

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 937935 JIV report S/N: 0028

(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: 937935 2. Type of incident* OIL SPILL
 3. Name of Location 30" NEMBE CREEK PIPELINE
 4. Name of nearest community BILLE 5. State: RIVERS 6. LGA DEGEMA
 7. Type of Production facility/Installation OIL PIPELINE 8. Asset owner/District NPE/CAWTHORNE CHANNEL

B. INCIDENT INFORMATION:

9. Details of incident

- a. Date of incident: 3RD MARCH 2013 !
 b. Start date/time of investigation: 14TH MARCH 2013
 c. Investigation End date: 14TH MARCH 2013 Actual investigation duration, days: ONE (1) DAY
 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) _____

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 (M)		<u>MINNA MID-BELT</u>	
Northing:		Easting:	
<u>62 913.70</u>		<u>488 812.36</u>	

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

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JOINT INVESTIGATION REPORT FOR INCIDENT NO: 937935 JIV report S/N: 0028

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 [,m]
- Drinking water source [,m]
- Built up area [,m]
- Farmlands [,m]
- Fish Farm/Pond [,m]
- Fishing net [,m]

Others (specify). **MANGROVE VEGETATION** IMPACTED BY SPILL

12. Containment measures put in place;

- Booms Trench Dyke Natural depression Pit
 Others: _____

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
NONE WITHIN AREA OF IMPACT					

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 937935 JIV report S/N: 0028

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16. Crops/Economic Trees

S/N	Type of crops	Young	Medium	Matured	Quantity	Comments
1	MANGROVE			✓	NUMEROUS	HEAVILY IMPACTED

17. Fish/Nets/Ponds

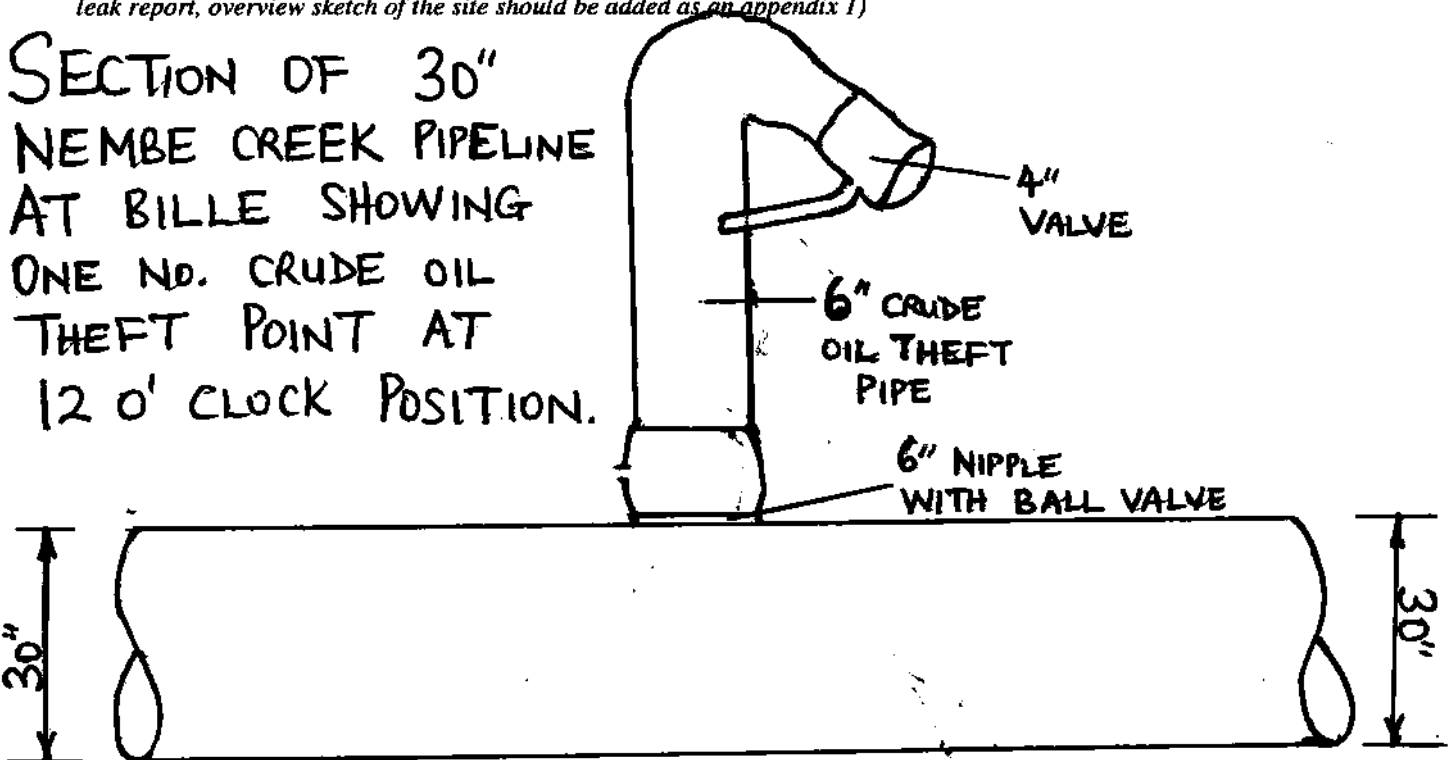
S/N	Fish/Nets/Ponds	Description	Quantity/Size	Comments
		NONE WITHIN AREA OF IMPACT		

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)

SECTION OF 30" NEMBE CREEK PIPELINE AT BILLE SHOWING ONE NO. CRUDE OIL THEFT POINT AT 12 O' CLOCK POSITION.



→ NEMBE

→ BONNY

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 937935 JIV report S/N: **0028**

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)

S/N	Northing	Easting

*SEE ATTACHED LIST FOR IMPACTED AREA COORDINATES
(APPENDIX A)*

APPENDIX A

JIV_BILLE_937935

name north east

IMPACTED AREA COORDINATES

FREE PHASE (SWAMP)

wp049	62916.76	488809.29
wp050	62916.75	488815.45
wp047	62910.6	488815.44
wp048	62910.62	488809.27

INFILTRATION (SWAMP)

pt1	62830.01	488538.03
pt2	62909.18	488752.62
wp049	62916.76	488809.29
wp048	62910.62	488809.27
pt3	62904.24	488754.42
pt4	62819.66	488542.98

IMPACT ON OPEN WATER

wp044	63549.82	488727.5
wp043	63531.85	488523.98
wp042	63618.3	488339.21
wp001	63526.91	488291.22
wp002	63272.68	488396.42
wp003	62857.72	488504.54
wp037	62766.76	488574.64
wp004	62696.99	488595.13
wp005	62176.83	489077.31
wp006	62097.93	489205.89
wp036	62104.68	489257.55
wp007	62042.4	489226.34
wp008	62077.47	489062.69
wp009	61975.19	488846.45
wp010	61694.65	488633.12
wp041	61648.68	488488.84
wp011	61671.28	488484.09
wp012	61697.58	488624.36
wp013	61986.88	488834.16
wp035	62080.75	488973.86
wp014	62100.85	489077.31
wp015	62065.78	489205.89
pt5	62176.85	489068
wp016	62711.6	488565.91
wp017	62153.45	488980.87
wp018	62588.87	488595.13
wp033	62871.61	488402.24
wp032	63225.22	488267.4
wp053	63381.97	488240.01
wp019	63579.51	488200.63
wp020	62901.55	488419.8
wp021	62854.79	488487.01
wp022	63258.07	488373.04

wp023	63567.83	488264.92
wp024	63658.42	488332.13
wp025	63556.14	488527.92
wp031	63418.89	488215.43
wp034	62576.26	488586.54
wp038	61901.94	487900.57
wp039	61413.32	487964.19
wp040	61513.53	488476.2
wp045	63256.94	489173.85
wp046	63294.16	489019.79
wp054	63372.82	488212.24

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JOINT INVESTIGATION REPORT FOR INCIDENT NO: 937935 JIV report S/N:

0028

G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact 10.99 Ha.
- 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} :	261	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 38
- ii. Average Depth (m) of pool of free phase oil 0.599
- iii. Emulsification factor: NIL

iv.

Estimated Volume of pool of free phase oil. V_{pool} :	143.17	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: 1
- ii. Average Depth (m) above leaking facility i.e. pipeline/flowline: 2.75
- iii. Soil type: CLAY iv. P_e (effective porosity of the soil): 8%
- v. Cause of spill: INTERFERENCE vi. Oil type: BONNY LIGHT
- vii. Oil Residence time on site, day: 11 DAYS
- viii. Average depth of infiltration below leaking facility i.e. pipeline/flowline: 0.003 m
- ix. Estimated depth of infiltration around spill point: 2.753 m

x.

Estimated Volume of infiltrated oil at spill point. $V_{inf a}$:	1.39	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: NOT APPLICABLE iv. P_e (effective porosity of the soil): NIL
- v. Cause of spill: NOT APPLICABLE vi. Oil type: NOT APPLICABLE
- 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. $V_{inf b}$:	NIL	barrels
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3. Estimated Volume of infiltrated oil outside immediate spill point(s) region ($V_{inf c}$)

THERE WAS EVIDENCE OF CRUDE OIL THEFT ACTIVITIES WITHIN THE SPILL SITE VICINITY AS AN ILLEGAL REFINERY WAS OBSERVED DURING JIV, WHICH POSSIBLY CONTRIBUTED TO THE SPILL.

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 937935 JIV report S/N: 0028

- i. Area (m²) of soil covered by the oil: 3771
- ii. Area (m²) of the pool of free phase oil in touch with soil: NIL
- iii. Average Depth (m) below ground surface of infiltration of oil: 0.003
- iv. Soil type: CLAY
- v. P_e (effective porosity of the soil): 8%
- vi.

Estimated Volume of infiltrated oil. At V _{inf} :	<u>5.72</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: 106,045 m²
- 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	<u>95%</u>	<u>10.0743</u>
Emulsion (30% Oil)	1	<u>5%</u>	<u>1.5907</u>
Percent Total		100%	<u>11.665</u>

- iii.

Estimated Volume of oil on open water. V _{wat} :	<u>73.37</u>	Barrels
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24. Calculation of evaporated volume:

- i. Estimated Volume available for evaporation within surface area: 223.65 BARRELS
- ii. E-Factor: 40%
- iii.

Estimated Volume of evaporated oil. V _{evap} :	<u>149.1</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%

<p>25. Net Estimated Spilled Volume $V_{\text{Est}}(\text{bbls}) = V_{\text{evap}}(\text{bbls}) + V_{\text{wat}}(\text{bbls}) + V_{\text{inf}}(\text{bbls}) + V_{\text{pool}}(\text{bbls}) + V_{\text{rec}}(\text{bbls}) =$ <u>149.1 + 73.37 + 7.1 + 143.17 + 261 = 633.75</u></p> <p>Estimated Reported Volume** $V_{\text{rep}}(\text{bbls}) =$ <u>634 BARRELS.</u></p>

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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 <input type="checkbox"/>
B. Investigation of the incident site showed that there is residual impact on site requiring further works <input checked="" type="checkbox"/>

27. REPRESENTATIVES

<p>This report was filled, agreed and signed on the <u>14/03/2013</u> by joint investigation representatives from</p> <ul style="list-style-type: none">• Host Community: <input checked="" type="checkbox"/>• Department of Petroleum Resources [DPR]: <input type="checkbox"/>• National Oil Spill Detection and Response Agency [NOSDRA]: <input checked="" type="checkbox"/>• State Ministry of Environment [SME]: <input checked="" type="checkbox"/>• Nigeria Police Force [NPF]: <input checked="" type="checkbox"/>• Shell Petroleum Development Company [SPDC]: <input checked="" type="checkbox"/>• Signatories agree with reported findings: <input checked="" type="checkbox"/>• Separate DPR form has been filled out with same findings <input type="checkbox"/> <p style="text-align: right;"><i>Tick as applicable</i></p>

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JOINT INVESTIGATION REPORT FOR INCIDENT NO: 937935 JIV report S/N: 0028

28. Appendix 1: Overview sketch of the site

