

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1315510 JIV report S/N: 00630

(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: 1315510 2. Type of incident* OIL SPILL
 3. Name of Location 4" YOKRI WELL - 114L FLOWLINE
 4. Name of nearest community YOKRI 5. State: DELTA 6. LGA BURUTU
 7. Type of Production facility/Installation FLOWLINE 8. Asset owner/District SWAMP WEST/YOKRI

B. INCIDENT INFORMATION:

9. Details of incident
 a. Date of incident: 7TH JANUARY, 2015
 b. Start date/time of investigation: 16TH JANUARY, 2015 AT 1500HRS
 c. Investigation End date: 17TH JANUARY, 2015 Actual investigation duration, days: 2 DAYS
 d. Description of spill point environment

- | | | |
|---|--|--|
| <input type="checkbox"/> Firmed soil | <input type="checkbox"/> Loose soil | <input type="checkbox"/> Recently excavated area |
| <input type="checkbox"/> Under water | <input checked="" 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: UPON EXCAVATION, THE JIT OBSERVED THAT THE 4" YOKRI WELL - 114L FLOWLINE WAS LEAKING AT 5 O'CLOCK POSITION. CAUSE OF LEAK WAS ESTABLISHED BY THE JOINT INVESTIGATION TEAM TO BE CORROSION (PIN-HOLE)

- c. Description of leak point (tick as applicable);
- | | | |
|---|---|--|
| <input 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 checked="" type="checkbox"/> Corrosion (PIN-HOLE) | <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"/> Cold vent |
| <input type="checkbox"/> Relief valve failure | <input type="checkbox"/> Others (specify) _____ | |

- 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>M</u>	<u>MINNA WEST BELT</u>	
Northing:		Easting:
<u>160718.48</u>		<u>311991.03</u>
<u>/</u>	<u>[Signature]</u>	<u>/</u>

C. RISK ASSESSMENT

10. Type of environment:

- Land Swamp (TIDA) 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 [0 , m]
 Fishing net [0 , m]
 Others (specify).

12. Containment measures put in place;

- Booms Trench Dyke Natural depression Pit None
 Others: _____

13. Any pictures or video coverage?

[N]

14. Further response/repair initiated as at the time of JIV?

[Y]

If yes to item 14, give brief description:

REPAIR IS BEING PLANNED BY ASSET

ENGINEERING

15. Was there any disruption to the investigation?

[Y]

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
1.	PALM TREES	6	14	—	20	
2.	MANGROVES	LOT	LOT	—	LOT	

18. Fish/Nets/Ponds

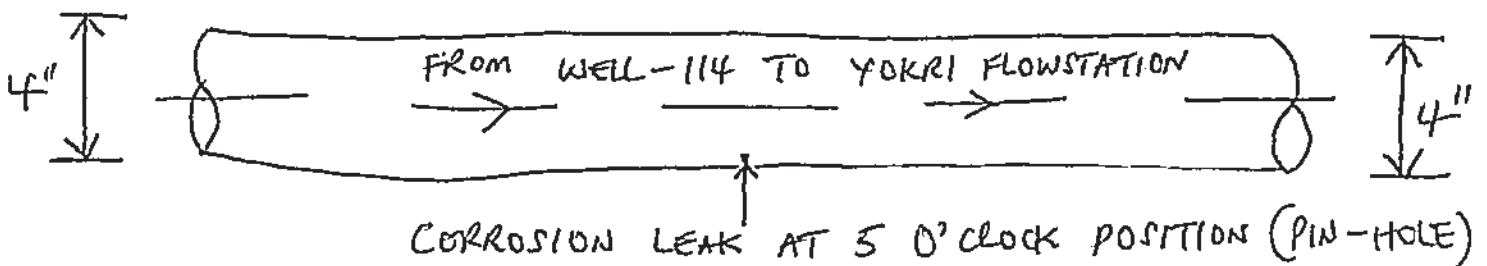
S/N	Fish/Nets/Ponds	Description	Quantity/Size	Comments
1.	FISH PONDS	CRUDE IMPACTED PONDS	2	CRUDE IMPACTED FISH PONDS
2.	FISH NETS	CRUDE IMPACTED NETS	8	CRUDE IMPACTED FISH NETS

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

S/N	Others	Description	Quantity/Size	Comments
1.	CROCODILE TRAP	OIL IMPACTED TRAPS	4	2 WITHIN ROW & 2 OUTSIDE
2.	CROCODILE NETS	CRUDE IMPACTED NET	1	CRUDE IMPACTED NET
3.	FISH HOOK	CRUDE IMPACTED HOOK	4	FOUND ALONG SPOC ROW

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 4" YOKRI WELL-114L FLOWLINE AT YOKRI, SHOWING LEAK DUE TO CORROSION AT 5 O'CLOCK POSITION (PIN-HOLE)



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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)

MINNA WEST-BELT

S/N	Northing METERS	Easting METERS
	160696.35	311978.13
	160766.45	312042.68
	160725.93	312057.50
	160683.44	311967.07
	160690.81	311961.52
	160746.12	311992.84
	160757.17	311983.60
	160749.77	311959.60
	160704.50	311929.51
	160744.71	312067.63
	160697.09	312110.23
	160671.16	312049.90
	160727.25	312089.06
	160771.65	312028.60
	160729.58	311998.65
	160728.62	311997.49
	160736.03	311987.12
	160736.87	311987.86
	160691.24	311971.88
	160690.40	311971.14
	160695.79	311963.52
	160696.75	311963.83
	160724.99	312029.12
	160696.15	312021.98
	160694.03	311994.99
	160733.19	311968.53

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

10,200.00	m ²
	m ²
	m ²

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

- i Estimated Recovered oil (Net)

0.00	bbbls
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Estimated Recovered oil (Net) V_{rec}		0.00	bbbls
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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%)

2,550.00	m ²
0.002	m
40	%

Estimated Volume of pool of free phase oil, V_{pool}		3.06	m³
Estimated Volume of pool of free phase oil, V_{pool}		19.25	bbbls

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)

	m ²
	m
- Select -	%
0	%

v Cause of spill

Operational

vi Calculation of days for infiltration below the leaking point on pipeline or flowline

Incident Date	JIV Date	Days on Site
1/7/2015 13:40	1/17/2015 14:45	10
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		
	Sand	Loam	Clay
Bonny Medium	3 weeks	3 years	> 10 years
Bonny Light	2 days	2 months	> 10 years

vii Oil type

Bonny Medium	
0.000	m

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

0.000	m
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ix Total depth below ground surface of infiltration of oil

0.00	m ³
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Estimated Volume of Infiltrated oil, V_{inf a}		0.00	m³
Estimated Volume of Infiltrated oil, V_{inf a}		0.00	bbbls

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
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vi Total depth below ground surface of infiltration of oil m

Estimated Volume of Infiltrated oil, $V_{inf b}$ m³

Estimated Volume of Infiltrated oil, $V_{inf b}$ bbls

3 Volume of Infiltrated oil outside Immediate spill point(s) region ($V_{inf c}$)

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 Soil type

iv P_e (effective porosity of the soil) %

v Average depth below ground surface of infiltration of oil m

Estimated Volume of Infiltrated oil, $V_{inf c}$ m³

Estimated Volume of Infiltrated oil, $V_{inf c}$ 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 m

Estimated Volume of Infiltrated oil, $V_{inf d}$ m³

Estimated Volume of Infiltrated oil, $V_{inf d}$ bbls

Estimated Total Volume of Infiltrated oil, V_{inf} m³

Estimated Total Volume of Infiltrated oil, V_{inf} bbls

c Computation of volume of oil on open water based on standard coloration m²

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	15%	0.0001
Slight Color	0.00015	10%	0.0001
Bright Color	0.0003	5%	0.0001
Dull	0.001		0.0000
Dark	0.002		0.0000
Black oil	0.1	45%	0.3443
Emulsion (30% Oil)	1	25%	0.5738
Percent Total:		100%	0.9183

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

Estimated Volume of oil on open water, V_{wat} 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?

ii Estimated volume available for evaporation

25.02 bbls

iii E-factor

25%

Estimated Volume of evaporated oil, V_{evap} 8.34 bbls

Net Total Estimated Spilled Volume, V_{Est} 33.36 bbls

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G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact 1.02 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} :	<u>NIL</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_{ES} (bbls) =	<u>33.36 BBLS</u>
Estimated Reported Volume** V_{rep} (bbls) =	<u>34 BBLS</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:

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 volume estimation; record the calculation in a plain sheet of paper and attach to the JIV report.

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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 type="checkbox"/>• National Oil Spill Detection and Response Agency [NOSDRA]: <input checked="" type="checkbox"/>• State Ministry of Environment [SME]: <input 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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25. Appendix 1: Overview sketch of the site

