

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 0703/1028053

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

**A. GENERAL INFORMATION:**

1. Spill incident Number: 1028053 2. Type of incident \* OIL SPILL  
 3. Name of Location 24" ALAKIRI - BONNY PIPELINE (DISUSED GPHSL)  
 4. Name of nearest community ILOMATORU 5. State: RIVERS 6. LGA BONNY  
 7. Type of Production facility/Installation PIPELINE 8. Asset owner/ District PIPELINE

**B. INCIDENT INFORMATION:**

**9. Details of incident**

- a. Date of incident: 22ND AUGUST, 2013  
 b. Start date/time of investigation: 29TH AUGUST, 2013 / 1.36 PM  
 c. Investigation End date: 29TH AUGUST, 2013  
 d. Description of spill point environment  
 Firmed soil  Loose soil  Previously excavated area  
 Under water  Swampy  Exposed pipe surface  
 Well Platform (on Water)  Rig  
 e. Description of leak point (tick as applicable);  
 Drilled hole  Hack saw cut  Explosive tear,  
 Complete Rupture  Inward dent,  Well head tampering  
 Failed Weld-on illegal hot tap valve,  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  
 Outward dent  Flare System/Bund wall failure  
 Valve Failure  com unit failure  Cold vent  
 Relief valve failure  Others (specify) \_\_\_\_\_  
 f. Incident caused by:  
 Third party interference  Operational  Mystery \_\_\_\_\_

**g. Spill point coordinates**

Measuring unit	
Northing: (m)  <u>57485.00</u>	Easting: (m)  <u>315878.00</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

i. Type of environment to which oil has spread:

- Land       Swamp       Water       River (identify) \_\_\_\_\_

ii. Weather condition

- Raining       Sunny

11. Distance from the nearest sensitive habitat

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

[ ,m] } NONE SEEN  
 [ ,m] }  
 [ ,m] } WITHIN VICINITY  
 [ ,m] }  
 [ ,m] }

12. Containment measures put in place;

- Booms       Trench       Dyke

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				

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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

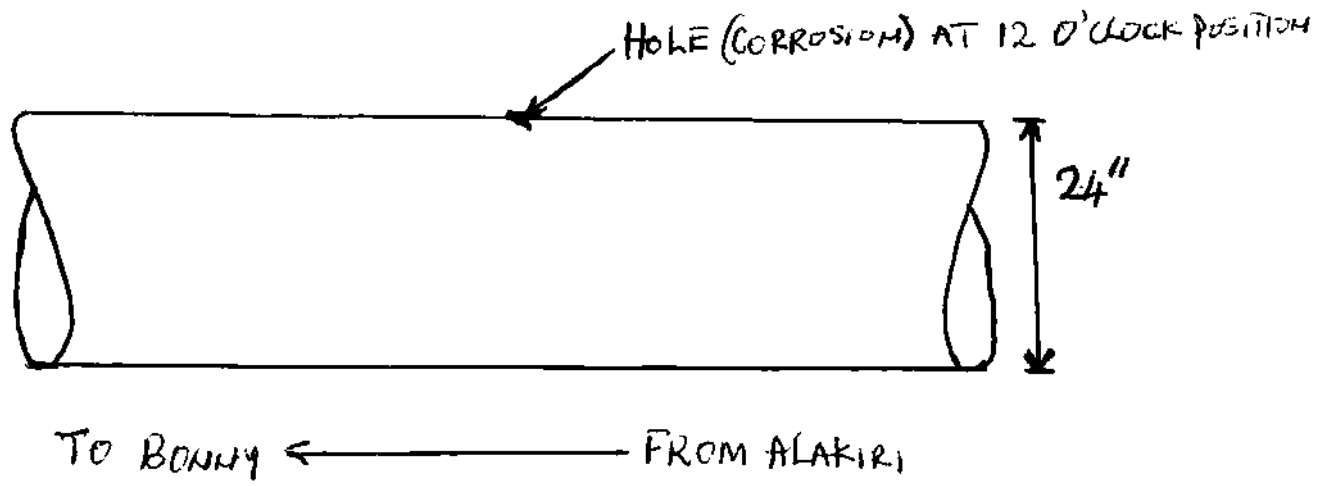
S/N	Fish/Nets/Ponds	Description	Quantity/Size	Comments
	NONE WITHIN AREA OF IMPACT			

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 SECTION OF 24" ALAKIRI - BONNY PIPELINE AT ILOMATORU  
SHOWING A HOLE AT 12 O'CLOCK POSITION



TO BONNY ← FROM ALAKIRI

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F: TABLE SHOWING SOME OF COORDINATES TAKEN DURING JIV FOR AREA CALCULATION

19. Impacted area boundary Coordinates (If more than 12 points, Attach as an appendix 2)

MUNA - MID BELT

S/N	Northing (m)	Easting (m)
471	57757.00	515239.00
472	57768.00	515243.00
473	57784.00	515256.00
474	57803.00	515250.00
475	57836.00	515251.00
479	57940.00	515396.00
480	57826.00	515549.00

G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact 2.77 Ha
- Impact within SPDC R.O.W YES
- Impact outside R.O.W YES

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

Recovered oil $V_{rec}$	<u>NIL</u>	barrels
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20. Computation of the residual volume on site

SEE ATTACHED NOTE FOR COMPUTATION

- a. Computation of volume of pool of free phase oil (on land or confined water body). OF SPILLED VOLUME
- Area ( $m^2$ ) occupied by pool of free phase oil NIL
  - Average Depth (m) of pool of free phase oil \_\_\_\_\_

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iii. Emulsification factor: NIL

iv. 

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

- i Area \*(m<sup>2</sup>) covered by the oil: \_\_\_\_\_
- ii Area of the pool of free phase oil in touch with soil: \_\_\_\_\_
- iii Average Depth (m) below ground surface of infiltration of oil: \_\_\_\_\_
- iv Soil type: \_\_\_\_\_
- v  $P_e$  (effective porosity of the soil): \_\_\_\_\_

iv. 

Volume of infiltrated oil. $V_{inf}$		barrels
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NOT APPLICABLE

21. Computation of volume of oil on open water based on standard coloration.

- i. Total area of oil on open water: \_\_\_\_\_
- ii. Table of average depth of oil on water based on coloration\*\*

	Thickness (mm)	Percentage coverage	Volume (m3)
Barely Visible	0.00004		
Silvery	0.00008		
Slight Color	0.00015		
Bright Color	0.0003		
Dull	0.001		
Dark	0.002		
Blackoil	0.1		
Emulsion (30% Oil)	1		
	Percent Total	100%	Total Volume <span style="float: right;">bb1</span>

NOT APPLICABLE

iii. 

Volume of oil on open water. $V_{wat}$ :		barrels
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22. Calculation of evaporated volume:

- i. Oil type: BONNY LIGHT
- ii. E-Factor: //

iii. 

Volume of evaporated oil. $V_{evap}$ :	<u>NOT APPLICABLE</u>	barrels
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Evaporation Factors (E-Factor) for SPDC Crude oil			
Oil Type	Days on site	Bonny Light	Bonny Medium
Period Since Oil Spill	< 1 day	10%	5%
	1-7 days	25%	15%
	> 7 days	40%	25%

\*If area is not same as the total area of impact, please indicate in the overview sketch  
 \*\* Spill Factor from USCG FOG (2000 Edition)

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**23. Gross Total Estimated Spilled Volume**

$$V_{Est}(bbls) = V_{evap}(bbls) + V_{wat}(bbls) + V_{inf}(bbls) + V_{pool}(bbls) + V_{rec}(bbls)$$

$V_{Est}(bbls) =$

**24. Net Total Estimated Spilled Volume**

$$V_{Est}(bbls) = V_{evap}(bbls) + 0.6 * V_{wat}(bbls) + V_{inf}(bbls) + V_{pool}(bbls) + V_{rec}(bbls)$$

$V_{Est}(bbls) =$  **SEE ATTACHED NOTE FOR VOLUME COMPUTATION**

\*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 Total volume VT (m3) x 6.29

\*Emulsification factor for spill on water to consider is 60% of volume of oil.

**25. 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

**26 REPRESENTATIVES**

This report was filled and signed on the 29/08/2013 at incident site 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]:

*Tick as applicable*

**Notes on the JIV to 24" Alakiri – Bonny Pipeline (disused GPHSL) at Ilomatoru****Date of the JIV:**29<sup>th</sup> August 2013

JIV team mobilized to site and JIV was successfully conducted.

**Cause of spill:**

- The JIV team observed and agreed that the cause of incident is Operational (Corrosion).

**Area of impact:**

- During the investigation, residual impact was observed on site in form of oil sheen on water and infiltration on swamp. The total area of impact is 2.77(HA).

**Volume spilled:**

As at the time of investigation, no free phase oil was observed despite the containment boom in place. Also, it was noted that the line is not in use. However, with the observed impact, it is assumed that due to tidal influence, all the spilled oil must have been dispersed. Due to the nature of the incident and the condition of the site, the preferred volume estimation method is based on the spilled volume equation:

$$V_s = A_o T C_o \sqrt{\frac{2(p - p_a)}{\rho_{liq}}} f$$

- The pressure differential  $\Delta p$  ( $p - p_a$ ) at spill point is assumed to be 100,000 N/ m<sup>2</sup> = 1bar.
- Bonny light is the crude in the line and the density ( $\rho_{liq}$ ) is 850 kg per m<sup>3</sup>
- Time (T) from the reported time of the oil leakage to time of the visit is 604800sec.
- Surface area of the hole ( $A_o$ ) on the line is taken to be 0.00011m<sup>2</sup> (as measured)
- Standard discharge coefficient ( $C_o$ ) is taken as 0.62
- The fraction ( $f$ ) of oil in the pipe during the incident (residual oil) is taken as 1% (disused pipeline)

Based on the above consideration and assumptions, total volume spilled is estimated to be 40.92 barrels, approximately 41 barrels.

**Therefore estimated spilled volume is 41 barrels.**

27. Appendix 1: Overview sketch of the site

