

JOINT INVESTIGATION REPORT

INCIDENT NO: 1547139 JIV report S/N: No. 0000126

(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: 1547139 2. Type of incident* OIL SPILL
3. Name of Location SOKU WELL 14 S WELL HEAD
4. Name of nearest community SOKU 5. State: RIVERS 6. LGA AKUKU-TORU
7. Type of Production facility/Installation WELL HEAD
8. Asset owner/District THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED/ SWAMP I

B. INCIDENT INFORMATION:

9. Details of incident

- a. Date of incident: 24TH DECEMBER, 2015
b. Start date/time of investigation: 30TH DECEMBER, 2015 / 16:02 HOURS
c. Investigation End date 30TH DECEMBER, 2015 Actual investigation duration, days: ONE (1) DAY
d. Description of spill point environment

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

Additional observations around the spill point: ON ARRIVAL AT SITE, THE JOINT INVESTIGATION TEAM OBSERVED NO RESIDUAL SPILL IMPACT ALTHOUGH OIL STAINS WERE NOTICED ON THE SOKU WELL 14 CHRISTMAS TREE. ON THE WELL 14 S ARM, THE SENSING LINE WAS OBSERVED CUT THROUGH BY UNKNOWN PERSON(S). ALSO, THE AVA CONTROL UNIT COVER WAS OBSERVED REMOVED FROM ITS ORIGINAL POSITION AND LEFT ON THE WELL PLATFORM 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 checked="" 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"/> 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"/> 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

h. Measuring unit

WGS 84

Northing: <u>LATITUDE</u> <u>4.65187</u>	Easting: <u>LONGITUDE</u> <u>6.62665</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 NO RESIDUAL [.m]
 Built up area SPILL IMPACT WAS [.m]
 Farmlands OBSERVED ON SITE AS [.m]
 Fish Farm/Pond AT TIME OF JOINT [.m]
 Fishing net INVESTIGATION VISIT [.m]
 Others (specify) _____ [.m]

12. Containment measures put in place;

- Booms
 Trench
 Dyke
 Natural depression
 Pit
 None

Others: NOT APPLICABLE (NO RESIDUAL SPILL IMPACT OBSERVED ON SITE).

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
NOT APPLICABLE					

17. Crops/Economic Trees

S/N	Type of crops	Young	Medium	Matured	Quantity	Comments
NOT APPLICABLE						

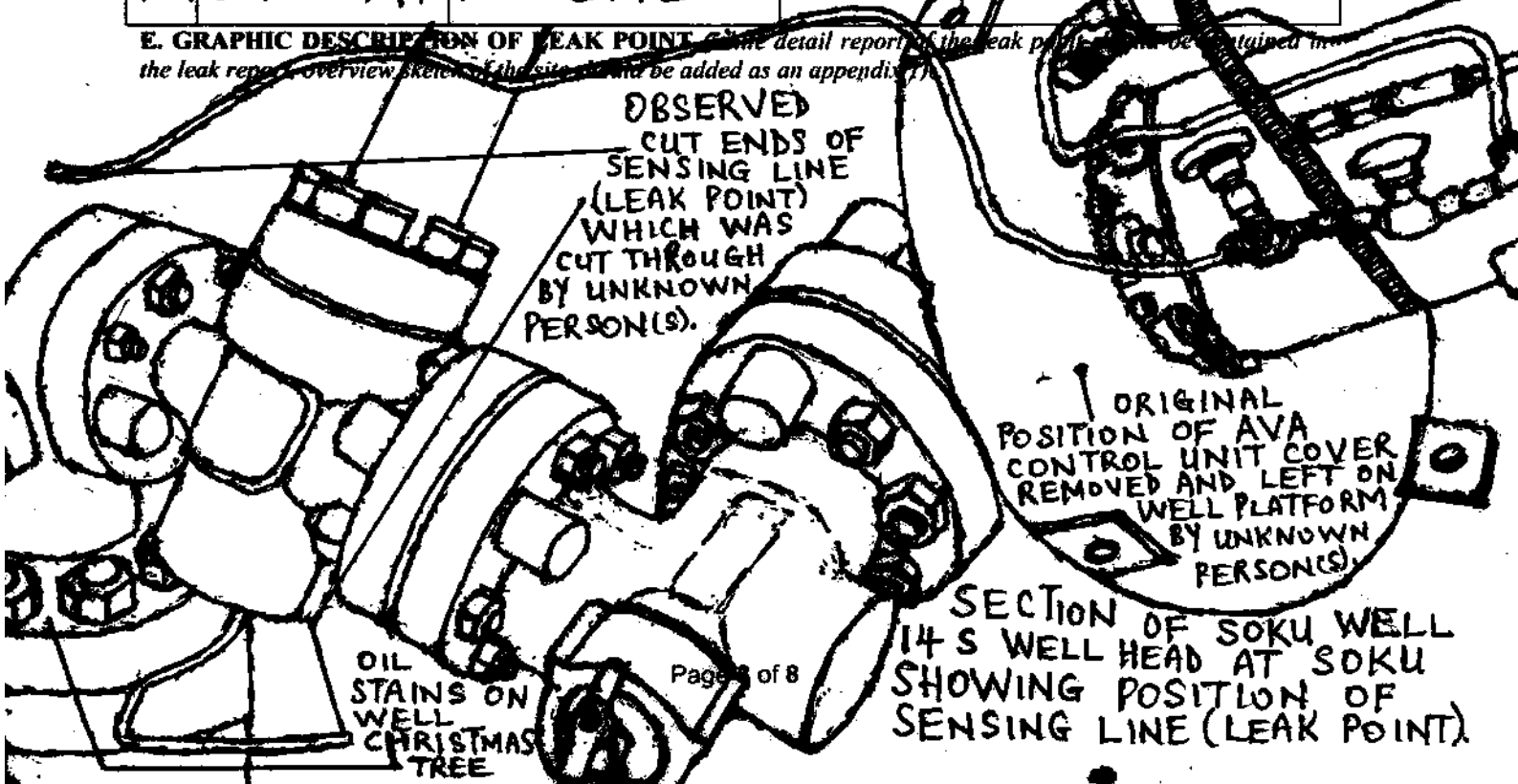
18. Fishing Nets/Fish Ponds

S/N	Nets/Ponds	Description	Quantity/Size	Comments
NOT APPLICABLE				

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

S/N	Others	Description	Quantity/Size	Comments
NOT APPLICABLE				

E. GRAPHIC DESCRIPTION OF LEAK POINT (The detail report of the leak point should be obtained in the leak report. Overview sketch of the site should be added as an appendix.)



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G. INCIDENT INFORMATION:

a. Impacted Area Details

- Total calculated area of impact NIL (NO RESIDUAL IMPACT OBSERVED AT THE TIME OF JIV)
- Impact within R.O.W NIL
- Impact outside R.O.W NIL

b. Volume of oil recovered before completion of JIV (V_{recd}):

Recovered oil V_{recd} :	<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. Net Estimated Spilled Volume V_{Est} (bbbl)* = 0.2

Estimated Reported Volume V_{rep} (bbbl) = 0.2 BARREL**

***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:

SINCE NO RESIDUAL SPILL IMPACT WAS OBSERVED ON SITE AS AT TIME OF JOINT INVESTIGATION VISIT, SPILLED VOLUME WAS ESTIMATED WITH THE AID OF CERTAIN PARAMETERS PROVIDED BY THE ASSET OWNER USING THE FORMULA EXPLAINED IN THE 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 m^3 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 = 15.1 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

ESTIMATION OF SPILLED VOLUME IS BASED ON THE FORMULA: $V_s = A_o T C_o \sqrt{\frac{2 \Delta P_o}{\rho}} f$ WHERE

V_s = ESTIMATED SPILLED VOLUME (IN M^3)

A_o = CROSS-SECTIONAL AREA OF THE SENSING LINE (LEAK POINT) COMPUTED AS FOLLOWS:

DIAMETER OF THE SENSING LINE IS $\frac{1}{4}$ INCH = $0.25 \times 0.0254 \text{ m} = 0.00635 \text{ m}$. THUS, RADIUS = $\frac{0.00635}{2} = 0.003175 \text{ m}$

AREA = $\pi \text{ RADIUS}^2 = \pi \times 0.003175^2 \approx 0.000031 \text{ m}^2$.

T = ESTIMATED LEAK DURATION COMPUTED AS FOLLOWS:

THE WELL AUTOMATIC SHUT DOWN SYSTEM IS DESIGNED TO ACTIVATE A TRIP-OFF IN SECONDS, HOWEVER, FOR ALLOWABLE TOLERANCE, A DURATION OF ONE (1) MINUTE IS USED. CONVERTING TO SECONDS, 1 MINUTE = 60 SECONDS.

C_o = DISCHARGE COEFFICIENT = 0.62

ΔP_o = PRESSURE DIFFERENTIAL (IN NEWTONS/ M^2) = PRESSURE INTERNALLY ACROSS THE LEAK POINT (P_{in}) - ATMOSPHERIC PRESSURE (P_{atm}).

P_{in} IS EQUIVALENT TO THE FLOWLINE PRESSURE (THAT IS, AFTER WELL TRIP-OFF) = 6 BARS = $(6 \times 100,000) \text{ N}/\text{m}^2 = 600,000 \text{ N}/\text{m}^2$. $P_{atm} = 1 \text{ BAR} = 100,000 \text{ N}/\text{m}^2$. THEREFORE, $\Delta P_o = 600,000 \text{ N}/\text{m}^2 - 100,000 \text{ N}/\text{m}^2 = 500,000 \text{ N}/\text{m}^2$.

ρ = OIL DENSITY IN KG/M^3 TAKEN AS $850 \text{ KG}/\text{M}^3$.

f = FRACTION OF OIL: GIVEN BSW (BASE SEDIMENT AND WATER) OF 17%, $f = 100\% - 17\% = 83\% = 0.83$

$V_s = 0.000031 \times 60 \times 0.62 \times \sqrt{\frac{2 \times 500,000}{850}} \times 0.83 \approx 0.03 \text{ m}^3$.

CONVERTING TO BARRELS, $0.03 \text{ m}^3 = (0.03 \times 6.29) \text{ BARRELS} = \underline{\underline{0.2 \text{ BARREL}}}$

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

e. Representatives

<p>This report was filled, agreed and signed by the following joint investigation team 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"/>• Asset Owner: <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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f. Appendix 1: Overview sketch of the site

