

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1189159 JIV report S/N: 0569

(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: 1189159 2. Type of incident* OIL SPILL
 3. Name of Location 12" BENISEDE - BRASS CREEK DELIVERY LINE
 4. Name of nearest community OJEBO 5. State: BAYELSA 6. LGA EKEREMOR
 7. Type of Production facility/Installation OIL PIPELINE 8. Asset owner/District PIPELINE

B. INCIDENT INFORMATION:

9. Details of incident
 a. Date of incident: 1ST JUNE, 2014
 b. Start date/time of investigation: 5TH JUNE, 2014 AT 1415 HRS
 c. Investigation End date: 5TH JUNE, 2014 Actual investigation duration, days: 1 DAY
 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: A 4" ILLEGAL HOT-TAP VALVE CONNECTED TO A GALVANIZED PIPE FITTING WAS OBSERVED WELDED ON THE 12" CRUDE OIL DELIVERY LINE AT 12 O'CLOCK POSITION.

- 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 checked="" type="checkbox"/> Failed Weld-on illegal hot tap valve, | <input type="checkbox"/> Failed Clamp | <input type="checkbox"/> Missing Pipeline/Flowline |
| <input checked="" 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>km</u> | | <u>Minna - West belt</u> | |
| Northing: | | Easting: | |
| <u>110513.34</u> | | <u>361002.50</u> | |
| <u>[Signature]</u> | | <u>[Signature]</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

- | | | | |
|--|---|-----|----------------------------|
| <input type="checkbox"/> Government reserved and designated protected area | [| ,m] | } NONE WITHIN THE VICINITY |
| <input type="checkbox"/> Drinking water source | [| ,m] | |
| <input type="checkbox"/> Built up area | [| ,m] | |
| <input type="checkbox"/> Farmlands | [| ,m] | |
| <input type="checkbox"/> Fish Farm/Pond | [| ,m] | |
| <input type="checkbox"/> Fishing net | [| ,m] | |
| <input type="checkbox"/> Others (specify). | [| ,m] | |

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? [N]

If yes to item 14, give brief description: BLIND FLANGING OF THE INCIDENT POINT COMMENCED IMMEDIATELY

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 |
|-----|----------------------------|-------|--------|---------|----------|----------|
| | NONE WITHIN AREA OF IMPACT | | | | | |

18. Fish/Nets/Ponds

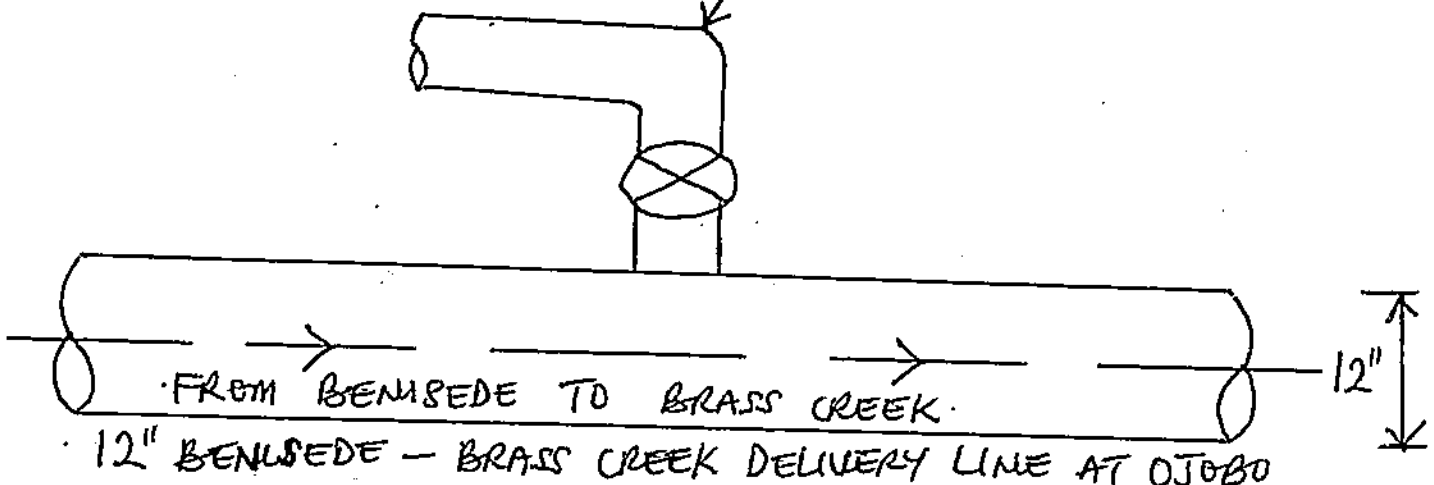
| S/N | Fish/Nets/Ponds | Description | Quantity/Size | Comments |
|-----|----------------------------|-------------|---------------|----------|
| | NONE WITHIN AREA OF IMPACT | | | |

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)

4" FAILED WELD - ON ILLEGAL HOT TAP VALVE WITH GALVANIZED PIPE FITTING AT 12 O'CLOCK POSITION.



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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 (m) | Easting (m) |
|-----|--------------|-------------|
| | 110528.70 | 361002.47 |
| | 110537.88 | 360987.05 |
| | 110519.44 | 360980.92 |
| | 110513.30 | 360980.93 |
| | 110516.44 | 361017.89 |
| | 110510.31 | 361027.14 |
| | | |
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CSA,
05/06/2014

ESTIMATION OF OIL SPILL VOLUME 12" BENISEDE - BRASS CREEK DELIVERY LINE AT OJOB0 - 1189159

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

Impacted Area Details

Total Calculated Area of Impact

| | |
|--------|----------------|
| 600.00 | m ² |
| | m ² |
| | m ² |

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

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

i Estimated Recovered oil (Net)

| | |
|------|------|
| 0.00 | bbls |
|------|------|

| | |
|---|------------------|
| Estimated Recovered oil (Net) V_{rec} | 0.00 bbls |
|---|------------------|

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

| | |
|--------|----------------|
| 420.00 | m ² |
|--------|----------------|

ii Average depth of pool of free phase oil

| | |
|-------|---|
| 0.010 | m |
|-------|---|

iii Emulsification factor (If applicable, else 0%)

| | |
|-------|---|
| 40.00 | % |
|-------|---|

| | |
|--|---------------------------|
| Estimated Volume of pool of free phase oil, V_{pool} | 2.52 m³ |
|--|---------------------------|

| | |
|--|-------------------|
| Estimated Volume of pool of free phase oil, V_{pool} | 15.85 bbls |
|--|-------------------|

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)

| | |
|-------|----------------|
| 15.00 | m ² |
|-------|----------------|

ii Average depth of infiltration above leaking facility i.e. pipeline/flowline

| | |
|-------|---|
| 0.500 | m |
|-------|---|

iii Soil type

| | |
|------|--|
| Clay | |
|------|--|

iv P_e (effective porosity of the soil)

| | |
|---|---|
| 8 | % |
|---|---|

v Cause of spill

| | |
|--------------------------|--|
| Third party interference | |
|--------------------------|--|

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

| Incident Date | JIV Date | Days on Site |
|--|----------------|--------------|
| 6/1/2014 14:00 | 6/5/2014 11:45 | 4 |
| 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 | |
|--------------|--|

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

| | |
|--------|---|
| 0.0011 | m |
|--------|---|

ix Total depth below ground surface of infiltration of oil

| | |
|--------|---|
| 0.5011 | m |
|--------|---|

| | |
|--|---------------------------|
| Estimated Volume of infiltrated oil, $V_{inf a}$ | 0.60 m³ |
|--|---------------------------|

| | |
|--|------------------|
| Estimated Volume of infiltrated oil, $V_{inf a}$ | 3.78 bbls |
|--|------------------|

2 Volume of infiltrated oil at second spill point (if applicable) ($V_{inf b}$)

i Total area covered by the oil (infiltration)

| | |
|--|----------------|
| | m ² |
|--|----------------|

ii Average depth of infiltration above leaking facility i.e. pipeline/flowline

| | |
|--|---|
| | m |
|--|---|

iii Soil type

| | |
|--------|--|
| Select | |
|--------|--|

iv P_e (effective porosity of the soil)

| | |
|---|---|
| 0 | % |
|---|---|

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

| | |
|--------|---|
| 0.0000 | m |
|--------|---|

vi Total depth below ground surface of infiltration of oil

| | |
|--------|---|
| 0.0000 | m |
|--------|---|

| | |
|--|---------------------------|
| Estimated Volume of infiltrated oil, $V_{inf b}$ | 0.00 m³ |
|--|---------------------------|

| | |
|--|------------------|
| Estimated Volume of infiltrated oil, $V_{inf b}$ | 0.00 bbls |
|--|------------------|

3 Volume of infiltrated oil outside immediate spill point(s) region ($V_{inf,c}$)

- i Total Area covered by the oil (infiltration) 165.00 m²
- ii Total Area of the pool of free phase oil in touch with soil 0.00 m²
- iii Soil type Clay
- iv P_e (effective porosity of the soil) 8%
- v Average depth below ground surface of infiltration of oil 0.0011 m

| | |
|--|---------------------|
| Estimated Volume of Infiltrated oil, $V_{inf,c}$ | 0.01 m ³ |
| Estimated Volume of Infiltrated oil, $V_{inf,c}$ | 0.09 bbls |
| Estimated Total Volume of Infiltrated oil, V_{inf} | 0.62 m ³ |
| Estimated Total Volume of Infiltrated oil, V_{inf} | 3.87 bbls |

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

- i Total area of oil on open water 0.00 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 (m ³) |
|--------------------|----------------|-------------------------|--------------------------|
| 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 m ³ |
| 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 19.72 bbls
- iii E-factor 15%

| | |
|---|-------------------|
| Estimated Volume of evaporated oil, V_{evap} | 3.48 bbls |
| Net Total Estimated Spilled Volume, V_{Est} | 23.20 bbls |

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G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact 0.06HA
- 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 |
|-----------------------------|------------|---------|

Controlled recovery/evacuation from source with no impact to environment:

| | |
|------------|---------|
| <u>NIL</u> | Barrels |
|------------|---------|

| | |
|--|-------------------|
| 22. Net Estimated Spilled Volume V_{Est} (bbls)* = | <u>23.20 BBLs</u> |
| Estimated Reported Volume** V_{Rep} (bbls) = | <u>24 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 column 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

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

- 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]:
- Signatories agree with reported findings:
- Separate DPR form has been filled out with same findings

Tick as applicable

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25. Appendix 1: Overview sketch of the site

