

JOINT INVESTIGATION REPORT

INCIDENT NO: 2013465 JIV report S/N: 1003

(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: 2013465 2. Type of incident* OIL SPILL
3. Name of Location SOKU WELL 14 S FLOW LINE
4. Name of nearest community SOKU 5. State: RIVERS 6. LGA AKUKU-TORU
7. Type of Production facility/Installation OIL FLOW LINE
8. Asset owner/District THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED / SWAMP EAST HUB

B. INCIDENT INFORMATION:

9. Details of incident

- a. Date of incident: 2ND FEBRUARY, 2018
b. Start date/time of investigation: 7TH FEBRUARY, 2018 / 13:40 HOURS
c. Investigation End date: 7TH FEBRUARY 2018 Actual investigation duration, days: ONE (1) DAY
d. Description of spill point environment

- | | | |
|---|--|---|
| <input type="checkbox"/> Firm soil | <input checked="" type="checkbox"/> Loose soil | <input checked="" 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: AS AT THE TIME THE JOINT INVESTIGATION TEAM ARRIVED SITE, HIGH TIDE WAS OBSERVED. THE FLOW LINE SECTION AT THE SPILL POINT WAS THEN LIFTED ABOVE THE TIDE (WATER) LEVEL, IN THE PRESENCE OF THE JOINT INVESTIGATION TEAM, TO REVEAL EVIDENCE OF MISSING FLOW LINE LENGTH WHICH HAD BEEN CUT OFF BY UNKNOWN PERSON(S).

e. 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 checked="" type="checkbox"/> Missing Pipeline/Flowline |
| <input type="checkbox"/> Crude oil theft (illegal bunkering) point, | <input type="checkbox"/> Saver-pit over flow | <input type="checkbox"/> Third party tampering with Clamp |
| <input type="checkbox"/> Third party tampering with valve setting | <input type="checkbox"/> Bulging Outward | <input type="checkbox"/> Third party tampering with flange, |
| <input type="checkbox"/> Flare System/Bund wall failure | <input type="checkbox"/> Cold vent | <input type="checkbox"/> Surge vessel overflow, |
| <input type="checkbox"/> Valve Failure | <input type="checkbox"/> Relief valve failure | <input type="checkbox"/> Accidental 3 rd party equipment impact |
| <input type="checkbox"/> Corrosion | <input type="checkbox"/> Others(specify) _____ | |

f. Incident caused by:

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

*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

h. Measuring unit WGS 84

Northing:	Easting:
<u>4.648728</u>	<u>6.628603</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 [,m]
- Fish Farm/pond [,m]
- Fishing net [,m]
- Others (specify). MANGROVE VEGETATION 5 m

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:

NOT APPLICABLE

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

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If yes to item 15 give brief description:

NOT APPLICABLE

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. Fishing Nets/Fish Ponds

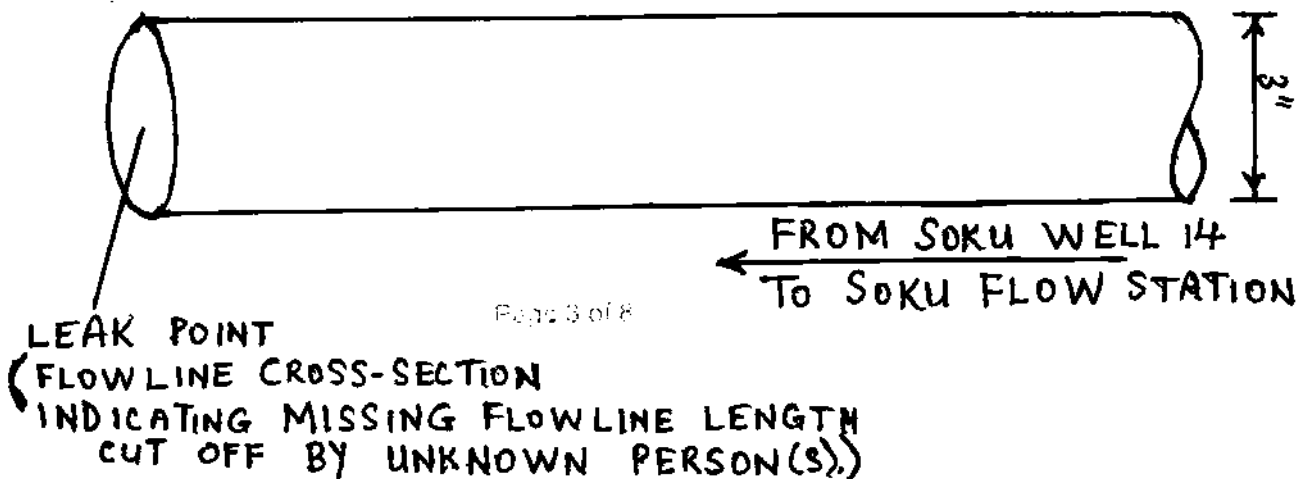
S/N	Nets/Ponds	Description	Quantity/Size	Comments
NONE WITHIN AREA OF IMPACT				

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 I)

SECTION OF SOKU WELL 14 S FLOW LINE
AT SOKU SHOWING EVIDENCE OF MISSING
FLOW LINE LENGTH



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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)

149584

S/N	Northing	Easting
	4.649134	6.627449
	4.650588	6.630243
	4.649498	6.630435
	4.648470	6.630245
	4.647972	6.629947
	4.647563	6.629728
	4.647153	6.629683
	4.647021	6.629647
	4.651089	6.629272
	4.651010	6.628988
	4.651351	6.628141
	4.651357	6.627677

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G. INCIDENT INFORMATION:

a. Impacted Area Details

- Total calculated area of impact 10.39 Ha
- Impact within R.O.W YES
- Impact outside R.O.W YES

b. 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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c. <u>Net Estimated Spilled Volume V_{Est}(bbls)* =</u>	<u>5.04</u>
<u>Estimated Reported Volume** V_{rep}(bbls) =</u> 6 BARRELS	

***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:

CONSIDERING THE TIDAL NATURE OF THE ENVIRONMENT (SPILL SITE) AND THE OBSERVED SPILL POINT, SPILLED VOLUME ESTIMATION WAS DONE USING EMPIRICAL FORMULA BASED ON PARAMETERS PROVIDED BY THE ASSET OWNER AND IN ADHERENCE TO THE SPDC "WORK INSTRUCTIONS FOR JOINT INVESTIGATION OF OIL SPILL INCIDENTS." SEE ATTACHED APPENDIX A.

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

APPENDIX A

METHODOLOGY FOR ESTIMATION OF SPILLED VOLUME USING

EMPIRICAL FORMULA: $V_s = Q(T_2 - T_1) + f A_p L$

THE PARAMETERS REQUIRED FOR ESTIMATING THE SPILLED VOLUME, V_s (IN M^3) ARE AS SHOWN BELOW:

L = LENGTH OF FLOWLINE THAT WILL SPILL ITS CONTENTS TAKEN INTO CONSIDERATION, THE FLOWLINE GRADIENT PROFILE AT THE LEAK POINT, WHICH EQUATES TO 123.83 M.

Q = OIL FLOW RATE IN THE FLOWLINE (IN M^3 /HOUR).

GIVEN A GROSS FLOW RATE OF 500 BARRELS/DAY, TAKING INTO COGNIZANCE, THE BASE SEDIMENT AND WATER (BSW) VALUE OF 5%, THE NET FLOW RATE IS COMPUTED AS

95% OF 500 = $0.95 \times 500 = 475$ BARRELS/DAY. TO CONVERT TO M^3 /HOUR, 475 BARRELS/DAY IS DIVIDED BY 6.29 AND THE RESULT IS IN TURN DIVIDED BY 24. THIS EQUATES TO $3.15 M^3$ /HOUR

T_1 = TIME AT WHICH THE LEAK OCCURRED = 20:00 HOURS ON 2ND FEBRUARY, 2018.

T_2 = TIME AT WHICH AUTOMATIC SHUT DOWN SYSTEM OF THE WELL WAS ACTIVATED = 20:05 HOURS ON 2ND FEBRUARY, 2018.

THUS, $T_2 - T_1 = 5$ MINUTES WHICH APPROXIMATES TO 0.09 HOUR.

f = FRACTION OF OIL IN FLOWLINE = 95% = 0.95

A_p = CROSS-SECTIONAL AREA OF THE FLOWLINE (OF 3" DIAMETER) = πR^2 WHERE R , RADIUS = 1.5" \approx 0.0375 M.

THUS $A_p = 3.142 \times 0.0375^2 = 0.0044 M^2$.

THEREFORE, V_s (IN M^3) = $3.15(0.09) + (0.95 \times 0.0044 \times 123.83)$
= $0.8 M^3$. CONVERTING TO BARRELS, $0.8 \times 6.29 = 5.04$ BARRELS

THIS VALUE IS ROUNDED OFF TO 6 BARRELS BASED ON THE ROUNDING RULES FOR SPILLED VOLUME ESTIMATES.

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d. General Status of the site

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

e. Representatives

This report was filled, agreed and signed by the following joint investigation team representatives:

- Host Community:
- Department of Petroleum Resources [DPR]:
- National Oil Spill Detection and Response Agency [NOSDRA]:
- State Ministry of Environment [SME]:
- Asset Owner:
- Signatories agree with reported findings:
- Separate DPR form has been filled out with same findings

NOSDRA WAS
INVITED BUT THE
NOMINATED REPRESENTATIVE
WAS UNABLE TO REACH
SITE AS AT THE TIME OF
JOINT INVESTIGATION VISIT.

Tick as applicable

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f. Appendix 1: Overview sketch of the site

