

CLEAN-UP AND REMEDIATION ACTIVITY REPORT

FOR

CAWTHORNE CHANNEL 1 FLOW STATION

BY

GIOLEE GLOBAL RESOURCES LIMITED

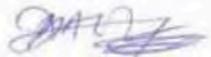
AND THE OSEI CORPORATION

SUBMITTED TO

OIL SPILL RESPONSE AND REMEDIATION DEPARTMENT

SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED

INCIDENT DATE: 22nd Sept 2008
INCIDENT NUMBER: 2008_00226
CONTRACT START DATE: 22/07/2013
CONTRACT END DATE: 20/08/2013
PURCHASE ORDER NO: 4510272605
CONTRACTOR: GIOLEE GLOBAL RESOURCES NIG. LTD., **OSEI CORP**


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MD, GIOLEE GLOBAL RES. LTD.

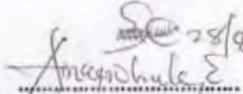

Amosohule E
28/8/2013
SPDC SITE REP

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ACRONYMS

SPDC Shell Petroleum Development Company of Nigeria Limited

OSE II Oil Spill Eater II)OSE II)

OSRT Oil Spill Response Team

JHA Job Hazard Analysis

RIBACA Risk based Corrective Action

JIV Joint Investigation Visit

QA/QC Quality Assurance/Quality Control

SITE BASIC INFORMATION

Field Name	SWAMP 1
Site Name	CAWC 1 Flow Station
Exact Location	Behind the Flow Station
Spill Incident No.	2008_00226
Incident Date	22/09/2008
JIV Date	25/09/2008
Volume Spilled x	NA
Volume Recovered x	NA
Impacted Area	129500 M3

SITE HISTORY

Site Use (previous & Current)	SPDC Operation (RoW)
Cause of Spill	Corrosion
Impacted Environment	Swamp
Distance of Site From Human Habitation	>400m
Soil Characteristics	Silt clay

SITE BASIC INFORMATION

SITE HISTORY

CHAPTER ONE

1.1 INTRODUCTION

Giolee Global Resources is an indigenous company and the OSEI Corporation a Global clean up companies carry out oil spill emergency response and remediation activity in the oil and gas industry. Hence, our companies are engaged by the swamp remediation team to render remediation services at CAWC 1 flow station. Available information has it that the spill occurred in the year 2008 as a result of pipeline corrosion behind the flow station. Initial site visit was carried out to scope and assess the level of impact and the remedial action to be taken in order to restore the site to its original state through tilling and application of oil spill eater 11 (OSE 11) on the impacted vegetation and soil. This practice is simply based on density difference between oil and water. In order words, oil floats on water when the two come in contact. So, the soil was subjected to tilling and Homogenization before OSE11 was applied to the impacted area to break the oil into CO^2 and HO^2 to achieve the desire of restoring the site to its original state of the pre-spill condition. Cawthorne Channel Oil Field is located in both Asari-toru and Degema Local Government Areas of Rivers State. However, Cawthorne channel 1 where the spill occurred is located in Degema local government.

The major occupations of the indigenes are fishing and subsistence farming. This report has been divided into subheadings to show details of the activity carried out during the period of the work. Also, JIV assessment showed that the area of impact was 129500 meters³ hence the need for remediation activity.

1.2 PROJECT OBJECTIVES

The project objectives are

- a) To remediate an impacted area of 129500 m³.
- b) Manage HSE on site
- c) Present report of activities to SPDC on completion of project.

1.3 BRIEF DESCRIPTION OF SITE

Cawthorne channel 1 is located in Degema local government areas of Rivers State. The spill site is located behind Cawthorne channel 1 flow station where the flow lines meet at the inlet manifold. The site is basically within the SPDC right of way. The major activity is transportation of crude oil from the various oil wells to the station.

The spill which impacted this site happened in the year 2008 and was assessed in 2011 Site picture and sketch is shown on the Remedial action plan attached to this report

1.4 WORK SCOPE

The work scope covers the following

- a) Mobilization
- b) Remediation of impacted environment Demobilization.
- c) Reporting

CHAPTER TWO

2.1 METHODOLOGY

Over the years, remediation of crude oil polluted soil has always been a major concern to the oil industries, government agency and the host communities. There are several methods of carrying out remediation activities but we have limited this report to the techniques deployed on site. Remediation by Oil Spill Eater II, is widely accepted in this part of the world especially in SPDC; however, we are gradually disabusing our minds from outright removal of dead vegetation for the purposes of remediation activity. Presently, remediation in the swamp looks at a systematic removal of impacted vegetation such that it does not expose the coastal region to further environmental deploration. The method of remediation deployed during this project was strictly on tilling, Homogenization with the application of oil spill eater 11 (Enzymes/Nutrient amendment)., which remove 100% of hydrocarbon from soil or any object and enhance soil restoration to its original state. However, some areas required that the impacted vegetation be removed for effective tilling to be achieved. On 22nd of July 2013, the workforce mobilized to CAWC 1 via CAWC 2 FLB in order to sign the permit to work and kick start the project. The work could not start as planned because some of the community workers needed to have swimming certificates. The site was declared open on 24th July 2013 after HSE documents were verified by the CAWC district HSE team.

Site HSE induction and kick-off meeting was done by the SPDC site rep.

Some of the issues discussed include the following

- a) PPE requirements for the work
- b) The SPDC 12 lifesaving rules
- c) 3 HSE golden rules
- d)Emergency preparedness

e) Worksite Hazard Management cascade and the implementation of PAUSE

- Worksite Hazard Management cascade and the implementation of PAUSE The work commenced with clearing of dead grasses, followed by tilling,

Homogenization before application of oil spill eater 11 (Ose11). During the course of the project, an area suspected to have buried impacted materials was observed and reported to the office for a re-assessment of the area. This observation was confirmed by the visit of Akosa who carried out several trial pit tests and saw that at depth of 0.5-0.8m there was presence of hydrocarbon. The office instructed that the area be excavated and treated on liner using the same oil spill eater 11 and land farming of the soil. **The work lasted for 30days (22/07/-20/08/2013).**

Waste generated includes absorbent pads used for mopping of residual or stranded oil before application of OSE11, stained materials like plastic water bottles, oily rags, dead shrubs and food waste. Some materials used during clean up includes the following;

- a) Transfer pumps and hoses
- b) Machetes, rake and shovels
- c) Absorbent Pad
- d) Oil Spill Eater II Concentrate

2.2 PROJECT EXECUTION IN CHRONOLOGICAL ORDER

DATE	ACTIVITIES
22/07/13 - 23/07/13	Mobilization/Verification of HSE document
24/07/13 -30/07/13	Clearing of impacted vegetation
31/07/13 -03/08/13	Tilling of impacted materials
04/08/2013	Initial sheen test (Section A)

Provision of Mangrove Restoration Project. Abiteye Jacket-1

05/08/2013	Initial sheen test (Section B)
06/08/13 - 08/08/13	Application of Oil Eater (OSE11) on the impacted soil.
09/08/13 -12/08/13	Homogenization of tilled soil
12/08//2013	75% QA/QC by ChimaAgomuo
13/08/13 - 15/08/13	No work as the attention of the CSR was required in the office
16/08/2013	Excavation of hot spot, land farming and treatment of the impacted oil using Oil spill eater (OSE11)
17/08/13 - 18/08/13	Application of OSE11 on excavated materials and land farming
19/08/2013	Housekeeping and evacuation of waste.
20/08/2013	External certification and demobilization

CHAPTER THREE

3.1 CHALLENGES

- a) The first challenge recorded was making the locals see the need to always use the PPE provided by the contractor. The complaint was that the PPE was uncomfortable. The non use of the PPE formed greater percentage of the unsafe conditions recorded never the less they had to comply under close supervision.
- b) Travelling from tourist beach jetty to CAWC 2 FLB to revalidate PTW every day was also a big challenge.
- c) The third challenge was working under cold weather condition.

3.2 SUGGESTION FOR IMPROVEMENT

Learning they say is a continuous exercise for development in every living person. For effective communication of HSE induction on site it is important to speak the language of person understands, by this I mean if possible site reps should use the simplest language to drive home the message. Note, until the locals in the community working with us on site understand and are able to discuss HSE issue at their own level and appreciate words like hazards and risk then we have not achieved our objective.

3.3 CONCLUSION

In this project, if there was anything to talk of, it is the way HSE was managed. We cannot stop thanking the creator for his protection and guidance throughout the work duration. We wish to thank the ever supportive CSR for painstaking to always ensure that the locals maintain good HSE culture. This new method of minimal removal of dead vegetation by applying oil spill eater 11 which break and remove all the hydrocarbon from soil, vegetation and all other object like the pipes achieve better result than any other method. this is

confirmed from the laboratory results conducted on this site after the application of oil spill eater II concentrate.

3.3 RECOMMENDATION

From our experience during this remediation, we wish to recommend as follows;

- a) SPDC should as a matter of necessity continues to carry out corrosion test on its line especially when the pipe is above 10 years. This will not only prevent spill but will help in planning for pipeline replacement.
- b) Install automatic pressure relieve valve that will cut supply during any pressure difference.
- c) Ensure that the surveillance contractors pay their staff as at when due as to motivate them to patrol the line and report any spill in time to the appropriate authority.
- d) Remediate all site within a short period of time to avoid impact to migrate to other third party areas.

APPENDICES

PICTURES

JHA

RAP

PTW

TRIC CARD

WASTE CONSIGNMENT NOTE

LANDLORD'S CERTIFICATION

WORK ORDER



Fig.1: Initial site picture (Section A)



07/08/2013

24/07/2013

Provision of Mangrove Restoration Project. Abiteye Jacket-1

Fig. 2: Initial site picture (Section B)

Fig 3: Initial site picture



Fig 4: Initial site picture

24/07/2013



Fig. 5: Cleaning of impacted vegetation(Section B)



Fig. 6: Tilling of impacted soil (Section A)



Fig. 7: Tilling of impacted soil (Section B)



Fig. 8: Oil sheen test at 50% of the job.



07/08/2013

Fig. 9: Tilling in progress



Fig 10: Tilled soil



Fig. 11: Tilled soil awaiting homogenization



Fig. 12: Homogenization of tilled soil (Section B)



Fig 13: Homogenization of tilled soil.(Section A)



Fig. 14:Excavated materials on liner (Section A)



Fig. 15: Excavated materials (Section B)



16/8/2013

Fig 16: Pump used for application of oil spill eater 11



16/08/2013

Fig 17: Oil spill eater 11 being applied on impacted tilled soi

16/08/2013



19/08/2013

Fig 18: Final look of the Cawthorne channel 1 flow station after work is completed



Site Assessment Form

Site Factors	Description
Fountain Incident Number	2008_00226
Incident Name	Cawthorne Channel 1 Flow station Flow Line
Incident Date	22 nd Sept. 2008
Community Area	Cawthorn Channel
Site Assessment Date (s)	13 th June 2013
Assessment Team	Sam Barde, Adeyanju Adekunle and Ebenuwa Augustine
Facility Type: (R.O.W/FS/MFD/Terminal/ Other)	Flow Station
Cause of Spill: (Sabotage/Non Sabotage/Other)	Operational
Type of Terrain: (Land, Swamp, Tidal/Other)	Land and swamp
Topography: (Flat/Slope/Valley/Hill/Other)	Flat/Gently slope

Horizontal Delineation					
Location of Impact	Sub Section	Area (m ²)	Description of Terrain	Visual /Olfactory Impact	GPS Co-ordinate of Composite Samples
On Site	1.		Back of flow station to the, the area closest to the flow station fence is firm further away is soft and muddy.	Impact is medium, soil is darken by crude	04 33 04 ; 07 02 48
	2.				
	3.				
	4.	2950			
	Total				
Off Site	1.				
	2.				
	3.				
	4.				
	Total				
	Grand Total	2950			

Note: if more than 4No. Sub sections use separate sheet.

Field Receptor Assessment

Type of Receptors	Distance from Edge of Spill to Receptor (m)	Is Receptor Impact Yes/No (i.e. distance =0 m)	Is Receptor Up or Down Gradient from Spill Point?	Direction of Receptor from Spill Point
Farm land: shallow root crops Plantation Livestock	N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A
Surface Water	0	Yes	down	south
Hand dug wells	N/A	N/A	N/A	N/A
Settlement/Village	N/A	N/A	N/A	N/A
Primary forest	>100	No	Down	South
Mangrove swamp	>100	NO	Down	South
Right of Way (path or road)	N/A	N/A	N/A	N/A
Others				

Vertical Delineation

Location of Impact	Sub Section	Depth (m)	Soil Description	Visual /Olfactory Impact	Sample Collected (Yes/No)	GPS Co-ordinate of Vertical Delineation
On Site	1.	0-0.5	Soft silty sand with mud drapes	medium		04 33 04 N 07 02 48E
		0.5-1.0				
		1.0-1.5				
		1.5-2.0				
		2.0-2.5				
	2.	0-0.5	Soft silty sand with mud drapes	medium		04 33 05 N 07 02 48E
		1.0				
		2.0				
		3.0				

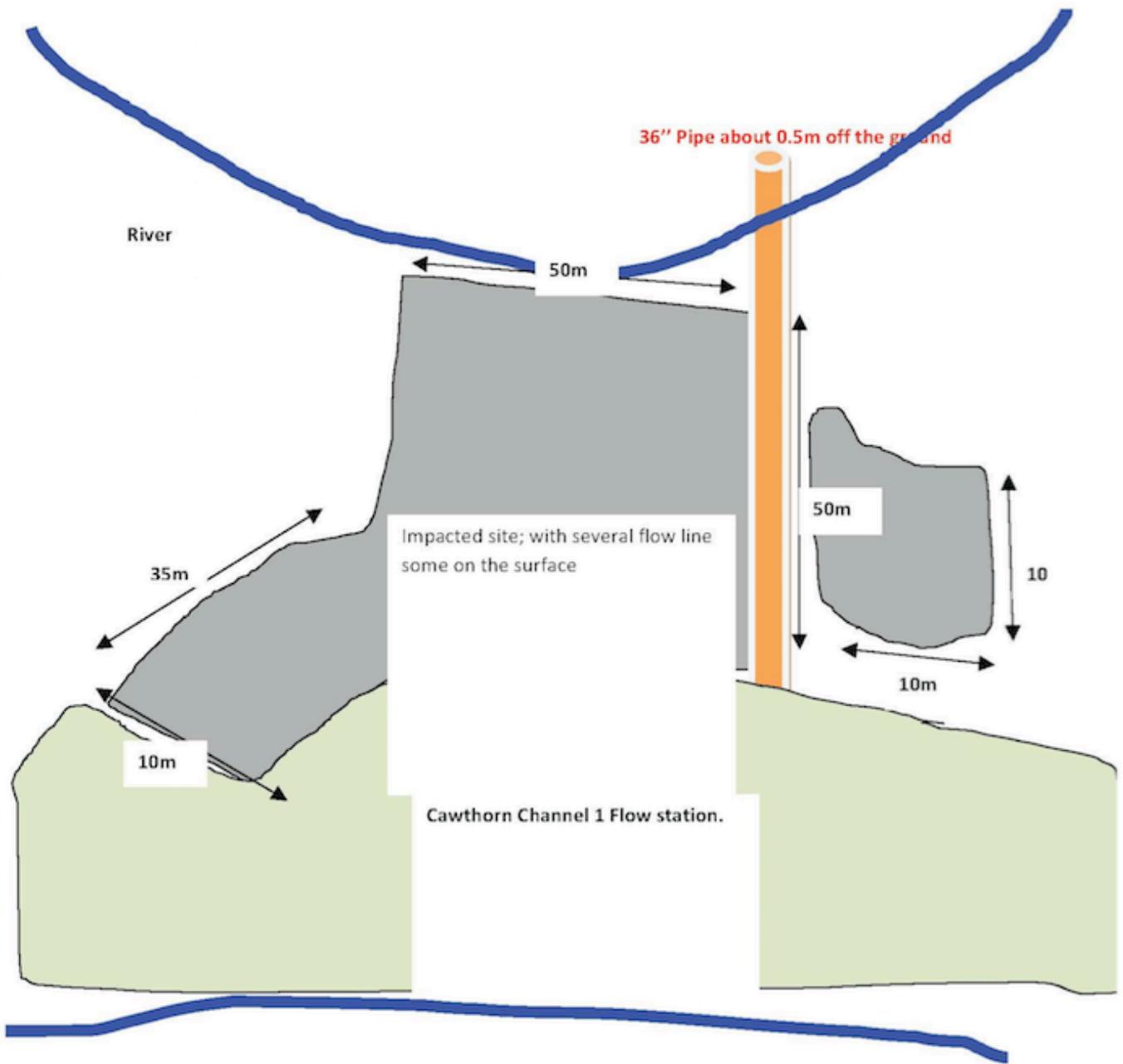
	3.	0-0.5	Soft silty sand with mud drapes	medium		04 33 02 N 07 02 49E	
		1.0					
		2.0					
Off Site	1.	0.0-0.5					
		0.5-1.0					
		1.0-1.5					
		1.5-2.0					
		>2.0					
	2.	0-0.5					
		0.5-1.0					
		1.0-1.5					
		1.5-2.0					
		>2.0					
	3.	0-0.5					
		0.5-1.0					
		1.0-1.5					
		1.5-2.0					
		>2.0					
	4.	0-0.5					
		0.5-1.0					
		1.0-1.5					
		1.5-2.0					
		>2.0					

Groundwater/Surface Observations

Location of Impact	Sub Section	Depth of Groundwater Encountered (m)	Visual/Olfactory Impact	Sample Collected (Yes/No)
On Site	1.	0.5m	Not impacted	No
	2.			
	3.			
	4.			
Off Site	1.			
	2.			
	3.			
	4.			
Surface			Light sheen	No

Water Impact				
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General Comments/Observations
<p>The site is located right at the back of Caw Channel 1 Flow Station; along the Flow Line ROW. The flow lines lead into the inlet manifold.</p> <p>Site appear to have suffered several generations of spill from 2008 when it was first reported till the date of this assessment. Assessment was first carried out in June 2011.</p> <p>Further release of oil possible from the flow station inlet manifold added to the impact.</p> <p>The most probable source of the spill is the Caw Channel 1 inlet manifold. Oil released from this facility flow downstream to impact the immediate surroundings. Cut flow lines that litter the place may also be a source of spill.</p> <p>Care must be taken working here because there are several flow line some are on the surface while other are buried but very shallow.</p>
<p>Lithology: The basic soil type is silty Sand.</p>
<p>Ground Water: was encountered at 0.5m, but it was not impacted.</p>
<p>Average Depth of Impact: 0.4m</p>
<p>Sampling: Four composite samples were taken in line with the RMS. However samples could not be taken beyond 0.5m. This is because the water table is too shallow.</p>
<p>Recommendation:</p> <p>First, care must be taken to protect the flow lines while carry out remediation on this site. Remediation will be achieved by tilling, homogenisation, and construction of two to three series of windrows.</p>
Site Diagram





An overview of site



Over viewing the site from the walk way



Edge of the Flow Station



The inlet manifold and it's immediate surrounding



Showing site with net work of flow lines



Isolated Pockets of impacted soil within an area with green grass.



OSEI Corporation Protocol



Date June 22, 2013

I. Parameters of contaminated site: Nigeria, Cawthorne Channel area ,
contaminated area covering 129500 square meters averaging between .5 meters of

depth of contaminated soil/sediments with oil on the waters surface where the oil spill meets the swamp.

II. Calculations: OSE II and water 25 to 1

1. $229500 \text{ m}^2 \times .5\text{m}$ equals 114750 cubic meters of contaminated soil with a light sheen on ground water/surface water.
2. $114750 \text{ cubic meters of soil} \times 2.3 \text{ liters of OSE II per cubic meter}$ equals 263925 liters of OSE II or 69821 gallons of OSE II divided by 55, (number of gallons in each drum) equals 1269.48 or 1270 drums, plus at least one drum for the sheen on the surface/ground water for a total of 1271 drums of OSE II
3. The water source is available on site and there will be a need to extract 1745535.7 gallons or 6598125 liters of water to mix with OSE II
4. Total volume of OSE II and water is 6862050 liters

III. Materials needed:

1. OSE II 1271, 55 gallon drums of OSE II.
2. Water tank that will hold 20 liters of liquid, a 25,000 liter tank would be better, with a suction/discharge pump, 20 meters of hose, and a nozzle with a dial for liters.
3. 50 1 meter wooden stakes
4. discing/tilling device to go down 1 meter.
5. moisture meter
6. wide mouth jars with Teflon sealed lids that are acceptable to the laboratory to perform the TPH tests.
7. labels for jars
8. note pad and pen
9. ice chest

IV. Procedure:

1. Stage OSE II drums, wooden stakes, water tank/truck with pump hoses, nozzle and dial, near contaminated area for easy access. A nozzle with a liter dial is absolutely required so you will know how much liquid has been applied.
2. Extract 3, 50 ml/g of soil from three different sections of the spill area, mark with a stake with orange paint(or laboratory requirements for the particular lab being utilized, ask before coming to the site) into wide moth jars and label the jars and make note of the extraction area to always extract the soil from the same general area each time. Place the 3 labeled jars into the ice chest.
3. Use the wooden stakes and separate the area into 3 meter by 3 meter grids as

equal as possible.

3. Based on pump flow rate and access to OSE II, determine the amount of area that OSE II can be applied in an 8 hour day.
4. Extract 24,000 liters of water into the tank to mix OSE II with.
5. Add 4.8 drums of OSE II to the tank or 264 gallons or 998.4 liters , and mix the OSE II and water until it is evenly mixed.
6. Apply 2173 gallons or 8210 liters of the OSE II and water mixture to each 3 meter X 3 meter grid. If you only add a portion of the OSE II and water mixture to a grid make sure you note how much was added so that once the tank is refilled you will know how much OSE II and water mixture to add to the unfinished grid.

Note the water tank/truck will be refilled 274 times to apply all the required OSE II and water to each grid. If a larger or smaller tank is used the amounts will need to be recalculated for the smaller or larger volume tank, or you can use multiple tanks to apply the entire volume of liquid in less time.

7. 1 drum of OSE II will need to be mixed with 10395 liters of water .
10. Lightly spray OSE II onto the waters surface where there is noticeable oil.

V. Test requirements: Before starting the clean up/demonstration make sure it is understood what level of TPH reduction is required, and what test methods are acceptable. Make sure this information is relayed to the OSEI Corporation so the test method can be verified as acceptable. OSEI Corporation can help with a test method if needed.

1. 1 day after applying OSE II and water to the site, Extract 3, 50 ml/g of soil (or laboratory requirements for the particular lab being utilized, ask before arriving at the site) into wide mouth jars, label the jars and make note of the extraction area in order to always extract the soil from the same general area each time. Place the 3 labeled jars into the ice chest.
2. Take the samples to the lab and perform the required GC/MS tests and fill out a chain of custody form.
3. 7 days after applying OSE II and water to the site, Extract 3, 50 ml/g of soil (or laboratory requirements for the particular lab being utilized, ask before arriving at the site) into wide mouth jars and label the jars and make note of the extraction area in order to always extract the soil from the same general area each time. Place the 3 labeled jars into the ice chest.
4. Take the samples to the lab and perform the required GC/MS tests and fill out a chain of custody form.
5. 14 days after applying OSE II and water to the site, Extract 3, 50 ml/g of soil (or laboratory requirements for the particular lab being utilized, ask before arriving at the site) into wide mouth jars and label the jars and make note of the extraction area in order to always extract the soil from the same general area each time. Place the 3 labeled jars into the ice chest.
6. Take the samples to the lab and perform the required GC/MS tests and fill out a

chain of custody form.

Note: once you receive the 14 day test results, there potentially will be no need for further tests, since the OSEI Corporations experience with Nigerian crude shows the TPH should be below acceptable levels, if not continue on, until the levels are at or below the acceptable levels.

7. 21 days after applying OSE II and water to the site, Extract 3, 50 ml/g of soil (or laboratory requirements for the particular lab being utilized, ask before arriving at the site) into wide mouth jars and label the jars and make note of the extraction area in order to always extract the soil from the same general area each time. Place the 3 labeled jars into the ice chest.

8. Take the samples to the lab and perform the required GC/MS tests and fill out a chain of custody form.

9. 30 after applying OSE II and water to the site, Extract 3, 50 ml/g of soil (or laboratory requirements for the particular lab being utilized, ask before arriving at the site) into wide mouth jars and label the jars and make note of the extraction area in order to always extract the soil from the same general area each time. Place the 3 labeled jars into the ice chest.

10. Take the samples to the lab and perform the required GC/MS tests and fill out a chain of custody form.

11. 45 days after applying OSE II and water to the site, Extract 3, 50 ml/g of soil (or laboratory requirements for the particular lab being utilized, ask before arriving at the site) into wide mouth jars and label the jars and make note of the extraction area in order to always extract the soil from the same general area each time. Place the 3 labeled jars into the ice chest.

12. Take the samples to the lab and perform the required GC/MS tests and fill out a chain of custody form

VI. Site maintenance:

1 twice a week and more if needed till the soil then add water as needed. Twice a week check the moisture meter to make sure the soil is above the 30% moisture level, too much water is not a problem. If the moisture level drops below 30% then the motility of the bacteria becomes limited.

VII. Observations

1. Make notes of the general conditions of the site before, during and after the application of OSE II, including smell.

2. Each day you go out to perform test extractions, water application, or soil turning or tilling write down observations each time.

VIII. Expected results/Conclusion

The OSEI Corporation expects that in a short time after the application of OSE II for the hydrocarbon smell to diminish and the oil to start separating from the soil and start rising to the waters surface.

The oil/hydrocarbons should digest to CO₂ and water quickly (10 to 14 days) reducing the TPH to acceptable levels, based on past experience with Nigerian oil. The areas where there is surface oil on the soil should breakdown quickly and lift off the sand and remain floating until the hydrocarbons have been completely converted to CO₂ and water.

ENG. Spencer

Steven Pedigo