

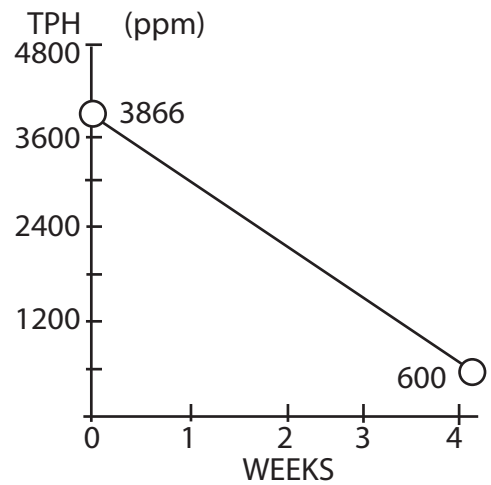


P.O. Box 515429
Dallas, Texas 75075
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DIESEL CONTAMINATION CLEANUP SUMMARY 27 July 1993
U.S. Marine Corps, 29 Palms, CA

CONTAMINANT: 89 cubic yards of aged Diesel Contaminated Soil. The soil was spread out in a rectangle approximately 33 inches deep. NOTE: Our instructions specify no deeper than 18 inches.

PROCEDURE: 29 Palms initial composite sample was 3,986 ppm TPH using EPA Test 8015 modified. 29 Palms applied 40 gallons of OSE II mixed with 2,000 gallons of pond water to the contaminated soil. They used a tanker truck and fire hose to apply the liquid.



29 Palms did not disc or add any additional water to the contaminated soil for the next four (4) weeks. NOTE: Our instructions specify to disc the soil at least once a week and keep the soil at a level of approximately 30% humidity.

29 Palms took samples after 4 weeks and had a composite reading of 600 ppm TPH.
THE ACCEPTABLE LEVEL IS 1,000 ppm TPH.

COMMENT: EVEN THOUGH 29 PALMS . . .

1. Piled the contaminated soil almost twice as deep as our instructions specify, and
2. Did not disc the contaminated soil at all during the 4 weeks, and
3. Did not add additional water to the contaminated soil in the desert climate –

"OIL SPILL EATER" II W O R K E D!!

4. Think of what the TPH level might have been had 29 Palms followed our OSEI Procedures?



Q. A. (George) Lively
Rear Admiral (RET)
President

**UNITED STATES MARINE CORPS
NATURAL RESOURCES and ENVIRONMENTAL AFFAIRS
Marine Corps Air Ground Combat Center
Box 788110
Twentynine Palms, California 92278-8110**

5090

MEMORANDUM

9

15 Oct 93

From: Installation Restoration (IR) Specialist

TO: FILE

SUBJ: TESTING AND EVALUATION OF ENZYMATIC CATALYSIS FOR THE
REMEDICATION OF PETROLEUM CONTAMINATED SOILS.

1. On 20 July 1993, MCAGCC began a testing and evaluation demonstration of a commercially available product of a natural biological enzymatic catalyst for the remediation of petroleum contaminated soils. The product, Oil Spill Eater II (OSE II), is on the National Contingency Plan Product Schedule of Biological Additives and is authorized for use by On-Scene Coordinators on releases of petroleum oil.
2. Before the Combat Center deploys this additive on a petroleum spill site or in the remediation of soils resulting from a spill, the Command decided to try the product on a small scale for its effectiveness. A summary of the results are as follows:
 - A control pile was constructed by berming and double lining (2–40 mil thick HDPE Liners) of a test area 21 feet x 42 feet. Non-hazardous soils under 40 CFR or Title 22 of CFR was placed in a 2' 9" high lift on top of the liner; resulting in approximately 69 cubic yards of petroleum contaminated soils from oil/water separators (OWS) to be tested with the product.
 - Three soil samples were obtained on 26 July 93 within the pile and were sent to an off-site laboratory for the analysis of BETZ by EPA 8020. Total Fuel Hydrocarbon by EPA 8015 (modified) as Diesel and Organic Lead by DHS Method.
 - On 28 July 1993, the test product was mixed according to manufacture application specifications of 40 gallons of product to 2,400 gallons of water. Application over the pile was accomplished by spraying with a 1,000 gallon water truck equipped with a 50 gpm pump. The pile was then covered with a black 12 mil thick plastic.
 - On 30 August 1993, three additional samples were taken to check progress of remediation. The samples were sent to an offsite laboratory for the same analysis of the initial sampling event. Due to lack of manpower, sampling could not begin being conducted at a two week interval.

TESTING AND EVALUATION OF ENZYMATIC CATALYSIS FOR THE
REMEDIATION OF PETROLEUM CONTAMINATED SOILS

3. The results are as of the testing as follows:

INITIAL SAMPLING EVENT OF 26 July 93 (1)

	Sample Number	OS-1	OS-2	OS-3
Analyte	Reporting Limit mg/kg		Concentration mg/kg	
Benzene	0.005	<0.05	<0.05	<0.05*
Toluene	0.005	<0.05	<0.05	0.77
Ethylbenzene	0.005	<0.05	<0.05	0.26
Xylene, total	0.015	<0.15	<0.15	1.6
BTEX, total	---	---	---	2.6
TPH as diesel	10	2000	1400	8200
Organic Lead**	0.5	0.5	0.5	1.2

SAMPLING EVENT OF 30 AUGUST 1993

	Sample Number	OS1-A*	OS1-B*	OS1-C*
Analyte	Reporting Limit mg/kg		Concentration mg/kg	
Benzene	0.005	<0.05	<0.05	<0.05
Toluene	0.005	<0.05	<0.05	<0.05
Ethylbenzene	0.005	<0.05	<0.05	<0.05
Xylene, total	0.015	<0.15	<0.15	<0.15
BTEX, total	---	---	---	---
TPH as diesel	10	820	380	600
Organic Lead	0.5	<0.5	<0.5	<0.05

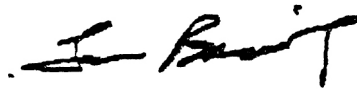
(1) Holding time was missed due to shipping of initial sampling delays.

* Reporting limit raised due to matrix effect (foaming).

** Extraction by DHS Method. Results are calculated on a wet weight basis. Total Organic Lead in Soil by Flame AA – DHS.

**Subj: TESTING AND EVALUATION OF ENZYMATIC CATALYSIS FOR THE
REMEDICATION OF PETROLEUM CONTAMINATED SOILS.**

- 4. It is assumed the reason for the matrix foaming of the samples are due to surfactants in the soil and from the test product.**
- 5. On the 30 August 1993 sampling event, soil samples were moist to saturated from the application of product. No tilling or turning of soils were required as recommended by the contractor.**
- 6. Results indicate bioremediation of soils within acceptable levels required by the Regional Water Quality Control Board (RWQCB) for the soils to be used as landfill cover.**
- 7. A request for disposal of remediated soils at the MCAGCC Class III landfill will be forwarded to the RWQCB.**
- 8. Additional, test piles will be run in the future utilizing OWS, JP-5 and diesel contaminated soils based on the availability of manpower.**

A handwritten signature in black ink, appearing to read "L. Bowling".

LEON BOWLING



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“OIL SPILL EATER II”

SOIL TPH TEST

CONCLUSION

The contaminated soil was extracted from a site in Anchorage, Alaska. The initial total parts hydrocarbon (TPH) was 767 and after three (3) diluted applications, applied per oil spill instructions for soil contamination cleanup, the TPH reduced to 391. This soil had been contaminated for approximately one (1) year which means the contaminant had weathered substantially. The more weathered, the more resistant the hydrocarbons are to remediation, which takes slightly longer for OSEII to help remediate the TPH. The test was carried out using sterile deionized water, which means bacteria take longer to colonize. If natural sea water or fresh water with naturally occurring bacteria already in it had been used, biodegradation would have been more rapid and a higher reduction of TPH would have occurred.

One of the concerns is once OSEII is applied, did bioremediation actually occur, or were the hydrocarbons simply mobilized into the water column (aqueous phase)? A test on the Supernate of the treated soil (the water used in the test) was then tested for its hydrocarbon content. The test showed only 2% hydrocarbon count which could be expected since the water is covering the contaminated soil. It does, however, definitely prove that the hydrocarbons are being converted to CO₂ and water, and are not being held in the water. This proves that the use of Oil Spill Eater II would not affect the ground water where treatment takes place.

This was a tough test for OSEII using older contaminated soil and sterile water, but it proves substantially that OSEII is a very viable bioremediation product to reduce the TPH from the soil.

This test was stopped short of obtaining the State of Alaska's 100 ppm reduction level. The reason the test was stopped short was because the cleanup company wanted to verify that biodegradation did occur and they felt that once it starts, only some outside action could stop bioremediation. The cleanup company was in a hurry to get their cleanup started.

Steven Pedigo
Chairman



NORTHERN TESTING LABORATORIES, INC.

2505 FAIRBANKS STREET
600 UNIVERSITY PLAZA WEST, SUITE A

ANCHORAGE, ALASKA 99503
FAIRBANKS, ALASKA 99709

907-277-8376 • FAX 274-0645
907-479-0115 • FAX 479-0847

March 21, 1990

Mr. Steve Karcz

P.O. Box 190151
Anchorage, AK 99519

Dear Mr. Karcz:

This letter is to report the results of the test that was performed by Northern Testing Laboratories, Inc. on Sky Blue Chems Oil Eater II.

A sample of soil contaminated with the petroleum hydrocarbons was provided to Northern Testing on March 7, 1990. A pretreatment EPA 418.1 determination was done in duplicate, using approximately 15 grams of soil per sample. Pretreatment levels were found to be 737 and 603 mg/dry kg.

The measurement for the soils were conducted by volume since the treatment instructions are based on soil volume. Five hundred milliliters of soil were divided into two portions of 250 ml each, for treatment and control. Each portion was spread evenly in the bottom of a clean, freon-rinsed 2000-ml beaker, forming a layer approximately two centimeters deep. Seven milliliters of product were diluted to 700 ml with deionized water.

The treatment consisted of three applications (approximately 233 ml each) of diluted product at approximately 48-hour intervals. The liquid was simply poured over the top of the soil layer. At the time of each application, the control portion received 233 ml of deionized water. Between treatments, the beakers were covered tightly with aluminum foil and held at approximately 62 degrees Fahrenheit.

- Treatment
- 1: Friday March 9 at 5:00 p.m.
 - 2: Sunday March 11 at 2:00 p.m.
 - 3: Tuesday March 13 at 4:45 p.m.

The treatment ended Thursday March 15 at 7:00 p.m. when the treated and control soils were drained. On Friday March 16, samples of approximately 15 grams were taken from each portion and analyzed for TPH, yielding the following results:

Control sample: 767 mg/dry kg
Treated sample: 391 mg/dry kg

Sincerely,

Eileen Herring
Chemist



NORTHERN TESTING LABORATORIES, INC.

2505 FAIRBANKS STREET
600 UNIVERSITY PLAZA WEST, SUITE A

ANCHORAGE, ALASKA 99503
FAIRBANKS, ALASKA 99709

907-277-8376 • FAX 274-0645
907-479-0115 • FAX 479-0847

Quality Control Report

Client: Blue Sky Chems.
ID#: A030790-4

Listed below are quality control assurance reference samples with a known concentration prior to analysis. The acceptable limits represent a 95% confidence interval established by the Environmental Protection Agency or by our laboratory through repetitive analyses of the reference sample. The reference samples indicated below were analyzed at the same time as your sample, ensuring the accuracy of your results.

Sample #	Parameter	Unit	Result	Acceptable Limit
EPA 379-1	Oil & Grease	mg/l	19.1	16.6 – 23.4

Reported By:

Date: 03/20/90

Francois Rodigari, Anchorage Operations Manager



NORTHERN TESTING LABORATORIES, INC.

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600 UNIVERSITY PLAZA WEST, SUITE A

ANCHORAGE, ALASKA 99503
FAIRBANKS, ALASKA 99709

907-277-8376 • FAX 274-0645
907-479-0115 • FAX 479-0847

P.O. Box 190151
Anchorage, AK 99519

Attn: Steve Karcz

Date Arrived: 03/07/90
Time Arrived: --
Date Sampled: 03/02/90
Time Sampled: 1151
Date Completed: 03/19/90

Source: Firestone-Northern Lights
Sample ID#: A030790-4

NTL ID#	Client ID	mg/dry kg	% Solids %
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Total Petroleum Hydrocarbons: EPA Method 418.1

A030790-4	Pre-treatment	737/603	75.9
	Treated	391	75.8
	Control	767	79.0

Reported By:

Date: 03/20/90



NORTHERN TESTING LABORATORIES, INC.

2505 FAIRBANKS STREET
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ANCHORAGE, ALASKA 99503
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907-277-8376 • FAX 274-0645
907-479-0115 • FAX 479-0847

Date Arrived: 03/07/90
Time Arrived: --
Date Sampled: 03/02/90
Time Sampled: 1151
Date Completed: 03/23/90

Attention: Steven Pedigo

Source: Supernate of treated soil
Sample ID#: A030790-4

NTL ID#	Client ID	mg/l
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Total Petroleum Hydrocarbons: EPA Method 418.1

A030790-4	Supernate of treated soil from test of Oil Spill Eater II conducted 03/09/90 – 03/19/90	2.0
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Reported By:

Date: 03/23/90

Francois Rodigari, Anchorage Operations Manager



NORTHERN TESTING LABORATORIES, INC.

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ANCHORAGE, ALASKA 99503
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907-277-8376 • FAX 274-0645
907-479-0115 • FAX 479-0847

Quality Control Report

Client: Blue Sky Chem
ID#: A030790-4

Listed below are quality control assurance reference samples with a known concentration prior to analysis. The acceptable limits represent a 95% confidence interval established by the Environmental Protection Agency or by our laboratory through repetitive analyses of the reference sample. The reference samples indicated below were analyzed at the same time as your sample, ensuring the accuracy of your results.

Sample #	Parameter	Unit	Result	Acceptable Limit
EPA WP379-1	Oil and Grease	mg/l	19.7	16.6 – 23.5

Reported By:

Date: 03/23/90

Francois Rodigari, Anchorage Operations Manager

BILLY E. (GENE) MCGOWEN



Rent-A-Can Toilet Co.

POST OFFICE BOX 433
EAGLE RIVER, ALASKA 99577



PHONE: 694-9202
ANS. SER. 272-3722

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ANCHORAGE DISTRICT OFFICE
800 E. DIAMOND BLVD. SUITE 3-470
ANCHORAGE, ALASKA 99515

ATTN: ROBERT WEIMER, ENVIRONMENTAL SPECIALIST

RE: SPILL # 91-2-1-1-295-1 FILE # L55138

ENCLOSED FOR YOU IS A REPORT PERTAINING TO THE CLEANUP OF THE CONTAMINATED SOIL INVOLVED WITH THE ABOVE SITE SPILL #. WE WANTED TO SEE IF THE COMMERCIAL PRODUCT OIL SPILL EATER, MANUFACTURED BY OSEI CORPORATION, WOULD MITIGATE THE HYDROCARBON CONTAMINATION. BECAUSE OF THE SMALL QUANTITY OF CONTAMINATION, WE TREATED ALL THE SOIL AT THE SAME TIME INSTEAD OF JUST A SMALL TRIAL PLOT. AS YOU CAN SEE IN THE REPORT, THE SOIL HAS BEEN CLEANED TO BELOW THE ADEC GUIDELINE OF 100 PPM. THEREFORE, WE REQUEST THAT YOU ACCEPT THIS REPORT AS A REMEDIATION PLAN AND ALSO GRANT US A SITE CLOSURE PER THE RESULTS OF THE INCLUDED FINAL TEST RESULT OF THE BIOREMEDIATION. WE ALSO ARE REQUESTING TO SPREAD THE CLEAN SOIL ON OUR PARKING LOT AS ADDITIONAL AERATION WILL CONTINUE THE BIOREMEDIATION PROCESS TO UNDETECTABLE LIMITS ASSUMING THERE IS NO RUN OFF FROM SPRINGBROOK DRIVE WHICH WE FRONT ON AND IS OILED REGULARLY. WE WILL NOT SPREAD THE SOIL UNTIL AFTER YOUR REVIEW AND APPROVAL.

REGARDS,

WAYNE CROMWELL
MANAGER

WC/CS



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Anchorage, Alaska
99519
907/248-9955
907/248-2604 (fax)
(Obsolete address/
phone)

RENT A CAN

EAGLE RIVER, ALASKA

BIOREMEDIATION OF CONTAMINATED SOILS

AUGUST 28, 1992

For: Mr. Wayne Cromwell
Rent a Can
P.O. Box 770433
Eagle River, Alaska
99577

Prepared by: Steve Karcz
OSEI of Alaska
PO Box 190151
Anchorage, Alaska
99519

This report represents the results of the bioremediation of contaminated soil located at the Rent a Can Shop, 12211 Springbrook Drive, Eagle River, Alaska. The goal was to reach a total petroleum hydrocarbon (TPH) level acceptable to the Alaska Department of Conservation (ADEC) by bioremediation using Oil Spill Eater (OSE), a biocatalytic nutrient, to enhance the growth of the local indigenous bacteria found in the contaminated soil. The acceptable level to be low enough to dispose of the soil as back fill on site. This report shows that independent companies with petroleum contaminated soils can clean the soil very inexpensively on site.

THE NUTRIENT

Oil Spill Eater is a biodegradable, non-toxic, water soluble, liquid nutrient. Oil Spill Eater stimulates and accelerates natural biological reactions. There are no petroleum components or any cultured bacteria in OSE. Oil Spill Eater rapidly grows the existing hydrocarbon degrading bacteria into large colonies quicker than fertilizers due to its nutrient components. Oil Spill Eater's use in Alaska and abroad has been proven as a most effective means of mitigating hydrocarbons.

CONTAMINATED SOIL

The contamination was believed to be diesel fuel which leaked from an underground storage tank. The soil was removed and stockpiled outside on a poly membrane. The amount was estimated to be 1 1/2 cubic yards. The TPH test showed a level of 3060 ppm by EPA test method 8100 MOD. Other EPA test methods, 8015 and 8020, also indicated diesel fuel was the probable contamination. The soil was permeable, consisting of mostly gravel up to two inches mixed with organics.

REMEDICATION PLAN

A remediation plan was designed allowing the clean up to be conducted in treatment cells on location inside the Rent a Can shop. The amount of contaminated soil was relatively small allowing for remediation of all the material in a controlled environment. This also allowed easy and convenient access by their employees for the daily remediation labor.

TREATMENT CELL

The treatment cells consisted of 55 gallon drums without lids. A six inch tall wooden grate was constructed to create a void at the bottom as a recovery sump. Filter fabric was then placed on top of the grate to prevent any soil from migrating into the sump. A two inch hole was drilled in to the grate in which a piece of two inch diameter PVC pipe was placed. The pipe was one-fourth of an inch from the bottom and reached to the rim of the drum. The pipe served as both a monitoring tube and as recovery access. A hand pump could then be placed into the PVC pipe and the effluent water/nutrient pumped back up so to percolate back down through the soil. The smallest aquarium air pump that could be found was obtained and air was injected through rubber tubing into the water in the sump. The drums were placed in the middle of the shop so to prevent any foreign contamination from entering the cells.

WORK PLAN

The work plan consisted of placing the contaminated soil into the drum, treating it with Oil Spill Eater, and recycle the nutrient water mixture through the soil daily. The contaminated soil was mixed in a small loader prior to placement in the drum. This was done to help get a consistent TPH level throughout the drums of soil. Previous projects have shown that consistency of contamination throughout a soil pile is not naturally congruent due to excessive excavation of cleaner soils. Approximately 5.6 cubic feet fit into each created treatment cell.

The amount of Oil Spill Eater used was determined by the manufacturers formula. The treatment for light petroleums required .22 gallons of Oil Spill Eater per cubic yard of soil. The amount of OSE required 5.8 ounces for 5.6 cubic feet of soil. This amount was then mixed at a 1 to 100 ratio with unchlorinated water. A well located on site was the water source for this project. Five hundred eighty ounces of water was mixed with the 5.8 ounces of OSE per drum.

The nutrient mixture was applied with a sprinkler type watering can at the surface of the drum. The rate of application was slow enough to prevent ponding on the surface to ensure a consistent percolation through the soil matrix.

The nutrient solution was pumped to the surface daily so it could percolate back down through the soil. This kept the soil at a high moisture content. The treatment began on April 9, 1992, and the pumping schedule continued through July 10, 1992 on a regular basis. There was no pumping on the weekends. Plain, unchlorinated water was added as needed to maintain moisture content.

SAMPLING

An initial sample was taken prior to the nutrient application to determine a starting TPH. Twelve weeks later, the first treated sample was extracted after the initial treatment. The sample was taken approximately 10 inches down into the matrix with the exact location marked. This would provide that both the initial and treated samples came from the exact location which would lessen any contamination inconsistency throughout the soil. The ten inch depth was chosen to assure volatilization or evaporation would not be a factor on the lighter end hydrocarbons. The samples were then taken to Chemical & Geological Laboratory in Anchorage for testing. The initial sample was tested by EPA Method 8100 Modified. This test was chosen as previous tests were available using the 8100 modified. The after treatment test was done by EPA Method 418.1.

RESULTS

The initial TPH value after the soil had been homogenized in the back hoe bucket was 572 ppm. Test results prior to the bioremediation project showed 3060 ppm with the sample being taken from the known "hot" spot. The homogenizing was necessary for this project to show a consistent level of contamination throughout the soil so the testing would represent the entire drums of soil. Due to OSE's many test results, the first treated sample was not extracted for twelve weeks. This time frame was chosen as previous tests have shown the biodegradation curve and testing would not be economic. The first treated sample by Method 418.1 had a value of 76.6 ppm. With this value being below the Alaska Department of Environmental Conservation's acceptable value of 100 ppm as being clean, the tests were terminated.

CONCLUSION

After 12 weeks of bioremediation, the homogenized soil which had a consistent contamination of 572 ppm (8100 Modified) was reduced to 76.7 ppm (418.1).

With this final value achieved below ADEC's acceptable guidelines limits, I submit this report to you and recommend you contact ADEC for their approval to spread the cleaned soil on your lot. This report should suffice as both a Remediation Plan and a Closure Request.

STATE OF ALASKA

WALTER J. HICKEL, GOVERNOR

DEPT. OF ENVIRONMENTAL CONSERVATION

ANCHORAGE DISTRICT OFFICE
800 E. DIMOND BLVD., SUITE 3-470
ANCHORAGE, ALASKA 99515

(907) 349-7755

December 7, 1992

Wayne Cromwell
Rent-A-Can Toilet Co.
P.O. Box 433
Anchorage, AK 99577

Subject: 12211 Springbrook Drive, Eagle River site – Soil Disposal
File#: L55.138

Dear Mr. Cromwell:

The Department has completed the review of the information you submitted and the file regarding the 1.5 cubic yards of remediated soils in drums at the above referenced site. The soils have been remediated to the most stringent cleanup levels and are approved to be spread on-site (as per verbal approval to you on 9/21/92).

If you have any questions concerning this letter, please contact me at the Anchorage District Office at 349-7755.

Sincerely,



Robert Weimer
Environmental Specialist

RW/cf