.68	21.92
1	1610	2592100	7.38	54.52
1	2650	7022500	7.88	62.13
1	101	10201	4.62	21.30
1	25	625	3.22	10.36
1	3900	15210000	8.27	68.37
1	2920	8526400	7.98	63.67
1	5110	26112100	8.54	72.91
1	960	921600	6.87	47.15
1	1810	3276100	7.50	56.27
5		88312306		724.46
	00 400/	Law Manual D	a full soft and David	L . I. 1114

86.46%Log Normal Distribution Probability86.26%Normal Distribution Probability

15	Samples	15	Samples
14	Deg. Frdm.	14	Deg. Frdm.
1825.20	Mean	6.77	Mean
167.10	Detect Limit	5.12	Detect Limit
1180	Median	7.07	Median
2738712.89	Variance	2.61	Variance
1654.91	Std. Dev.	1.62	Std. Dev.
427.29	Std. Error	0.42	Std. Error
1.74	T-test Value	1.86	H-test Value
2568.69	UCL	3225.31	UCL
1081.71	LCL	235.53	LCL

#### ADEC Regulatory Limits

No additional treatment required	<1,360 ppm
Free release as clean soil	<1,360 ppm
All VOCs Detected Under Published Limits	Yes

83.87% reduction in

62 days

770 CY 1,309 tons

Background not subtracted

Results of the statistical analyses are noted as follows for 15 samples:

DRO Treatment Limit:	<b>1,360 ppm</b>
Statistical Mean at a 95% Upper Confidence Limit:	641 ppm
Normal average at SD of 652 ppm	618 ppm
RRO Treatment Limit:	8,300 ppm
Statistical Mean at a 95% Upper Confidence Limit:	3,225 ppm
Normal average at SD of 2,341 ppm	2,188 ppm

The statistical analyses from several perspectives indicate successful clean-up to the established limits.

### **Final Disposition**

Treated soils were used to fill excavated areas. After placement, soils were graded to former contours and the area was inspected to confirm completion of work by a State employee.

# APPENDIX A

# PROPOSAL AND REMEDIAL WORK PLAN

# **APPENDIX B**

# SAMPLING AND ANLAYSES RESULTS

# **APPENDIX C**

## **PHOTOGRAPHIC LOG**



Photo 1. Shop Building.



Photo 2. Northeast side of shop building showing pad.



Photo 3. Former location of tank pad servicing timber operations.





Photo 5. Path of drainage channel behind shop building toward Falls Creek feeder streams and ponds.



Photo 6. End of drainage channel behind and northeast of shop building.



Photo 7. Oily stained soils and buried debris in channel behind shop building.



Photo 8. Terminal end of drainage channel behind shop at northeast location near muskeg associated with falls Creek feeder streams.



Photo 9. Start of excavations northwest of shop near edge of old tank pad.



Photo 10. Continuation of northwest excavation and uncovering of metal debris including a crushed tank and drum.



Photo 11. Excavated lead-acid battery from area northwest and behind shop.



Photo 12. Excavation proceeding along drainage channel northwest to northeast behind the shop. Shallow groundwater noted at bottom right.



Photo 13. Excavation and loading northwest and behind shop.



Photo 14. Clearing and grubbing of former wood waste pile to establish a soil treatment area.



Photo 15. Initial dumping of contaminated soil onto laydown area northwest of shop.



Photo 15. Continued dumping of contaminated soil into bermed treatment area.



Photo 16. Liner covering laydown area for City of Petersburg contaminated soils.



Photo 17. Excavation on northwest side of shop in front of door to look for contamination from previous operations.



Photo 18. Excavations on northeast side of shop inside pad area formerly used as a tire shop to look for historic contamination.



Photo 19. Excavation at back of shop on the northeast side to remove contamination detected during site characterization work.



Photo 20. Excavation at back northwest corner of shop to remove contamination detected during site characterization work.



Photo 21. Buried drum uncovered in area northeast and behind shop.



Photo 22. Crushed tank and debris removed from drainage channel northeast and behind shop.



Photo 23. Excavation area immediately behind shop and moving northeasterly.



Photo 24. Debris including tank removed from excavation area behind and northeast of shop.



Photo 25. Excavation at end of drainage channel northeast of shop in muskeg.



Photo 26. Debris removed from excavations northeast of shop.



Photo 27. Excavations at end of drainage channel northeast of shop.



Photo 28. More debris removed from excavations northeast of shop.



Photo 29. Contaminated soil spread into bermed treatment area and dosed with bionutrient (blue color).



Photo 30. Contaminated soil spread into bermed treatment area and dosed with bionutrient (blue color).



Photo 32. City of Petersburg soils in treatment area dosed with bionutrient (blue).



Photo 33. Main treatment area dosed with bionutrient looking towards Falls Creek.



Photo 34. View looking into bacteria culturing tank.



Photo 35. Vacuum agar tube test from cultured bacteria showing color change For 1XE9 microbes/ml.



Photo 36. Spraying bacteria onto soil dosed with bionutrient.



Photo 37. Aerating and mixing bacteria and nutrient into soil using track hoe.



Photo 38. City of Petersburg treated soils.



Photo 39. Drums collected from area surrounding shop and placed in shop.