

APPENDIX I

NIGER DELTA METOCEAN DATA (Santala M. J. 2002)

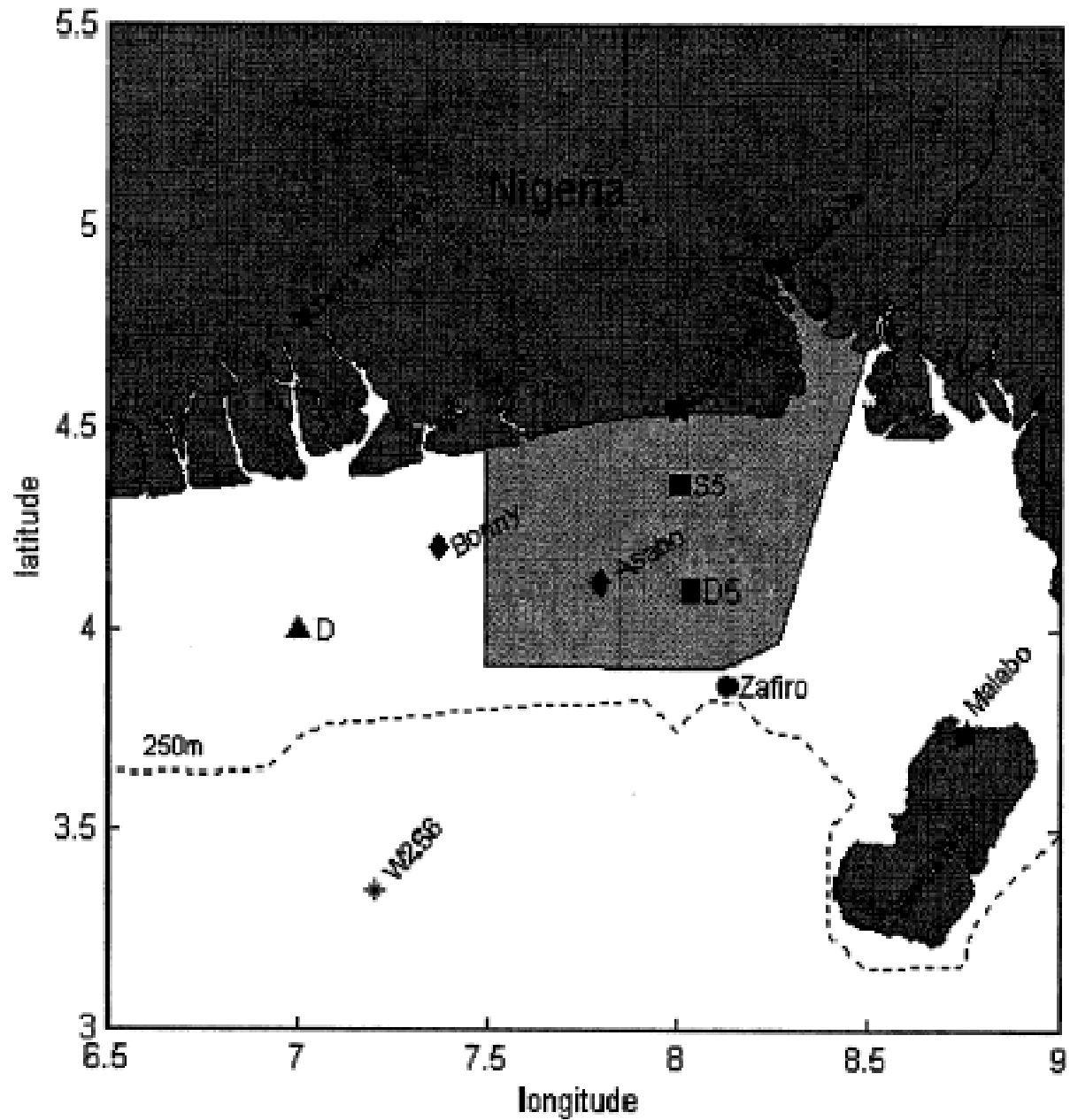


Figure I.1 Map of Niger Delta Area Cover by the Study

Table I.1 Jacket Platform Age Distribution (DPR/IOC- 2009)

Jacket platform Age (year)	Percentage
< 10	40%
19 – 10	30%
29 – 20	20%
> 10	10%

Table I.2 Platform Maximum Water Depth

Max water depth (ft)				
Condition	Return period	water depth	HAT	Max depth
Inplace	1-year	110-ft (33.5-m)	5.9 (1.8-m)	115-ft (35.0-m)
Operating	10-year	110-ft (33.5-m)	5.9 (1.8-m)	115-ft (35.0-m)
Extreme	100-year	110-ft (33.5-m)	5.9 (1.8-m)	115-ft (35.0-m)

Table I.3 Environmental Load

	Operating	Storm
Current Speed (m/s)	0.57	0.88
Wind Speed (m/s)	10.70	14.11
Marine Growth (mm)	4	4
Highest Astronomical Tide	1.80 meters above MLWL	1.80 meters above MLWL
Mean Sea Level	0.60 meters above MLWL	0.60 meters above MLWL
Lowest Astronomical Tide	0.50 meters below MLWL	0.50 meters below MLWL

Table I.4 100-Year Directional Wave Height Extremes, Water Depth Range (30-60m)

Metocean Direction	SACS Direction	H _s		T _p (s)	H _{max}		T _{Hmax} (s)	W _{sla}		V _a	
		(m)	(ft)		(m)	(ft)		(m/s)	(ft/s)	(m/s)	(ft/s)
20	0	3.2	10.5	15.5	6.4	20.9	15-19	14.1	46.2	0.46	1.5
65	45	2.5	8.2	12.0	5.0	16.4	13-17	14.1	46.2	0.88	2.8
110	90	2.1	6.8	9.0	4.2	13.7	8-12	14.1	46.2	0.88	2.8
155	135	1.8	5.9	8.0	3.6	11.8	7-11	14.1	46.2	0.46	1.5
200	180	1.8	5.9	8.0	3.6	11.8	7-11	14.1	46.2	0.62	2.0
245	225	1.8	5.9	8.0	3.6	11.8	7-11	14.1	46.2	0.88	2.8
290	270	1.8	5.9	8.0	3.6	11.8	7-11	14.1	46.2	0.88	2.8
335	315	2.7	8.8	12.5	5.4	17.7	13-17	14.1	46.2	0.57	1.8

Table I.5 10-Year Directional Wave Height Extremes, Water Depth Range (30-60m)

Metocean Direction	SACS Direction	H _s		T _p (s)	H _{max}		T _{Hmax} (s)	W _{sla}		V _a	
		(m)	(ft)		(m)	(ft)		(m/s)	(ft/s)	(m/s)	(ft/s)
20	0	2.8	9.1	15.0	5.6	18.3	14-18	12.4	40.6	0.40	1.3
65	45	2.2	7.2	12.5	4.4	14.4	12-16	12.4	40.6	0.77	2.5
110	90	1.8	5.9	7.0	3.6	11.8	7-11	12.4	40.6	0.77	2.5
155	135	1.6	5.2	6.5	3.2	10.5	7-11	12.4	40.6	0.40	1.3
200	180	1.6	5.2	6.5	3.2	10.5	7-11	12.4	40.6	0.54	1.7
245	225	1.6	5.2	6.5	3.2	10.5	7-11	12.4	40.6	0.77	2.5
290	270	1.6	5.2	6.5	3.2	10.5	7-11	12.4	40.6	0.77	2.5
335	315	2.4	7.8	13.0	4.8	15.7	13-17	12.4	40.6	0.50	1.6

Table I.6 1-Year Directional Wave Height Extremes, Water Depth Range (30- 60m)

Metocean Direction	SACS Direction	H _s		T _p (s)	H _{max}		T _{Hmax} (s)	W _{sla}		V _a	
		(m)	(ft)		(m)	(ft)		(m/s)	(ft/s)	(m/s)	(ft/s)
20	0	2.5	8.2	14.0	5.0	16.4	13-17	10.7	35.1	0.31	1.0
65	45	2.0	6.7	13.0	4.0	13.1	12-16	10.7	35.1	0.57	1.9
110	90	1.5	4.9	5.0	3.0	9.8	7-11	10.7	35.1	0.57	1.9
155	135	1.5	4.9	5.0	3.0	9.8	7-11	10.7	35.1	0.31	1.0
200	180	1.5	4.9	5.0	3.0	9.8	7-11	10.7	35.1	0.41	1.3
245	225	1.5	4.9	5.0	3.0	9.8	7-11	10.7	35.1	0.57	1.9
290	270	1.5	4.9	5.0	3.0	9.8	7-11	10.7	35.1	0.57	1.9
335	315	2.2	7.2	13.5	4.4	14.4	13-17	10.7	35.1	0.36	1.2

Table I.7 Seawater temperature and salinity for Niger Delta

D (m)	Temperature			Salinity (ppt)		
	Min	Mean	Max	Min	Mean	Max
0	22.6	28.0	31.3	18.2	28.2	34.3
-10	21.1	28.0	31.3	22.6	30.7	35.1
-20	19.6	27.5	31.3	27.0	32.5	35.8
-30	17.3	24.2	30.3	31.2	34.7	36.4
-50	15.3	19.2	27.1	34.2	35.6	36.4
-75	14.1	17.3	23.0	35.1	35.7	36.3
-100	12.8	16.4	18.9	35.1	35.6	36.1
-125	12.8	15.6	17.5	35.1	35.6	36.0

Table I.8 Tide and Storm Water Level

Condition	Height relative to MLW (m)
Highest Astronomical Tide (HAT)	1.8
Mean High Water Spring (MHWS)	1.4
Mean Higher High Water (MHHWS)	1.3
Mean High water (MHW)	1.2
Mean Sea Level (MSL)	0.6
Mean Lower water (MLW)	0.0
Mean Lower Low water (MLLW)	-0.1
Mean Low water Spring (MLWS)	-0.2
Lowest Astronomical Tide (LAT)	-0.5

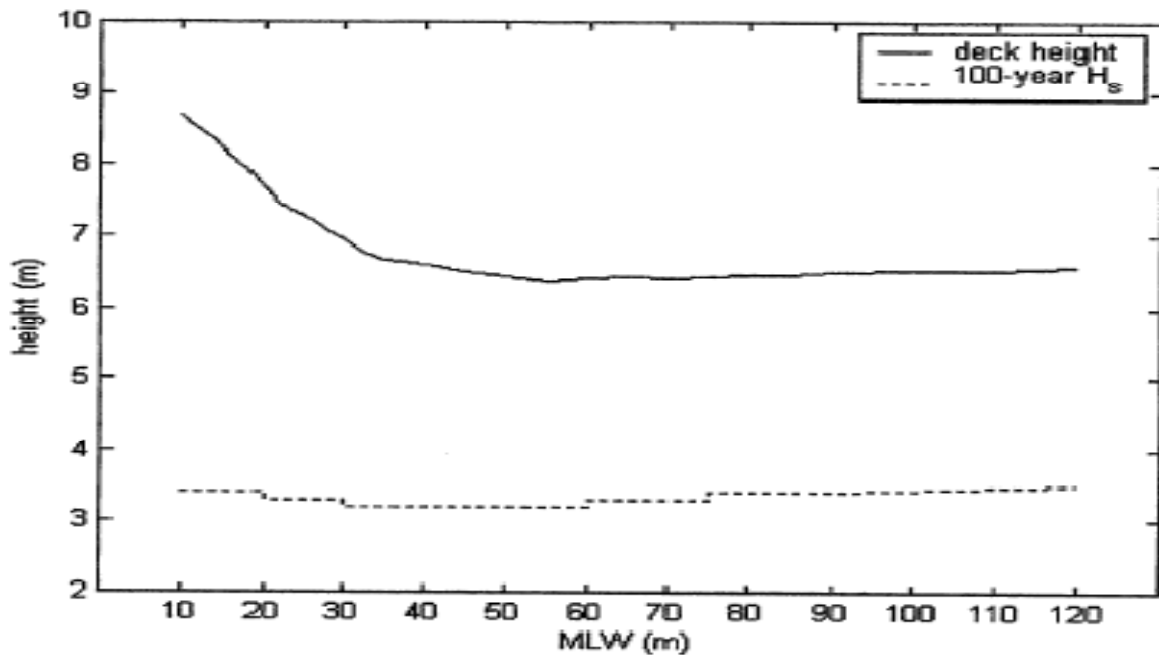


Figure I.2 Wave Height Versus Minimum Recommended Deck Height

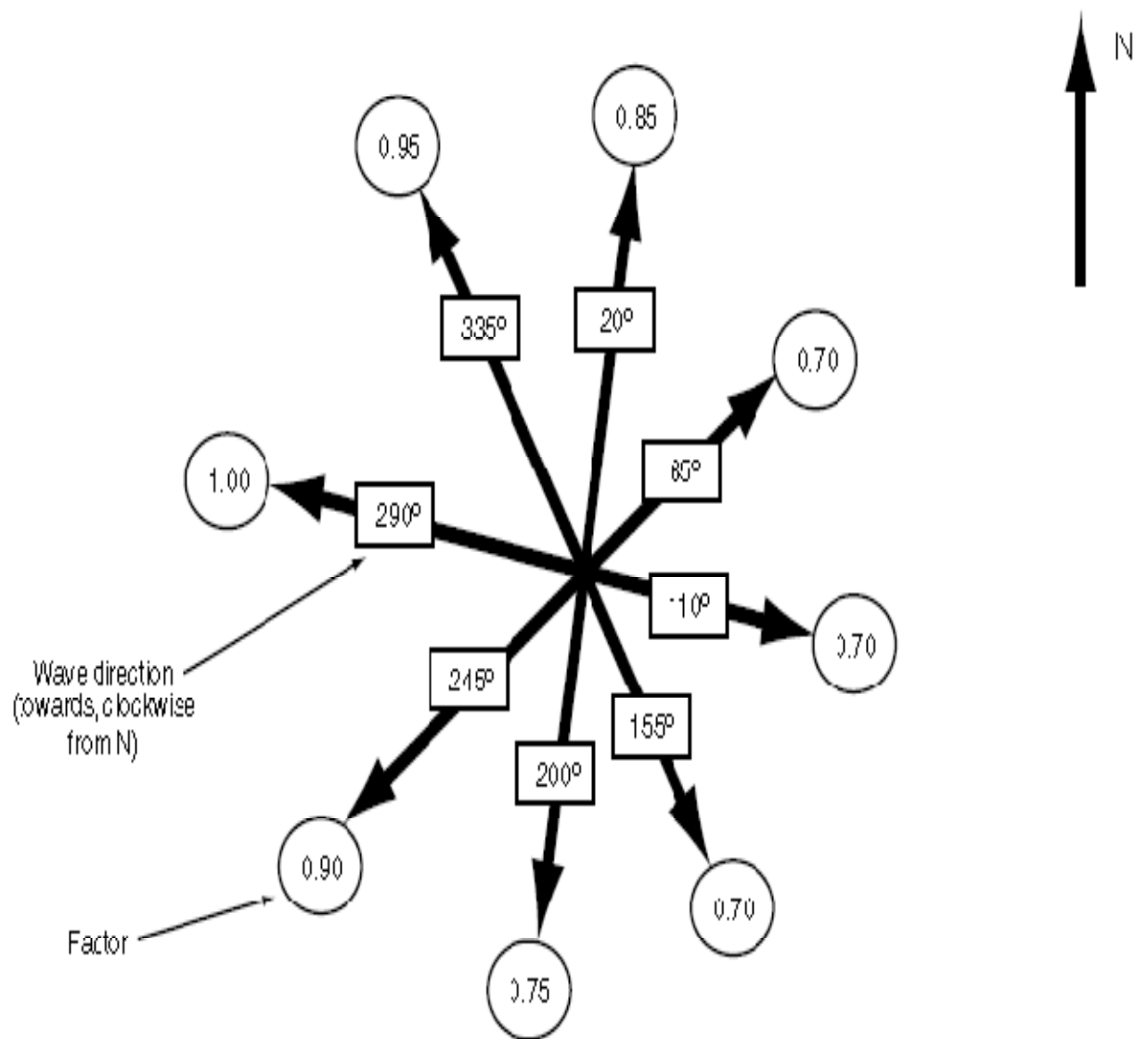


Figure I.3 Wave Direction Factors and Omni Directional

Table I. 9 The Recommended Minimum Height above mean low water (MLW)

MLW (m)	Deck Height (m)
10	8.7
12	8.5
14	8.3
16	8.1
18	7.9
20	7.7
22	7.5
24	7.3
26	7.2
28	7.1
30	7.0
32.5	6.8
35	6.7
40	6.6
45	6.5
50	6.4
75	6.4
80	6.5
110	6.5
120	6.6

APPENDIX II

OFFSHORE JACKET PLATFORM CORROSION DAMAGE



Figure II.1 Well Head Jacket Platform



Figure II.2 Uniform Corrosion



Figure II.3 Pitting corrosion



Figure II.4 Process Jacket Platform



Figure II.5 Production Jacket Platform



Figure II.6 Personnel on Offshore Site

APPENDIX III

OFFSHORE JACKET PLATFORM

STRUCTURAL ANALYSIS COMPUTER SOFTWARE (SACS)

SACS MEMBER RESULTS

- **SACS MEMBER RESULTS - OPERATING (pp.146 – 1570)**
- **SACS SACS JOINT RESULTS - OPERATING (pp.159 – 189)**
- **MEMBER RESULTS- STORM (pp.191 - 234)**
- **SACS PILE RESULTS- OPERATING (pp.236 – 241)**
- **SACS FATIGUE RESULTS (pp.243 – 251)**

APPENDIX IV

SACS MODEL PLOTS

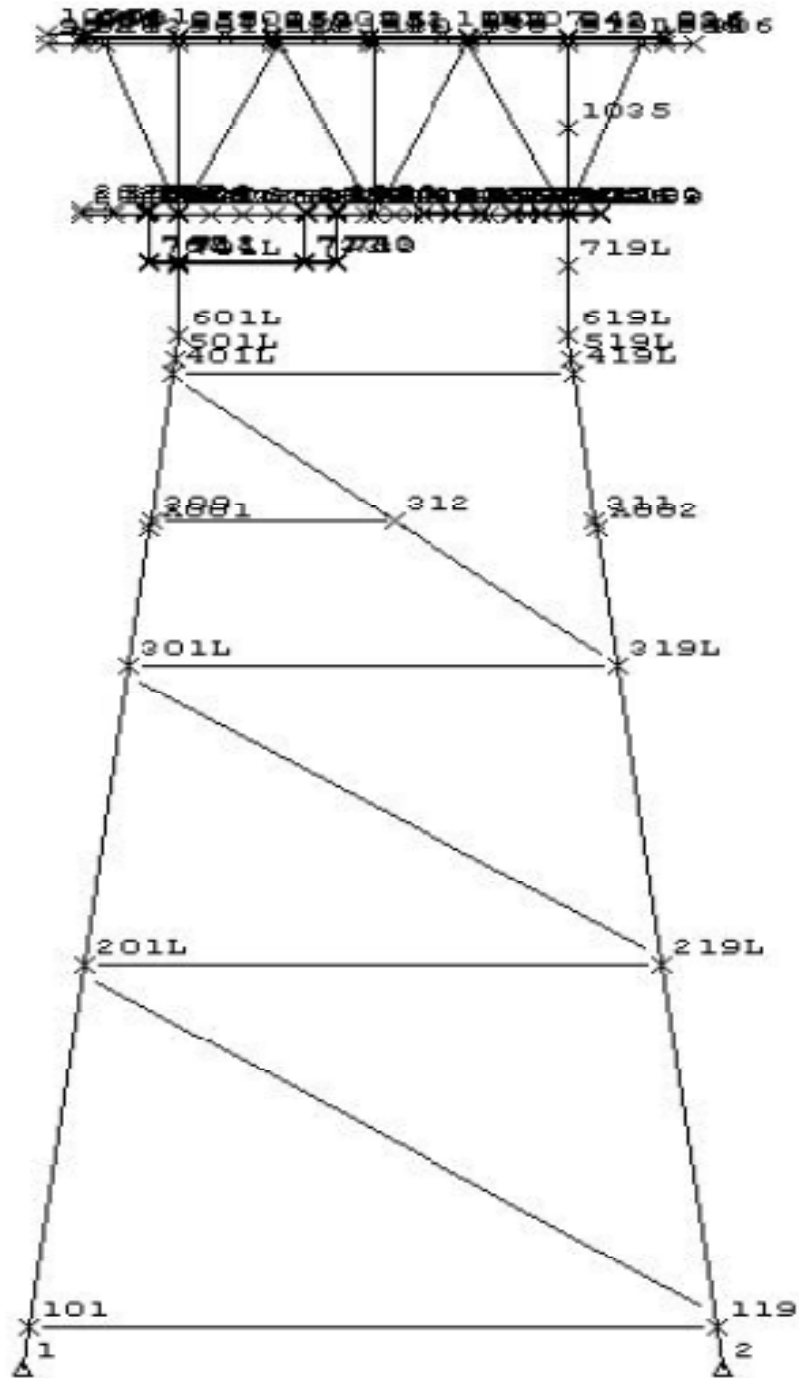


Figure IV.1 SACS Model Plot - Row A

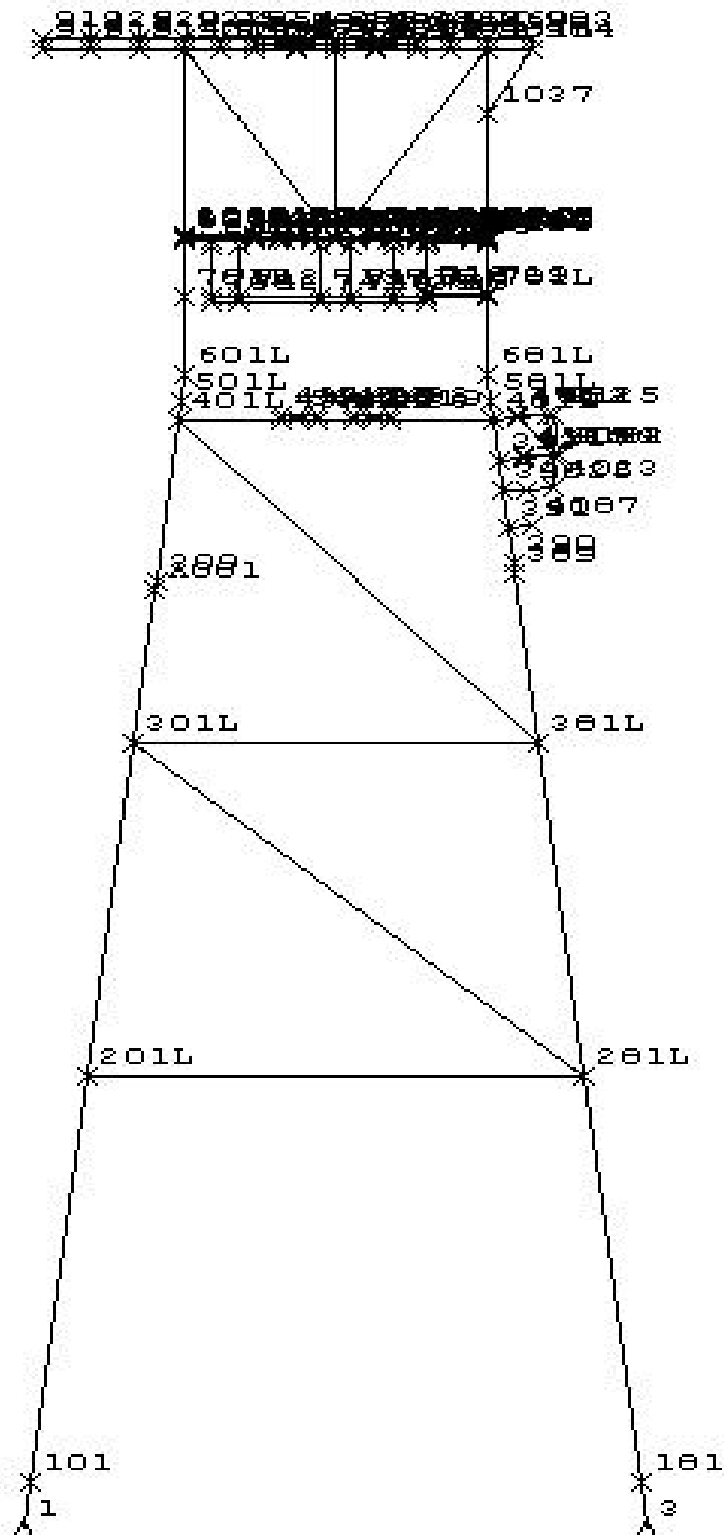


Figure IV.3 SACS Model Plot - Row 1





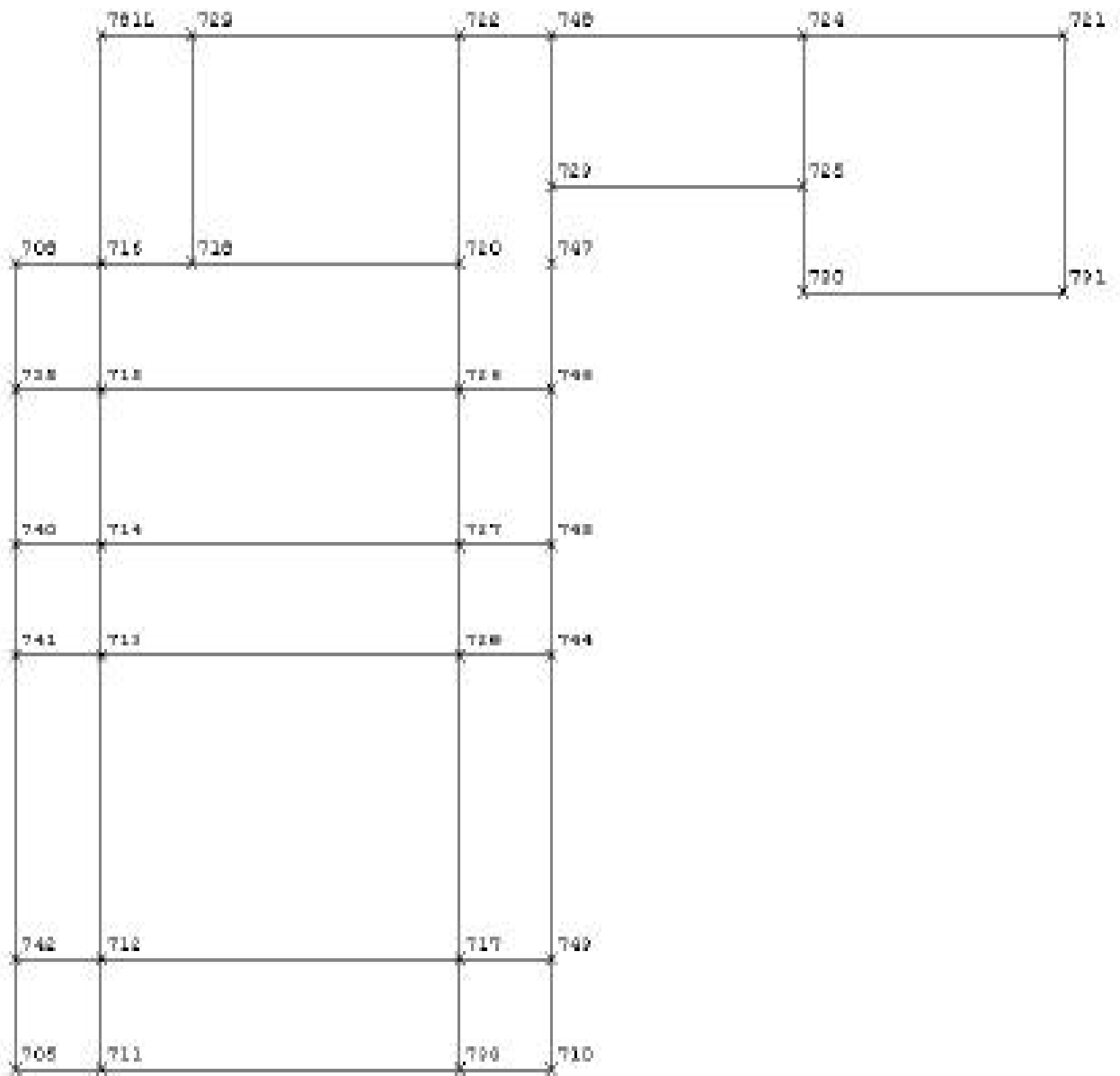


Figure IV.6 SACS Model Plot – Sub Cellar Deck

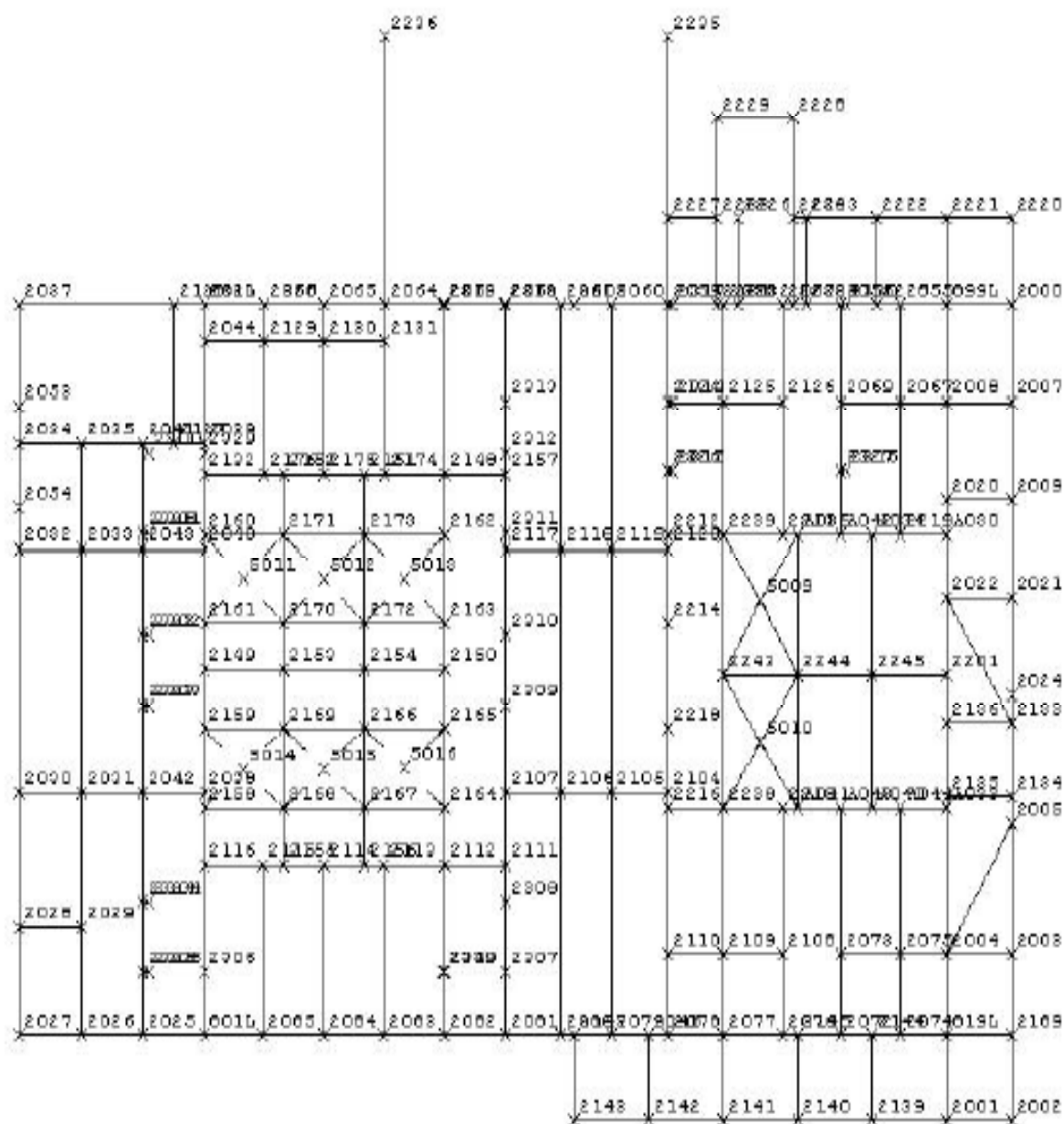


Figure IV.7 SACS Model Plot - Cellar Deck

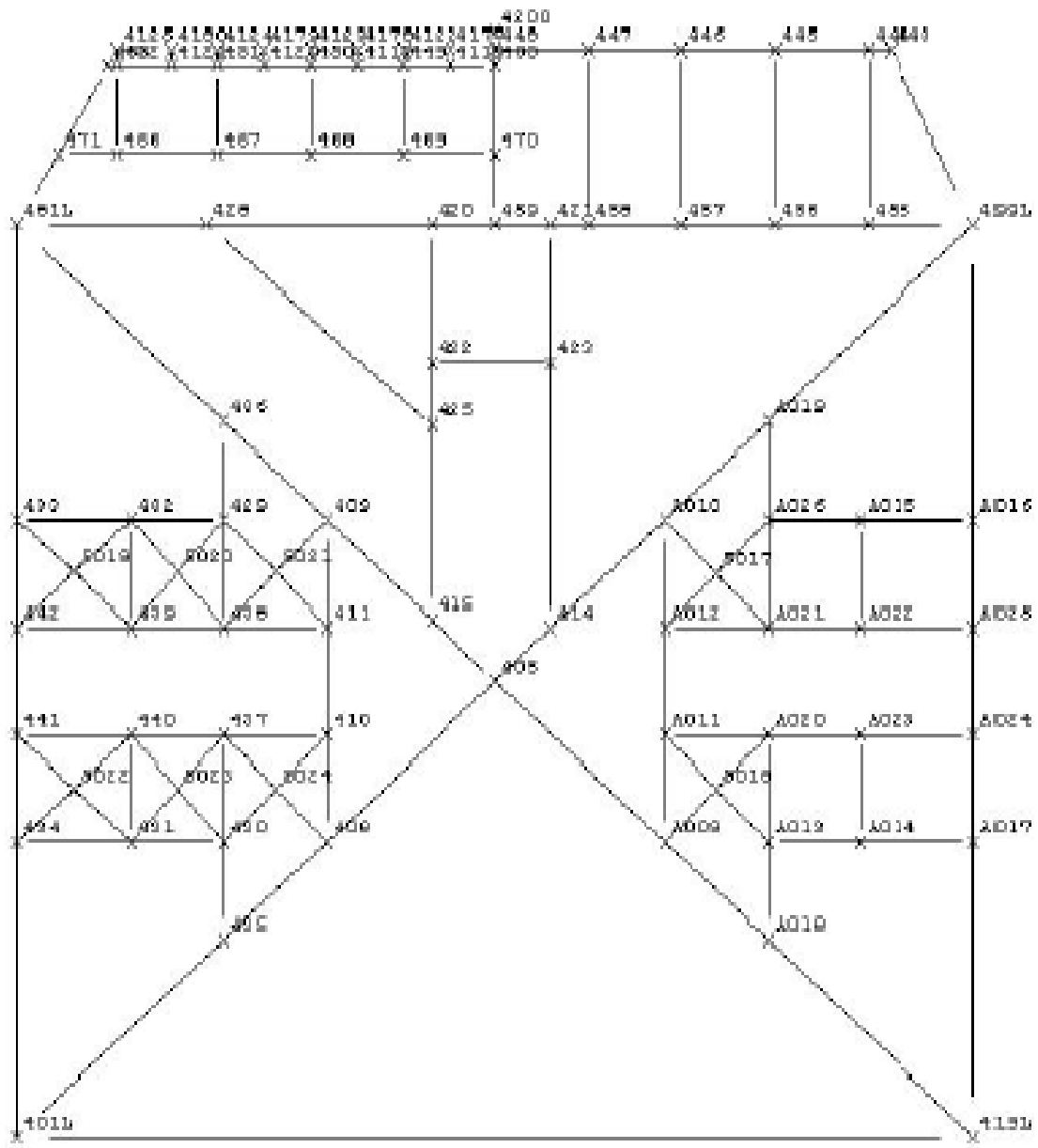


Figure IV.8 SACS Model Plot - Elevation (+) 13.0m

PART –II

PUBLICATIONS

- **“Reliability Assessment of Offshore Jacket Platform in the Niger Delta”**
Petroleum and Coal International Journal Volume 4, December-2011
- **“Offshore Steel Structures Corrosion Damage Model”** *International Journal Of Science & Engineering Research Volume 2, Issue 10, October-2011*
- **“Risk-based Assessment for Offshore Jacket Platform Structures (Corrosion and Fatigue Hazard) in the Niger Delta, ARPN Journal of Engineering and Applied Sciences Volume 6, N0. 12, December-2011**