



THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED
JOINT INVESTIGATION REPORT FOR INCIDENT NO: 689552

No. 00951

A. GENERAL INFORMATION:

1. Spill incident Number: 689552
2. Name of Location AWOBA WELL 5L FLOWLINE RISER
3. Name of nearest community BILLE
4. State RIVERS LGA DEGEMA
5. Type of Production facility/Installation FLOWLINE Asset owner /District NEST

B. INCIDENT INFORMATION:

6. Details of incident

- a. Date of incident 19TH JULY 2011
- b. Date/Period of investigation, 22ND JULY, 2011
- c. Description of spill point environment

- | | | |
|--|------|------|
| <input type="checkbox"/> Firmed soil | [Y] | [N]✓ |
| <input type="checkbox"/> Loose soil | [Y]✓ | [N] |
| <input type="checkbox"/> Previously excavated area | [Y] | [N]✓ |
| <input type="checkbox"/> Under water | [Y]✓ | [N] |
| <input type="checkbox"/> Swampy | [Y]✓ | [N] |
| <input type="checkbox"/> Exposed pipe surface | [Y]✓ | [N] |

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

- | | | |
|--|------|------|
| <input type="checkbox"/> Drilled hole, | [Y] | [N]✓ |
| <input type="checkbox"/> Hack saw cut, | [Y] | [N]✓ |
| <input type="checkbox"/> Explosive tear, | [Y] | [N]✓ |
| <input type="checkbox"/> Complete Rupture | [Y] | [N]✓ |
| <input type="checkbox"/> Inward dent, | [Y] | [N]✓ |
| <input type="checkbox"/> Well head tampering | [Y] | [N]✓ |
| <input type="checkbox"/> Failed Weld-on illegal hot tap valve, | [Y] | [N]✓ |
| <input type="checkbox"/> Missing pipeline (flowline) | [Y] | [N]✓ |
| <input type="checkbox"/> Crude oil theft (illegal bunkering) point, | [Y] | [N]✓ |
| <input type="checkbox"/> Third party tampering with Clamp Bolt/Nut, | [Y] | [N]✓ |
| <input type="checkbox"/> Third party tampering with valve setting, | [Y] | [N]✓ |
| <input type="checkbox"/> Third party tampering with flange Nuts/bolts, | [Y] | [N]✓ |
| <input type="checkbox"/> Corrosion, | [Y]✓ | [N] |
| Type: <u>EXTERNAL CORROSION</u> | | |
| <input type="checkbox"/> Saver-pit over flow, | [Y] | [N]✓ |
| <input type="checkbox"/> Surge vessel overflow, | [Y] | [N]✓ |
| <input type="checkbox"/> Outward dent | [Y] | [N]✓ |
| <input type="checkbox"/> Others (specify) <u>NOT APPLICABLE</u> | | |

AFTER JOINT
INVESTIGATION
OF THE INCIDENT,
SPILL WAS FOUND
TO BE DUE TO
EQUIPMENT
FAILURE.

e. Spill point coordinates (MINNA GRID - BET)

Northings:

58240.61m

Easting:

484901.53m



OF NIGERIA L
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☐ Land
☒ Swamp
☒ water

☐ Land

☐ Swamp ✓

☐ water ✓

- ☐ Government reserved and designated protected area
- ☐ Drinking water source
- ☐ Built up area
- ☐ Farmlands
- ☐ Fish Farm/Pond
- ☐ Fishing net
- ☐ Others (specify).

[,m]
[,m]
[,m]
[,m]
[,m]
[,m]
[,m]

} NOT APPLICABLE

| | | | |
|---------------------------------|-------|-------|-------------------------------------|
| <input type="checkbox"/> Booms | [Y] | [N] | <input checked="" type="checkbox"/> |
| <input type="checkbox"/> Trench | [Y] | [N] | <input checked="" type="checkbox"/> |
| <input type="checkbox"/> Dyke | [Y] | [N] | <input checked="" type="checkbox"/> |

☐ Others: NOT APPLICABLE.

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

NOT APPLICABLE

A. Structures / Properties

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



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B. Crops/Economic Trees

| S/N | Types of crops | Young | Medium | Matured | Quantity | Comments |
|-----|----------------|--------|--------|---------|----------|----------|
| | NONE | WITHIN | AREA | OF | IMPACT | |

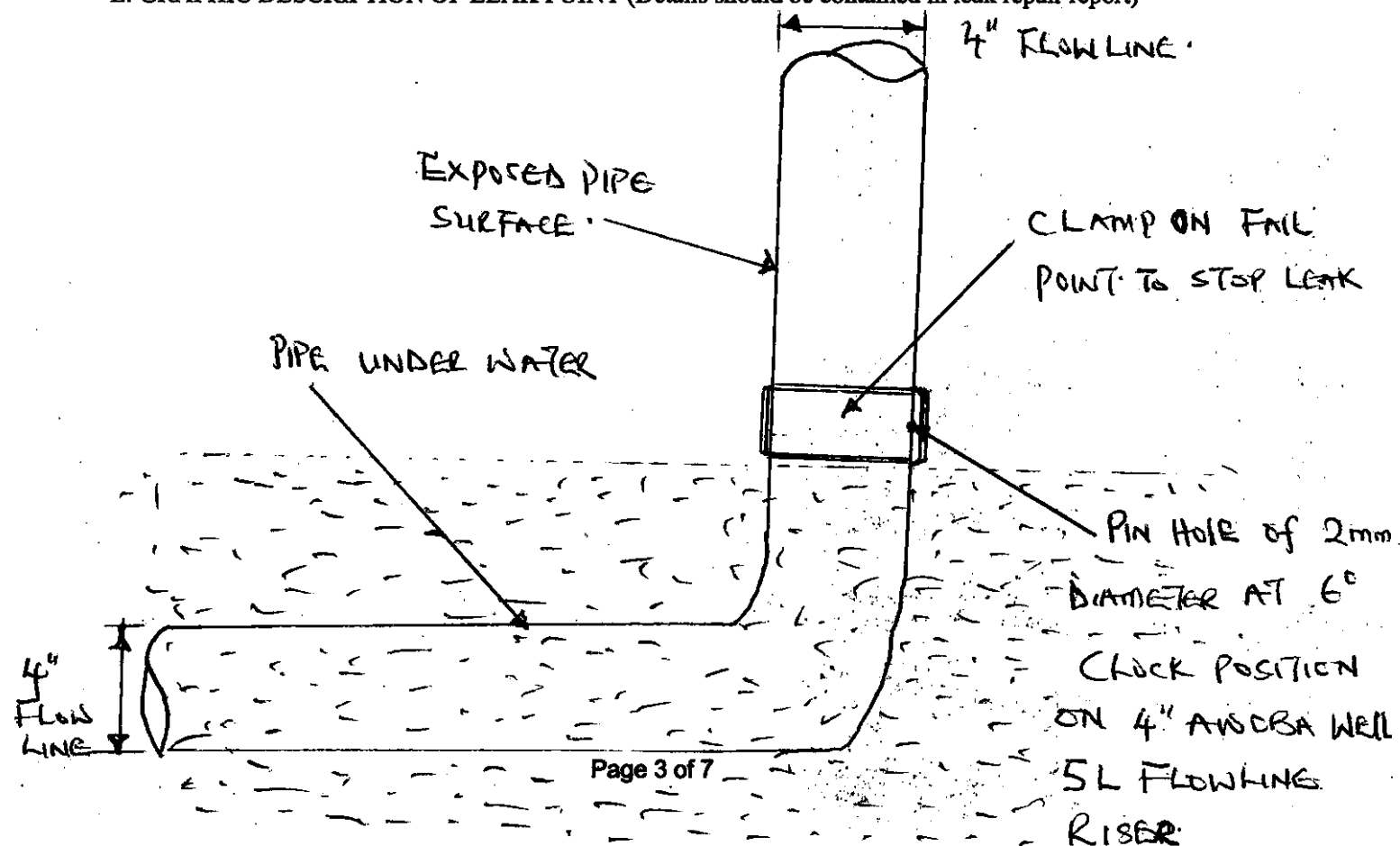
C. Fish/Nets/Ponds

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

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

| S/N | Others | Description | Quantity/Size | Comments |
|-----|--------|-------------|---------------|-----------|
| | NONE | WITHIN | AREA | OF IMPACT |

E. GRAPHIC DESCRIPTION OF LEAK POINT (Details should be contained in leak repair report)





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

E. Coordinates (MINNA MID-BEIT)

| S/N | Northing meter. | Easting meter |
|-----|-----------------|---------------|
| 419 | 58584.98 | 484785.16 |
| 420 | 58357.62 | 484790.80 |
| 421 | 58256.17 | 484818.32 |
| 422 | 58271.09 | 484829.36 |
| 423 | 58271.09 | 484902.13 |
| 424 | 58266.07 | 484922.21 |
| 425 | 58244.24 | 484920.95 |
| 426 | 58241.73 | 484932.25 |
| 427 | 58232.95 | 484922.21 |
| 428 | 58221.01 | 484922.27 |
| 429 | 58214.63 | 484902.00 |
| 430 | 58210.86 | 484830.62 |
| 431 | 58195.81 | 484816.82 |
| 432 | 58190.79 | 484785.45 |
| 433 | 58670.82 | 484760.36 |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |



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G. INCIDENT INFORMATION:

17 Impacted Area Details

- a. Total calculated area of impact 1.56 Ha
- Impact within SPDC R.O.W 1.56 Ha
 - Impact outside R.O.W NIL

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

| | | |
|----------------------------|-----|---------|
| Recovered oil V_{recj} : | NIL | barrels |
|----------------------------|-----|---------|

19. Computation of the residual volume on site

- a. Computation of the volume of pooled free phase oil (on land or confined water body). $= 4500 \text{ PC} = 2.1$
- i. Area (m^2) occupied by pool of free phase oil SIZE OF PIPE = 4" = 101.66 mm
- ii. Average Depth (m) of pool of free phase oil LEAK POINT = PIN HOLE = 2 mm
- iii. LEAK TIME = 45 mins

| | |
|--|---------|
| Volume of pooled of free phase oil, V_{pool} : | barrels |
|--|---------|

- b. Computation of volume of infiltrated oil in the soil (V-3).

- i Area (m^2) covered by the oil: -----
- ii Average Depth (m) below ground surface of infiltration of oil: -----
- iii Soil type: CLAY ALLOWABLE LEAK
- iv p_e (effective porosity of the soil): 8% THROUGH PIN HOLE
- v = 84.31 BBL

| | |
|-------------------------------------|---------|
| Volume of infiltrated oil, V_{in} | barrels |
|-------------------------------------|---------|

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

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

Spill Factors from USCG FOG (2000 Edition)

EVAPORATED GAS OF 20%
 $= 2.63 \times 0.10$
 $= 0.26 \text{ BBLs}$



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Volume of oil on open water V_{wat} :

NIL

barrels

21. Calculation of evaporated volume:

- i. Oil type: BONNY LIGHT
- ii. E-Factor: 25%
- iii.

Volume of evaporated oil V_{ev} :

0.26

barrels

| Oil Type | | Bonny Light | Bonny Medium |
|------------------------|----------|-------------|--------------|
| | | E-Factor | E-Factor |
| Period Since Oil Spill | <1 day | 10% | 5% |
| | 1-7 days | 25% | 15% |
| | >7 days | 40% | 25% |

9. Gross Total Estimated Spilled Volume $V_{Est}(bbls) = V_{vap}(bbls) + V_{wat}(bbls) + V_{inf}(bbls) + V_{pool}(bbls) + V_{recJ}(bbls)$

$V_{Est}(bbls) =$ 2.63 BARRELS

10. Net Total Estimated Spilled Volume $V_{Est}(bbls) = V_{vap}(bbls) + 0.6 * V_{wat}(bbls) + V_{inf}(bbls) + V_{pool}(bbls) + V_{recJ}(bbls)$

$V_{Est}(bbls) =$ 2.63 BARRELS \approx 2.6 BARRELS

*Calculation of the respective estimated volume is to done using the new spill estimation software on site

*Conversion of m3 to barrel is Total volume VT (m3) x6.29

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

This report was filled and signed on the 22 / 07 / 20 11 at incident site by joint investigation representative 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