CytoCulture
ENVIRONMENTAL
BIOTECHNOLOGY
A DIVISION OF CYTOCULTURE INTERNATIONAL INC

December 15, 1989

Mr. William Meckel
Source Control Division
EAST BAY MUNICIPAL UTILITY DISTRICT
Mail Stop 59 P.O. Box 24055
Oakland, CA 94623

RE: Wastewater Discharge Permit (Groundwater Treatment)
EBMUD Account No. 001-00002
Ninth monthly report of treatment and discharge operations for **NOVEMBER 1989**

CytoCulture/Sybron Chemicals are herein reporting on the results for the ninth month of continuous biological treatment of diesel-contaminated groundwater and discharge of the treated water into an EBMUD interceptor at the former P.I.E. Nationwide truck terminal in Emeryville. Laboratory analytical results are enclosed along with our Daily Facility Log Sheets.

SUMMARY OF EVENTS AND OPERATIONS IN NOVEMBER

Operating Conditions in November

At the end of October, both bioreactor systems were in continuous operation processing diesel-contaminated groundwater at a rate of 3-4 gpm (4,000-6,000 gpd). These moderate flow rates continued into the first half of November, but the lack of rainfall lowered the water table and limited the flow of extracted groundwater by the middle of the month. On November 15, the flow rate ebbed to 3 gpm but it dropped to 1-1.5 gpm by the end of the following week. A heavy rainfall over Thanksgiving weekend contributed to a transient rise in groundwater flow over the next few days, reaching 3 gpm again by November 28.

The total amount of water treated in the month of November was estimated from the averaged flow rate (3.16 gpm; 4,550 gpd) to be 136,000 gallons. The total groundwater treated since March 2nd through the end of October had been 667,000 gallons, so by the end of November this total stood at 803,000 gallons.

Free product was collected intermittently from both trenches, with approximately 30 gallons from the south and 5 gallons from the north recovered in November. The total recovered oil stored on site at the end of the month was 180 gallons (capacity is 440 gallons). 200 gallons of oil had been recycled in September.

124 WASHINGTON AVENUE POINT RICHMOND CA 94801
415 233 6660 FAX 415 233 3[illegible]

All treated groundwater effluent discharges registered as non-detectable for benzene, toluene, xylene and ethyl benzene as well as for total petroleum hydrocarbons (TPH; Data summarized below). Effluent treated water contained a healthy bacterial floc which settled out in about a half an hour to leave a clear, transparent and odorless supernatant.

After several months of normal operation, the treated effluent and the groundwater influent is monitored twice a month. An effluent sample (E-89) and an influent (I-90) taken on November 9 for routine analysis confirmed a week later that the system was discharging treated groundwater with non-detectable levels of BTXE and total petroleum hydrocarbons (TPH). The influent level of diesel was 400 ppm TPH and 6.5 ppb xylene.

Ten days later, another influent/effluent pair of samples were taken. The influent (I-91) level of diesel from the north trench was 23,000 ppm TPH with 100 ppb xylene while the effluent level of hydrocarbons in the treated water remained non-detectable. Clearly there was free product coming through the system at the time of this particular sampling of influent groundwater. Note that the north trench has the intermittent flow and usually runs at only about 1.5 gpm when it is on. A free product plume is obviously still present along the western edge of the property. There continues to exist some correlation with the groundwater flow rates (more hydrocarbon when the water table is lower).

Routine ammonium and phosphate readings indicated that the nutrient levels were normal. Visual inspection of the cultures confirmed the presence of a good floc. No free product was detected in the bioreactors during the entire month, indicating satisfactory operation of the oil/water separators.

SUMMARY OF GROUNDWATER TREATMENT RATES

Dates	Average Flow	Net Volume
October 1-31	3.16 gpm (4,550 gpd)	136,000 gal
Estimated volume of treated water, March-October:		667,000 gal
Total groundwater treated to date:		803,000 gal

LABORATORY ANALYSIS OF GROUNDWATER TREATMENT SAMPLES

Tests run by Curtis & Tompkins, Ltd. on samples collected by CytoCulture field technicians:

1) EPA 602 - Volatile Aromatic Hydrocarbons in Water
2) EPA 8015 (modified) - Total Extractable Petroleum Hydrocarbons in Aqueous Solutions (TPH/TEH)

ND = Not Detectable; Detection limits for BTXE, ND = 1 ug/L; for TPH, ND = 0.5 mg/L

			ug/L (ppb)			Diesel mg/L(ppm)
No.	Date	Description / Comment	Benz.	Tol.	Xyl.	TPH/TEH
E-89	11/09	Combined N/S Effluent 3-4 gpm	ND	ND	ND	ND
I-85	11/09	South trench **INFLUENT** 2-3 gpm	ND	1.8	6.5	400
I-90	11/17	North trench **INFLUENT** 1.5 gpm	15	ND	100	23,000
E-91	11/17	Combined N/S Effluent 3 gpm	ND	ND	ND	ND

Effluent treated water discharged into the EBMUD interceptor at the end of November was at non-detectable levels of BTXE and total extractable petroleum hydrocarbons. Upon standing 30 minutes to allow the bacterial floc to settle, this treated water appears clear and odorless. Independent monthly sampling and testing for hydrocarbons and priority pollutants by EBMUD confirm these results.

GENERAL OPERATION NOTES

Aeration and mixing are continuous, providing saturated oxygen levels in the water and little accumulation of sediment on the bottom of the tanks. The aeration blower and air compressor for powering the pneumatic well pumps in the extraction trenches performed very well in the field. After proper adjustment, the well pumps themselves now easily deliver 2 gpm apiece (there are two wells per trench), although the tidally influenced north well works intermittently.

Daily observations of the turbidity, color and foam accumulation confirmed that the bioreactors were maintaining healthy bacterial cultures. Continual diammonium phosphate addition is supposed to keep ammonium nitrogen levels at 10 ppm or greater, and ortho phosphate levels at 5 ppm or greater, to ensure adequate nutrients for full degradation of the diesel COD. When the bioreactors were overwhelmed with free-product, the nutrient addition rate is increased to support the greater biomass.

All discharges of treated water leaving either bioreactor system are directed first to the 2,000 gallon aerated holding tank. This tank continues to serve as a final "polishing" step in the biological treatment process by extending the actual retention rate of contaminated water within the system.

Soil infiltration with treated water and bacterial cultures will utilize the effluent from an aerated holding tank which is now being discharged into the EBMUD interceptor.

UPDATE ON REINFILTRATION PLANS

CytoCulture plans to construct a series of infiltration galleries under the parking lot pavement along both sides of building D (upfield of both the north and south extraction trenches in an attempt to achieve some "hydraulic control" of infiltrated water). Please refer to CytoCulture's Phase II Report and Operational Plan for details on the proposed infiltration program for seeding contaminated soil with bacteria.

Following the informal meeting in October with John Wesnouski and Dr. Ken Smarkel of the DHS Office of Alternative Technology, CytoCulture obtained bids for the cost of building reinfiltration trenches on the former P.I.E. property, now the Powell Street Plaza Shopping Center. These construction bids will be used to prepare a detailed proposal for proceeding with the reinfiltration program once CytoCulture has studied "as built" plans for the site and conferred with the construction firm that built the shopping center.

CytoCulture had a brief discussion with John Wesnouski on November 29 at the Superfund '89 conference in Washington, D.C. over the reinfiltration issue. The concerns raised before by DHS and reiterated by Mr. Wesnouski at this last meeting focus on the issues of:

1. Proper and adequate site characterization of the ground water table and gradient; predictions of hydraulic control based on gradient measurements before and during groundwater extraction which include an analysis of tidal impact on the gradient. These issues will be addressed by a hydrogeological study to be performed by a contracted geotechnical firm pending approval by the client and the DHS. Much of this gradient information can be generated by data collected over a period of days in many wells using automatically reading pressure transducers at the bottom of selected existing monitoring wells. Pressure readings on recorders are converted directly into water table level data.

By performing the gradient study with individual extraction trenches on or off, it should be possible to document the extent of hydraulic control exerted by the depression zone created by continuous extraction of groundwater. This hydraulic control of the contaminated zone upfield from the trenches must be demonstrated prior to reinfiltrating bacteria and nutrients.

2. The reinfiltration trenches will run parallel to the buildings and current extraction trenches on the upfield side of the most serious contamination zones. The trenches will be deep enough (6 ft.) to allow direct infiltration into the saturated and contaminated zones immediately above the water table. CytoCulture has decided to employ industrial water hoses (1") instead of subsurface conduits under sidewalks to deliver treated, nutrient-laden water to the reinfiltration trenches. CytoCulture could also use the existing mobile bioreactor system to generate batch cultures of bacteria and nutrients using tap water to avoid regulatory issues associated with the reinfiltration of treated groundwater. CytoCulture is not expecting much penetration of the bacterial cells through the dense clay at this site, but fully expects to circulate essential nutrients to the saturated zones in contaminated areas. The introduction of the excess oil-degrading bacteria will provide natural surfactants and abundant seed culture to promote the biodegradation of hydrocarbon in situ.

CytoCulture is submitting detailed proposals and bids to proceed with the expansion of current extraction trench systems and to begin the reinfiltration program discussed over the past few months. The groundwater gradient study could begin in January.

CytoCulture Bioremediation Project
for P.I.E. Nationwide former Truck Terminal Site
Emeryville, CA

Laboratory Analytical Results for **November** 1989
including BTXE and TPH/TEH Data
provided by Curtis & Tompkins, Ltd.

Each sample data set is preceded by the
corresponding Chain of Custody sheet

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Chain of Custody Form

Job Description: PIF
Job Number: CYTO
Client Contact: R. J. van Wedel

Samplers: D. Vivra
Recorder:

Water	Soil	Waste	Oil	#Containers	H_2SO_4	HNO_3	Ice	None	Other	Sample Number	Yr	Mo	Dy	Time	SAMPLE NOTES	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA PP Metals (#)	TPH Method- TF/H	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's
✓							✓			E-89	89	11	09	1500	Effluent at 4pm							✓	✓		
✓							✓			I-90	89	11	09	1506	Influent South at 4pm							✓	✓		

Laboratory Notes :

Normal

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
[signature]	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature) [signature] 11/9/89 15:50

Curtis & Tompkins, Ltd

LABORATORY NUMBER: 18668
CLIENT: CYTO CULTURE INTERNATIONAL
PROJECT NAME: PIE
LOCATION: EMERYVILLE

DATE RECEIVED: 11/09/89
DATE ANALYZED: 11/18/89
DATE REPORTED: 11/21/89

Extractable Petroleum Hydrocarbons in Aqueous Solutions
EPA 8015 (Modified)
Extraction Method: EPA 3510

LAB ID	CLIENT ID	GASOLINE (mg/L)	KEROSENE (mg/L)	DIESEL (mg/L)	OTHER (mg/L)
18668-1	E-89	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
18668-2	I-90	ND(0.5)	ND(0.5)	400*	ND(0.5)

ND = Not Detected; Limit of detection in parentheses.

* = Fingerprint Pattern does not match Hydrocarbon Standards.
Quantitation based on area sum within C12 to C22 boiling range.

QA/QC SUMMARY

RPD, %	3
Spike: % Recovery	93

Curtis & Tompkins, Ltd

LABORATORY NUMBER: 18668
CLIENT: CYTO CULTURE INTERNATIONAL
JOB NAME: PIE
JOB LOCATION: EMERYVILLE

DATE RECEIVED: 11/09/89
DATE ANALYZED: 11/10/89
DATE REPORTED: 11/21/89

Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	BENZENE (ug/L)	TOLUENE (ug/L)	TOTAL XYLENES (ug/L)	ETHYL BENZENE (ug/L)
18668-1	E-89	ND(1)	ND(1)	ND(1)	ND(1)
18668-2	I-90	ND(1)	1.8	6.5	ND(1)

ND = NOT DETECTED; LIMIT OF DETECTION IN PARENTHESES

QA/QC SUMMARY

%RPD	9
%RECOVERY	84

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Mo

Job Description: PTF

Job Number: CYTC

Client Contact: RJ von Glahn

Recorder:

Matrix: Water	Soil	Waste	Oil			#Containers	Method Preserved: H_2SO_4	HNO_3	Ice	None	Other	Sample Number	Sampling Date: Yr	Mo	Dy	Time	SAMPLE NOTES
✓									✓			1-91	91	11	17	1600	Influent at 1.5
✓									✓			2-92	91	11	17	1600	Effluent at 3.0

ANALYSIS REQUESTED	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA PP Metals (#)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's
							✓	✓		
							✓	✓		

Laboratory Notes :

Normal

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature) 5:00 Michael May 11-17-84 PM
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature)

Curtis & Tompkins, Ltd

LABORATORY NUMBER: 18752
CLIENT: CYTO CULTURE
PROJECT NAME: PIE
LOCATION: EMERYVILLE

DATE RECEIVED: 11/20/89
DATE ANALYZED: 11/29/89
DATE REPORTED: 12/06/89

Extractable Petroleum Hydrocarbons in Aqueous Solutions
EPA 8015 (Modified)
Extraction Method: EPA 3510

LAB ID	CLIENT ID	KEROSENE (mg/L)	DIESEL (mg/L)	OTHER (mg/L)
18752-1	I - 91	ND(500)	23,000*	ND(500)
18752-2	E - 92	ND(0.5)	ND(0.5)	ND(0.5)

ND = Not Detected; Limit of detection in parentheses.

* = Fingerprint Pattern does not match Hydrocarbon Standards.
Quantitation based on area sum within C12 to C26 boiling range.

QA/QC SUMMARY

RPD, %	2
Spike: % Recovery	100

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 18752
CLIENT: CYTO CULTURE
JOB NAME: PIE
JOB LOCATION: EMERYVILLE

DATE RECEIVED: 11/20/89
DATE ANALYZED: 12/01/89
DATE REPORTED: 12/06/89

Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	BENZENE (ug/L)	TOLUENE (ug/L)	TOTAL XYLENES (ug/L)	ETHYL BENZENE (ug/L)	REPORTING LIMIT * (ug/L)
18752-1	I - 91	15	ND	100	ND	10
18752-2	E - 92	ND	ND	ND	ND	1.0

ND = Not Detected.

* Reporting Limit applies to all analytes.

QA/QC SUMMARY

%RPD	3
%RECOVERY	83

Daily Facility Log Sheets for November 1989

CytoCulture - PIE Bioremediation Project, Emeryville

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: DC

DATE: 1 Nov 89 TIME: 1515 HIGH TIDE: _____

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill 6 Discharge 0+1½ Pressure 83

East well flow setting: ½ West well flow setting: ½

NORTH TRENCH: Refill 8+½ Discharge 0+1½ Pressure 84

South well flow setting: ½ North well flow setting: 8½

COMPRESSOR CHECKS: Hours 4456 Temperature 110 Oil N

Air Filter drain checks: 1) ✓ 2) ✓ 3) ✓

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 81 in. South system: 81 in. Blower: 82 in.

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench: 2 GPM South Trench: 2 GPM

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 4 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 12.5/20 45 % South: 12.5/20 45 %

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: 27 Oct South Units: 27 Oct 2,000 Gal. Unit _____

CULTURE OBSERVATIONS: Water Temperature: ____ Deg.C.

DOURs: [NH4]: N 10 S 10 E 10 [PO4]: N 7 S 9 E 6

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

OPERATIONAL CHANGES TODAY:

Consolodated Oil N 80 gal/S 65 gal Reset Mets to 12.5:20 ½

Skimmed oil N/S

Blew Air vectors N/S

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: DJU

DATE: 3 Nov 89 TIME: 1430 HIGH TIDE: _____

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill 0 Discharge 0+1½ Pressure 83

East well flow setting: ½ West well flow setting: ½

NORTH TRENCH: Refill 0+½ Discharge 0+1½ Pressure 82

South well flow setting: ½ North well flow setting: ½

COMPRESSOR CHECKS: Hours 4503 Temperature 100 Oil ✓

Air Filter drain checks: 1) ✓ 2) ✓ 3) ✓

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 82 in. South system: 81 in. Blower: 82 in.

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench; 2 GPM South Trench: 2 GPM

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 4 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 12.5/30 43 % South: 12.5/70 41 %

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: 3 Nov South Units: 3 Nov 2,000 Gal. Unit _____

CULTURE OBSERVATIONS: Water Temperature: ____ Deg.C.

DOURs: [NH4]: [PO4]:

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

OPERATIONAL CHANGES TODAY:

Bio stocked W/S #2, Skimmed Oil South, Blew Air Stones

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: DFU

DATE: 5 Nov 89 TIME: 1630 HIGH TIDE: _____

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill 6 Discharge 6+1½ Pressure 84

East well flow setting: ½ West well flow setting: ½

NORTH TRENCH: Refill 6+½ Discharge 6+1½ Pressure 83

South well flow setting: ½ North well flow setting: ½

COMPRESSOR CHECKS: Hours 4553 Temperature 105 Oil ✓

Air Filter drain checks: 1) ✓ 2) ✓ 3) ✓

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 81 in. South system: 82 in. Blower: 82 in.

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench: 2 GPM South Trench: 2 GPM

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 4 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 12.5 / 20 37 % South: 12.5 / 20 38 %

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: 3 Nov South Units: 3 Nov 2,000 Gal. Unit _____

CULTURE OBSERVATIONS: Water Temperature: ____ Deg.C.

	S	W	E		S	N	E
DOURs:	[NH4]:	8	8	5	[PO4]:	8	8	7

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

OPERATIONAL CHANGES TODAY:
Blew Aerators, Skimmed oil South

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: DCd

DATE: 7 Nov TIME: 1100 HIGH TIDE: _____

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill 6 Discharge 0+1½ Pressure 64

East well flow setting: ½ West well flow setting: ½

NORTH TRENCH: Refill 6+½ Discharge 0+1½ Pressure 63

South well flow setting: ½ North well flow setting: ½

COMPRESSOR CHECKS: Hours 4601 Temperature 100 Oil W

Air Filter drain checks: 1) ✓ 2) ✓ 3) ✓

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 82 in. South system: 82 in. Blower: 82 in.

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench: 2 GPM South Trench: 2 GPM

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 4 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 12.5/10 34 % South: 14.5/10 35 %

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: 3 Wks South Units: 3 Wks 2,000 Gal. Unit _____

CULTURE OBSERVATIONS: Water Temperature: ____ Deg.C.

DOURs: [NH4]: [PO4]:

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

OPERATIONAL CHANGES TODAY:

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: DD

DATE: 9 Nov 89 TIME: 1500 HIGH TIDE: _____

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill 0 Discharge 0+1½ Pressure 84

East well flow setting: ½ West well flow setting: ½

NORTH TRENCH: Refill 0+½ Discharge 0+1½ Pressure 83

South well flow setting: ½ North well flow setting: ½

COMPRESSOR CHECKS: Hours 4646 Temperature 100 Oil W

Air Filter drain checks: 1) ✓ 2) ✓ 3) —

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 82 in. South system: 82 in. Blower: 82 in.

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench; 2 GPM South Trench: 2 GPM

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 4 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 12.5 / 20 30 % South: 12.5 / 20 33 %

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: 9 Nov 89 South Units: 9 Nov 89 2,000 Gal. Unit _____

CULTURE OBSERVATIONS: Water Temperature: ___ Deg.C.

	S	W	E		S	W	E
DOURs:	[NH4]: 7	8	4	[PO4]:	9	9	7

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No. E-89 TPH/TEH: ✓ BTXE: ✓ Comment: _____

Sample No. I-89 TPH/TEH: ✓ BTXE: ✓ Comment: _____

OPERATIONAL CHANGES TODAY:

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: DLJ

DATE: 11 Nov 85 TIME: 1830 HIGH TIDE: _____

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill 6 Discharge 0+1½ Pressure 84

East well flow setting: ½ West well flow setting: ½

NORTH TRENCH: Refill 6+½ Discharge 0+1½ Pressure 83

South well flow setting: ½ North well flow setting: ½

COMPRESSOR CHECKS: Hours _____ Temperature _____ Oil ___

Air Filter drain checks: 1) ✓ 2) ✓ 3) ✓

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 82 in. South system: 83 in. Blower: 83 in.

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench: 2 GPM South Trench: 2 GPM

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 4 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 12.5 / 20 27 % South: 12.5 / 20 27 %

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: Nov 9 South Units: Nov 9 2,000 Gal. Unit _____

CULTURE OBSERVATIONS: Water Temperature: ____ Deg.C.

DOURs: [NH4]: [PO4]:

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

OPERATIONAL CHANGES TODAY:

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: DDJ

DATE: 13 Nov 89 TIME: 1710 HIGH TIDE: _____

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill B Discharge 0+1½ Pressure 90

East well flow setting: ½ West well flow setting: ½

NORTH TRENCH: Refill B Discharge 0+2 Pressure 00C

South well flow setting: ½ North well flow setting: ½

COMPRESSOR CHECKS: Hours 4746 Temperature 95 Oil W

Air Filter drain checks: 1) ✓ 2) ✓ 3) ✓

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 82 in. South system: 83 in. Blower: 83 in.

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench: 2 GPM South Trench: 2 GPM

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 4 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 12.5 / 20 23 % South: 12.5 / 20 20 %

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: No. 9 South Units: No. 9 2,000 Gal. Unit _____

CULTURE OBSERVATIONS: Water Temperature: ____ Deg.C.

DOURs: [NH4]: [PO4]:

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

OPERATIONAL CHANGES TODAY:
Skimmed Oil N/S ⊛ North wells pumping Free Product
North Controler 0-160 gage is out of Calebration
Reset N/S Controler pressey for more efficeto Pumping
Reset N Discharge timer from 0+1½ to 0+2

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: DJC

DATE: 15 Nov 89 TIME: 1330 HIGH TIDE: _____

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill 6 Discharge 01 1/4 Pressure 91

East well flow setting: 1/4 West well flow setting: 1/2

NORTH TRENCH: Refill 6 Discharge 01 2 Pressure 00

South well flow setting: 1/2 North well flow setting: 1/2

COMPRESSOR CHECKS: Hours 4790 Temperature 100 Oil N.

Air Filter drain checks: 1) ✓ 2) ✓ 3) ✓

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 82 in. South system: 82 in. Blower: 82 in.

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench; 1.5 GPM South Trench: 1.5 GPM

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 3 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 12.5 / 20 20 % South: 12.5 / 70 18 %

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: 9 Nov South Units: 9 Nov 2,000 Gal. Unit _____

CULTURE OBSERVATIONS: Water Temperature: ____ Deg.C.

DOURs: [NH4]: [PO4]:

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

OPERATIONAL CHANGES TODAY:

Skimmed Oil N/S / Blew Eductors N/S

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: DW

DATE: 17 Nov 89 TIME: 1600 HIGH TIDE: _____

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill 6 Discharge 0+1½ Pressure 9?

East well flow setting: ½ West well flow setting: ½

NORTH TRENCH: Refill 6 Discharge 0+2 Pressure 00c

South well flow setting: 1/4 North well flow setting: 1/2

COMPRESSOR CHECKS: Hours 4038 Temperature 100 Oil ✓

Air Filter drain checks: 1) ✓ 2) ✓ 3) ✓

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 82 in. South system: 82 in. Blower: 82 in.

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench: 1.5 GPM South Trench: 1.5 GPM

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 3 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 12.5 / 20 17 % South: 12.5 / 20 15 %

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: 17 Nov South Units: 17 Nov 2,000 Gal. Unit _____

CULTURE OBSERVATIONS: Water Temperature: ____ Deg.C.

DOURs: [NH4]: [PO4]:

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No. E-91 TPH/TEH: ✓ BTXE: ✓ Comment: Influent North

Sample No. E-92 TPH/TEH: ✓ BTXE: ✓ Comment: Effluent at 3 gpm

OPERATIONAL CHANGES TODAY:

Skimmed Oil N/S ⊛ Pumping Free Product North

bio stocked N/S #1

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: RVW

DATE: 11/18 TIME: 4pm HIGH TIDE: —

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill 6 Discharge 6+1½ Pressure 92

East well flow setting: full West well flow setting: full

NORTH TRENCH: Refill 6 Discharge 6+2 Pressure 100

South well flow setting: ½ North well flow setting: ½

COMPRESSOR CHECKS: Hours 4866 Temperature 110° Oil OK - will need change soon

Air Filter drain checks: 1) ✓ 2) — 3) —

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 80.5 in. South system: 91 in. Blower: 92" in.

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench: 0.5 GPM South Trench: 1.5 GPM

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 2 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 12.5 40/20 15 % South: 12.5 40/20 5 % ready re-fill

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: 11/17 South Units: 11/17 2,000 Gal. Unit ____

CULTURE OBSERVATIONS: Water Temperature: ___ Deg.C.

DOURs: [NH4]: [PO4]:

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No.____ TPH/TEH:___ BTXE:___ Comment:____

Sample No.____ TPH/TEH:___ BTXE:___ Comment:____

OPERATIONAL CHANGES TODAY:

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: RvW

DATE: 11/20 TIME: 1:15 pm HIGH TIDE: —

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill 6 Discharge 0+1½ Pressure 91

East well flow setting: full West well flow setting: full

NORTH TRENCH: Refill 6 Discharge 0+2 Pressure 000

South well flow setting: ½ North well flow setting: ½

COMPRESSOR CHECKS: Hours 4907 Temperature 110° Oil ✓

Air Filter drain checks: 1) ✓ 2) ✓ 3) ✓

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 84 in. South system: 82 in. Blower: 85 in.

→ blew out aerators on North + lowered air pressure to 81" before bypass

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench: <0.5 GPM South Trench: 1-1.5 GPM → lots of air (any trench)

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 1.5 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 12.5 / 20 100 % South: 12.5 / 20 100 %

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: 11/17 South Units: 11/17 2,000 Gal. Unit ____

CULTURE OBSERVATIONS: Water Temperature: 17 Deg.C.

DOURs: [NH4]: [PO4]:

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No.____ TPH/TEH:___ BTXE:___ Comment:____

Sample No.____ TPH/TEH:___ BTXE:___ Comment:____

OPERATIONAL CHANGES TODAY:

Refilled Nuts N/S

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: Rudwadd

DATE: 11/21 TIME: 1-3:50 pm HIGH TIDE: _____

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill 5 Discharge 01½ Pressure 92

East well flow setting: full West well flow setting: full

NORTH TRENCH: Refill 5 Discharge 012 Pressure 000

South well flow setting: ½ North well flow setting: ½

COMPRESSOR CHECKS: Hours 4926 Temperature 110° Oil ✓

Air Filter drain checks: 1) ✓ 2) ✓ 3) ✓

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 81 in. South system: 81 in. Blower: 82 in.

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench; <0.5 GPM South Trench: 0.5-1 GPM

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 1 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 12.5 / 20 90 % South: 12.5 / 20 90 %

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: 11/17 South Units: 11/17 2,000 Gal. Unit _____

CULTURE OBSERVATIONS: air=9.4ppm Water Temperature: 17 Deg.C.

DO~~Rs~~: DO bioreactor=8.5ppm
DO holdtank = 8.8 ppm [NH4]: >5 [PO4]: 2ppm

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

OPERATIONAL CHANGES TODAY:

1 hr 15min mtg with Bill Meckel - EBMUD - progress rpt.

Received Tom Glimme of Environ. Res. Re: Inspection of interception tonight
Re-routed discharge to single 500gal holding tank (they will disconnect discharge lines tomorrow)

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: DJ

DATE: 23 Nov TIME: 1330 HIGH TIDE: _____

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill 5 Discharge 0+1½ Pressure 92

East well flow setting: ½ West well flow setting: ½

NORTH TRENCH: Refill 5 Discharge 0+2 Pressure 00C

South well flow setting: ½ North well flow setting: ½

COMPRESSOR CHECKS: Hours 4984 Temperature 100 Oil W

Air Filter drain checks: 1) ✓ 2) ✓ 3) ✓

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 81 in. South system: 81 in. Blower: 82 in.

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench; .5 GPM South Trench: 1 GPM

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 1.5 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 12.5 1 84 % South: 12.5 1 82 %

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: 11/17 South Units: 11/17 2,000 Gal. Unit _____

CULTURE OBSERVATIONS: Water Temperature: ____ Deg.C.

DOURs: [NH4]: [PO4]:

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

OPERATIONAL CHANGES TODAY:

Skimmed 0.1 N/S

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: DCJ

DATE: 24 Nov TIME: 1630 HIGH TIDE: _____

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill 6 Discharge 0+1½ Pressure 92

East well flow setting: ½ West well flow setting: ½

NORTH TRENCH: Refill 6 Discharge 0+2 Pressure 00C

South well flow setting: ½ North well flow setting: ½

COMPRESSOR CHECKS: Hours 5035 Temperature 95 Oil W

Air Filter drain checks: 1) ✓ 2) ✓ 3) ✓

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 82 in. South system: 82 in. Blower: 82 in.

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench; 1 GPM South Trench: 1 GPM

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 2 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 11.5 lbs 80 ~~70~~ % South: 11.5 lbs 85 %

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: 11/17 South Units: 11/17 2,000 Gal. Unit _____

CULTURE OBSERVATIONS: Water Temperature: ____ Deg.C.

DOURs: [NH4]: [PO4]:

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

OPERATIONAL CHANGES TODAY:

/

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: OJ

DATE: 26 Nov TIME: 1900 HIGH TIDE: _____

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill 6 Discharge 0+1½ Pressure 91

East well flow setting: ½ West well flow setting: ½

NORTH TRENCH: Refill 6 Discharge 0+2 Pressure 00

South well flow setting: 1/2 North well flow setting: 1/2

COMPRESSOR CHECKS: Hours 5085 Temperature 95 Oil ✓

Air Filter drain checks: 1) ✓ 2) ✓ 3) ✓

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 81 in. South system: 81 in. Blower: 81 in.

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench: 1 GPM South Trench: 1.5 GPM

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 2.5 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 125 / 72 70 % South: 125 / 70 80 %

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: 11/17 South Units: 11/17 2,000 Gal. Unit _____

CULTURE OBSERVATIONS: Water Temperature: ____ Deg.C.

DOURs: [NH4]: [PO4]:

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

OPERATIONAL CHANGES TODAY:

Blew Aerators

Skimmed Oil Spills

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: DDJ

DATE: 28 Nov TIME: 1630 HIGH TIDE: _____

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill 6 Discharge 0+1½ Pressure 92

East well flow setting: ½ West well flow setting: 1½

NORTH TRENCH: Refill 6 Discharge 0+2 Pressure 100

South well flow setting: 1½ North well flow setting: 1½

COMPRESSOR CHECKS: Hours 5136 Temperature 90 Oil W

Air Filter drain checks: 1) ✓ 2) ✓ 3) ✓

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 81 in. South system: 81 in. Blower: 82 in.

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench; 1.5 GPM South Trench: 1.5 GPM

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 3 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 12.5 / 20 60 % South: 12.5 / 20 67 %

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: 11/17 South Units: 11/17 2,000 Gal. Unit _____

CULTURE OBSERVATIONS: Water Temperature: ____ Deg.C.

DOURs: [NH4]: [PO4]:

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

OPERATIONAL CHANGES TODAY:

Skimmed oil N/S

CytoCulture International, Inc.

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA

OPERATOR: DJ

DATE: 30 Nov TIME: 1730 HIGH TIDE: _____

WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:

SOUTH TRENCH: Refill 6 Discharge 0+1½ Pressure 99

East well flow setting: ½ West well flow setting: ½

NORTH TRENCH: Refill 6 Discharge 0+2 Pressure 00

South well flow setting: ½ North well flow setting: ½

COMPRESSOR CHECKS: Hours 5185 Temperature 95 Oil W

Air Filter drain checks: 1) ✓ 2) ✓ 3) ✓

BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:

North system: 81 in. South system: 82 in. Blower: 82 in.

GROUNDWATER EXTRACTION TRENCH FLOW RATES:

North Trench: 1.5 GPM South Trench: 1.5 GPM

TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 3 GPM

DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:

North: 12.5 / 20 57 % South: 12.5 / 20 64 %

DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)

North Units: 11/17 South Units: 11/17 2,000 Gal. Unit _____

CULTURE OBSERVATIONS: Water Temperature: ____ Deg.C.

DOURs: [NH4]: [PO4]:

SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

Sample No._____ TPH/TEH:___ BTXE:___ Comment:_____

OPERATIONAL CHANGES TODAY:
Skimmed 0.1 N/S Consolodated oil +30 gal S = 95 gal +5 gal N = 85 gal