

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1282321 JIV report S/N: 00751

(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: 1282321 2. Type of incident* OIL SPILL
 3. Name of Location 28" NKPOKU - BOMU PIPELINE
 4. Name of nearest community NORKPO 5. State: RIVERS 6. LGA TAI
 7. Type of Production facility/Installation OIL PIPELINE 8. Asset owner/District PIPELINE

B. INCIDENT INFORMATION:

9. Details of incident

- a. Date of incident: 5TH NOVEMBER, 2014
 b. Start date/time of investigation: 6TH NOVEMBER, 2014/13:19 HOURS
 c. Investigation End date: 6TH NOVEMBER, 2014 Actual investigation duration, days: ONE (1) DAY
 d. Description of spill point environment

- | | | |
|---|--|---|
| <input type="checkbox"/> Firmed soil | <input checked="" type="checkbox"/> Loose soil | <input checked="" type="checkbox"/> Recently excavated area |
| <input type="checkbox"/> Under water | <input type="checkbox"/> Swampy | <input type="checkbox"/> Exposed pipe surface |
| <input type="checkbox"/> Well Platform (on Water) | | <input type="checkbox"/> Drill Rig |

Additional observations around the spill point: **A TRENCH, COMMENCING FROM A DITCH AROUND THE SPILL POINT AND TERMINATING AT AN OBSERVED PIT WITHIN THE SURROUNDING BUSH, WAS NOTICED BY THE JOINT INVESTIGATION TEAM ON ARRIVAL AT SITE; ALL EXCAVATIONS HAVING BEEN DUG BY UNKNOWN PERSONS. IMPACTED SOIL AT SPILL SITE IS REDDISH-BROWN SILT.**

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

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

f. Incident caused by:

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

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

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g. Spill point coordinates

Measuring unit	<u>MINNA MID BELT</u>	
Northing: (m)		Easting: (m)
	<u>81413.39</u>	<u>526951.70</u>

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 [2 ,m]
- Fish Farm/Pond [,m]
- Fishing net [,m]
- Others (specify).

12. Containment measures put in place;

- Booms Trench Dyke Natural depression Pit None
- Others: _____

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

14. Further response/repair initiated as at the time of JIV? [Y] [N]

If yes to item 14, give brief description:

RECOVERY OF FREE PHASE OIL WITHIN SPILL POINT DITCH WAS DONE TO ENABLE EXPOSURE OF SPILL POINT (BY EXCAVATION) AFTER WHICH REPAIRS (BY CLAMPING) WERE EFFECTED ON THE AFFECTED PIPELINE SECTION.

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

If yes to item 15 give brief description:

NOT APPLICABLE

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

16. Structures / Properties

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

17. Crops/Economic Trees

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

18. Fish/Nets/Ponds

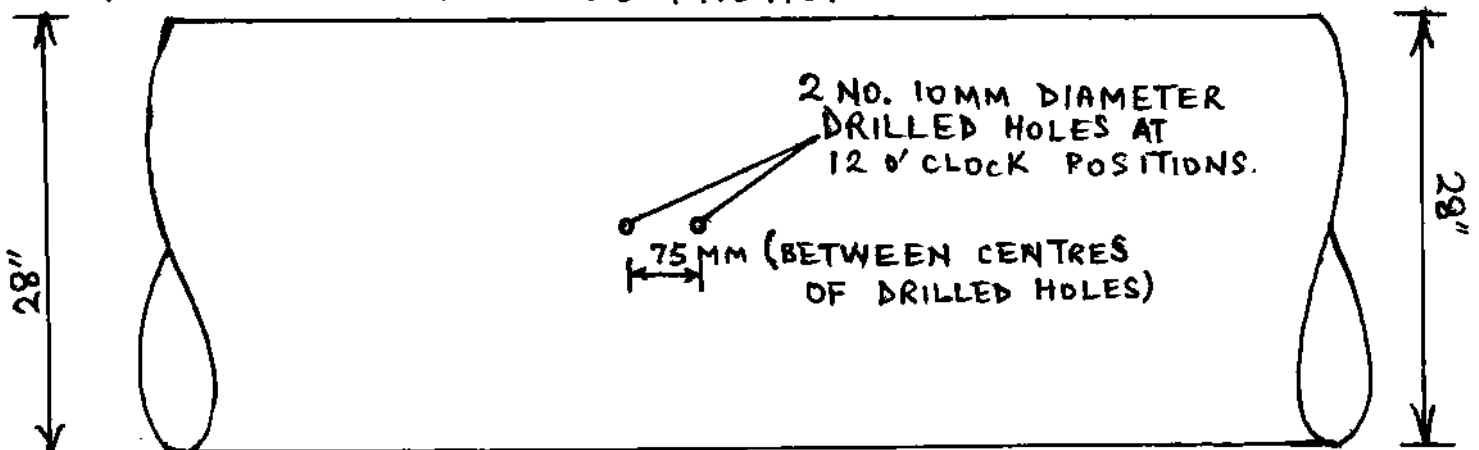
S/N	Fish/Nets/Ponds	Description	Quantity/Size	Comments
	NONE WITHIN AREA OF IMPACT			

19. 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 (SHOWING PLAN) OF 28" NKPOKU - BOMU PIPELINE AT NORKPO SHOWING 2 NO. DRILLED HOLES AT 12 O' CLOCK POSITIONS.



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

S/N	Northing	Easting

SEE ATTACHED COORDINATE LIST OF IMPACTED AREA

28"NKPOKU_BOMU TRUNK LINE AT NORKPO**INCIDENT NUMBER:1282321****MINNA_MID BELT****IMPACTED AREA COORDINATES**

POINT	NORTHING(m)	EASTING(m)
3	81419.54	526948.63
4	81419.53	526954.79
5	81416.45	526957.87
6	81391.92	526939.33
7	81385.75	526948.57
8	81370.34	526976.27
9	81367.28	526973.19
10	81373.46	526954.71
11	81373.46	526951.63
12	81382.72	526930.07
13	81370.44	526923.88
14	81370.45	526917.72
15	81367.39	526911.55
16	81364.31	526917.71
17	81364.33	526908.46
18	81370.48	526905.39
19	81373.53	526914.64
20	81373.51	526923.89
21	81376.59	526923.90
22	81385.79	526926.99
23	81388.88	526917.76
24	81401.22	526893.12
25	81413.54	526874.66
26	81441.30	526813.07
27	81472.14	526748.42
28	81478.32	526729.94
29	81490.63	526717.63
30	81502.91	526717.66
31	81496.75	526729.97
32	81499.82	526729.98
33	81530.65	526668.40
34	81530.65	526671.48
35	81533.70	526680.73
36	81530.62	526683.81
37	81524.48	526683.80
38	81490.57	526748.45
39	81490.58	526745.37
40	81493.99	526735.27
41	81496.74	526736.14
42	81422.75	526877.76
43	81428.89	526877.77
44	81428.88	526883.93
45	81422.73	526887.00
46	81419.64	526896.24
47	81413.50	526896.23

48	81410.40	526911.63
49	81401.14	526933.19
50	81401.12	526942.43
51	81416.48	526945.54
52	81427.71	526920.46
53	81428.81	526920.91
54	81488.00	526797.79
55	81457.66	526859.92
56	81487.40	526797.75
57	81518.12	526800.89
58	81518.63	526800.21
59	81475.45	526794.10
60	81475.12	526794.65
61	81552.14	526677.69
62	81555.21	526677.69
63	81561.35	526680.79
64	81558.27	526680.78
65	81567.48	526683.88
66	81573.64	526677.73
67	81573.64	526674.64
68	81563.22	526672.30
69	81552.22	526675.43

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G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact 0.44Ha
- 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>7</u>	Barrels
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Controlled recovery/evacuation from source with no impact to environment:

<u>NIL</u>	Barrels
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22. Net Estimated Spilled Volume V_{est} (bbbls)* =	<u>37.59</u>
Estimated Reported Volume** V_{rep} (bbbls) =	<u>38 BARRELS</u>

***Notes:**

- Volume estimation was done using an excel based tool. (see attached for details on the calculation)
- Reported spilled volume is an estimate

Write other relevant notes taken into consideration for estimating the spilled in the box below:

NOT APPLICABLE

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 m^3 to barrels is Volume (m^3) 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.

ESTIMATION OF OIL SPILL VOLUME

A OIL SPILLED ONSHORE/OFFSHORE (Leak stopped at source)

Impacted Area Details

Total Calculated Area of Impact

- i Impact within SPDC R.O.W
- ii Impact outside SPDC R.O.W

4,436.00	m ²
	m ²
	m ²

1 Volume of oil recovered before completion of JIV (V_{rec,1})

- i Estimated Recovered oil (Net)

7.00	bbls
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Estimated Recovered oil (Net) V_{rec,1}	7.00 bbls
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2 Computation of estimated residual volume on site

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

- i Total area occupied by pool of free phase oil
- ii Average depth of pool of free phase oil
- iii Emulsification factor (If applicable, else 0%)

120.00	m ²
0.023	m
0	%

Estimated Volume of pool of free phase oil, V_{pool}	2.76 m³
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Estimated Volume of pool of free phase oil, V_{pool}	17.36 bbls
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b Computation of estimated volume of infiltrated oil in the soil (V_{inf})

1 Volume of infiltrated oil at spill point (V_{inf,a})

- i Total area covered by the oil (infiltration)
- ii Average depth of infiltration above leaking facility i.e. pipeline/flowline
- iii Soil type
- iv P_e (effective porosity of the soil)

1.00	m ²
1.800	m
SWR	▼
21	%

- v Cause of spill

Third party interference	▼
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vi Calculation of days for infiltration below the leaking point on pipeline or flowline		
Incident Date	JIV Date	Days on Site
11/5/2014 12:30	11/6/2014 15:00	1
If 'cause of spill' is operational, use 1 week as worst case scenario except where 'days on site' exceeds 7.		7

Infiltration of oil types in various soil types vs time.			
Soil type	Approximate time to reach 1m depth below ground level		
Oil type	Sand	Loam	Clay
Bonny Medium	3 weeks	3 years	> 10 years
Bonny Light	2 days	2 months	> 10 years

- vii Oil type

Bonny Medium	▼
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- viii Average depth of infiltration below leaking facility i.e. pipeline/flowline

0.001	m
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- ix Total depth below ground surface of infiltration of oil

1.801	m
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Estimated Volume of infiltrated oil, V_{inf,a}	0.38 m³
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Estimated Volume of infiltrated oil, V_{inf,a}	2.38 bbls
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2 Volume of infiltrated oil at second spill point [if applicable] (V_{inf,b})

- i Total area covered by the oil (infiltration)
- ii Average depth of infiltration above leaking facility i.e. pipeline/flowline
- iii Soil type
- iv P_e (effective porosity of the soil)

	m ²
	m
- Select -	▼
0	%

- v Average depth of infiltration below leaking facility i.e. pipeline/flowline

0.000	m
-------	---

- vi Total depth below ground surface of infiltration of oil

0.000	m
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Estimated Volume of infiltrated oil, V_{inf,b}	0.00 m³
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Estimated Volume of infiltrated oil, V_{inf,b}	0.00 bbls
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3 Volume of infiltrated oil outside immediate spill point(s) region ($V_{inf,c}$)

i Total Area covered by the oil (infiltration) 4,316.00 m²

ii Total Area of the pool of free phase oil in touch with soil 2.00 m²

iii Soil type Silt

iv P_e (effective porosity of the soil) 21%

v Average depth below ground surface of infiltration of oil 0.001 m

Estimated Volume of infiltrated oil, $V_{inf,c}$ **0.83 m³**

Estimated Volume of infiltrated oil, $V_{inf,c}$ **5.21 bbls**

4 Volume of infiltrated oil outside immediate spill point(s) region (superficial impact, $V_{inf,d}$)

i Total Area covered by the oil (infiltration) m²

ii Total Area of the pool of free phase oil in touch with soil m²

iii Average depth below ground surface of infiltration of oil 0.000 m

Estimated Volume of infiltrated oil, $V_{inf,d}$ **0.00 m³**

Estimated Volume of infiltrated oil, $V_{inf,d}$ **0.00 bbls**

Estimated Total Volume of infiltrated oil, V_{inf} **1.21 m³**

Estimated Total Volume of infiltrated oil, V_{inf} **7.59 bbls**

c Computation of volume of oil on open water based on standard coloration

i Total area of oil on open water m²

ii Table of average depth of oil on water based on coloration

[Link to Coverage Visual Aid](#)

Spill Factors from USCG FOG (2000 Edition)

	Thickness (mm)	Percentage coverage (%)	Volume (m3)
Barely Visible	0.00004		0.0000
Silvery	0.00008		0.0000
Slight Color	0.00015		0.0000
Bright Color	0.0003		0.0000
Dull	0.001		0.0000
Dark	0.002		0.0000
Black oil	0.1		0.0000
Emulsion (30% Oil)	1		0.0000
Percent Total:		0%	0.0000

Estimated Volume of oil on open water, V_{wat} **0.00 m³**

Estimated Volume of oil on open water, V_{wat} **0.00 bbls**

3 Calculation of evaporated volume

Evaporation Factors (E-Factor) for SPDC Crude oil

Residence time of spilled oil (days on site)	Oil type	
	Bonny Light	Bonny Medium
< 1 day	10%	5%
1-7 days	25%	15%
> 7 days	40%	25%

i Was oil recovery before JIV completion done before JIV date? No

ii Estimated volume available for evaporation 31.95 bbls

iii E-factor 15%

Estimated Volume of evaporated oil, V_{evap} **5.64 bbls**

Net Total Estimated Spilled Volume, V_{Est} **37.59 bbls**

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23. GENERAL STATUS OF THE SITE

A. Joint investigation of the incident site found that there is no residual impact after the initial response and JIT 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"/>

24. REPRESENTATIVES

<p>This report was filled, agreed and signed by the following joint investigation representatives:</p> <ul style="list-style-type: none">• Host Community: <input checked="" type="checkbox"/>• Department of Petroleum Resources [DPR]: <input checked="" 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 checked="" type="checkbox"/> <p style="text-align: right;"><i>Tick as applicable</i></p>
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25. Appendix 1: Overview sketch of the site

