

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1033486 JIV report S/N: 0184

(Note: As practicable as possible the JIV report is to be signed in the field by all the participating parties)

A. GENERAL INFORMATION:

1. Spill incident Number: 2013-1033486 2. Type of incident* OIL SPILL
 3. Name of Location 4" CAWTHORPE CHANNEL II WELL 2GT
 4. Name of nearest community MBCAMA 5. State: RIVERS 6. LGA DEGEMA
 7. Type of Production facility/Installation FLOW LINE 8. Asset owner/District MES 1

B. INCIDENT INFORMATION:

9. Details of incident

a. Date of incident: 30-08-2013
 b. Start date/time of investigation: 04-09-2013
 c. Investigation End date: 04-09-2013 Actual investigation duration, days: ONE

d. Description of spill point environment

- Firmed soil
- Loose soil
- Recently excavated area
- Under water
- Swampy
- Exposed pipe surface
- Well Platform (on Water)
- Drill Rig

e. Description of leak point (tick as applicable);

- Drilled hole
- Hack saw cut
- Tear (_____).
- Complete Rupture
- Inward dent,
- Well head tampering
- Failed Weld-on illegal hot tap valve, Failed Clamp
- Missing Pipeline/Flowline
- Crude oil theft (illegal bunkering) point,
- Third party tampering with Clamp
- Third party tampering with valve setting,
- Third party tampering with flange,
- Corrosion
- Saver-pit over flow,
- Surge vessel overflow,
- Bulging Outward
- Flare System/Bund wall failure
- Accidental 3rd party equipment impact
- Valve Failure
- com unit failure
- Cold vent
- Relief valve failure
- Others (specify) PIN HOLE

f. Incident caused by:

- Third party interference (Sabotage ; crude theft ; Line theft ; Accidental 3rd party damage)
- Operational
- Others (including Mystery spills) _____

g. Spill point coordinates

Measuring unit	<u>MINNA MID BELT</u>
Northing: <u>61367.29m</u>	Easting: <u>504809.07m</u>

*This can be: a) Oil Spill b) Drilling fluid/Chemical c) Siltation d) construction e) Encroachment f) Fire.

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C. RISK ASSESSMENT

10. Type of environment:

- Land Swamp Water Seasonal swamp Shoreline/Waterfront

i. Type of environment to which oil has spread:

- Land Swamp Water River (identify) _____

ii. Weather condition

- Rain Sunny Dry Wet Windy Hot cool

11. Distance from the nearest sensitive habitat

- Government reserved and designated protected area [NIL ,m]
- Drinking water source [NIL ,m]
- Built up area [80 ,m]
- Farmlands [NIL ,m]
- Fish Farm/Pond [NIL ,m]
- Fishing net [NIL ,m]
- Others (specify).

12. Containment measures put in place;

- Booms Trench Dyke Natural depression Pit
 Others: BUND WALL CONSTRUCTED AROUND SPILL

13. Any pictures or video coverage? [Y] [N]

14. Was there any disruption to the investigation? [Y] [N]

If yes give brief description:

NOT APPLICABLE

D. TYPE/NUMBERS OF PROPERTIES, IF ANY, FOUND WITHIN THE AREA OF SPREAD OF OIL

15. Structures / Properties

S/N	Type of Structures	Description	Size	Number	Comments
	<u>NONE WITHIN AREA OF IMPACT</u>				

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16. Crops/Economic Trees

S/N	Type of crops	Young	Medium	Matured	Quantity	Comments
NONE WITHIN AREA OF IMPACT						

17. Fish/Nets/Ponds

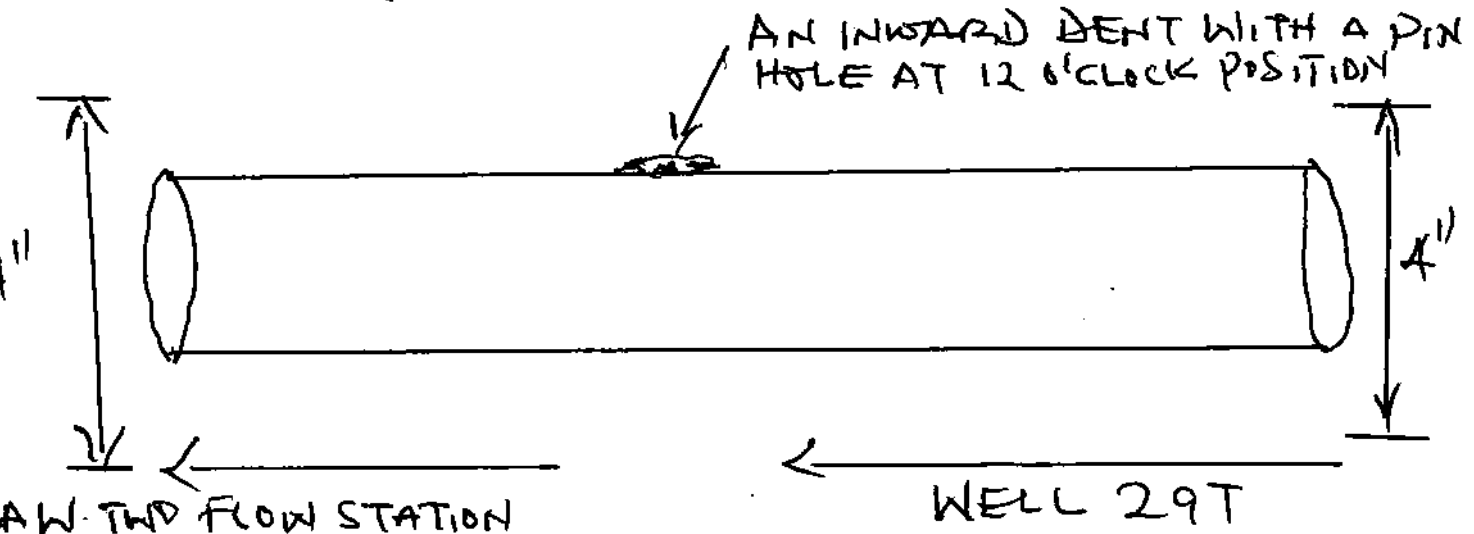
S/N	Fish/Nets/Ponds	Description	Quantity/Size	Comments
NONE WITHIN AREA OF IMPACT				

18. Others (Specify) i.e. Animal Traps

S/N	Others	Description	Quantity/Size	Comments
NONE WITHIN AREA OF IMPACT				

E. GRAPHIC DESCRIPTION OF LEAK POINT (while detail report of the leak point should be contained in the leak report, overview sketch of the site should be added as an appendix 1)

A SKETCH SHOWING AN INWARD BENT WITH A PIN HOLE AT TWELVE (12) O'CLOCK POSITION

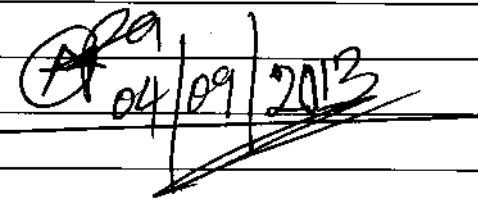


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F: TABLE SHOWING SOME OF COORDINATES TAKEN DURING JIV FOR AREA CALCULATION
 19. Impacted area boundary Coordinates (If more, Print and attach as an appendix)

MINNA MID BELT

S/N	Northing	Easting
AREA 1		
1.	61367.29m	504809.07m
2.	61370.36m	504809.08m
3.	61373.42m	504815.25m
4.	61367.25m	504827.57m
5.	61361.12m	504821.39m
AREA 2		
6.	61382.57m	504843.01m
7.	61388.71m	504846.11m
8.	61373.33m	504858.41m
9.	61367.20m	504849.15m
10.	61361.06m	504846.05m
		

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G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact 0.0349
- Impact within SPDC R.O.W YES
- Impact outside SPDC R.O.W YES

21. Volume of oil recovered before completion of JIV (V_{rec}):

Recovered oil V_{rec} :	<u>3.8</u>	Barrels
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22. Computation of estimated residual volume on site

a. Computation of estimated volume of pool of free phase oil (on land or confined water body).

- i. Area (m^2) occupied by pool of free phase oil 20 m^2
- ii. Average Depth (m) of pool of free phase oil 0.1 m^2
- iii. Emulsification factor: 20%

iv.

Estimated Volume of pool of free phase oil. V_{pool} :	<u>1.01</u>	barrels
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b. Computation of estimated volume of infiltrated oil in the soil (V_{inf}).

1. Estimated Volume of infiltrated oil at spill point ($V_{inf a}$)

- i. Area* (m^2) of soil covered by the oil: 3 m^2
- ii. Average Depth (m) above leaking facility i.e. pipeline/flowline: 0.1
- iii. Soil type: CLAY iv. P_e (effective porosity of the soil): 8%
- v. Cause of spill: OPERATIONAL vi. Oil type: BONNY LIGHT
- vii. Oil Residence time on site, day: 5
- viii. Average depth of infiltration below leaking facility i.e. pipeline/flowline: 0.0019
- ix. Estimated depth of infiltration around spill point: 0.1019

x.

Estimated Volume of infiltrated oil at spill point. $V_{inf a}$:	<u>0.15</u>	barrels
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2. Estimated Volume of infiltrated oil at second spill point [if applicable] ($V_{inf b}$)

- i. Area* (m^2) of soil covered by the oil: NIL
- ii. Average Depth (m) above leaking facility i.e. pipeline/flowline: NIL
- iii. Soil type: NIL iv. P_e (effective porosity of the soil): NIL
- v. Cause of spill: NIL vi. Oil type: NIL
- vii. Oil Residence time on site, day: NIL
- viii. Average depth of infiltration below leaking facility i.e. pipeline/flowline: NIL
- ix. Estimated depth of infiltration around spill point: NIL

Estimated Volume of infiltrated oil at spill point. $V_{inf b}$:	<u>NIL</u>	barrels
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3. Estimated Volume of infiltrated oil outside immediate spill point(s) region ($V_{inf c}$)

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- i. Area (m²) of soil covered by the oil: 2,698 m²
- ii. Area (m²) of the pool of free phase oil in touch with soil: _____
- iii. Average Depth (m) below ground surface of infiltration of oil: 0.0014
- iv. Soil type: CLAY
- v. P_e (effective porosity of the soil): _____
- vi.

Estimated Volume of infiltrated oil. At V_{inf} :	<u>2.01</u>	barrels
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23. Computation of estimated volume of oil on open water based on standard coloration.

- i. Total area of oil on open water: NIL
- ii. Table of average depth of oil on water based on coloration (**Spill Factors from USCG FOG (2000 Edition))

	Thickness (mm)	Percentage coverage	Volume (m ³)
Barely Visible	0.00004		
Silvery	0.00008		
Slight Color	0.00015		
Bright Color	0.0003		
Dull	0.001		
Dark	0.002		
Black oil	0.1		
Emulsion (30% Oil)	1		

NOT APPLICABLE

- iii.

Percent Total	100%
Estimated Volume of oil on open water. V_{wat} :	<u>NIL</u>
	Barrels

24. Calculation of evaporated volume:

- i. Estimated Volume available for evaporation within surface area: 3.02 BARRELS
- ii. E-Factor: 25%
- iii.

Estimated Volume of evaporated oil. V_{evap} :	<u>1.01</u>	Barrels
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Evaporation Factors (E-Factor) for SPDC Crude oil			
Oil Type	Days on site	Bonny Light	Bonny Medium
Oil Residence time	< 1 day	10%	5%
	1-7 days	25%	15%
	> 7 days	40%	25%

25. Net Estimated Spilled Volume $V_{est}(bbls) = V_{evap}(bbls) + V_{wat}(bbls) + V_{inf}(bbls) + V_{pool}(bbls) + V_{rec}(bbls) = 1.01 + NIL + 2.01 + 1.01 + 3 = 7.8 \text{ BARRELS}$

Estimated Reported Volume $V_{rep}(bbls) = 1.01 + NIL + 2.01 + 1.01 + 3 = 7.8 \text{ BARRELS}$**

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Calculation of the respective estimated volume is to be done on site as far as practicable using the new spill volume estimation software on site; Conversion of m³ to barrels is Volume (m³) x 6.29; **Round up estimated volume to next whole number using the following rules:

- Any spill volume in excess of 1 bbl is rounded up to the next whole number.
- Any spill volume in less than 1 bbl is rounded up to the next 0.1 bbl.

Examples: Calculated volume = 15.3 bbl ----- Reported volume = 16 bbl
Calculated volume = 0.35 bbl ----- Reported volume = 0.4 bbl
Calculated volume = 0.01 bbl ----- Reported volume = 0.1 bbl.

Wherever this estimation tool is not applicable please refer to paragraph 6c (Deviations) of the JIV procedure to use appropriate steps for column estimation; record the calculation in a plain sheet of paper and attach to the JIV report.

26. GENERAL STATUS OF THE SITE

A. Joint investigation of the incident site found that there is no residual impact after the initial response and therefore recommend that the site be closed out

B. Investigation of the incident site showed that there is residual impact on site requiring further works

27. REPRESENTATIVES

This report was filled, agreed and signed on the 04/09/2013 by joint investigation representatives from

- Host Community:
- Department of Petroleum Resources [DPR]:
- National Oil Spill Detection and Response Agency [NOSDRA]:
- State Ministry of Environment [SME]:
- Nigeria Police Force [NPF]:
- Shell Petroleum Development Company [SPDC]:
- Signatories agree with reported findings:
- Separate DPR form has been filled out with same findings

Tick as applicable

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28. Appendix 1: Overview sketch of the site

Location: 4" CAWTHORNE CHANNEL II WELL 29T AT MBIAMA

