

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1291463 JIV report S/N: 00787

(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: 1291463 2. Type of incident* OIL SPILL
 3. Name of Location 24" BOMU - BONNY PIPELINE
 4. Name of nearest community OKOLO LAURET State: RIVERS 6. LGA BONNY
 7. Type of Production facility/Installation OIL PIPELINES Asset owner/District PIPELINE

B. INCIDENT INFORMATION:

9. Details of incident
 a. Date of incident: 22ND NOVEMBER, 2014
 b. Start date/time of investigation: 25TH NOVEMBER, 2014 / 14:15 PM.
 c. Investigation End date: 27TH AND 28TH NOVEMBER 2014 Actual investigation duration, days: 3 DAYS
 d. Description of spill point environment

- | | | |
|---|--|---|
| <input type="checkbox"/> Firmed 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: A BUND WALL WAS OBSERVED TO HAVE BEEN BUILT AROUND THE SPILL POINT. SECTION OF THE PIPELINE CONCRETE COATING AROUND THE FT POINTS WAS NOTICED TO HAVE BEEN REMOVED BY UNKNOWN PERSON. PLANKS AND FAILED ILLEGAL BUNKERING FITTING WAS ALSO OBSERVED AT SPILL POINT.

- 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

MINNA (MID BELT)

Measuring unit	Northings: (m)	Easting: (m)
Point 1 (LEAKING)	<u>55767.06</u>	<u>528957.87</u>
Point 2 (NON LEAKING)	<u>55767.05</u>	<u>528960.95</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) CREEKS BONNY

ii. Weather condition

- Rain
 Sunny
 Dry
 Wet
 Windy
 Hot
 cool

11. Distance from the nearest sensitive habitat

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

12. Containment measures put in place;

- Booms
 Trench
 Dyke
 Natural depression
 Pit
 None
 Others: BARRIERS

13. Any pictures or video coverage? NY [N]

14. Further response/repair initiated as at the time of JIV? [Y] [N]

If yes to item 14, give brief description:

RECOVERY ACTIVITIES ON GOING.
REPAIR WORK WAS DONE BY CLAMPING.

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

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
	COMMUNITIES	LANDING		MORE THAN	IMPACTED BY
	CONCRETE AND	JETTY		TEN	SPILL.
	WOODEN JETTY				
	FISHING BOATS AND	CRADLES	VARIOUS SIZE	MANY	IMPACTED BY SPILL.

17. Crops/Economic Trees

S/N	Type of crops	Young	Medium	Matured	Quantity	Comments
1	PALM TREE	—	✓	✓	FEW	ALL IMPACTED BY SPILL.
2	BREAD FRUIT TREE	—	✓	✓	FEW	
3	MAT PALM TREE	✓	✓	✓	MANY	
4	COCOA TREE	—	✓	✓	FEW	
5	CASHEW	—	✓	—	TWO	

18. Fish/Nets/Ponds

S/N	Fish/Nets/Ponds	Description	Quantity/Size	Comments
1	FISH NETS	VARIOUS TYPES	VARIOUS SIZE	THEY ARE IMPACTED
2	FISH FENCE	VARIOUS TYPES	VARIOUS SIZE	BY SPILL
3	FISH TRAPS	VARIOUS TYPES	VARIOUS SIZE	

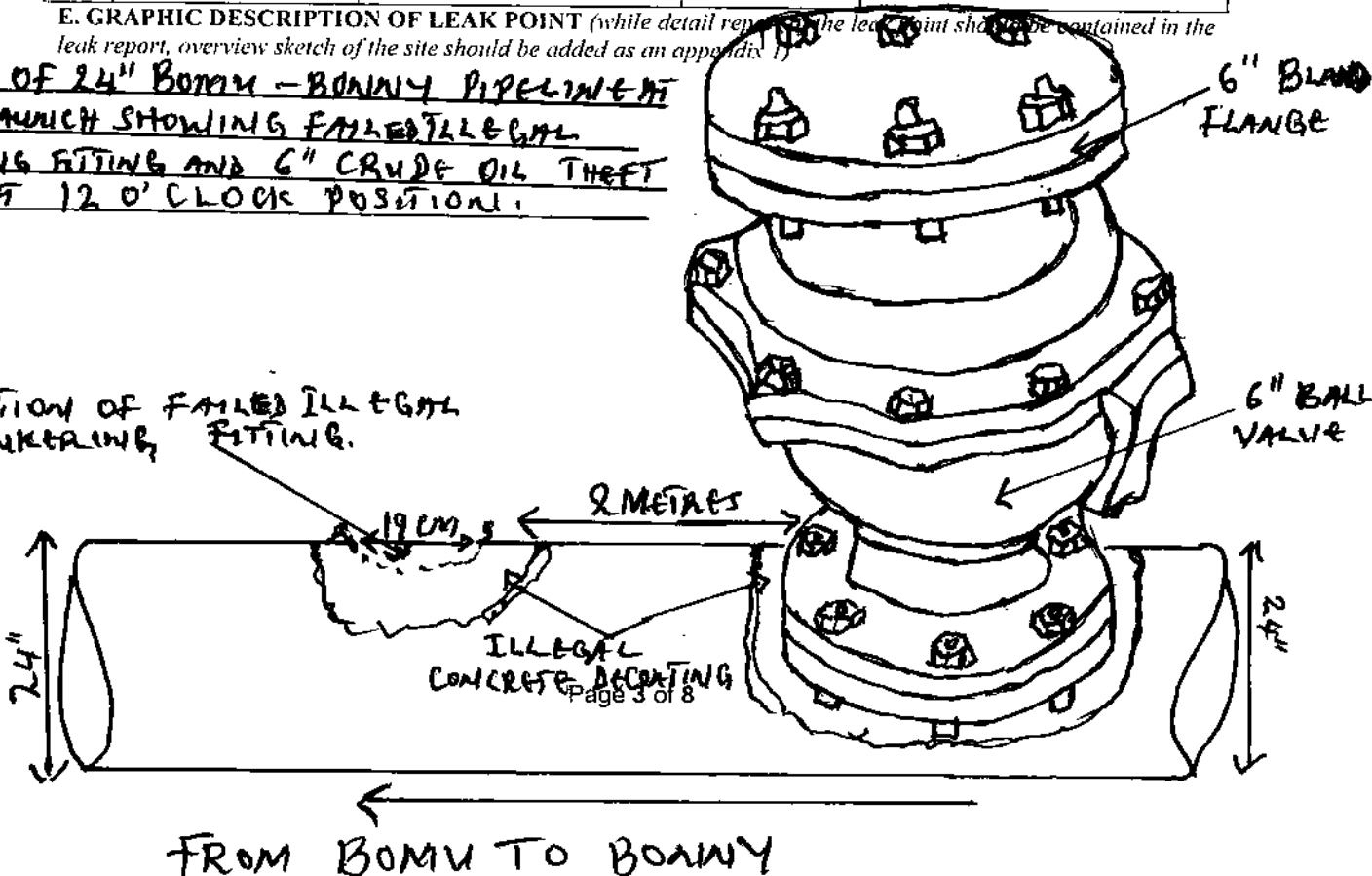
19. Others (Specify) i.e. Animal Traps

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

E. GRAPHIC DESCRIPTION OF LEAK POINT (while detail report the leak point should be contained in the leak report, overview sketch of the site should be added as an appendix 1)

SECTION OF 24" BOTTOM - BONNY PIPELINE AT OKOLO LAUNCH SHOWING FAILED ILL & GML BUNKERING FITTING AND 6" CRUDE OIL THEFT POINT AT 12 O' CLOCK POSITION.

POSITION OF FAILED ILL & GML BUNKERING FITTING.



ILLEGAL CONCRETE DECORATING

← FROM BOMU TO BONNY

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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 (MID BELT)

S/N	Northing (m)	Easting (m)
See Attached		
XXXXXXXXXX		
28/4/2014		

NUMBER	LAT	LONG	NORTH	EAST
1	4°30'28.598"N	7°14'16.464"E	56200.34	530582.11
2	4°30'24.606"N	7°14'06.785"E	56078.23	530283.52
3	4°30'39.006"N	7°14'05.318"E	56520.62	530239.07
4	4°31'10.027"N	7°14'12.023"E	57473.12	530447.43
5	4°31'35.025"N	7°14'03.071"E	58241.47	530172.79
6	4°31'50.121"N	7°14'05.928"E	58705.02	530261.69
7	4°31'49.837"N	7°14'20.915"E	58695.50	530723.66
8	4°32'04.515"N	7°14'21.164"E	59146.35	530732.12
9	4°33'03.924"N	7°14'06.468"E	60971.98	530282.33
10	4°33'31.499"N	7°14'12.600"E	61818.64	530472.83
11	4°33'31.526"N	7°14'28.222"E	61818.64	530954.37
12	4°32'35.028"N	7°14'32.784"E	60082.97	531091.96
13	4°32'26.778"N	7°14'43.270"E	59828.97	531414.75
14	4°31'45.056"N	7°14'50.295"E	58547.06	531629.06
15	4°29'50.831"N	7°16'01.429"E	55034.71	533815.85
16	4°29'40.201"N	7°16'56.936"E	54705.31	535526.38
17	4°30'07.373"N	7°18'37.698"E	55534.78	538633.92
18	4°30'47.277"N	7°19'43.423"E	56757.15	540661.96
19	4°30'36.098"N	7°20'22.066"E	56411.87	541852.58
20	4°28'29.487"N	7°19'10.815"E	52526.46	539649.92
21	4°28'41.571"N	7°18'33.203"E	52899.52	538491.05
22	4°27'57.203"N	7°18'02.764"E	51538.24	537550.45
23	4°28'34.307"N	7°16'58.204"E	52681.24	535562.10
24	4°29'00.268"N	7°16'51.852"E	53478.96	535367.63
25	4°28'31.087"N	7°15'47.145"E	52585.99	533371.35
26	4°28'54.832"N	7°15'30.111"E	53316.24	532847.47
27	4°29'10.668"N	7°15'22.531"E	53803.08	532614.64
28	4°29'10.095"N	7°14'49.746"E	53787.20	531603.93
29	4°29'18.881"N	7°14'49.903"E	54057.08	531609.22
30	4°29'17.237"N	7°15'35.909"E	54004.16	533027.39
31	4°28'41.598"N	7°15'48.672"E	52908.78	533418.97
32	4°29'11.158"N	7°16'48.358"E	53813.66	535260.48
33	4°29'02.229"N	7°17'06.054"E	53538.49	535805.52
34	4°28'11.834"N	7°17'55.573"E	51988.03	537329.52
35	4°28'54.956"N	7°18'27.259"E	53310.95	538308.48
36	4°28'46.415"N	7°19'12.075"E	53046.37	539689.61
37	4°29'47.107"N	7°19'42.705"E	54909.04	540636.82
38	4°29'59.072"N	7°18'44.835"E	55279.45	538853.53
39	4°29'33.202"N	7°16'18.110"E	54492.32	534329.14
40	4°30'04.136"N	7°15'34.285"E	55444.82	532979.76
41	4°30'50.823"N	7°15'09.529"E	56880.19	532219.09
42	4°30'46.022"N	7°14'32.630"E	56734.66	531081.38

NUMBER	LAT	LONG	NORTH	EAST
1	4°27'36.847"N	7°12'58.296"E	50928.9009	528163.1475
2	4°27'43.736"N	7°12'57.083"E	51140.568	528126.1057
3	4°27'40.185"N	7°12'36.509"E	51032.6178	527491.6336
4	4°27'52.242"N	7°12'27.815"E	51403.4321	527224.2717
5	4°28'07.567"N	7°12'26.548"E	51874.259	527186.0393
6	4°28'22.422"N	7°12'00.208"E	52331.9891	526374.8252
7	4°28'16.095"N	7°11'48.101"E	52138.3137	526001.2327
8	4°27'40.389"N	7°11'51.357"E	51041.3491	526099.6579
9	4°27'41.976"N	7°11'42.858"E	51090.5616	525837.7199
10	4°27'52.969"N	7°11'34.445"E	51428.6998	525578.9569
11	4°28'12.710"N	7°11'33.431"E	52035.126	525548.7943
12	4°28'18.255"N	7°11'41.815"E	52204.988	525807.5574
13	4°28'25.073"N	7°11'39.537"E	52414.5393	525737.7072
14	4°28'19.214"N	7°11'29.249"E	52235.1514	525420.2066
15	4°28'34.956"N	7°11'17.840"E	52719.3399	525069.3684
16	4°28'51.711"N	7°11'23.217"E	53233.6909	525236.0562
17	4°28'55.110"N	7°11'16.620"E	53338.4661	525032.8558
18	4°28'34.266"N	7°11'07.440"E	52698.7024	524748.6927
19	4°27'36.048"N	7°10'25.105"E	50912.7613	523440.3255
20	4°27'29.379"N	7°10'28.679"E	50707.7088	523550.1278
21	4°27'29.734"N	7°10'34.428"E	50718.2922	523727.399
22	4°27'36.451"N	7°10'33.901"E	50924.6676	523711.524
23	4°27'53.891"N	7°10'51.626"E	51459.3916	524258.948
24	4°28'22.944"N	7°11'10.370"E	52350.7746	524838.3867
25	4°28'25.692"N	7°11'15.051"E	52434.9123	524982.8495
26	4°28'20.331"N	7°11'22.681"E	52269.8119	525217.7999
27	4°28'12.172"N	7°11'26.352"E	52018.9864	525330.5127
28	4°27'50.367"N	7°11'29.120"E	51349.0601	525414.6503
29	4°27'32.924"N	7°11'43.415"E	50812.484	525854.3887
30	4°27'35.434"N	7°11'59.682"E	50888.6842	526356.0397
31	4°28'01.401"N	7°11'58.220"E	51686.4045	526312.3834
32	4°28'10.183"N	7°11'55.578"E	51956.28	526231.4207
33	4°28'14.067"N	7°12'00.206"E	52075.3428	526374.296
34	4°28'02.734"N	7°12'21.030"E	51726.0921	527015.6473
35	4°27'48.679"N	7°12'22.496"E	51294.2912	527060.0974
36	4°27'33.958"N	7°12'36.528"E	50841.3237	527491.8982
37	4°27'48.679"N	7°12'22.496"E	51294.2912	527060.0974
38	4°27'33.958"N	7°12'36.528"E	50841.3237	527491.8982

NUMBER	LAT	LONG	NORTH	EAST
1	4°28'52.077"N	7°11'23.350"E	53244.9357	525240.1573
2	4°28'55.480"N	7°11'16.542"E	53349.8433	525030.4746
3	4°30'50.418"N	7°12'23.024"E	56876.7461	527086.2912
4	4°30'42.621"N	7°12'55.996"E	56635.4457	528102.2932
5	4°30'16.816"N	7°13'30.678"E	55840.9003	529170.0214
6	4°30'04.325"N	7°13'29.949"E	55457.2537	529146.8703
7	4°29'58.736"N	7°13'35.645"E	55285.2742	529322.1571
8	4°29'54.012"N	7°13'43.377"E	55139.7531	529560.2826
9	4°29'53.270"N	7°13'50.030"E	55116.602	529765.3351
10	4°29'57.910"N	7°13'55.601"E	55258.8158	529937.3146
11	4°30'11.952"N	7°13'58.419"E	55689.9868	530024.9365
12	4°30'15.522"N	7°14'08.068"E	55799.1276	530322.5933
13	4°30'09.522"N	7°14'24.923"E	55613.9189	530841.8392
14	4°30'12.973"N	7°14'28.350"E	55719.7525	530947.6727
15	4°30'17.492"N	7°14'26.626"E	55858.659	530894.7559
16	4°30'24.242"N	7°14'07.410"E	56067.0188	530302.7496
17	4°30'28.457"N	7°14'16.307"E	56196.0034	530577.2553
18	4°30'22.554"N	7°14'27.368"E	56014.102	530917.907
19	4°30'17.500"N	7°14'31.024"E	55858.659	531030.3552
20	4°30'10.503"N	7°14'32.002"E	55643.6846	531060.1209
21	4°29'55.859"N	7°14'31.598"E	55193.892	531046.8917
22	4°29'49.501"N	7°14'28.176"E	54998.7614	530941.0581
23	4°29'44.874"N	7°14'29.900"E	54856.5476	530993.9749
24	4°29'43.933"N	7°14'46.317"E	54826.7819	531499.9915
25	4°29'36.624"N	7°14'53.410"E	54601.8856	531718.2732
26	4°29'16.158"N	7°14'48.939"E	53973.499	531579.3667
27	4°28'55.698"N	7°14'47.258"E	53345.1123	531526.4499
28	4°28'48.996"N	7°14'32.142"E	53140.0598	531060.1209
29	4°28'52.096"N	7°14'18.834"E	53235.9715	530650.0159
30	4°28'38.954"N	7°14'15.745"E	52832.4811	530554.1042
31	4°28'34.735"N	7°14'04.273"E	52703.4964	530200.2233
32	4°28'35.465"N	7°13'50.326"E	52726.6475	529770.2745
33	4°28'34.164"N	7°13'45.178"E	52686.9599	529611.5242
34	4°28'39.969"N	7°13'39.911"E	52865.554	529449.4666
35	4°28'51.270"N	7°13'37.532"E	53212.8204	529376.706
36	4°29'01.148"N	7°13'21.851"E	53517.0918	528893.8405
37	4°28'46.053"N	7°13'09.862"E	53054.07	528523.4231
38	4°28'46.457"N	7°12'54.413"E	53067.2992	528047.1721
39	4°28'41.711"N	7°12'50.023"E	52921.7781	527911.5729
40	4°28'19.893"N	7°13'12.268"E	52250.3966	528596.1836
41	4°28'22.623"N	7°13'33.719"E	52333.079	529257.6433
42	4°28'14.774"N	7°13'40.277"E	52091.6462	529459.3885
43	4°28'08.097"N	7°13'39.216"E	51886.5938	529426.3155
44	4°28'08.341"N	7°13'55.629"E	51893.2083	529932.3321
45	4°28'02.742"N	7°13'55.746"E	51721.2288	529935.6394
46	4°28'03.568"N	7°13'35.576"E	51747.6872	529313.8674

47	4°27'48.591"N	7°13'29.380"E	51287.9728	529122.0441
48	4°27'27.932"N	7°13'36.925"E	50652.9715	529353.5549
49	4°27'23.102"N	7°13'46.052"E	50504.1431	529634.6753
50	4°27'11.264"N	7°13'49.398"E	50140.3403	529737.2015
51	4°26'53.286"N	7°13'51.038"E	49588.0214	529786.811
52	4°26'46.968"N	7°13'08.782"E	49396.1981	528483.7355
53	4°26'36.832"N	7°13'00.218"E	49085.3121	528219.1516
54	4°26'24.784"N	7°13'06.461"E	48714.8947	528410.9749
55	4°26'09.061"N	7°13'04.771"E	48232.0292	528358.0582
56	4°26'10.227"N	7°12'54.364"E	48268.4094	528037.2502
57	4°26'23.482"N	7°13'00.777"E	48675.207	528235.6881
58	4°26'33.376"N	7°12'54.109"E	48979.4786	528030.6356
59	4°26'42.421"N	7°12'54.522"E	49257.2916	528043.8648
60	4°26'54.286"N	7°13'07.053"E	49621.0944	528430.8187
61	4°26'59.710"N	7°13'30.323"E	49786.4593	529148.5025
62	4°27'21.245"N	7°13'30.285"E	50447.919	529148.5025
63	4°27'44.807"N	7°13'20.053"E	51172.2173	528834.3091
64	4°28'13.253"N	7°13'32.126"E	52045.3441	529208.0338
65	4°28'16.581"N	7°13'26.757"E	52147.8703	529042.6689
66	4°28'14.504"N	7°13'09.059"E	52085.0316	528496.9647
67	4°28'39.115"N	7°12'43.268"E	52842.403	527703.2131
68	4°28'47.951"N	7°12'47.330"E	53113.6014	527828.8904
69	4°28'51.847"N	7°12'58.373"E	53232.6642	528169.5422
70	4°28'51.111"N	7°13'08.351"E	53209.5131	528477.1209
71	4°29'05.344"N	7°13'20.235"E	53646.0764	528844.231
72	4°28'53.970"N	7°13'42.247"E	53295.5028	529522.2272
73	4°28'39.548"N	7°13'45.598"E	52852.3249	529624.7534
74	4°28'41.100"N	7°14'11.450"E	52898.627	530421.8123
75	4°28'57.040"N	7°14'13.740"E	53388.1072	530493.2499
76	4°28'58.210"N	7°14'43.005"E	53422.5031	531395.4809
77	4°29'37.836"N	7°14'44.911"E	54639.5888	531456.3352
78	4°29'41.246"N	7°14'24.135"E	54745.4224	530816.0422
79	4°29'50.545"N	7°14'21.716"E	55031.173	530741.9588
80	4°30'01.320"N	7°14'26.417"E	55361.9028	530887.4799
81	4°30'10.414"N	7°14'05.889"E	55642.3617	530255.1245
82	4°29'51.188"N	7°13'55.451"E	55052.3397	529932.3321
83	4°29'49.535"N	7°13'46.270"E	55002.0687	529649.2274
84	4°29'55.450"N	7°13'30.210"E	55184.6316	529154.4556
85	4°30'39.968"N	7°12'33.485"E	56555.176	527408.2021
86	4°30'39.968"N	7°12'33.485"E	56555.176	527408.2021

ESTIMATION OF OIL SPILL VOLUME

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

Impacted Area Details

Total Calculated Area of Impact

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

24,699,200.00	m ²
	m ²
	m ²

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

- i Estimated Recovered oil (Net)

674.20	bbbls
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Estimated Recovered oil (Net) V_{rec}	674.20 bbbls
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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
- ii Average depth of pool of free phase oil
- iii Emulsification factor (If applicable, else 0%)

2,200.00	m ²
0.030	m
0	%

Estimated Volume of pool of free phase oil, V_{pool}	66.00 m³
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Estimated Volume of pool of free phase oil, V_{pool}	416.14 bbbls
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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)
- ii Average depth of infiltration above leaking facility i.e. pipeline/flowline
- iii Soil type
- iv P_e (effective porosity of the soil)

4.00	m ²
1.200	m
Clay	
8	%

- v Cause of spill

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

Incident Date	JIV Date	Days on Site
11/22/2014 12:00	11/28/2014 14:15	6
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		
Oil type	Sand	Loam	Clay
Bonny Medium	3 weeks	3 years	> 10 years
Bonny Light	2 days	2 months	> 10 years

- vii Oil type

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

0.002	m
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- ix Total depth below ground surface of infiltration of oil

1.202	m
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Estimated Volume of infiltrated oil, V_{inf a}	0.38 m³
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Estimated Volume of infiltrated oil, V_{inf a}	2.42 bbbls
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2 Volume of infiltrated oil at second spill point [if applicable] (V_{inf b})

- i Total area covered by the oil (infiltration)
- ii Average depth of infiltration above leaking facility i.e. pipeline/flowline
- iii Soil type
- iv P_e (effective porosity of the soil)

	m ²
	m
- Select -	
0	%

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

0.000	m
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- vi Total depth below ground surface of infiltration of oil

0.000	m
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Estimated Volume of infiltrated oil, V_{inf b}	0.00 m³
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Estimated Volume of infiltrated oil, V_{inf b}	0.00 bbbls
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3 Volume of infiltrated oil outside immediate spill point(s) region ($V_{inf,c}$)

- i Total Area covered by the oil (infiltration) 1,377,796.00 m²
- ii Total Area of the pool of free phase oil in touch with soil m²
- iii Soil type Clay
- iv P_e (effective porosity of the soil) 8%
- v Average depth below ground surface of infiltration of oil 0.002 m

Estimated Volume of infiltrated oil, $V_{inf,c}$ 181.19 m³
Estimated Volume of Infiltrated oil, $V_{inf,c}$ 1,139.68 bbls

4 Volume of infiltrated oil outside immediate spill point(s) region (superficial impact, $V_{inf,d}$)

- i Total Area covered by the oil (infiltration) m²
- ii Total Area of the pool of free phase oil in touch with soil m²
- iii Average depth below ground surface of infiltration of oil 0.002 m

Estimated Volume of infiltrated oil, $V_{inf,d}$ 0.00 m³
Estimated Volume of infiltrated oil, $V_{inf,d}$ 0.00 bbls

Estimated Total Volume of infiltrated oil, V_{inf} 181.57 m³
Estimated Total Volume of infiltrated oil, V_{inf} 1,142.10 bbls

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

- i Total area of oil on open water 23,319,200.00 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	30%	0.5597
Slight Color	0.00015	30%	1.0494
Bright Color	0.0003	20%	1.3992
Dull	0.001	5%	1.1660
Dark	0.002	10%	4.6638
Black oil	0.1	5%	116.5960
Emulsion (30% Oil)	1		0.0000
Percent Totals:		100%	125.4340

Estimated Volume of oil on open water, V_{wat} 125.43 m³
Estimated Volume of oil on open water, V_{wat} 788.98 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? Yes
- ii Estimated volume available for evaporation 2,346.22 bbls

iii E-factor 25%

Estimated Volume of evaporated oil, V_{evap} 782.07 bbls

Net Total Estimated Spilled Volume, V_{Est} 3,802.49 bbls

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1291483 JIV report S/N: 00787

G. INCIDENT INFORMATION:

20. Impacted Area Details

- Total calculated area of impact 2469.92 Ha
- 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>674.2</u>	Barrels
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Controlled recovery/evacuation from source with no impact to environment:

<u>NIL</u>	Barrels
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22. Net Estimated Spilled Volume V_{est} (bbls)* =

3,602.49 BARRELS

Estimated Reported Volume V_{rep} (bbls)=** 3,803 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:

DUE TO THE TIDAL TERRAIN OF THE PLACE, SOME AREA OF IMPACT WAS OBSERVED AS OIL STAIN WHEN TIDE LOW. THEREFORE, INFILTRATION WAS NOTICED IN THOSE AREAS.

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

THE SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA LIMITED.

JOINT INVESTIGATION REPORT FOR INCIDENT NO: 1291463 JIV report S/N: 00787

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

<p>This report was filled, agreed and signed by the following joint investigation 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"/>• Nigeria Police Force [NPF]: <input checked="" type="checkbox"/>• Shell Petroleum Development Company [SPDC]: <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>

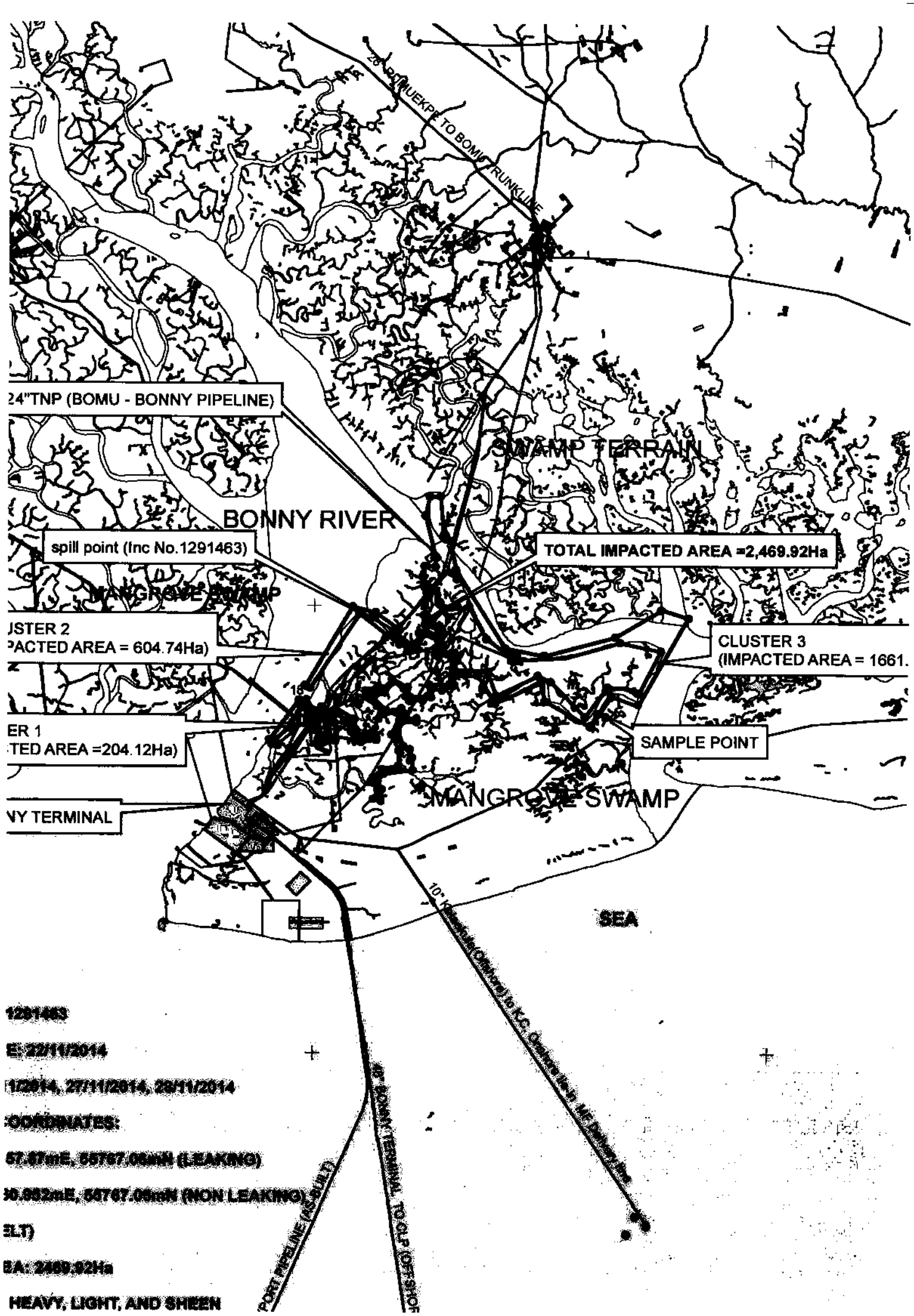
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25. Appendix 1: Overview sketch of the site

Location: 24" BONNY - BONNY PIPELINE AT OKOLO LAMINETH.

SEE ATTACHED MAP.



24" TNP (BOMU - BONNY PIPELINE)

BONNY RIVER

spill point (Inc No. 1291463)

MANGROVE SWAMP

CLUSTER 2
IMPACTED AREA = 604.74Ha

TOTAL IMPACTED AREA = 2,469.92Ha

CLUSTER 3
(IMPACTED AREA = 1661)

CLUSTER 1
IMPACTED AREA = 204.12Ha

SAMPLE POINT

PORT TERMINAL

MANGROVE SWAMP

SEA

1291463
 E: 22/11/2014
 12914, 27/11/2014, 28/11/2014
 COORDINATES:
 67.87mE, 65767.05mN (LEAKING)
 30.882mE, 65767.06mN (NON LEAKING)
 3LT)
 BA: 2469.92Ha
 HEAVY, LIGHT, AND SHEEN

PORT PIPELINE (AS BUILT)

10" PORT PIPELINE TO OIL PLATFORM

10" PORT PIPELINE TO OIL PLATFORM