

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 0522 891286

(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: 891286 2. Type of incident * OIL SPILL
 3. Name of Location 28" NKPOKU - BOMU PIPELINE
 4. Name of nearest community G10 5. State: RIVERS 6. LGA TAI
 7. Type of Production facility/Installation OIL PIPELINE 8. Asset owner/ District UIG/PL/MSF

B. INCIDENT INFORMATION:

9. Details of incident

- a. Date of incident: 10TH NOVEMBER, 2012
 b. Start date/time of investigation: 11TH AND 12TH NOVEMBER, 2012
 c. Investigation End date: 12TH NOVEMBER, 2012

d. Description of spill point environment

- Firmed soil Loose soil Previously excavated area
 Under water Swampy Exposed pipe surface
 Well Platform (on Water) Rig

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

- Drilled hole Hack saw cut Explosive tear,
 Complete Rupture Inward dent, Well head tampering
 Failed Weld-on illegal hot tap valve, Missing Pipeline/Flowline)
 Crude oil theft (illegal) bunkering) point, Third party tampering with Clamp
 Third party tampering with valve setting, Third party tampering with flange,
 Corrosion Saver-pit over flow, Surge vessel overflow
 Outward dent Flare System/Bund wall failure
 Valve Failure com unit failure Cold vent
 Relief valve failure Others (specify) _____

f. Incident caused by:

- Third party interference Operational Mystery _____

g. Spill point coordinates

| Measuring unit (M) <u>MINNA MID-BELT</u> | |
|--|-----------|
| Northing: | Easting: |
| SP1: 77842.69 | 531028.49 |
| SP2: 77697.29 | 531210.35 |

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 0522 891286

C. RISK ASSESSMENT

10. Type of environment:

- Land Swamp Water Seasonal swamp

i. Type of environment to which oil has spread:

- Land Swamp Water River (identify) _____

ii. Weather condition

- Raining Sunny

11. Distance from the nearest sensitive habitat

- Government reserved and designated protected area [NIL ,m]
- Drinking water source [NIL ,m]
- Built up area [NIL ,m]
- Farmlands [< 1 ,m]
- Fish Farm/Pond [NIL ,m]
- Fishing net [NIL ,m]
- Others (specify).

12. Containment measures put in place;

- Booms Trench Dyke

Others: CONTAINMENT PITS

13. Any pictures or video coverage? [N]

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

If yes give brief description:

NOT APPLICABLE

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

15. Structures / Properties

| S/N | Type of Structures | Description | Size | Number | Comments |
|-----|-----------------------------------|-------------|------|--------|----------|
| | | | | | |
| | <u>NONE WITHIN AREA OF IMPACT</u> | | | | |
| | | | | | |
| | | | | | |

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 0522 891286

16. Crops/Economic Trees

| S/N | Type of crops | Young | Medium | Matured | Quantity | Comments |
|-----|---------------|-------|--------|---------|----------|----------|
| 1 | CASSAVA | — | ✓ | ✓ | MANY | IMPACTED |
| 2 | OKORO | — | ✓ | — | FEW | BY OIL |
| | | | | | | |

17. Fish/Nets/Ponds

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

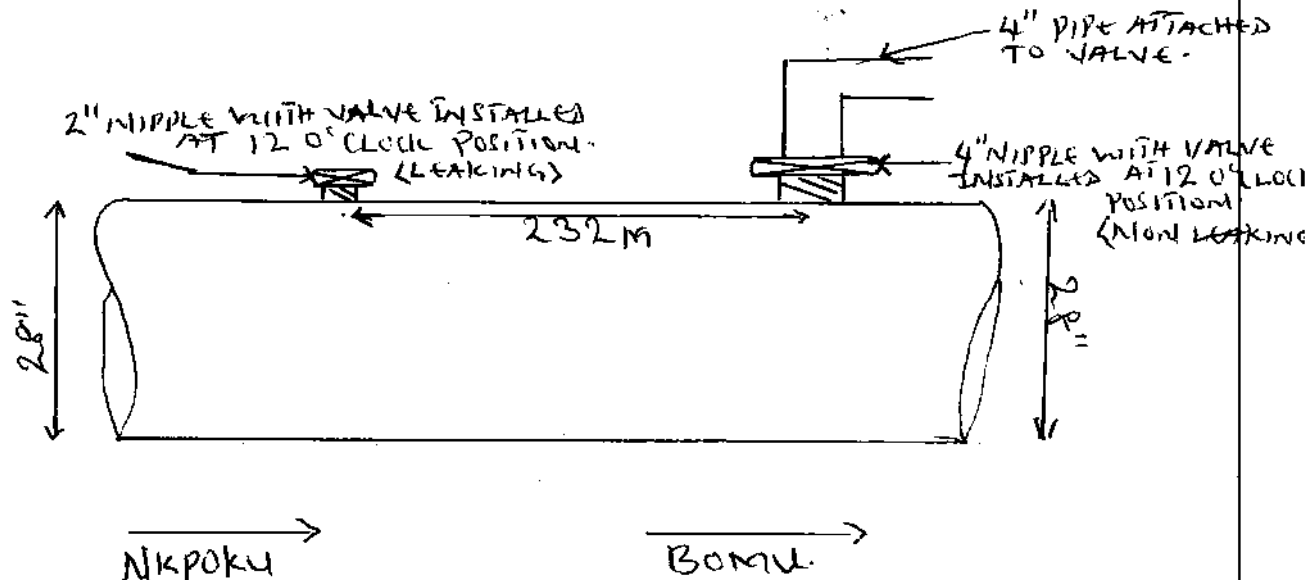
18. Others (Specify) i.e. Animal Traps

| 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)

A SECTION OF 28" NIKYOKU - BOMU PIPELINE AT G10 SHOWING

2 NOS ILLEGAL BUNKERING POINTS AT 12 O'CLOCK POSITIONS.



THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 0522 891288

F: TABLE SHOWING SOME OF COORDINATES TAKEN DURING JIV FOR AREA CALCULATION

19. Impacted area boundary Coordinates (If more than 12 points, Attach as an appendix 2)

MINNA MID-BELT

| S/N | Northing (m) | Easting (m) |
|-------|--------------------------|-------------|
| WP006 | 77 854.96 | 531 037.75 |
| WP007 | 77 854.95 | 531 047.00 |
| WP008 | 77 851.87 | 531 050.08 |
| WP009 | 77 8 ⁴⁵ 54.73 | 531 050.06 |
| WP010 | 77 845.73 | 531 050.06 |
| WP011 | 77 848.81 | 531 043.91 |
| WP012 | 77 842.68 | 531 037.73 |
| WP013 | 77 841.35 | 531 028.79 |
| WP014 | 77 885.80 | 530 973.09 |
| WP015 | 77 885.79 | 530 976.17 |
| WP016 | 77 876.54 | 530 997.73 |
| WP017 | 77 864.23 | 531 010.03 |
| WP018 | 77 851.90 | 531 031.58 |

G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact $0.0289 + 0.0643 + 0.0256 = 0.1188 \text{ Ha}$
- Impact within SPDC R.O.W YES
- Impact outside R.O.W YES

21. Volume of oil recovered before completion of JIV (V_{rec}):

| | | |
|-------------------------|----|---------|
| Recovered oil V_{rec} | 75 | barrels |
|-------------------------|----|---------|

20. Computation of the residual volume on site

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

- Area (m^2) occupied by pool of free phase oil 4m
- Average Depth (m) of pool of free phase oil 0.05

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 0522 891286

iii. Emulsification factor: NIL

iv.

| | | |
|--|----|---------|
| Volume of pool of free phase oil. V_{pool} : | 13 | barrels |
|--|----|---------|

b. Computation of volume of infiltrated oil in the soil (V_{inf}).

COMPUTATION OF INFILTRATED OIL
SPILL POINT 1
 AREA = 1 m²
 DEPTH = 1.2
 SOIL POROSITY = 8%
 $1 \times 1.2 \times 0.08 \times 6.29 = 0.6 \text{ BARREL}$
SPILL POINT 2

i. Area *(m²) covered by the oil: 1,185
 ii. Area of the pool of free phase oil in touch with soil: -
 iii. Average Depth (m) below ground surface of infiltration of oil: 0.008
 iv. Soil type: CLAY
 P_e (effective porosity of the soil): 8%
 INFILTRATED VOLUME OUTSIDE SPILL POINT = 4.8 BARREL

iv.

| | | |
|--------------------------------------|-----------------------|---------|
| Volume of infiltrated oil. V_{inf} | 0.6 + 1.5 + 4.8 = 6.9 | barrels |
|--------------------------------------|-----------------------|---------|

21. Computation of volume of oil on open water based on standard coloration.

AREA = 2 m²
 DEPTH = 1.5
 SOIL POROSITY = 8%
 $2 \times 1.5 \times 0.08 \times 6.29 = 1.5 \text{ BARRELS}$
 Barely Visible

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

| | Thickness (mm) | Percentage coverage | Volume (m3) |
|--------------------|----------------|---------------------|---|
| Barely Visible | 0.00004 | | |
| Silvery | 0.00008 | | |
| Slight Color | 0.00015 | | |
| Bright Color | 0.0003 | NOT APPLICABLE | |
| Dull | 0.001 | | |
| Dark | 0.002 | | |
| Black oil | 0.1 | | |
| Emulsion (30% Oil) | 1 | | |
| Percent Total | | 100% | Total Volume bbl |

iii.

| | | |
|--|-----|---------|
| Volume of oil on open water. V_{wat} : | NIL | barrels |
|--|-----|---------|

22. Calculation of evaporated volume:

i. Oil type: BONNY LIGHT

ii. E-Factor: 25%

iii.

| | | |
|--|------|---------|
| Volume of evaporated oil. V_{evap} : | 27.7 | barrels |
|--|------|---------|

| Evaporation Factors (E-Factor) for SPDC Crude oil | | | |
|---|--------------|-------------|--------------|
| Oil Type | Days on site | Bonny Light | Bonny Medium |
| Period Since Oil Spill | < 1 day | 10% | 5% |
| | 1-7 days | 25% ✓ | 15% |
| | > 7 days | 40% | 25% |

*If area is not same as the total area of impact, please indicate in the overview sketch
 ** Spill Factor from USCG FOG (2000 Edition)

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 0522 891286

23. Gross Total Estimated Spilled Volume

$$V_{Est}(bbls) = V_{evap}(bbls) + V_{wat}(bbls) + V_{inf}(bbls) + V_{pool}(bbls) + V_{recJ}(bbls)$$

$$V_{Est}(bbls) = 27.7 + NIL + 6.9 + 1.3 + 75 = 110.9 \text{ BARRELS}$$

24. Net Total Estimated Spilled Volume

$$V_{Est}(bbls) = V_{evap}(bbls) + 0.6 * V_{wat}(bbls) + V_{inf}(bbls) + V_{pool}(bbls) + V_{recJ}(bbls)$$

$$V_{Est}(bbls) = 27.7 + NIL + 6.9 + 1.3 + 75 = 110.9 \approx 111 \text{ BARRELS}$$

*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 Total volume VT (m3) x 6.29

*Emulsification factor for spill on water to consider is 60% of volume of oil.

25. GENERAL STATUS OF THE SITE

- A. Joint investigation of the incident site found that there is no residual impact after the initial response and therefore recommend that the site be closed out
- B. Investigation of the incident site showed that there is residual impact on site requiring further works

26 REPRESENTATIVES

This report was filled and signed on the 12/11/2012 at incident site by joint investigation representatives from

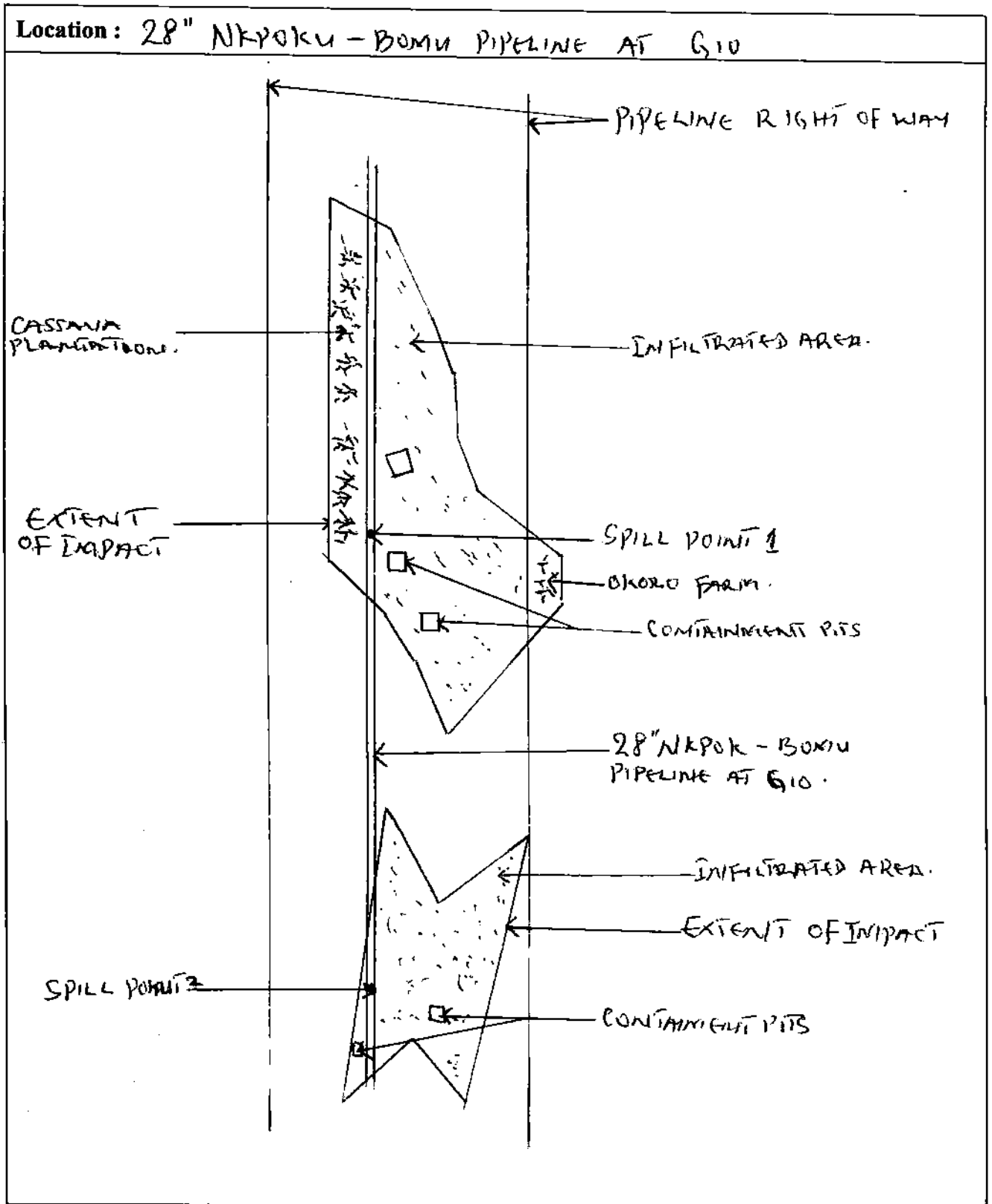
- Host Community
- Department of Petroleum Resources [DPR]:
- National Oil Spill Detection and Response Agency [NOSDRA]:
- State Ministry of Environment [SME]:
- Nigeria Police Force [NPF]:
- Shell Petroleum Development Company [SPDC]:

Tick as applicable

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JOINT INVESTIGATION REPORT FOR INCIDENT NO: 0522 891286

27. Appendix 1: Overview sketch of the site



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0522 891286

JOINT INVESTIGATION REPORT FOR INCIDENT NO: _____

21. Appendix 2: TABLE SHOWING ADDITIONAL COORDINATES TAKEN DURING JIV FOR AREA CALCULATION

MINNA MID-BELT

| S/N | Northing (m) | Easting (m) |
|-------|--|---|
| WP019 | 77 836.56 | 531 022.31 |
| WP020 | 77 836.57 | 531 016.15 |
| WP021 | 77 842.73 | 531 006.91 |
| WP022 | 77 855.06 | 530 985.36 |
| WP023 | 77 861.20 | 530 988.46 |
| WP024 | 77 858.10 | 531 000.78 |
| WP025 | 77 845.76 | 531 031.57 |
| WP026 | 77 845.77 | 531 028.49 |
| WP028 | 77 ^{7 19 50} 847.29 29 | 531 ^{07 01} 210.35 35 |
| WP029 | 77 704.12 | 531 222.39 |
| WP030 | 77 697.99 | 531 216.22 |
| WP031 | 77 688.78 | 531 213.12 |
| WP033 | 77 707.21 | 531 213.15 |
| WP034 | 77 713.38 | 531 197.75 |
| | | |
| | | |
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