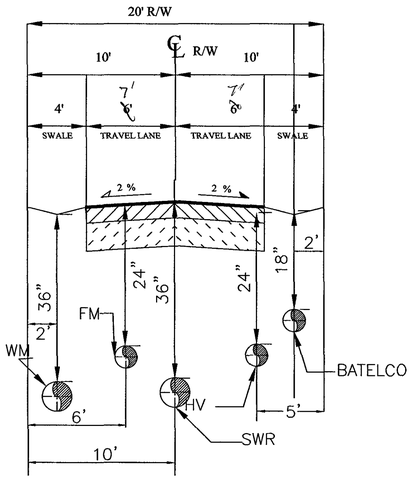
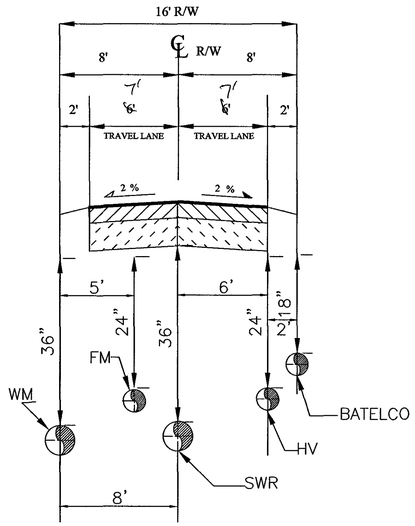
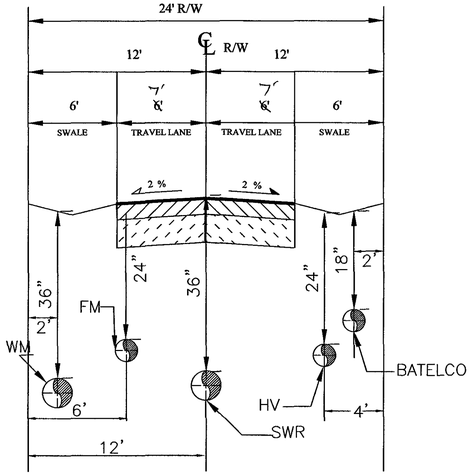


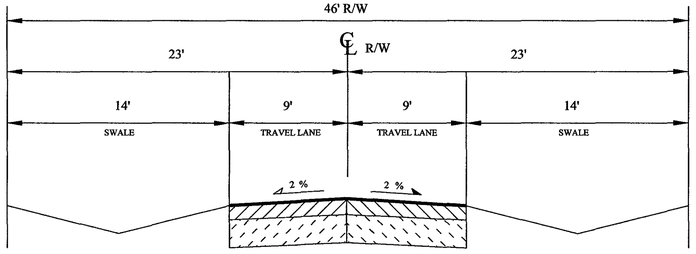
SECTION A
ROADS 1, 2, 4



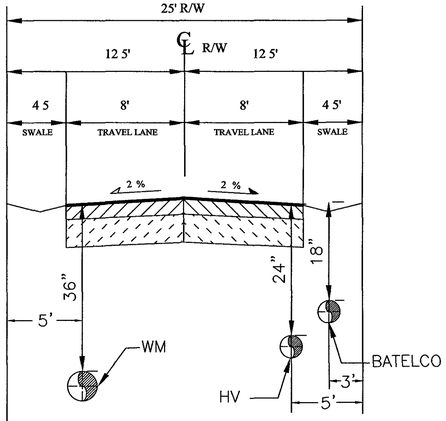
SECTION B
ROADS 6, 7, 8



SECTION C
ROAD 3



SECTION D
ROADS 13-QUEENS HIGHWAY



SECTION E
ROADS 12
PROPOSED PUBLIC MAINS

WM
FM
HV
SWR

CIVIL WORKS APPROVED
SUBJECT TO COMMENTS AS MARKED
Date 13/05/19
Signature
Civil Design Section

REGISTERED PROFESSIONAL ENGINEER
CHINYERE T A UEOMA
REGISTRATION NO 1032
COMMONWEALTH OF THE BAHAMAS

REVISIONS

NO	DESCRIPTION	DATE	BY	NO	DESCRIPTION	DATE	BY
1	DESIGN DEVELOPMENT DRAWINGS	03/12/2019	CTI				

ENGINEER OF RECORD

ISLAND DIMENSIONS DEVELOPMENT COMPANY
Farrington House, Gladstone Road
P O Box EE-15036
Nassau, Bahamas
Tel#. (242)-341-6315/25
Fax#. (242)-368-6312

PREPARED FOR

MR MICHAEL WIENER
4M HARBOUR ISLAND LTD.
HARBOUR ISLAND, BAHAMAS

DESIGNED BY	CTI
DRAWN BY	CTI
CHECKED BY	
PROJECT ENGR	AF

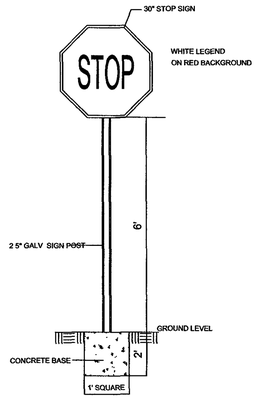
PROPOSED BRILAND RESIDENCES & MARINA

UTILITY SECTIONS

SCALE: N.T.S.

IF SHEET IS LESS THAN 24" X 36" IT IS A REDUCED PRINT SCALE ACCORDINGLY

DRAWING NO
B-14

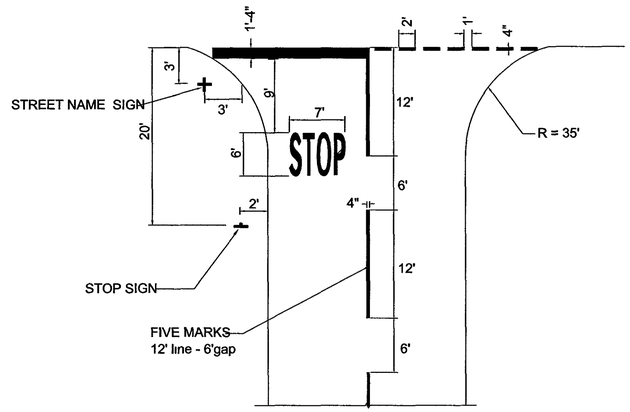


ERECTED SIGN DETAIL

NTS

MINISTRY OF WORKS & UTILITIES

JANUARY 2003

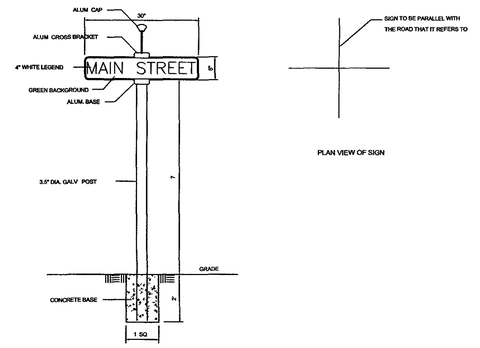


STOP JUNCTION MARKINGS

NTS

MINISTRY OF PUBLIC WORKS

JANUARY 2002

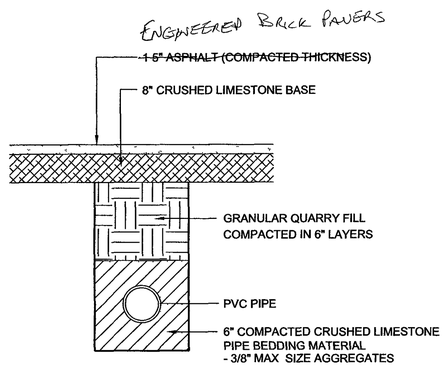


ERECTED STREET NAME SIGN DETAIL

NTS

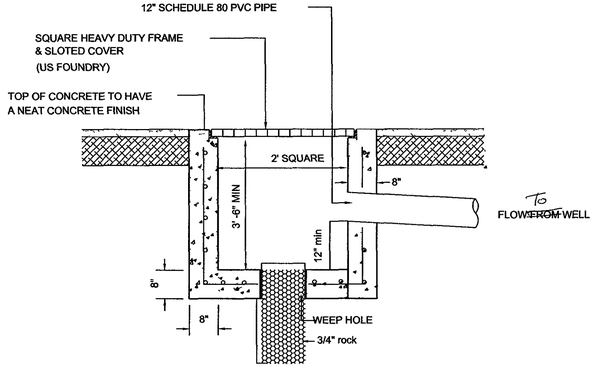
MINISTRY OF WORKS & UTILITIES

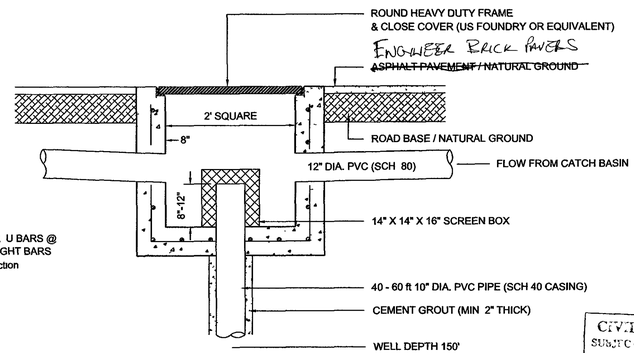
FEBRUARY 2003



NOTE FOR PVC PIPE < 12" DIA A=6" OTHERWISE
AS DIRECTED BY ENGINEER

TYPICAL PIPE TRENCH DETAIL





REINFORCED CONC W/ 1/2" DIA U BARS @
10" C C AND 1/2" DIA HORIZ STRAIGHT BARS
@ 10" C C or Concrete Block Construction

TYPICAL CATCHPIT/WELL DETAIL

CIVIL WORKS APPROVED
SUBJECT TO COMMENTS AS MARKED
Date 13/05/19
Signature
Civil Design Section

REGISTERED PROFESSIONAL ENGINEER
CHINYERE T A IJEOMA
REG NO 10622
COMMONWEALTH OF THE BAHAMAS

REVISIONS

NO	DESCRIPTION	DATE	BY	NO	DESCRIPTION	DATE	BY
1	DESIGN DEVELOPMENT DRAWINGS	03/12/2019	CTI				

ENGINEER OF RECORD

ISLAND DIMENSIONS DEVELOPMENT COMPANY
Farmington House, Gladstone Road
P O Box EE-15036
Nassau, Bahamas
Tel#. (242)-341-6318/25
Fax#. (242)-368-6312

PREPARED FOR

MR MICHAEL WIENER
4M HARBOUR ISLAND LTD.
HARBOUR ISLAND, BAHAMAS

DESIGNED BY	CTI
DRAWN BY	CTI
CHECKED BY	
PROJECT ENGR	AF

PROPOSED BRILAND RESIDENCES & MARINA

ROAD DETAIL SHEET

SCALE: N.T.S.

IF SHEET IS LESS THAN 24" X 36" IT IS A REDUCED PRINT SCALE ACCORDINGLY

DRAWING NO

B-15

APPENDIX D – Sewer Profile and Flow Calculations

ISLAND DIMENSIONS DEVELOPMENT CO. LTD.
4M HARBOR ISLAND DEVELOPMENT
SEWER FLOW CALCULATIONS

DESIGN PARAMETERS:	Units	
Population	persons/lot	**5**
Average Flowrate	GPD	**75**
Peaking Factor	constant	**2**
Mannings #	constant	**0.013**
Minimum Soil Cover to pipe crown	ft	**3.5**
Manhole Diameter	ft	**4.00**
Thickness of Manhole Wall	in	**6.00**
Drop across the Manhole	ft	**0.10**

Road 4 - B Sewer Flows from MH21 TO MH27							
Pipe	**From Manhole**	**To Manhole**	**Length of Pipe**	**Number of Lots**	**Population Density**	**Cum. Design pop.**	**Avg. unit Flow**
			ft	**Between Manholes**	**Persons /lot**	**Persons/Lot**	**gal/cap*d**
P1	21	22	159.93	2.00	10	10	750
P2	22	23	99.85	2.00	10	20	750
P3	23	24	199.72	0.00	0	20	0
P4	24	25	59.89	2.00	10	30	750
P5	25	26	139.82	0.00	0	30	0
P6	26	27	199.91	2.00	10	40	750
			859.12				

Road 4 - A Sewer Flows from MH-28 to MH-31							
Pipe	**From Manhole**	**To Manhole**	**Length of Pipe**	**Number of Lots**	**Population Density**	**Cum. Design pop.**	**Avg. unit Flow**
			ft	**Between Manholes**	**Persons /lot**	**Persons/Lot**	**gal/cap*d**
P7	28	19	139.79	7.00	35	35	2625
P8	19	29	95.95	0.00	0	35	0
P9	29	12	86.30	0.00	0	35	0
P10	12	30	113.68	2.00	10	45	750
P11	30	31	100.06	0.00	0	45	0
			535.78				

Road 3 - Sewer Flows from MH-13 to MH-19							
Pipe	**From Manhole**	**To Manhole**	**Length of Pipe**	**Number of Lots**	**Population Density**	**Cum. Design pop.**	**Avg. unit Flow**
			ft	**Between Manholes**	**Persons /lot**	**Persons/Lot**	**gal/cap*d**
P12	13	14	179.39	2.00	10	10	750
P13	14	15	126.71	2.00	10	20	750
P14	15	16	110.96	0.00	0	20	0
P15	16	17	161.97	2.00	10	30	750
P16	17	18	96.14	0.00	0	30	0
P17	18	19	129.05	2.00	10	40	750
			804.22	8.00			

Cum. Avg. Flow	Peaking Factor	Cum. Peak flow	Cum Peak Flow	Cum. Peak Flow	Pipe DIA	Slope	Flow (full)	Velocity (full)	Rim Elev. Upstream MH	Rim Elevation DownStream MH
gal/d (8x9)		GPD	GPM	ft^3/s	in	ft/ft	ft^3/s	ft/s	ft	ft
750.0	2	1500.0	1.0	0.0023	8	0.0050	0.85	2.45	18.34	17.54
1500.0	2	3000.0	2.1	0.0046	8	0.0050	0.85	2.45	17.54	17.04
1500.0	2	3000.0	2.1	0.0046	8	0.0050	0.85	2.45	17.04	16.04
2250.0	2	4500.0	3.1	0.0070	8	0.0050	0.85	2.45	16.04	15.74
2250.0	2	4500.0	3.1	0.0070	8	0.0200	1.71	4.90	15.74	13.34
3000.0	2	6000.0	4.2	0.0093	8	0.0200	1.71	4.90	13.34	9.31

Cum. Avg. Flow	Peaking Factor	Cum. Peak flow	Cum Peak Flow	Cum. Peak Flow	Pipe DIA	Slope	Flow (full)	Velocity (full)	Rim Elev. Upstream MH	Rim Elevation DownStream MH
gal/d (8x9)		GPD	GPM	ft^3/s	in	ft/ft	ft^3/s	ft/s	ft	ft
2625.0	2	5250.0	3.6	0.0081	8	0.0230	1.83	5.25	18.55	15.32
2625.0	2	5250.0	3.6	0.0081	8	0.0230	1.83	5.25	15.32	13.11
2625.0	2	5250.0	3.6	0.0081	8	0.0150	1.48	4.24	13.11	11.28
3375.0	2	6750.0	4.7	0.0104	8	0.0040	0.76	2.19	11.28	11.19
3375.0	2	6750.0	4.7	0.0104	8	0.0040	0.76	2.19	11.19	13.59

Cum. Avg. Flow	Peaking Factor	Cum. Peak flow	Cum Peak Flow	Cum. Peak Flow	Pipe DIA	Slope	Flow (full)	Velocity (full)	Rim Elev. Upstream MH	Rim Elevation DownStream MH
gal/d (8x9)		GPD	GPM	ft^3/s	in	ft/ft	ft^3/s	ft/s	ft	ft
750.0	2	1500.0	1.0	0.0023	8	0.0040	0.76	2.19	22.46	23.59
1500.0	2	3000.0	2.1	0.0046	8	0.0040	0.76	2.19	23.59	24.17
1500.0	2	3000.0	2.1	0.0046	8	0.0040	0.76	2.19	24.17	23.16
2250.0	2	4500.0	3.1	0.0070	8	0.0040	0.76	2.19	23.16	21.05
2250.0	2	4500.0	3.1	0.0070	8	0.0145	1.45	4.17	21.05	18.64
3000.0	2	6000.0	4.2	0.0093	8	0.0145	1.45	4.17	18.64	15.40

									Rim Elev.	Rim Elevation
Cum. Avg. Flow	Peaking Factor	Cum. Peak flow	Cum Peak Flow	Cum. Peak Flow	Pipe DIA	Slope	Flow (full)	Velocity (full)	Upstream MH	DownStream MH
gal/d (8x9)		GPD	GPM	ft^3/s	in	ft/ft	ft^3/s	ft/s	ft	ft
750.0	2	1500.0	1.0	0.0023	8	0.0050	0.85	2.45	18.34	17.54
1500.0	2	3000.0	2.1	0.0046	8	0.0050	0.85	2.45	17.54	17.04
1500.0	2	3000.0	2.1	0.0046	8	0.0050	0.85	2.45	17.04	16.04
2250.0	2	4500.0	3.1	0.0070	8	0.0050	0.85	2.45	16.04	15.74
2250.0	2	4500.0	3.1	0.0070	8	0.0200	1.71	4.90	15.74	13.34
3000.0	2	6000.0	4.2	0.0093	8	0.0200	1.71	4.90	13.34	9.31

									Rim Elev.	Rim Elevation
Cum. Avg. Flow	Peaking Factor	Cum. Peak flow	Cum Peak Flow	Cum. Peak Flow	Pipe DIA	Slope	Flow (full)	Velocity (full)	Upstream MH	DownStream MH
gal/d (8x9)		GPD	GPM	ft^3/s	in	ft/ft	ft^3/s	ft/s	ft	ft
2625.0	2	5250.0	3.6	0.0081	8	0.0230	1.83	5.25	18.55	15.32
2625.0	2	5250.0	3.6	0.0081	8	0.0230	1.83	5.25	15.32	13.11
2625.0	2	5250.0	3.6	0.0081	8	0.0150	1.48	4.24	13.11	11.28
3375.0	2	6750.0	4.7	0.0104	8	0.0040	0.76	2.19	11.28	11.19
3375.0	2	6750.0	4.7	0.0104	8	0.0040	0.76	2.19	11.19	13.59

									Rim Elev.	Rim Elevation
Cum. Avg. Flow	Peaking Factor	Cum. Peak flow	Cum Peak Flow	Cum. Peak Flow	Pipe DIA	Slope	Flow (full)	Velocity (full)	Upstream MH	DownStream MH
gal/d (8x9)		GPD	GPM	ft^3/s	in	ft/ft	ft^3/s	ft/s	ft	ft
750.0	2	1500.0	1.0	0.0023	8	0.0040	0.76	2.19	22.46	23.59
1500.0	2	3000.0	2.1	0.0046	8	0.0040	0.76	2.19	23.59	24.17
1500.0	2	3000.0	2.1	0.0046	8	0.0040	0.76	2.19	24.17	23.16
2250.0	2	4500.0	3.1	0.0070	8	0.0040	0.76	2.19	23.16	21.05
2250.0	2	4500.0	3.1	0.0070	8	0.0145	1.45	4.17	21.05	18.64
3000.0	2	6000.0	4.2	0.0093	8	0.0145	1.45	4.17	18.64	15.40

Invert Elev. Upstream MH ft	Invert Elev. Downstream MH ft	MH #	COVER TO TOP OF PIPE ft	DEPTH TO INVERT	
14.50	13.71	21	3.17	3.84	OK
13.50	13.00	22	3.37	4.04	OK
12.80	11.81	23	3.57	4.24	OK
11.61	11.31	24	3.76	4.43	OK
11.11	8.31	25	3.96	4.63	OK
8.11	4.11	26	4.56	5.23	OK

Invert Elev. Upstream MH ft	Invert Elev. Downstream MH ft	MH #	COVER TO TOP OF PIPE ft	DEPTH TO INVERT	
13.45	10.24	28	4.43	5.10	OK
10.04	7.83	19	4.61	5.28	OK
7.63	6.34	29	4.81	5.48	OK
6.04	5.59	12	4.57	5.24	OK
5.39	4.99	30	5.13	5.80	OK

Invert Elev. Upstream MH ft	Invert Elev. Downstream MH ft	MH #	COVER TO TOP OF PIPE ft	DEPTH TO INVERT	
17.26	16.54	13	4.53	5.20	OK
16.34	15.83	14	6.58	7.25	OK
15.63	15.19	15	7.87	8.54	OK
14.99	14.34	16	7.50	8.17	OK
14.14	12.75	17	6.24	6.91	OK
12.55	10.68	18	5.42	6.09	OK

Road 2 - Sewer Flows from MH-8 to MH-12							
Pipe	From Manhole	To Manhole	Length of Pipe	Number of Lots	Population Density	Cum. Design pop.	Avg. unit Flow
			ft	Between Manholes	Persons /lot	Persons/Lot	gal/cap*d
P18	8	9	132.86	2.00	10	10	750
P19	9	10	155.23	2.00	10	20	750
P20	10	11	117.12	0.00	0	20	0
P21	11	7	107.80	2.00	10	30	750
P22	7	12	129.61	0.00	0	30	0
			642.62				

Road 1 - Sewer Flows from MH1 TO MH7							
Pipe	From Manhole	To Manhole	Length of Pipe	Number of Lots	Population Density	Cum. Design pop.	Avg. unit Flow
			ft	Between Manholes	Persons /lot	Persons/Lot	gal/cap*d
P23	1	2	34.41	2.00	10	10	750
P24	2	3	79.88	0.00	0	10	0
P25	3	4	250.07	6.00	30	40	2250
P26	4	5	69.21	0.00	0	40	0
P27	5	6	59.48	0.00	0	40	0
P28	6	7	92.56	3.00	225	265	450
			585.61				

Road 5 - Sewer Flows from MH32 TO MH33							
Pipe	From Manhole	To Manhole	Length of Pipe	Number of Lots	Population Density	Cum. Design pop.	Avg. unit Flow
			ft	Between Manholes	Persons /lot	Persons/Lot	gal/cap*d
P29	32	33	198.00	4.00	20	20	1500
P30	34	33	228.00	4.00	20	40	1500
			426.00				

Road 6 - Sewer Flows from MH35 TO MH39							
Pipe	From Manhole	To Manhole	Length of Pipe	Number of Lots	Population Density	Cum. Design pop.	Avg. unit Flow
			ft	Between Manholes	Persons /lot	Persons/Lot	gal/cap*d
P31	35	36	85.49	3.00	15	15	1125
P32	36	37	151.23	2.00	10	25	750
P33	37	38	32.88	0.00	0	25	0
P34	38	39	93.28	4.00	20	45	1500
			362.88				

									Rim Elev.	Rim Elevation
Cum. Avg. Flow	Peaking Factor	Cum. Peak flow	Cum Peak Flow	Cum. Peak Flow	Pipe DIA	Slope	Flow (full)	Velocity (full)	Upstream MH	DownStream MH
gal/d (8x9)		GPD	GPM	ft^3/s	in	ft/ft	ft^3/s	ft/s	ft	ft
750.0	2	1500.0	1.0	0.0023	8	0.0101	1.21	3.48	25.43	24.03
1500.0	2	3000.0	2.1	0.0046	8	0.0086	1.12	3.21	24.03	22.48
1500.0	2	3000.0	2.1	0.0046	8	0.0137	1.41	4.05	22.48	19.71
2250.0	2	4500.0	3.1	0.0070	8	0.0369	2.32	6.65	19.71	15.93
2250.0	2	4500.0	3.1	0.0070	8	0.0386	2.37	6.80	15.93	11.38

									Rim Elev.	Rim Elevation
Cum. Avg. Flow	Peaking Factor	Cum. Peak flow	Cum Peak Flow	Cum. Peak Flow	Pipe DIA	Slope	Flow (full)	Velocity (full)	Upstream MH	DownStream MH
gal/d (8x9)		GPD	GPM	ft^3/s	in	ft/ft	ft^3/s	ft/s	ft	ft
750.0	2	1500.0	1.0	0.0023	8	0.0127	1.36	3.90	26.62	25.96
750.0	2	1500.0	1.0	0.0023	8	0.0130	1.38	3.95	25.96	24.60
3000.0	2	6000.0	4.2	0.0093	8	0.0158	1.52	4.35	24.60	20.53
3000.0	2	6000.0	4.2	0.0093	8	0.0297	2.08	5.97	20.53	18.43
3000.0	2	6000.0	4.2	0.0093	8	0.0184	1.64	4.70	18.43	17.02
3450.0	2	6900.0	4.8	0.0107	8	0.0054	0.89	2.55	17.02	15.94

									Rim Elev.	Rim Elevation
Cum. Avg. Flow	Peaking Factor	Cum. Peak flow	Cum Peak Flow	Cum. Peak Flow	Pipe DIA	Slope	Flow (full)	Velocity (full)	Upstream MH	DownStream MH
gal/d (8x9)		GPD	GPM	ft^3/s	in	ft/ft	ft^3/s	ft/s	ft	ft
1500.0	2	3000.0	2.1	0.0046	8	0.0141	1.43	4.11	16.17	13.50
3000.0	2	6000.0	4.2	0.0093	8	0.0250	1.91	5.48	21.01	13.50

									Rim Elev.	Rim Elevation
Cum. Avg. Flow	Peaking Factor	Cum. Peak flow	Cum Peak Flow	Cum. Peak Flow	Pipe DIA	Slope	Flow (full)	Velocity (full)	Upstream MH	DownStream MH
gal/d (8x9)		GPD	GPM	ft^3/s	in	ft/ft	ft^3/s	ft/s	ft	ft
1125.0	2	2250.0	1.6	0.0035	8	0.0040	0.76	2.19	19.02	18.87
1875.0	2	3750.0	2.6	0.0058	8	0.0040	0.76	2.19	18.87	18.92
1875.0	2	3750.0	2.6	0.0058	8	0.0100	1.21	3.46	18.92	17.91
3375.0	2	6750.0	4.7	0.0104	8	0.0300	2.09	6.00	17.91	14.61

Invert Elev. Upstream MH ft	Invert Elev. Downstream MH ft	MH #	COVER TO TOP OF PIPE ft	DEPTH TO INVERT	
20.23	18.90	8	4.53	5.20	OK
18.70	17.37	9	4.66	5.33	OK
17.16	15.56	10	4.65	5.32	OK
15.36	11.38	11	3.68	4.35	OK
11.18	6.18	7	4.08	4.75	OK

Invert Elev. Upstream MH ft	Invert Elev. Downstream MH ft	MH #	COVER TO TOP OF PIPE ft	DEPTH TO INVERT	
21.45	21.01	1	4.50	5.17	OK
20.81	19.77	2	4.48	5.15	OK
19.57	15.62	3	4.36	5.03	OK
15.42	13.37	4	4.44	5.11	OK
13.17	12.07	5	4.60	5.26	OK
11.87	11.37	6	4.48	5.15	OK

Invert Elev. Upstream MH ft	Invert Elev. Downstream MH ft	MH #	COVER TO TOP OF PIPE ft	DEPTH TO INVERT	
10.60	7.81	32	4.90	5.57	OK
13.30	7.60	34	7.04	7.71	OK

Invert Elev. Upstream MH ft	Invert Elev. Downstream MH ft	MH #	COVER TO TOP OF PIPE ft	DEPTH TO INVERT	
14.02	13.68	35	4.33	5.00	OK
13.48	12.87	36	4.73	5.39	OK
12.67	12.34	37	5.58	6.25	OK
12.14	9.35	38	5.10	5.77	OK

Road 7 - Sewer Flows from MH42 TO MH46							
Pipe	From Manhole	To Manhole	Length of Pipe	Number of Lots	Population Density	Cum. Design pop.	Avg. unit Flow
			ft	Between Manholes	Persons /lot	Persons/Lot	gal/cap*d
P35	42	43	167.87	2.00	10	10	750
P36	43	44	26.19	1.00	5	15	375
P37	44	45	44.18	0.00	0	15	0
P38	45	46	56.69	1.00	5	20	375
			294.93				

From Marina - Sewer Flows from Docks							
Pipe	From Manhole	To Manhole	Length of Pipe	Number of Lots	Population Density	Cum. Design pop.	Avg. unit Flow
			ft	Between Manholes	Persons /lot	Persons/Lot	gal/cap*d
P39	47	46	19.76	0.00	0	0	0
P40	46	LS	178.00	0.00	0	0	0

Cum. Avg. Flow	Peaking Factor	Cum. Peak flow	Cum Peak Flow	Cum. Peak Flow	Pipe DIA	Slope	Flow (full)	Velocity (full)	Rim Elev. Upstream MH	Rim Elevation DownStream MH
gal/d (8x9)		GPD	GPM	ft^3/s	in	ft/ft	ft^3/s	ft/s	ft	ft
750.0	2	1500.0	1.0	0.0023	8	0.0325	2.18	6.24	26.49	18.57
1125.0	2	2250.0	1.6	0.0035	8	0.0325	2.18	6.24	18.57	18.92
1125.0	2	2250.0	1.6	0.0035	8	0.0325	2.18	6.24	17.27	17.91
1500.0	2	3000.0	2.1	0.0046	8	0.0325	2.18	6.24	15.21	12.53

Cum. Avg. Flow	Peaking Factor	Cum. Peak flow	Cum Peak Flow	Cum. Peak Flow	Pipe DIA	Slope	Flow (full)	Velocity (full)	Rim Elev. Upstream MH	Rim Elevation DownStream MH
gal/d (8x9)		GPD	GPM	ft^3/s	in	ft/ft	ft^3/s	ft/s	ft	ft
0.0	2	0.0	0.0	0.0000	8	0.0060	0.94	2.68	12.53	12.53
0.0	2	0.0	0.0	0.0000	8	0.0060	0.94	2.68	12.53	20.22

Invert Elev. Upstream MH ft	Invert Elev. Downstream MH ft	MH #	COVER TO TOP OF PIPE ft	DEPTH TO INVERT	
18.00	12.54	42	7.82	8.49	OK
12.34	11.49	43	5.56	6.23	OK
11.29	9.86	44	5.31	5.98	OK
9.66	7.81	45	4.89	5.55	OK

Invert Elev. Upstream MH ft	Invert Elev. Downstream MH ft	MH #	COVER TO TOP OF PIPE ft	DEPTH TO INVERT	
7.50	7.38	47	4.36	5.03	OK
7.18	6.11	46	4.68	5.35	OK

APPENDIX E – Geotechnical Investigation Report

ENGINEERING AND TECHNICAL SERVICES

CIVIL & STRUCTURAL CONSULTING
P.O. BOX SS 5589
NASSAU, BAHAMAS
TEL: 242-356-0500
FAX: 242-325-8740
EMAIL ETSBAHAMAS@GMAIL.COM

June 10, 2019

David V. Hayes
Vice President
Wharton-Smith, Inc.
Construction Group of Choice
750 Monroe Road,
Sanford, FL 32771

Dear Mr. Hayes,

Re: Briland Marina Development Preliminary Geotechnical Investigation Report

In accordance with our proposal dated March 22, 2019, we have completed the geotechnical investigation for the proposed upland and marina structures. We have completed the upland site investigation testing and a review of the design drawings for the proposed offshore structures.

1.0 Background

It is our understanding that it is proposed to construct multi-storey buildings for a new hotel, marina and residential subdivision on Harbour Island. Construction had commenced on the marina works at the time of the site investigation. It is our understanding that the construction will include on offshore structure constructed on an infill area of the marina enclosed by steel sheet pile walls.

The upland site exploration was carried out between May 6 and May 24, 2019. The scope of the soil sampling consisted of completing twelve (12) standard penetration borings to approximately 30 feet below the existing grade. The boring logs are enclosed in the appendix for your reference. The borings were carried out using a BK51 rig with 4-inch casing. Soil samples were obtained using a Standard Penetration Test (SPT) sampler with a 2.0-inch-outside diameter and a 1.5-inch-inside diameter, without liners. The samplers were driven with a manual hammer to determine the "N" resistance values. Details of drilling, sampling, and field conditions are indicated on the boring logs. The approximate locations of the borings are indicated on Figure 1.0.

The upland site surface elevation appears to vary from approximately +10.0 to +25.0 feet above mean sea level based on the observed ground water levels recorded in the borings.

2.0 Soil / Rock Profile

Generally, the subsurface conditions encountered in the borings consisted of a five to eight feet thick surficial layer of well cemented sandy limestone. This cemented limestone had an average resistance of 36 blows per foot (bpf) with a minimum resistance of 5 bpf. Directly beneath this cemented limestone a less cemented limestone was encountered at a depth of 8 to 18 feet below the existing grade. This layer of limestone had an average resistance of 22 blows per foot (bpf) with a minimum resistance of 3 bpf. Beneath this depth a weakly cemented sandy limestone, with rock fragments, was encountered from a depth of 18 to 30 feet below the surface. This layer of limestone had an average resistance of 18 bpf with a minimum resistance of 2 bpf. In boring B4 a thin layer of well cemented limestone was encountered in this zone with a resistance of 52 bpf. Figure 2 illustrates a summary of the resistance relative to depth encountered in each boring and the approximate design resistance values used for our evaluation. Figures 3 and 4 illustrates the observed resistance relative to existing grade elevation for the shoreline and upland borings respectively.

Cont'd...

Groundwater was encountered each boring and the water level was monitored shortly after drilling. Well screens and casing were installed in borings B6, B8, B9, and B12 to allow for future monitoring and sampling of the ground water during construction. It should be noted that the groundwater observations only reflect the groundwater conditions at the time of our exploration. Fluctuations of the groundwater table should be expected to occur both seasonally and annually due to variations in rainfall, evaporation, construction activities, and other site-specific factors.

3.0 FOUNDATION ALTERNATIVES – UPLAND STRUCTURES

Based on the standard penetration resistance test results and anticipated design loads it is our opinion that from a geotechnical standpoint the site is suitable for the proposed structures. Based on the information provided the following is our recommended foundation alternatives for the upland structures. Our recommendations should be confirmed when actual loading conditions are available.

3.1 SHALLOW FOUNDATIONS FOR UPLAND STRUCTURES

It is our opinion that the structures built on the surficial sandy limestone can be supported on conventional spread footing foundations. It is recommended that the spread foundations bear on the competent limestone located at an average depth of 2 to 3 feet below the existing grade.

Figure 5 illustrates the recommended allowable bearing capacity relative to the footing depth based on the penetration resistance encountered. ***It is our recommendation that spread footings bearing on the upper limestone be designed for an allowable soil bearing capacity of 4,000 pounds per square foot (psf).*** The net allowable capacity refers to the pressure that can be transmitted to the foundation bearing soils in excess of the final overburden pressure at the base of a footing. For uplift designs, it is recommended that a soil unit weight of 110psf be used.

For a designed allowable bearing pressure of 4,000psf, we estimate that the total immediate settlements of the footings, designed and constructed as outlined in this report, will be approximately 1/2 inch. Maximum total immediate settlements on the order of 1/2 inch generally can normally be tolerable by the structure; however, if such settlement magnitudes will not be acceptable for the planned building, ETS should be advised so that other foundation alternatives can be evaluated.

Prior to any placement of reinforcement and concrete for footings, the bases of all footing excavations must be inspected, tested, and approved by a representative of ETS to verify that the soil conditions at each footing location are suitable for the design bearing pressure. The Contractor shall notify the Engineer when the footing excavation is substantially complete and is ready for inspection. No reinforcement or concrete shall be placed until the Engineer approves the footing excavation surface.

3.2 DEEP FOUNDATIONS FOR UPLAND STRUCTURES

Alternatively, the upland buildings could be supported on Augered Cast-In-Place Piles, (ACIP). ACIP piles are drilled deep foundations in which the pile is installed to the required depth in one continuous process utilizing a continuous flight auger. Grout is then injected through, the hollow center of the auger pipe to the bottom of the shaft, under continuous positive pressure as the auger is being withdrawn in order to exert a positive upward pressure on the earth-filled auger flights as well as lateral pressure on the soil surrounding the placed grout or concrete column. Reinforcing steel is then inserted into the column of concrete following the completion of concrete placement. The structure is then founded on pile caps that are supported by the auger piles. Load applied to the piles shall be transferred to the soil mainly through skin friction that develops along the sides of the piles. A 16-inch diameter auger cast pile is commonly used in the Bahamas for structures; therefore, our analysis presented in this report is based on a 16-inch pile. Figure 5.0A illustrates the recommended allowable capacity for a 16-inch auger cast pile relative to pile depth. The piles should be installed to a minimum tip elevation as indicated on the drawings and as determined to support their respective working loads. Due to possible varying soil and limestone conditions the actual pile tip elevations will be determined in the field based on the observations by the piling inspector and as agreed to by the Engineer.

Cont'd...

Due to the anticipated compressive, uplift and lateral loads, rebar cages should be utilized for the piles. Steel bars or high-strength plastic wheel centralizers should be used to provide a minimum of 3-inch grout cover around the rebar cage or pipe and to keep the rebar cage or pipe centered. It is recommended that the centralizers be spaced at not less than 5-foot intervals. It is recommended that the ACIP be reinforced their full length with continuous reinforcement of no less than 6 - #5 rebars. Concrete grout used in the auger cast piles should have minimum design strength of 5000psi.

3.3 Upland Foundation Recommendations

Based on the anticipated loads, the construction advantages and our experience with similar projects it is our recommendation that a shallow foundation system be utilized to support the proposed upland structures. The shallow foundations should consist of conventional spread and continuous wall footings designed to bear on the upper cemented limestone generally located at a minimum depth of three feet below the existing grade. As stated previously we recommend that a ***net allowable design soil bearing capacity of 4,000 pounds per square foot (psf) be used for the design of all spread footings.***

3.4 Building Pad Earthworks

The building pad area should be prepared by removing and disposing of all surface vegetation, organic matter and construction debris, including all roots, debris, stumps, rubbish and other material that is considered unsuitable. After leveling and striping it is anticipated that only minor preparation under the building area will be required. The limits of the pad area for surface preparation should extend at least 5 feet beyond the edges of the building footings.

Imported clean and organic free limestone fill should be used for all engineered fill material under the building's footprint. The fill soils must be tested to determine the maximum dry density and optimum moisture content determined by a Modified Proctor Test per ASTM D 1557.

The fill should be placed in layers not exceeding 8 inches in thickness before compaction. The total required depth of the import fill must be determined from the final levels specified on the architectural drawings. The engineering fill may need to be conditioned with water to produce a suitable water content to optimize compaction. Fill shall be placed and compacted to at least 95% of the maximum Modified Proctor dry density and within 2 percentage points of the optimum moisture content. Density testing shall be carried out and the results submitted to the geotechnical engineer for approval. The fill compaction should be checked with nuclear gauges or approved equipment with one test for every 2,000 square feet per lift in the building areas and 5,000 square feet per lift in the parking areas to ensure conformance with the recommended in-place density and moisture contents.

Cont'd...

4.0 Foundation Recommendation for Marine Structures

The marina design drawings indicate that the location of the proposed structure shall be filled to an elevation of approximately +6.0 MSL. At this location the existing water depth appears to range from 12 to14 feet and the sand depth varies from 8 to 12 feet. Beneath the sand it is anticipated that cemented limestone will be encountered based on the borings and sheet pile driving observations. It is our recommendation that the structures built on marina area should be supported on deep foundations that extend to the competent limestone below the seabed sand.

We have analyzed the estimated capacity of a 30', and a 42', long 14" square precast driven pile. The analysis indicates that the allowable compressive capacity of the 30' driven pile is 148 kips and the allowable capacity of the 42' driven pile is 206 kips; see Figures 6 and 8 respectively. Each pile had a total settlement of approximately ½ inch; see Figures 7 and 9 respectively.

It is our recommendation that at 14-inch square concrete precast pile 42 feet long be driven full length to support the proposed marine structures with an allowable compressive capacity of 148 kips.

4.1 Marine Building Pad Earthworks

The fill placed in the building pad area should be placed in layers not exceeding 24 inches in thickness before compaction. The fill material should be compacted using a vibro-densification probe inserted no less than 2 feet beyond the bottom of the uncompacted layer of fill and at a grid spacing not to exceed 5 feet. It is recommended that fill above the elevation 2 MSL shall be limestone fill and be compacted to at least 95% of the maximum Modified Proctor dry density and within 2 percentage points of the optimum moisture content. Density testing shall be carried out and the results submitted to the geotechnical engineer for approval. The fill compaction should be checked with nuclear gauges or approved equipment with one test for every 2,000 square feet per lift in the building areas and 5,000 square feet per lift in the parking areas to ensure conformance with the recommended in-place density.

5.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

The undersigned should be notified at least 2 days before site grading and footing excavations commence and should be present to observe footing excavations on site. The recommendations in this report are based on the observed soil conditions encountered at the place, and time, of the investigation only. Any recommendations given are based on these observations; however, it is possible that soil conditions encountered during construction may differ significantly from those reported. If so we should be contacted to provide supplemental recommendations. It is the owner's responsibility to ensure that the information and recommendations contained in this report are brought to the attention of the architect, structural engineer and contractor for the proposed project.

We appreciate the opportunity to be of service in preparing this report. If you have any questions on the above or require additional assistance, please do not hesitate to contact the undersigned.

LAMBERT KNOWLES P.E.

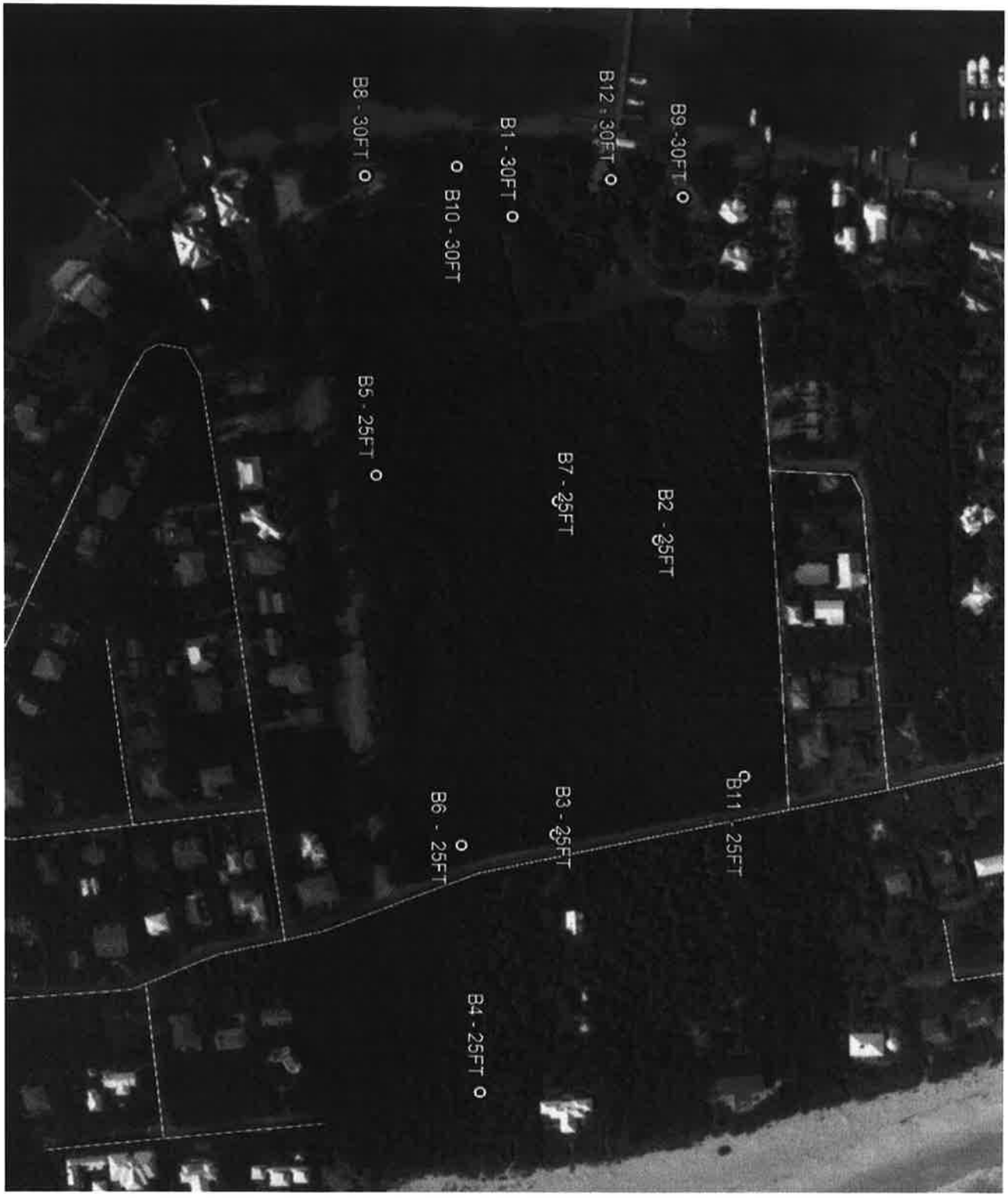
ENGINEERING & TECHNICAL SERVICES

CONSULTING ENGINEERS

ets

ENGINEERING AND TECHNICAL SERVICES

FIGURE 1.0 - BORING PLAN			DATE	6/5/2019	
ets ENGINEERING AND TECHNICAL SERVICES	ENGINEERING AND TECHNICAL SERVICES P.O. BOX SS 5589 NASSAU, BAHAMAS	*PROJECT:*	HARBOUR ISLAND MARINA HARBOUR ISLAND	SHEET:	1
		LOCATION:	ELEUTHERA, BAHAMAS	OF:	1



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ENGINEERING AND TECHNICAL SERVICES

FIGURE 2: HARBOUR ISLAND PROJECT
ALL BORINGS
Summary of Penetration Resistance Readings

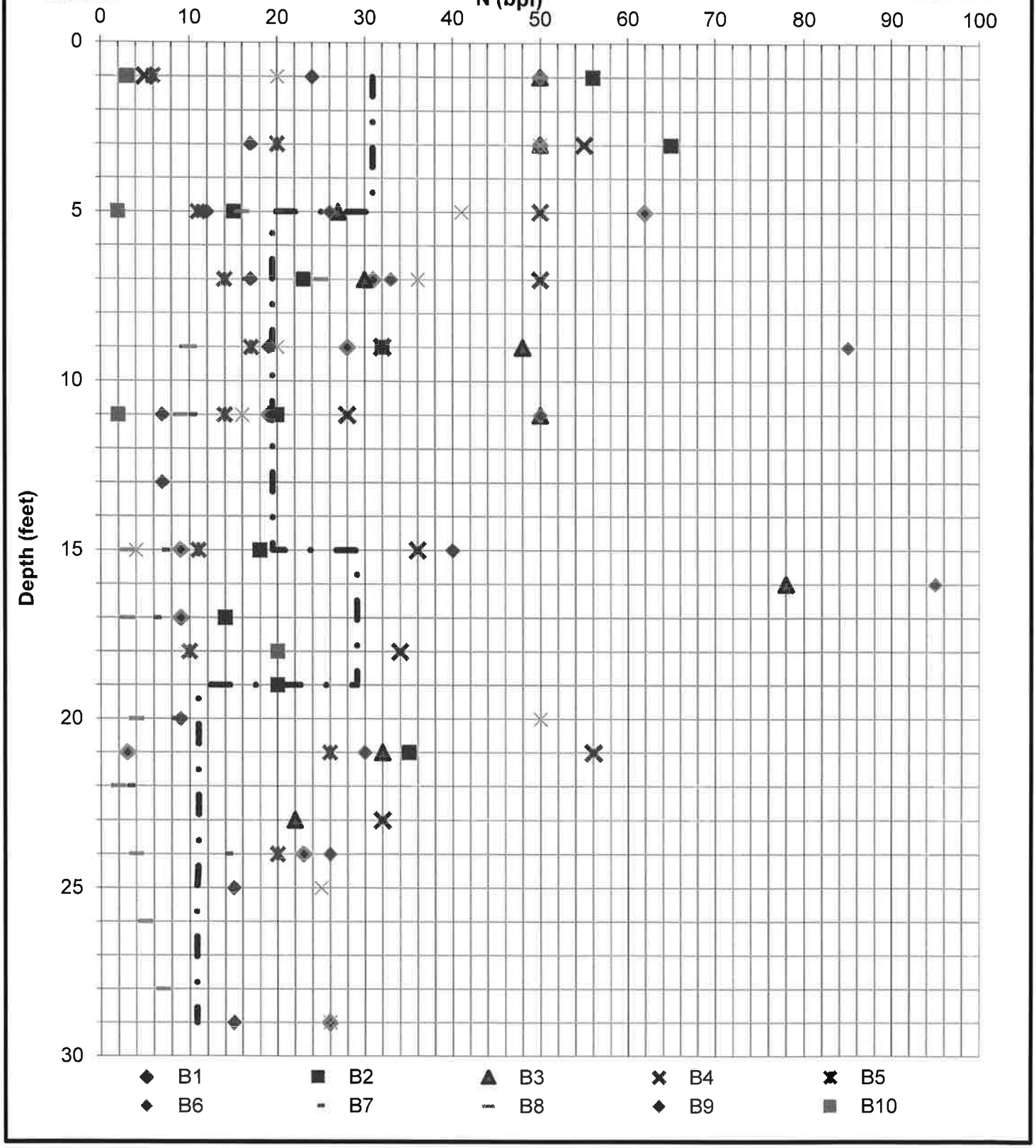
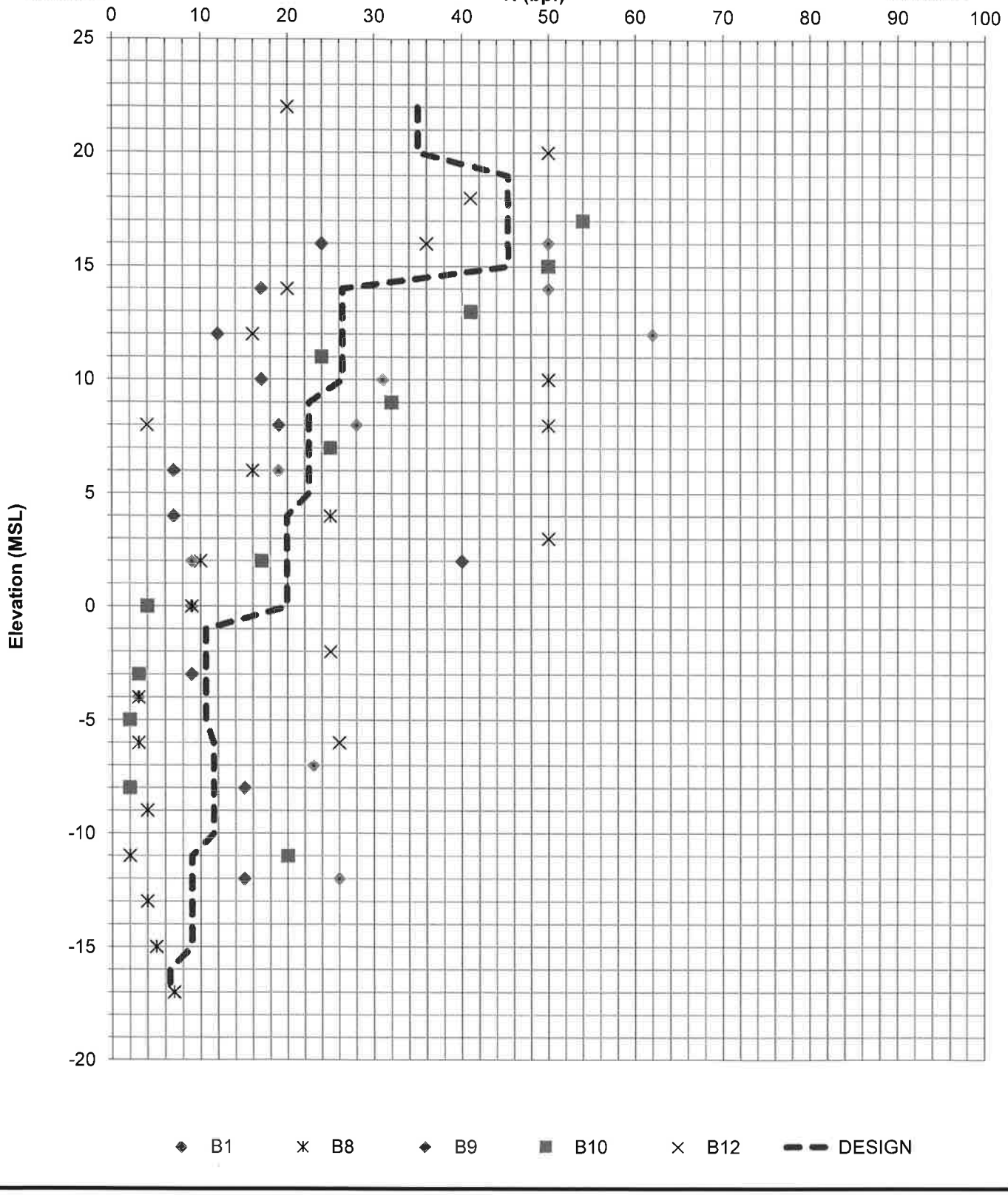


FIGURE 3: HARBOUR ISLAND PROJECT
SHORLINE BORINGS
Summary of Resistance Readings
N (bpf)



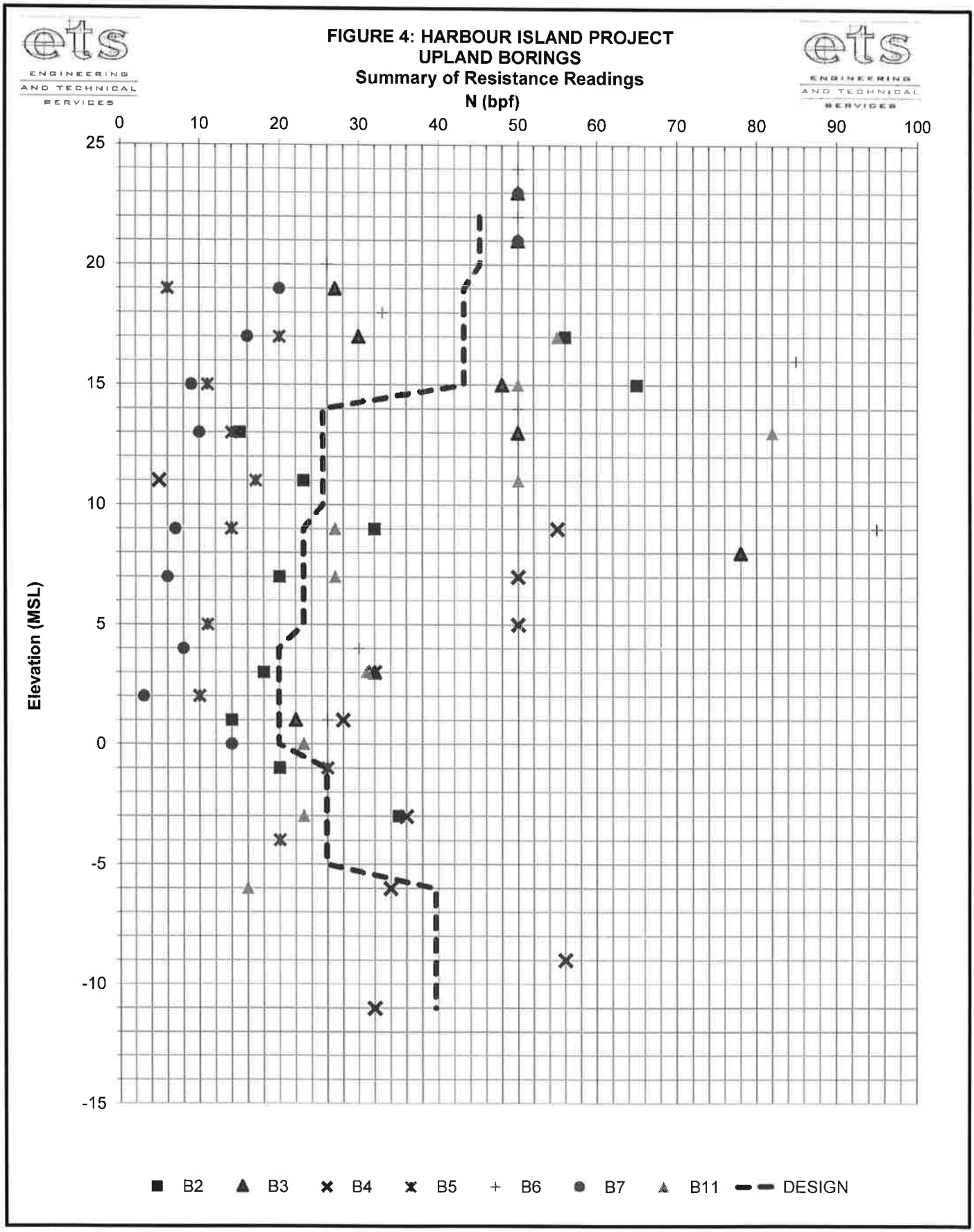


FIGURE 4: HARBOUR ISLAND PROJECT
UPLAND BORINGS
Summary of Resistance Readings
N (bpf)
ets
ENGINEERING AND TECHNICAL SERVICES
0
10
20
30
40
50
60
70
80
90
100
25
20
15
10
5
0
-5
-10
-15
Elevation (MSL)
B2
B3
B4
B5
B6
B7
B11
DESIGN

FIGURE 5.0
HARBOUR ISLAND
ALLOWABLE BEARING PRESSURE

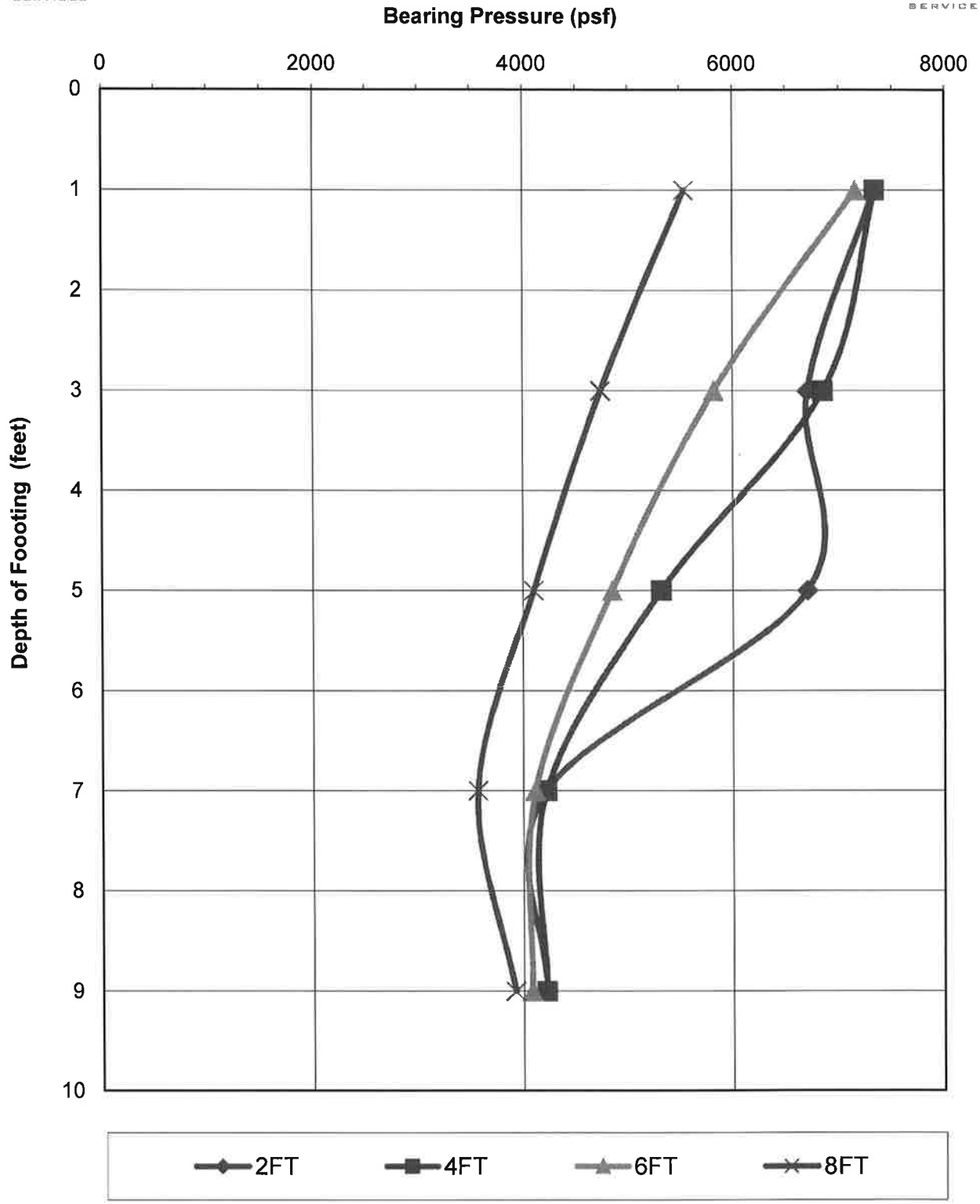
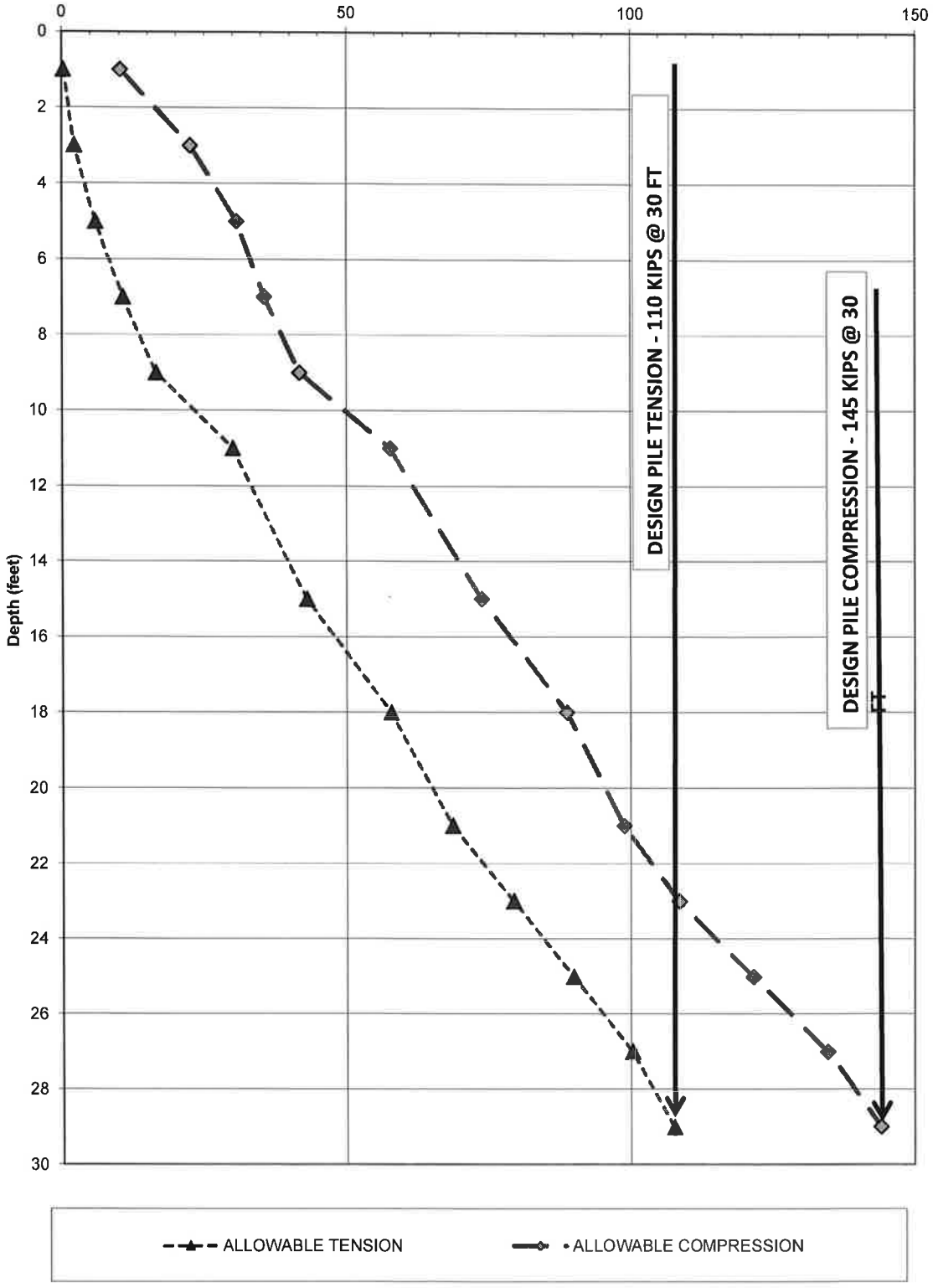
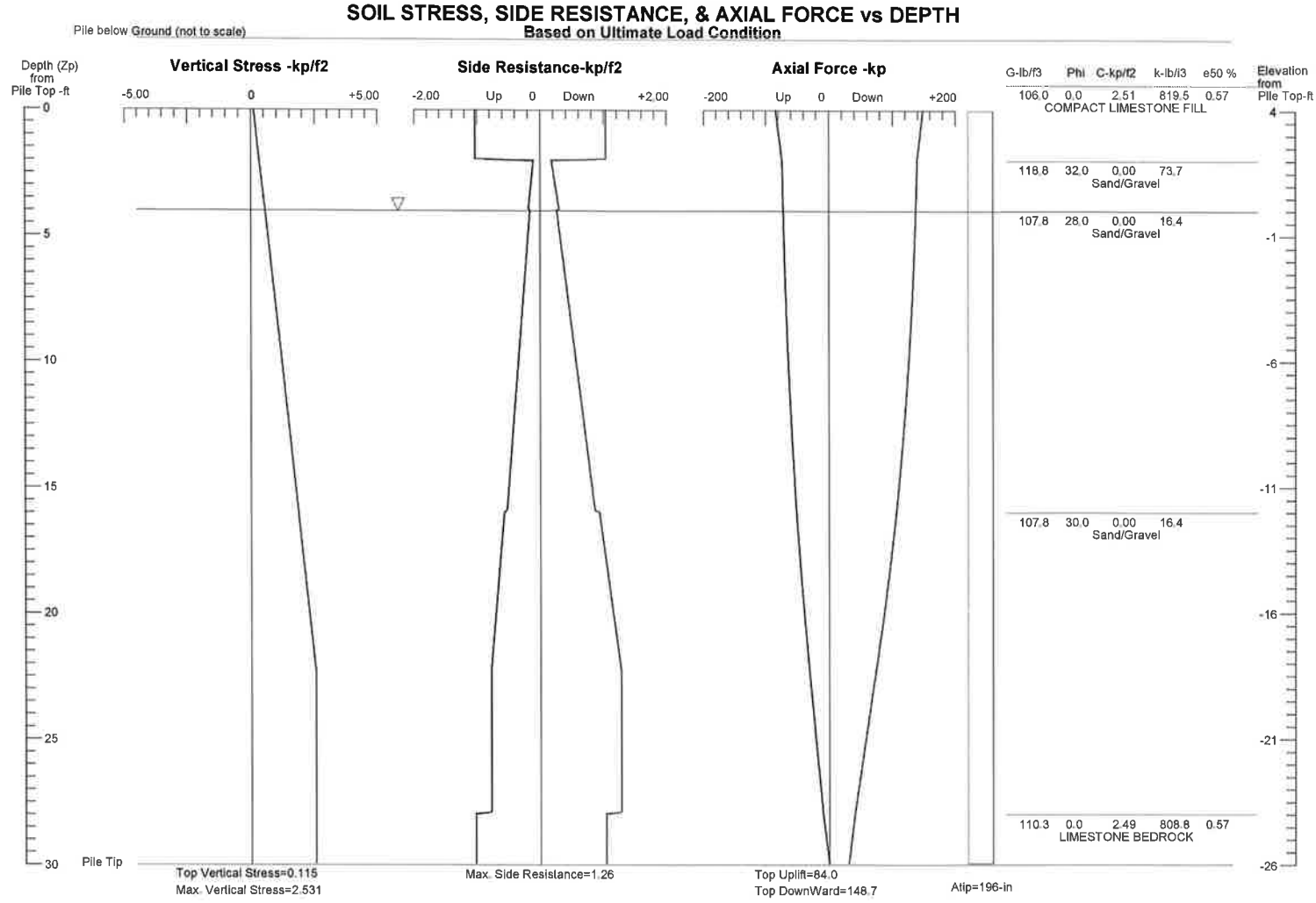


FIGURE 5.0A - BRILAND CLUB
16- INCH AUGER CAST PILE
ESTIMATE LOAD CAPCAITY
5000psi Concrete



SOIL STRESS, SIDE RESISTANCE, & AXIAL FORCE vs DEPTH

Based on Ultimate Load Condition

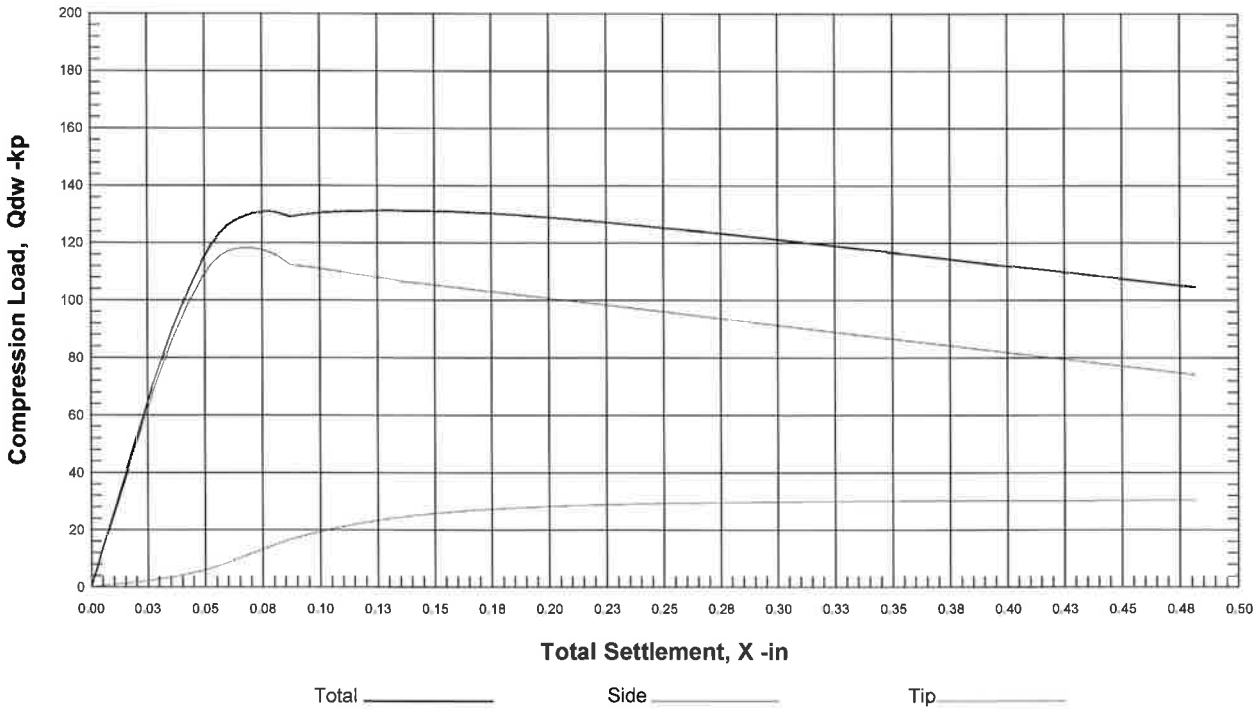


ENGINEERING AND TECHNICAL SERVICES
NASSAU, BAHAMAS

HARBOUR ISLAND DEVELOPMENT
14X14 CONC. PILES - 30FT LONG

Figure 6.0

Vertical Load vs. Total Settlement



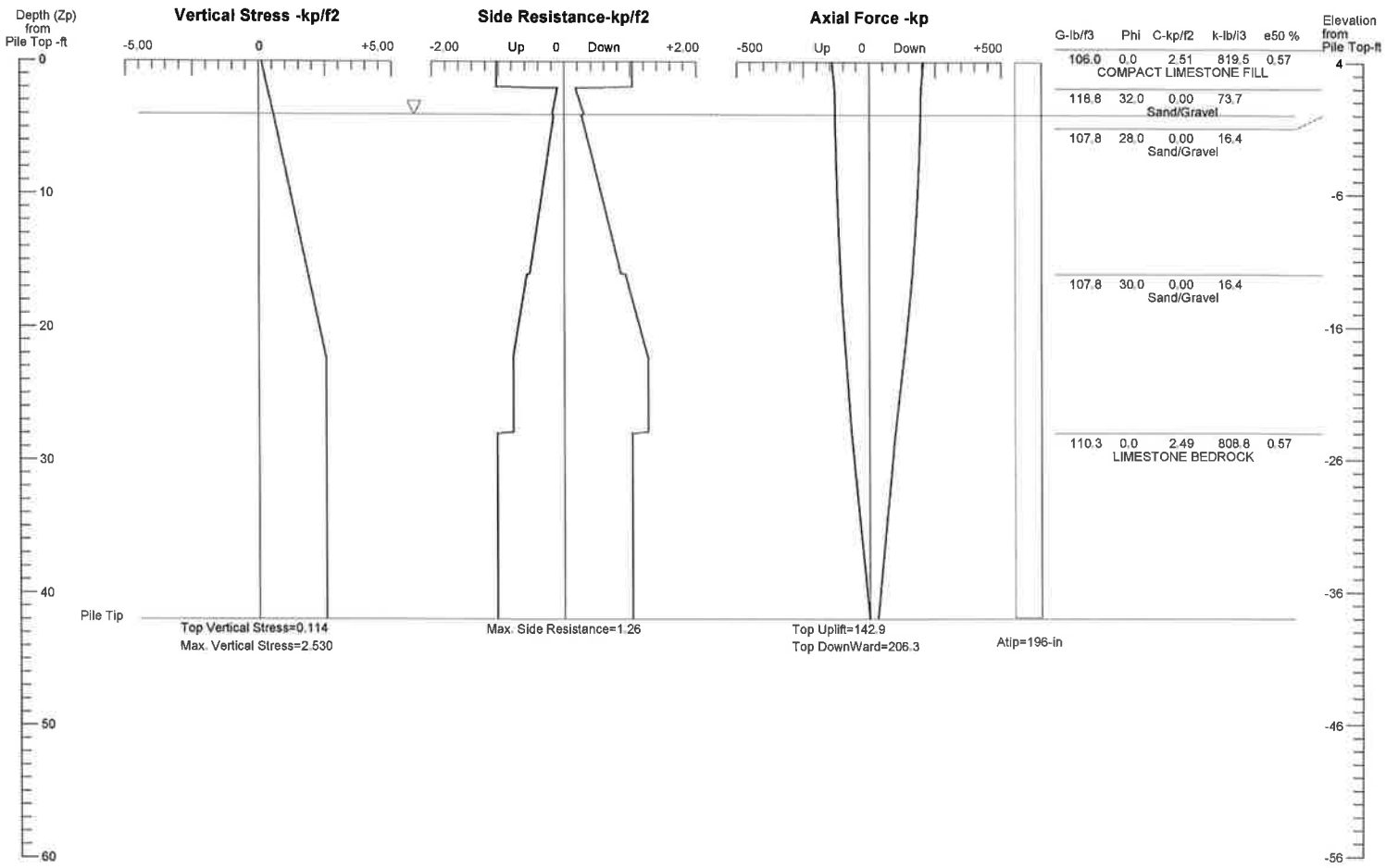
ENGINEERING AND TECHNICAL SERVICES
NASSAU, BAHAMAS

HARBOUR ISLAND DEVELOPMENT
14X14 CONC. PILES - 30FT LONG

Figure 7.0

SOIL STRESS, SIDE RESISTANCE, & AXIAL FORCE vs DEPTH

Based on Ultimate Load Condition

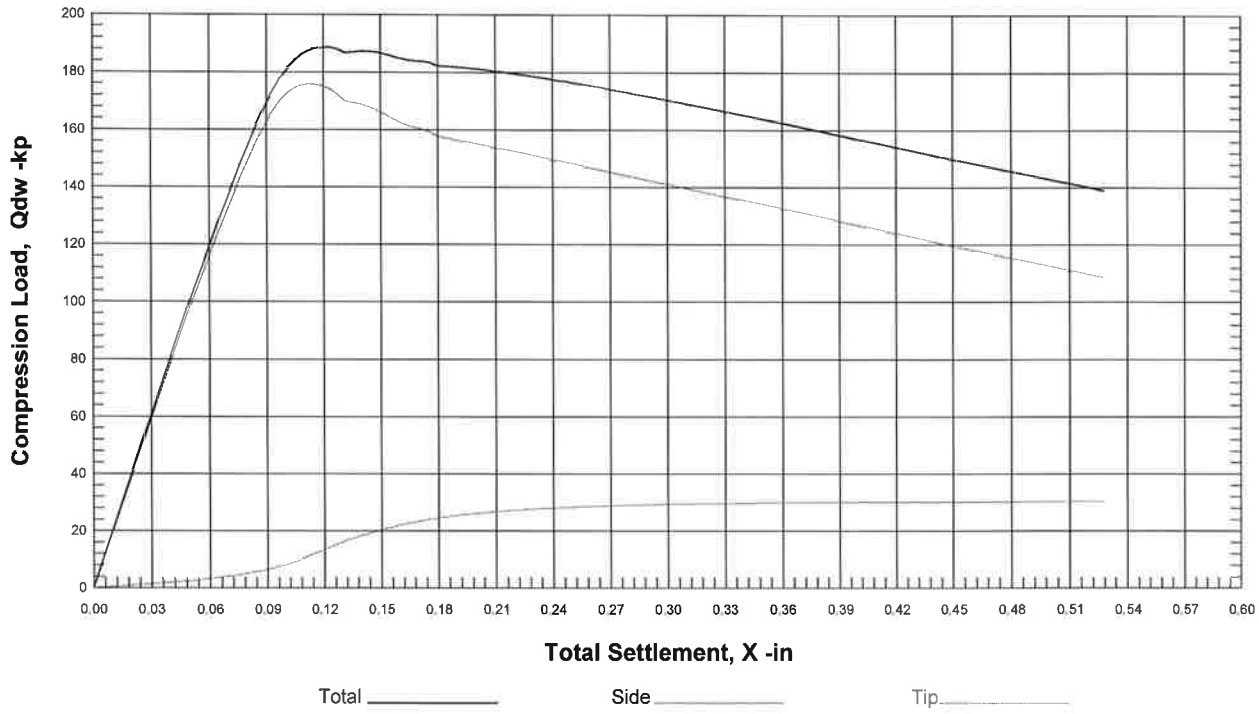


ENGINEERING AND TECHNICAL SERVICES
NASSAU, BAHAMAS

HARBOUR ISLAND DEVELOPMENT
14X14 CONC. PILES - 42FT LONG

Figure 8.0

Vertical Load vs. Total Settlement



ENGINEERING AND TECHNICAL SERVICES
NASSAU, BAHAMAS

HARBOUR ISLAND DEVELOPMENT
14X14 CONC. PILES - 42FT LONG

Figure 9.0

APPENDIX – BORING LOGS

BORING / SAMPLE LOG

BORING #: B1

ENGINEERING AND TECHNICAL SERVICES
P.O. BOX SS 5589
NASSAU, BAHAMAS

PROJECT: Harbour Island Marina

LOCATION: Harbour Island, Eleuthera

SHEET: 1 **OF:** 2

DRILLING CO:	ETS	START DATE:	7/5/2019	CASING: 3.5' HAS	COORDINATES:
DRILLER:	MW	WATER DEPTH	10ft	SAMPLER: 2" SS-SPT	
ENGINEER:	LK	HAMMER WT:	140	CORE BARREL:	
Drill Rig:		FALL:	30	SEABED ELEV:	

BORING RECORD

Depth (ft)	Sample No.	Depth Range (feet)	Samp. Type	0-12 / 0-6	12-24 / 6-12	24-36 / 12-18	36-48 / 18-24	48-60 / N/A	Pen. (inch)	Rec. (inch)	RQD (%)	SPT "N" / UCS	FIELD DESCRIPTION AND REMARKS
1	1	0.0-2.0	SS	25	50/4"			N/A	11	9	N/A	50	TOP SOIL & LIMEROCK
3	2	2.0-4.0	SS	50/4"				N/A	4	2	N/A	50	TOP SOIL & LIMEROCK
5	3	4.0-6.0	SS	13	32	30	12	N/A	24	24	N/A	62	LT. TAN SANDY LIMESTONE
7	4	6.0-8.0	SS	12	13	18	16	N/A	24	24	N/A	31	LT. TAN SANDY LIMESTONE
9	5	8.0-10.0	SS	13	16	12	12	N/A	24	15	N/A	28	LT. TAN SANDY LIMESTONE
11	6	10.0-12.0	SS	9	10	9	8	N/A	24	15	N/A	19	LT. TAN SANDY LIMESTONE
		WASH		DRILLED OUT									
15	7	14.0-16.0	SS	3	4	5	7	N/A	24	12	N/A	9	LT. TAN SANDY LIMESTONE
17	8	16.0-18.0	SS	3	5	4	4	N/A	24	6	N/A	9	LT. TAN SANDY LIMESTONE
21	9	20.0-22.0	SS	4	1	2	2	N/A	24	20	N/A	3	LT. TAN SANDY LIMESTONE
24	10	23.0-25.0	SS	1	9	14	25	N/A	24	20	N/A	23	LT. TAN SANDY LIMESTONE
		WASH		DRILLED OUT									
29	11	28.0-30.0	SS	9	12	14	13	N/A	24	20	N/A	26	LT. TAN SANDY LIMESTONE

Proportions Used: trace = < 5%, few = 5-10%, little = 15-25%, some = 30-45%, and = 50-100%

Notes:

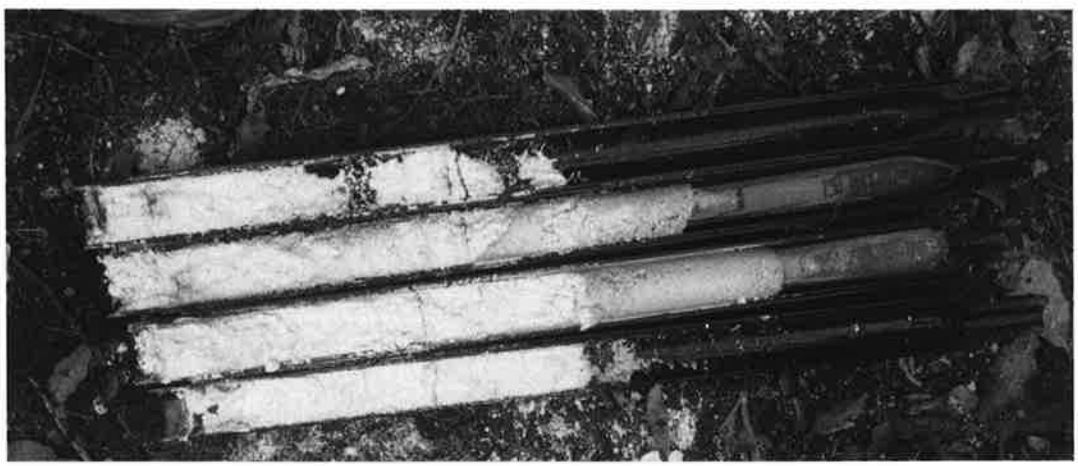
ENGINEERING AND TECHNICAL SERVICES

ENGINEER

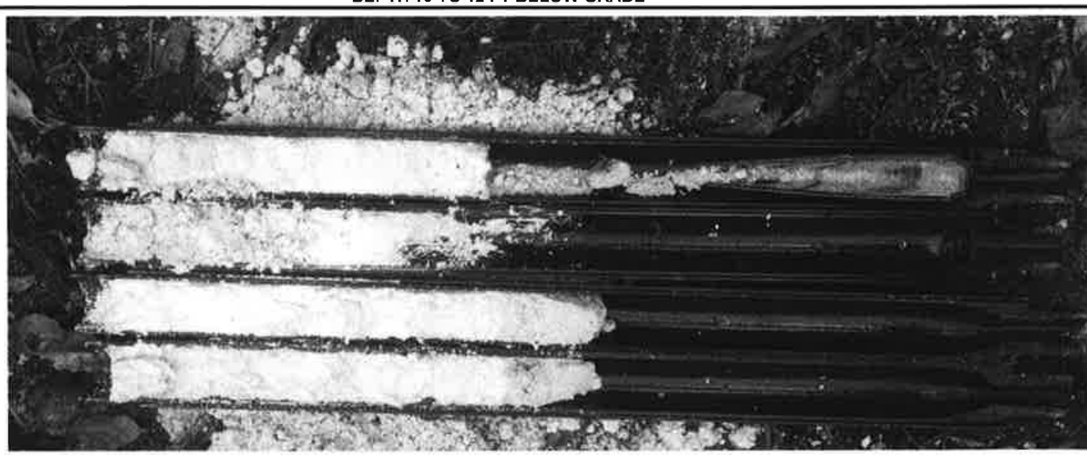
BORING PHOTOGRAPHS

BORING	B1					
ENGINEERING AND TECHNICAL SERVICES P.O. BOX SS 5589 NASSAU, BAHAMAS 242-356-0500				PROJECT:	HARBOUR ISLAND MARINA *B1*	
				LOCATION:	ARBOUR ISLAND, ELEUTHR	
Drillin CO:	ETS	START DATE:	7/5/2019	CASING:	HQ	

DEPTH 4 TO 6 FT BELOW GRADE



DEPTH 10 TO 12 FT BELOW GRADE



DEPTH 16 TO 18 FT BELOW GRADE

BORING / SAMPLE LOG

BORING #: B2

ENGINEERING AND TECHNICAL SERVICES
P.O. BOX SS 5589
NASSAU, BAHAMAS

PROJECT: HARBOUR ISLAND MARINA
LOCATION: Harbour Island, Eleuthera

SHEET: 1
OF: 2

DRILLING CO:	ETS	**START DATE:**	9/5/2019	**CASING:**	**COORDINATES:**
DRILLER:	MW	**WATER DEPTH**	18ft	**SAMPLER:**	
ENGINEER:	LK	**HAMMER WT:**	140	**CORE BARREL:**	
Drill Rig:		**FALL:**	30	**SEABED ELEV:**	

BORING RECORD

Depth (ft)	Sample No.	Depth Range (feet)	Samp. Type	0-12 / 0-6	12-24 / 6-12	24-36 / 12-18	36-48 / 18-24	48-60 / N/A	Pen. (inch)	Rec. (inch)	RQD (%)	SPT "N" / UCS	FIELD DESCRIPTION AND REMARKS
1	1	0.0-2.0	SS	26	30	26	23	N/A	24	20	N/A	56	LT. TAN SANDY LIMESTONE
3	2	2.0-4.0	SS	35	35	30	22	N/A	24	20	N/A	65	LT. TAN SANDY LIMESTONE
5	3	4.0-6.0	SS	5	7	8	7	N/A	24	24	N/A	15	LT. TAN SANDY LIMESTONE
7	4	6.0-8.0	SS	9	5	18	25	N/A	24	20	N/A	23	LT. TAN SANDY LIMESTONE
9	5	8.0-10.0	SS	9	17	15	16	N/A	24	24	N/A	32	LT. TAN SANDY LIMESTONE
11	6	10.0-12.0	SS	9	9	11	15	N/A	15	20	N/A	20	LT. TAN SANDY LIMESTONE
		12.0-14.0		DRILLED OUT									
15	7	14.0-16.0	SS	6	6	12	12	N/A	8	12	N/A	18	LT. TAN SANDY LIMESTONE
17	8	16.0-18.0	SS	9	9	5	7	N/A	24	24	N/A	14	LT. TAN SANDY LIMESTONE
19	9	18.0-20.0	SS	5	7	13	17	N/A	15	20	N/A	20	LT. TAN SANDY LIMESTONE
21	10	20.0-22.0	SS	13	15	20	30	N/A	3	6	N/A	35	LT. TAN SANDY LIMESTONE

Proportions Used: trace = < 5%, few = 5-10%, little = 15-25%, some = 30-45%, and = 50-100%

Notes:

ENGINEERING AND TECHNICAL SERVICES

ENGINEER

BORING PHOTOGRAPHS

				BORING	B2
ENGINEERING AND TECHNICAL SERVICES	ENGINEERING AND TECHNICAL SERVICES P.O. BOX SS 5589 NASSAU, BAHAMAS 242-356-0500		PROJECT:	HARBOUR ISLAND MARINA	
				B2	
			LOCATION:	Harbour Island, Eleuthera	
Drillin CO:	ETS	START DATE: 9/5/2019	CASING:	HQ	

DEPTH 0 TO 2 FT BELOW GRADE

DEPTH 4 TO 6 FT BELOW GRADE

DEPTH 10 TO 12 FT BELOW GRADE

BORING / SAMPLE LOG

BORING #: B3

ENGINEERING AND TECHNICAL SERVICES
P.O. BOX SS 5589
NASSAU, BAHAMAS

PROJECT: Harbour Island Marina
LOCATION: Harbour Island, Eleuthera
SHEET: 1
OF: 2

DRILLING CO:	ETS	**START DATE:**	10/5/2019	**CASING:**	**COORDINATES:**
DRILLER:	MW	**WATER DEPTH**	N/A	**SAMPLER:**	
ENGINEER:	LK	**HAMMER WT:**	140	**CORE BARREL:**	
Drill Rig:		**FALL:**	30	**SEABED ELEV:**	

BORING RECORD

Depth (ft)	Sample No.	Depth Range (feet)	Samp. Type	0-12 / 0-6	12-24 / 6-12	24-36 / 12-18	36-48 / 18-24	48-60 / N/A	Pen. (inch)	Rec. (inch)	RQD (%)	SPT "N" / UCS	FIELD DESCRIPTION AND REMARKS
1	1	0.0-2.0	SS	50/3"				N/A	3	2	N/A	50	LT TAN LIMESTONE
3	2	2.0-4.0	SS	40	50/3"			N/A	9	4	N/A	50	LT TAN LIMESTONE
5	3	4.0-6.0	SS	10	14	13	14	N/A	24	12	N/A	27	LT TAN LIMESTONE
7	4	6.0-8.0	SS	14	14	16	19	N/A	24	24	N/A	30	LT TAN LIMESTONE
9	5	8.0-10.0	SS	21	24	24	26	N/A	24	20	N/A	48	LT TAN LIMESTONE
11	6	10.0-12.0	SS	21	25	25	26	N/A	24	12	N/A	50	LT TAN LIMESTONE
		WASH		DRILLED OUT									
16	7	15.0-17.0	SS	31	38	40	50	N/A	15	20	N/A	78	LT TAN LIMESTONE
		WASH		DRILLED OUT									
21	8	20.0-22.0	SS	16	17	15	15	N/A	15	20	N/A	32	LT TAN LIMESTONE
23	9	22.0-24.0	SS	10	10	12	15	N/A	14	20	N/A	22	LT TAN LIMESTONE

Proportions Used: trace = < 5%, few = 5-10%, little = 15-25%, some = 30-45%, and = 50-100%

Notes:

ENGINEERING AND TECHNICAL SERVICES

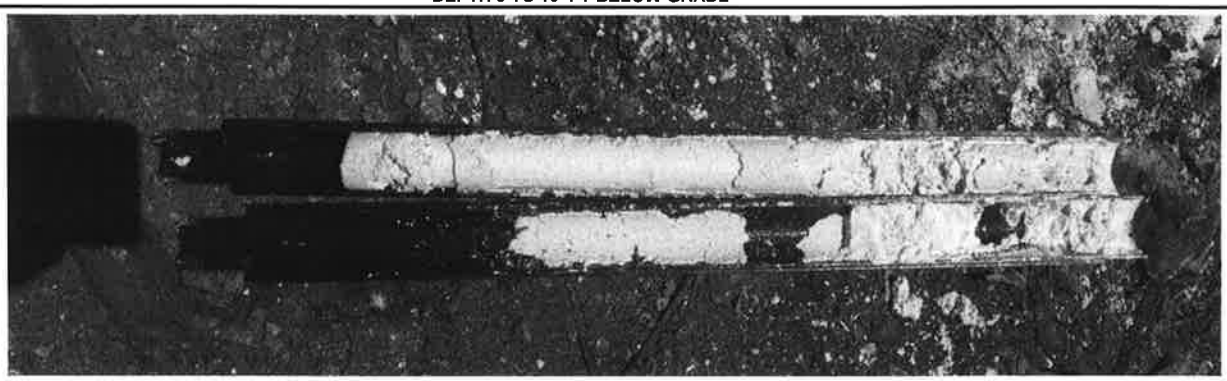
ENGINEER

BORING PHOTOGRAPHS

						BORING	B3
ets ENGINEERING AND TECHNICAL SERVICES	ENGINEERING AND TECHNICAL SERVICES P.O. BOX SS 5589 NASSAU, BAHAMAS 242-356-0500			PROJECT: LOCATION:	HARBOUR ISLAND MARINA B3 Harbour Island, Eleuthera		
Drillin CO:	ETS	START DATE:	10/5/2019	CASING:	HQ		

DEPTH 4 TO 6 FT BELOW GRADE

DEPTH 8 TO 10 FT BELOW GRADE



DEPTH 15 TO 17 FT BELOW GRADE

BORING / SAMPLE LOG

BORING #: B4

ENGINEERING AND TECHNICAL SERVICES
P.O. BOX SS 5589
NASSAU, BAHAMAS

PROJECT: Harbour Island Marina
LOCATION: Harbour Island, Eleuthera
SHEET: 1
OF: 2

DRILLING CO:	ETS	**START DATE:**	10/5/2019	**CASING:**	**COORDINATES:**
DRILLER:	MW	**WATER DEPTH**	12ft	**SAMPLER:**	
ENGINEER:	LK	**HAMMER WT:**	140	**CORE BARREL:**	
Drill Rig:		**FALL:**	30	**SEABED ELEV:**	

BORING RECORD

Depth (ft)	Sample No.	Depth Range (feet)	Samp. Type	0-12 / 0-6	12-24 / 6-12	24-36 / 12-18	36-48 / 18-24	48-60 / N/A	Pen. (inch)	Rec. (inch)	RQD (%)	SPT "N" / UCS	FIELD DESCRIPTION AND REMARKS
1	1	0.0-2.0	SS	1	2	3	4	N/A	24	20	N/A	5	TOP SOIL & SAND
3	2	2.0-4.0	SS	4	5	50/2"		N/A	14	12	N/A	55	TOP SOIL AND LIMESTONE
5	3	4.0-6.0	SS	50/3"				N/A	3	3	N/A	50	LT. TAN LIMESTONE
7	4	6.0-8.0	SS	32	50/3"			N/A	9	9	N/A	50	LT. TAN LIMESTONE
9	5	8.0-10.0	SS	14	16	16	12	N/A	15	20	N/A	32	LT. TAN LIMESTONE
11	6	10.0-12.0	SS	6	12	16	20	N/A	9	12	N/A	28	LT. TAN LIMESTONE
		WASH		DRILLED OUT									
15	7	14.0-16.0	SS	14	16	20	20	N/A	24	20	N/A	36	LT. TAN LIMESTONE
18	8	17.0-19.0	SS	16	16	18	20	N/A	24	20	N/A	34	LT. TAN LIMESTONE
21	9	20.0-22.0	SS	16	27	29	15	N/A	24	18	N/A	56	LT. TAN LIMESTONE
23	10	22.0-24.0	SS	17	18	14	30	N/A	24	22	N/A	32	LT. TAN LIMESTONE

Proportions Used: trace = < 5%, few = 5-10%, little = 15-25%, some = 30-45%, and = 50-100%

Notes:

ENGINEERING AND TECHNICAL SERVICES

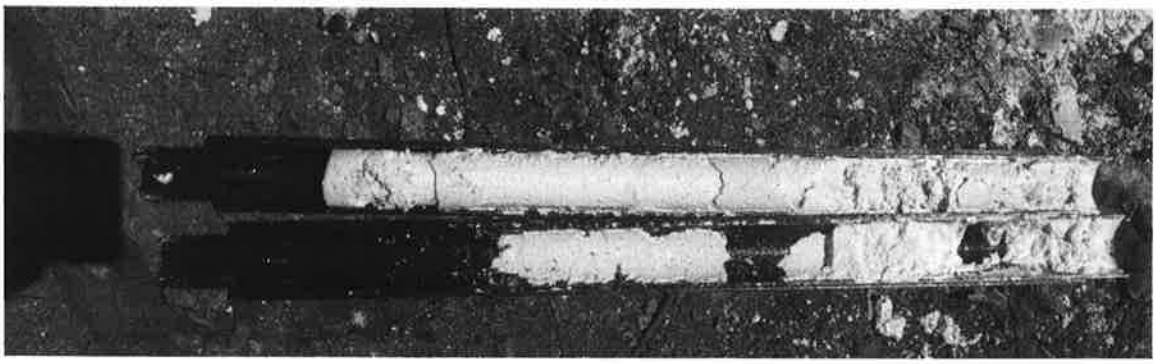
ENGINEER

BORING PHOTOGRAPHS

				BORING	B4
ets ENGINEERING AND TECHNICAL SERVICES	ENGINEERING AND TECHNICAL SERVICES P.O. BOX SS 5589 NASSAU, BAHAMAS 242-356-0500		PROJECT:	HARBOUR ISLAND MARINA B4	
			LOCATION:	Harbour Island, Eleuthera	
Drillin CO:	ETS	START DATE: 10/5/2019	CASING:	HQ	

DEPTH 2 TO 4 FT BELOW GRADE

DEPTH 10 TO 12 FT BELOW GRADE



DEPTH 14 TO 16 FT BELOW GRADE

BORING / SAMPLE LOG

BORING #: B5

ENGINEERING AND TECHNICAL SERVICES
P.O. BOX SS 5589
NASSAU, BAHAMAS

PROJECT: Harbour Island Marina

LOCATION: Harbour Island, Eleuthera

SHEET: 1 **OF:** 2

DRILLING CO:	ETS	**START DATE:**	9/5/2019	**CASING:**	**COORDINATES:**
DRILLER:	MW	**WATER DEPTH**	20ft	**SAMPLER:**	
ENGINEER:	LK	**HAMMER WT:**	140	**CORE BARREL:**	
Drill Rig:		**FALL:**	30	**SEABED ELEV:**	

BORING RECORD

Depth (ft)	Sample No.	Depth Range (feet)	Samp. Type	0-12 0-6	12-24 6-12	24-36 12-18	36-48 18-24	48-60 N/A	Pen. (inch)	Rec. (inch)	RQD (%)	SPT "N" / UCS	FIELD DESCRIPTION AND REMARKS
1	1	0.0-2.0	SS	4	3	3	3	N/A	24	24	N/A	6	TOP SOIL AND LIMESTONE
3	2	2.0-4.0	SS	7	9	11	13	N/A	24	24	N/A	20	LT. TAN LIMESTONE
5	3	4.0-6.0	SS	8	8	3	4	N/A	24	20	N/A	11	LT. TAN LIMESTONE
7	4	6.0-8.0	SS	5	7	7	4	N/A	24	20	N/A	14	LT. TAN LIMESTONE
9	5	8.0-10.0	SS	8	8	9	9	N/A	24	18	N/A	17	LT. TAN LIMESTONE
11	6	10.0-12.0	SS	5	7	7	10	N/A	24	20	N/A	14	LT. TAN LIMESTONE
13		WASH		DRILLED OUT									
15	7	14.0-16.0	SS	4	5	6	7	N/A	15	20	N/A	11	LT. TAN LIMESTONE
18	8	17.0-19.0	SS	4	5	5	6	N/A	15	20	N/A	10	LT. TAN LIMESTONE
21	9	20.0-22.0	SS	5	12	14	13	N/A	15	20	N/A	26	LT. TAN LIMESTONE
24	10	23.0-25.0	SS	9	10	10	12	N/A	14	20	N/A	20	LT. TAN LIMESTONE

Proportions Used: trace = < 5%, few = 5-10%, little = 15-25%, some = 30-45%, and = 50-100%

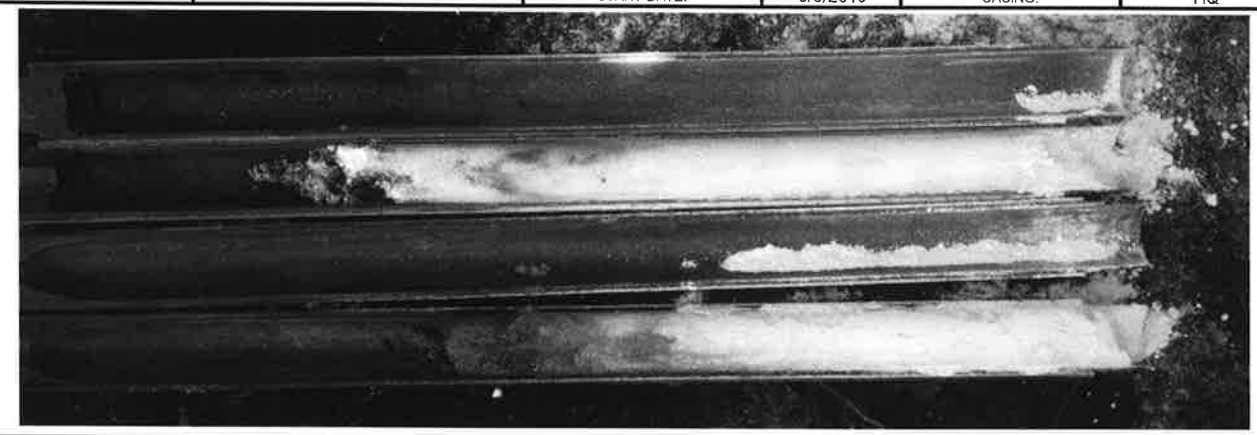
Notes:

ENGINEERING AND TECHNICAL SERVICES

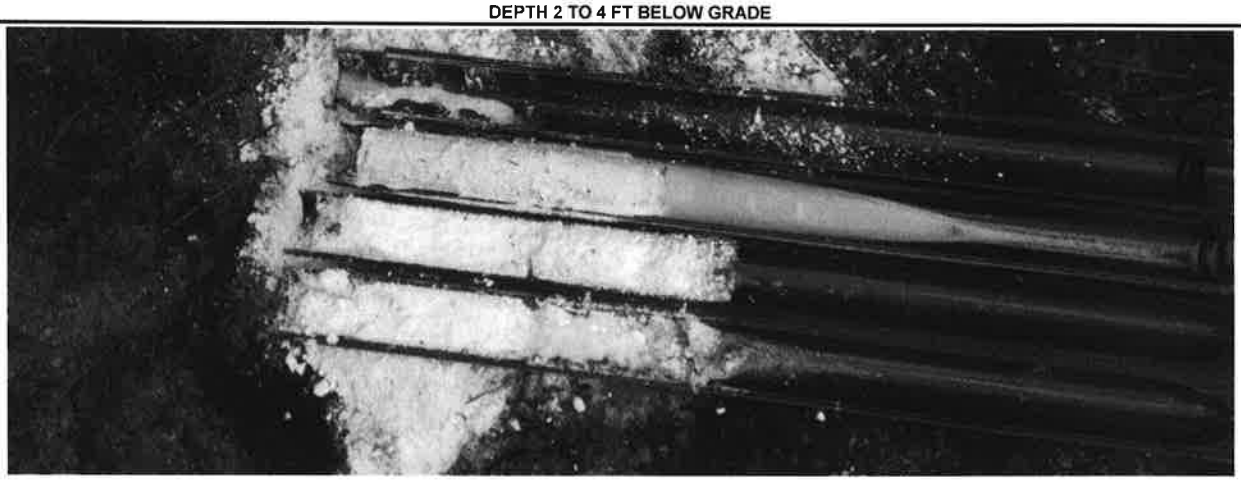
ENGINEER

BORING PHOTOGRAPHS

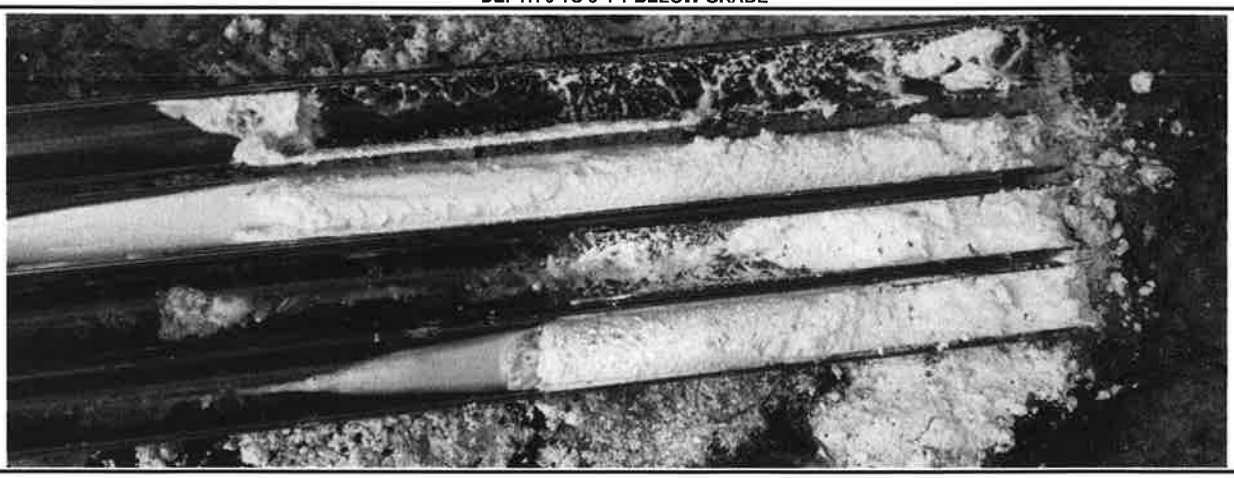
BORING	B5				
ets ENGINEERING AND TECHNICAL SERVICES	ENGINEERING AND TECHNICAL SERVICES P.O. BOX SS 5589 NASSAU, BAHAMAS 242-356-0500		PROJECT:	HARBOUR ISLAND MARINA B5	
			LOCATION:	Harbour Island, Eleuthera	
Drillin CO:	ETS	START DATE: 9/5/2019	CASING:	HQ	



DEPTH 2 TO 4 FT BELOW GRADE



DEPTH 6 TO 8 FT BELOW GRADE



DEPTH 10 TO 12 FT BELOW GRADE

BORING / SAMPLE LOG

BORING #: B6

ENGINEERING AND TECHNICAL SERVICES
P.O. BOX SS 5589
NASSAU, BAHAMAS

PROJECT: Harbour Island Marina
LOCATION: Harbour Island, Eleuthera
SHEET: 1
OF: 2

DRILLING CO:	ETS	**START DATE:**	11/5/2019	**CASING:**	**COORDINATES:**
DRILLER:	MW	**WATER DEPTH**	N/A	**SAMPLER:**	
ENGINEER:	LK	**HAMMER WT:**	140	**CORE BARREL:**	
Drill Rig:		**FALL:**	30	**SEABED ELEV:**	

BORING RECORD

Depth (ft)	Sample No.	Depth Range (feet)	Samp. Type	0-12 / 0-6	12-24 / 6-12	24-36 / 12-18	36-48 / 18-24	48-60 / N/A	Pen. (inch)	Rec. (inch)	RQD (%)	SPT "N" / UCS	FIELD DESCRIPTION AND REMARKS
1	1	0.0-2.0	SS	10	50/3"			N/A	9	8	N/A	50	TOP SOIL AND LIMESTONE
3	2	2.0-4.0	SS	50/3"				N/A	3	2	N/A	50	TOP SOIL AND LIMESTONE
5	3	4.0-6.0	SS	14	12	14	18	N/A	24	24	N/A	26	LT. TAN SANDY LIMESTONE
7	4	6.0-8.0	SS	15	15	18	30	N/A	24	24	N/A	33	LT. TAN SANDY LIMESTONE
9	5	8.0-10.0	SS	14	35	50/3"		N/A	24	20	N/A	85	LT. TAN SANDY LIMESTONE
11	6	10.0-12.0	SS	45	50/2"			N/A	8	8	N/A	50	LT. TAN SANDY LIMESTONE
13		WASH		DRILLED OUT									
16	7	15.0-17.0	SS	35	45	50/4"		N/A	15	12	N/A	95	LT. TAN SANDY LIMESTONE
17		WASH		DRILLED OUT									
21	9	20.0-22.0	SS	20	17	13	12	N/A	24	20	N/A	30	LT. TAN SANDY LIMESTONE
24	10	23.0-25.0	SS	10	13	13	10	N/A	24	20	N/A	26	LT. TAN SANDY LIMESTONE

Proportions Used: trace = < 5%, few = 5-10%, little = 15-25%, some = 30-45%, and = 50-100%

Notes:

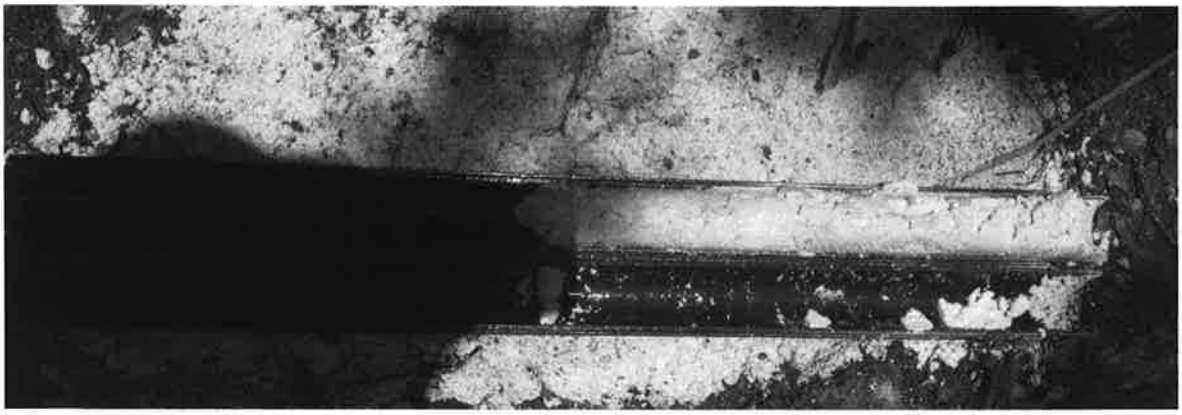
ENGINEERING AND TECHNICAL SERVICES

ENGINEER

BORING PHOTOGRAPHS

				BORING	B6
ets ENGINEERING AND TECHNICAL SERVICES	**ENGINEERING AND TECHNICAL SERVICES** P.O. BOX SS 5589 NASSAU, BAHAMAS 242-356-0500		*PROJECT:*	HARBOUR ISLAND MARINA ***B6***	
			LOCATION:	Harbour Island, Eleuthera	
Drillin CO:	ETS	START DATE: 11/5/2019	CASING:	HQ	

DEPTH 4 TO 6 FT BELOW GRADE



DEPTH 15 TO 17 FT BELOW GRADE

BORING / SAMPLE LOG

BORING #: B7

ENGINEERING AND TECHNICAL SERVICES
P.O. BOX SS 5589
NASSAU, BAHAMAS

PROJECT: Harbour Island Marina
LOCATION: Harbour Island, Eleuthera
SHEET: 1
OF: 2

DRILLING CO:	ETS	**START DATE:**	8/5/2019	**CASING:**	**COORDINATES:**
DRILLER:	MW	**WATER DEPTH**	N/A	**SAMPLER:**	
ENGINEER:	LK	**HAMMER WT:**	140	**CORE BARREL:**	
Drill Rig:		**FALL:**	30	**SEABED ELEV:**	

BORING RECORD

Depth (ft)	Sample No.	Depth Range (feet)	Samp. Type	0-12 / 0-6	12-24 / 6-12	24-36 / 12-18	36-48 / 18-24	48-60 / N/A	Pen. (inch)	Rec. (inch)	RQD (%)	SPT "N" / UCS	FIELD DESCRIPTION AND REMARKS
1	1	0.0-2.0	SS	32	50/3"			N/A	9	6	N/A	50	LT. TAN SANDY LIMESTONE
3	2	2.0-4.0	SS	50/4"				N/A	4	4	N/A	50	LT. TAN SANDY LIMESTONE
5	3	4.0-6.0	SS	8	11	9	9	N/A	24	12	N/A	20	LT. TAN SANDY LIMESTONE
7	4	6.0-8.0	SS	7	8	8	12	N/A	24	24	N/A	16	LT. TAN SANDY LIMESTONE
9	5	8.0-10.0	SS	4	3	6	6	N/A	24	20	N/A	9	LT. TAN SANDY LIMESTONE
11	6	10.0-12.0	SS	5	5	5	5	N/A	24	12	N/A	10	LT. TAN SANDY LIMESTONE
13		WASH		DRILLED OUT									
15	7	14.0-16.0	SS	3	4	3	3	N/A	24	20	N/A	7	LT. TAN SANDY LIMESTONE
17	8	16.0-18.0	SS	4	3	3	5	N/A	24	20	N/A	6	LT. TAN SANDY LIMESTONE
20	9	19.0-21.0	SS	4	5	3	4	N/A	24	18	N/A	8	LT. TAN SANDY LIMESTONE
22	10	21.0-23.0	SS	2	2	1	2	N/A	24	24	N/A	3	LT. TAN SANDY LIMESTONE
24	11	23.0-25.0	SS	5	6	8	12	N/A	24	24	N/A	14	LT. TAN SANDY LIMESTONE

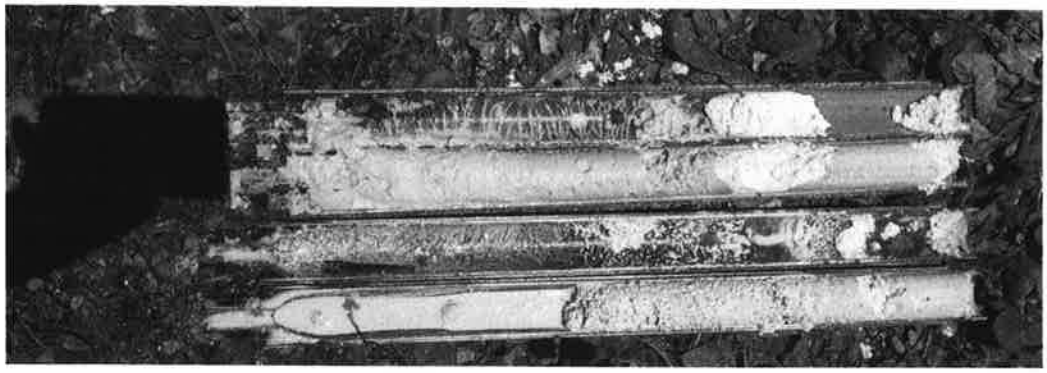
Proportions Used: trace = < 5%, few = 5-10%, little = 15-25%, some = 30-45%, and = 50-100%

Notes:

ENGINEERING AND TECHNICAL SERVICES
ENGINEER

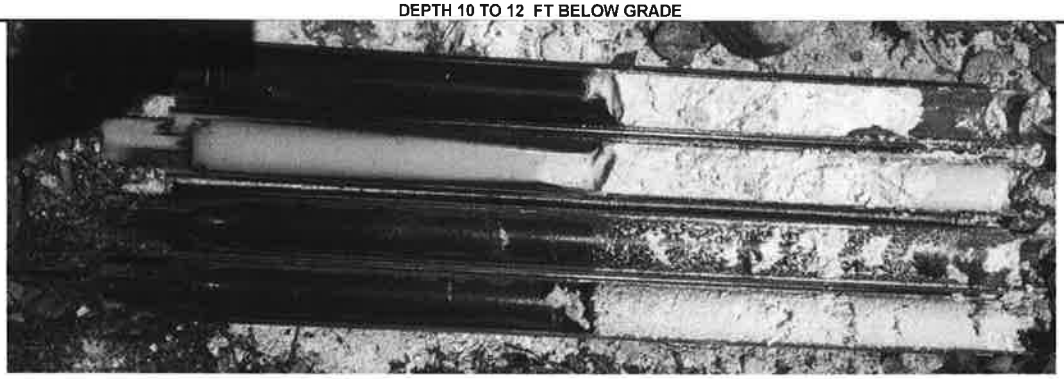
BORING PHOTOGRAPHS

				BORING	B7
ets ENGINEERING AND TECHNICAL SERVICES	ENGINEERING AND TECHNICAL SERVICES P.O. BOX SS 5589 NASSAU, BAHAMAS 242-356-0500		PROJECT:	HARBOUR ISLAND MARINA B7	
			LOCATION:	Harbour Island, Eleuthera	
Drillin CO:	ETS	START DATE: 8/5/2019	CASING:	HQ	



DEPTH 4 TO 6 FT BELOW GRADE

DEPTH 10 TO 12 FT BELOW GRADE



DEPTH 14 TO 16 FT BELOW GRADE

BORING / SAMPLE LOG

BORING #: B8

ENGINEERING AND TECHNICAL SERVICES
P.O. BOX SS 5589
NASSAU, BAHAMAS

PROJECT: Harbour Island Marina
LOCATION: Harbour Island, Eleuthera

SHEET: 1
OF: 2

DRILLING CO:	ETS	**START DATE:**	9/5/2019	**CASING:**		**COORDINATES:**	
DRILLER:	MW	**WATER DEPTH**	11ft	**SAMPLER:**			
ENGINEER:	LK	**HAMMER WT:**	140	**CORE BARREL:**			
Drill Rig:		**FALL:**	30	**SEABED ELEV:**			

BORING RECORD

Depth (ft)	Sample No.	Depth Range (feet)	Samp. Type	0-12 / 0-6	12-24 / 6-12	24-36 / 12-18	36-48 / 18-24	48-60 / N/A	Pen. (inch)	Rec. (inch)	RQD (%)	SPT "N" / UCS	FIELD DESCRIPTION AND REMARKS
1	1	0.0-2.0	SS	50/4"				N/A	4	3	N/A	50	LT. TAN SANDY LIMESTONE
3	2	2.0-4.0	SS	50/4"				N/A	4	4	N/A	50	LT. TAN SANDY LIMESTONE
5	3	4.0-6.0	SS	7	7	9	7	N/A	24	12	N/A	16	LT. TAN SANDY LIMESTONE
7	4	6.0-8.0	SS	9	11	14	19	N/A	24	24	N/A	25	LT. TAN SANDY LIMESTONE
9	5	8.0-10.0	SS	5	5	5	7	N/A	24	20	N/A	10	LT. TAN SANDY LIMESTONE
11	6	10.0-12.0	SS	5	5	4	6	N/A	24	18	N/A	9	LT. TAN SANDY LIMESTONE
		WASH		DRILLED OUT									
15	7	14.0-16.0	SS	4	1	2	2	N/A	24	20	N/A	3	LT. TAN SANDY LIMESTONE
17	8	16.0-18.0	SS	2	1	2	2	N/A	24	18	N/A	3	LT. TAN SANDY LIMESTONE
20	9	19.0-21.0	SS	2	2	2	2	N/A	24	22	N/A	4	LT. TAN SANDY LIMESTONE
22	10	21.0-23.0	SS	1	1	1	1	N/A	24	24	N/A	2	LT. TAN SANDY LIMESTONE
24	11	23.0-25.0	SS	2	2	2	1	N/A	24	24	N/A	4	LT. TAN SANDY LIMESTONE
26	12	25.0-27.0	SS	3	2	3	2	N/A	24	20	N/A	5	LT. TAN SANDY LIMESTONE
28	13	27.0-29.0	SS	3	4	3	5	N/A	24	20	N/A	7	LT. TAN SANDY LIMESTONE

Proportions Used: trace = < 5%, few = 5-10%, little = 15-25%, some = 30-45%, and = 50-100%

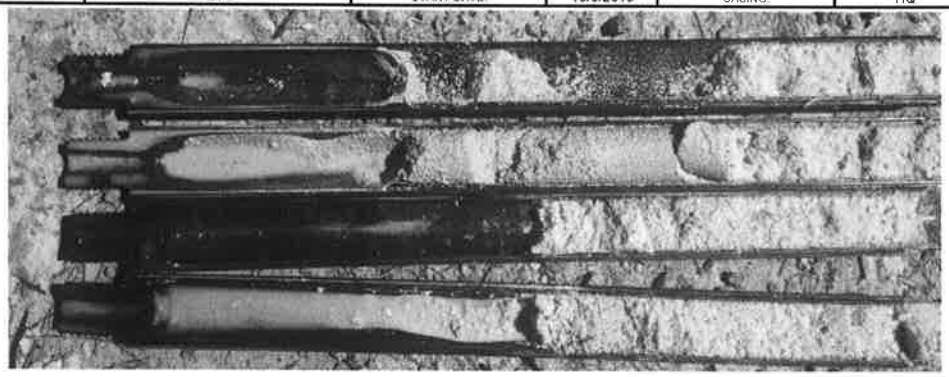
Notes:

ENGINEERING AND TECHNICAL SERVICES

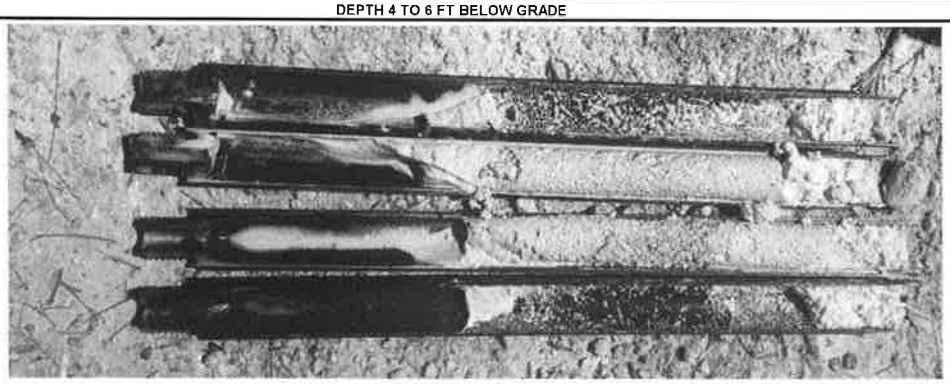
ENGINEER

BORING PHOTOGRAPHS

	ENGINEERING AND TECHNICAL SERVICES P.O. BOX SS 5589 NASSAU, BAHAMAS 242-356-0500			PROJECT:	BORING B8 HARBOUR ISLAND MARINA B8
				LOCATION:	Harbour Island, Eleuthera
Drilln CO:	ETS	START DATE:	10/5/2019	CASING:	HQ

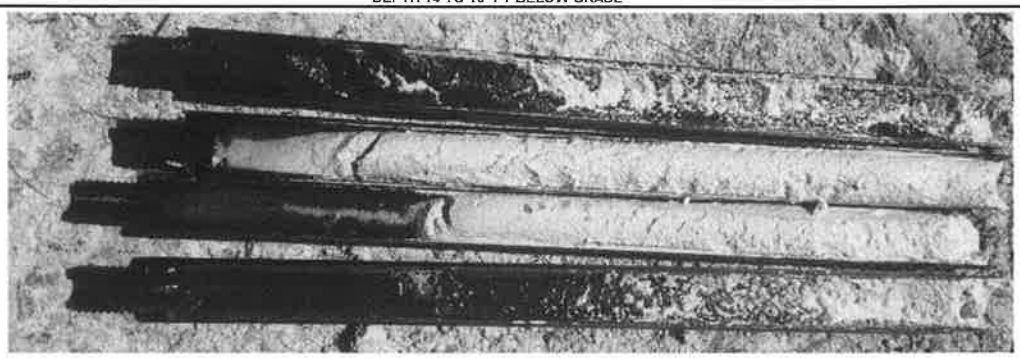


DEPTH 4 TO 6 FT BELOW GRADE



DEPTH 10 TO 12 FT BELOW GRADE

DEPTH 14 TO 16 FT BELOW GRADE



DEPTH 20 TO 22 FT BELOW GRADE

BORING / SAMPLE LOG

BORING #: B9

ENGINEERING AND TECHNICAL SERVICES
P.O. BOX SS 5589
NASSAU, BAHAMAS

PROJECT: Harbour Island Marina

LOCATION: Harbour Island, Eleuthera

SHEET: 1 **OF:** 2

DRILLING CO:	ETS	**START DATE:**	6/5/2019	**CASING:**	**COORDINATES:**
DRILLER:	MW	**WATER DEPTH**	17ft	**SAMPLER:**	
ENGINEER:	LK	**HAMMER WT:**	140	**CORE BARREL:**	
Drill Rig:		**FALL:**	30	**SEABED ELEV:**	

BORING RECORD

Depth (ft)	Sample No.	Depth Range (feet)	Samp. Type	0-12 0-6	12-24 6-12	24-36 12-18	36-48 18-24	48-60 N/A	Pen. (inch)	Rec. (inch)	RQD (%)	SPT "N" / UCS	FIELD DESCRIPTION AND REMARKS
1	1	0.0-2.0	SS	6	12	12	14	N/A	24	24	N/A	24	LIMESTONE FILL
3	2	2.0-4.0	SS	6	7	10	12	N/A	24	24	N/A	17	LIMESTONE FILL
5	3	4.0-6.0	SS	6	7	5	5	N/A	24	12	N/A	12	LIMESTONE FILL
7	4	6.0-8.0	SS	7	8	9	10	N/A	24	24	N/A	17	LIMESTONE FILL
9	5	8.0-10.0	SS	8	9	10	12	N/A	24	20	N/A	19	LIMESTONE FILL
11	6	10.0-12.0	SS	7	5	2	2	N/A	24	12	N/A	7	LT. TAN SANDY LIMESTONE
13	7	12.0-14.0	SS	2	2	5	7	N/A	24	12	N/A	7	LT. TAN SANDY LIMESTONE
15	8	14.0-16.0	SS	13	17	23	23	N/A	24	20	N/A	40	LT. TAN SANDY LIMESTONE
17		WASH		DRILLED OUT									
20	9	19.0-21.0	SS	6	5	4	3	N/A	24	20	N/A	9	LT. TAN SANDY LIMESTONE
		WASH		DRILLED OUT									
25	10	24.0-26.0	SS	9	8	7	6	N/A	24	20	N/A	15	LT. TAN SANDY LIMESTONE
		WASH		DRILLED OUT									
29	11	28.0-30.0	SS	7	8	7	12	N/A	24	20	N/A	15	LT. TAN SANDY LIMESTONE

Proportions Used: trace = < 5%, few = 5-10%, little = 15-25%, some = 30-45%, and = 50-100%

Notes:

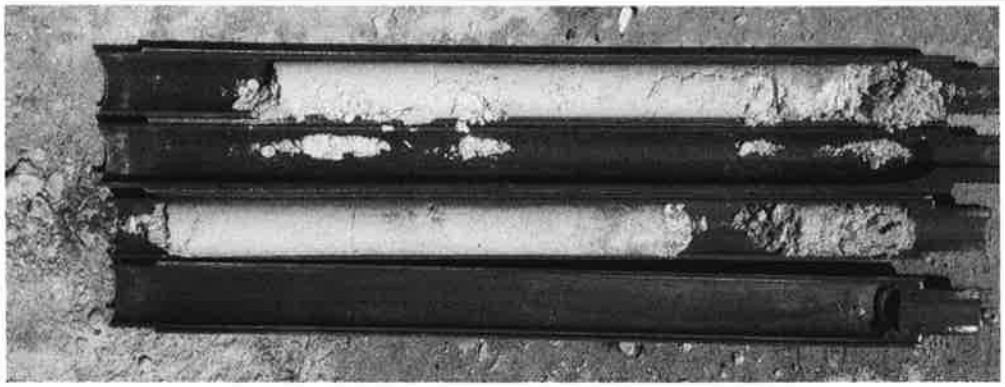
ENGINEERING AND TECHNICAL SERVICES

ENGINEER

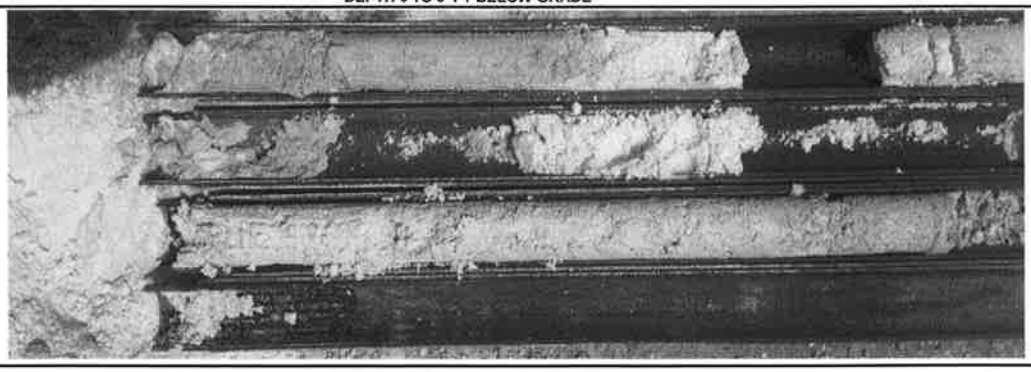
BORING PHOTOGRAPHS

				BORING	B9
ets ENGINEERING AND TECHNICAL SERVICES	ENGINEERING AND TECHNICAL SERVICES P.O. BOX SS 5589 NASSAU, BAHAMAS 242-356-0500		PROJECT:	HARBOUR ISLAND MARINA B9	
			LOCATION:	Harbour Island, Eleuthera	
Drillin CO:	ETS	START DATE: 6/5/2019	CASING:	HQ	

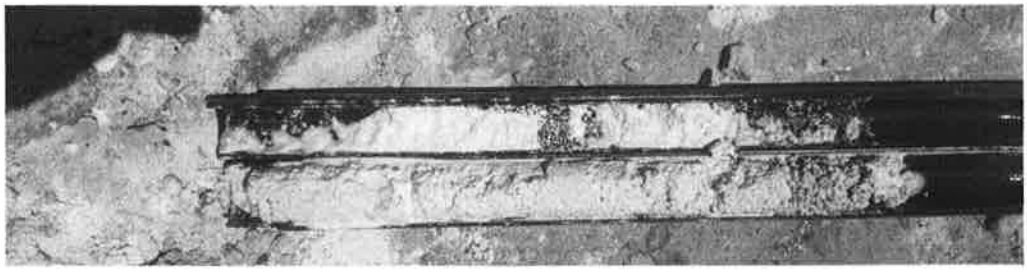
DEPTH 0 TO 2 FT BELOW GRADE



DEPTH 6 TO 8 FT BELOW GRADE



DEPTH 12 TO 14 FT BELOW GRADE



DEPTH 19 TO 21 FT BELOW GRADE

BORING / SAMPLE LOG

BORING #: B10

ENGINEERING AND TECHNICAL SERVICES
P.O. BOX SS 5589
NASSAU, BAHAMAS

PROJECT: Harbour Island Marina

LOCATION: Harbour Island, Eleuthera

SHEET: 1 **OF:** 2

DRILLING CO:	ETS	**START DATE:**	7/5/2019	**CASING:**	**COORDINATES:**
DRILLER:	MW	**WATER DEPTH**	10ft	**SAMPLER:**	
ENGINEER:	LK	**HAMMER WT:**	140	**CORE BARREL:**	
Drill Rig:		**FALL:**	30	**SEABED ELEV:**	

BORING RECORD

Depth (ft)	Sample No.	Depth Range (feet)	Samp. Type	0-12 / 0-6	12-24 / 6-12	24-36 / 12-18	36-48 / 18-24	48-60 / N/A	Pen. (inch)	Rec. (inch)	RQD (%)	SPT "N" / UCS	FIELD DESCRIPTION AND REMARKS
1	1	0.0-2.0	SS	19	19	35	50/4"	N/A	20	20	N/A	54	LT. TAN SANDY LIMESTONE
3	2	2.0-4.0	SS	50/4"				N/A	4	1	N/A	50	LT. TAN SANDY LIMESTONE
5	3	4.0-6.0	SS	17	18	23	27	N/A	24	24	N/A	41	LT. TAN SANDY LIMESTONE
7	4	6.0-8.0	SS	11	11	13	23	N/A	24	24	N/A	24	LT. TAN SANDY LIMESTONE
9	5	8.0-10.0	SS	15	17	15	17	N/A	24	24	N/A	32	LT. TAN SANDY LIMESTONE
11	6	10.0-12.0	SS	10	12	13	15	N/A	24	20	N/A	25	LT. TAN SANDY LIMESTONE
		WASH		DRILLED OUT									
16	7	15.0-17.0	SS	7	9	8	5	N/A	24	120	N/A	17	LT. TAN SANDY LIMESTONE
18	8	17.0-19.0	SS	4	2	2	2	N/A	24	12	N/A	4	LT. TAN SANDY LIMESTONE
21	9	20.0-22.0	SS	2	1	2	3	N/A	24	20	N/A	3	LT. TAN SANDY LIMESTONE
23	10	22.0-24.0	SS	2	1	1	1	N/A	24	8	N/A	2	LT. TAN SANDY LIMESTONE
		WASH		DRILLED OUT									
26	11	25.0-27.0	SS	3	1	1	1	N/A	24	18	N/A	2	LT. TAN SANDY LIMESTONE
29	12	28.0-30.0	SS	8	9	11	13	N/A	24	16	N/A	20	LT. TAN SANDY LIMESTONE

Proportions Used: trace = < 5%, few = 5-10%, little = 15-25%, some = 30-45%, and = 50-100%

Notes:

ENGINEERING AND TECHNICAL SERVICES

ENGINEER

BORING PHOTOGRAPHS

					BORING	B10
ets ENGINEERING AND TECHNICAL SERVICES	ENGINEERING AND TECHNICAL SERVICES P.O. BOX SS 5589 NASSAU, BAHAMAS 242-356-0500			PROJECT: LOCATION:	HARBOUR ISLAND MARINA B10 Harbour Island, Eleuthera	
Drillin CO:	ETS	START DATE:	7/5/2019	CASING:	HQ	

DEPTH 0 TO 2 FT BELOW GRADE

DEPTH 4 TO 6 FT BELOW GRADE

DEPTH 10 TO 12 FT BELOW GRADE

BORING / SAMPLE LOG

BORING #: B11

ENGINEERING AND TECHNICAL SERVICES
P.O. BOX SS 5589
NASSAU, BAHAMAS

PROJECT: HARBOUR ISLAND MARINA
LOCATION: HARBOUR ISLAND, ELEUTHRA

SHEET: 1
OF: 2

DRILLING CO:	ETS	**START DATE:**	10/5/2019	**CASING:**	**COORDINATES:**
DRILLER:	MW	**WATER DEPTH**	18ft	**SAMPLER:**	
ENGINEER:	LK	**HAMMER WT:**	140	**CORE BARREL:**	
Drill Rig:		**FALL:**	30	**SEABED ELEV:**	

BORING RECORD

Depth (ft)	Sample No.	Depth Range (feet)	Samp. Type	0-12 / 0-6	12-24 / 6-12	24-36 / 12-18	36-48 / 18-24	48-60 / N/A	Pen. (inch)	Rec. (inch)	RQD (%)	SPT "N" / UCS	FIELD DESCRIPTION AND REMARKS
1	1	0.0-2.0	SS	6	5	50/3"		N/A	15	12	N/A	55	TOP SOIL AND LIMESTONE
3	2	2.0-4.0	SS	50/3"				N/A	3	3	N/A	50	LT. TAN SANDY LIMESTONE
5	3	4.0-6.0	SS	20	32	50/3"		N/A	15	10	N/A	82	LT. TAN SANDY LIMESTONE
7	4	6.0-8.0	SS	40	50/2"			N/A	6	4	N/A	50	LT. TAN SANDY LIMESTONE
9	5	8.0-10.0	SS	13	13	14	14	N/A	24	24	N/A	27	LT. TAN SANDY LIMESTONE
11	6	10.0-12.0	SS	14	13	14	16	N/A	15	20	N/A	27	LT. TAN SANDY LIMESTONE
13		WASH		DRILLED OUT									
15	7	14.0-16.0	SS	12	17	14	12	N/A	24	24	N/A	31	LT. TAN SANDY LIMESTONE
18	8	17.0-19.0	SS	12	12	11	13	N/A	24	24	N/A	23	LT. TAN SANDY LIMESTONE
21	9	20.0-22.0	SS	9	10	13	15	N/A	24	20	N/A	23	LT. TAN SANDY LIMESTONE
24	10	23.0-25.0	SS	9	9	7	10	N/A	24	24	N/A	16	LT. TAN SANDY LIMESTONE

Proportions Used: trace = < 5%, few = 5-10%, little = 15-25%, some = 30-45%, and = 50-100%

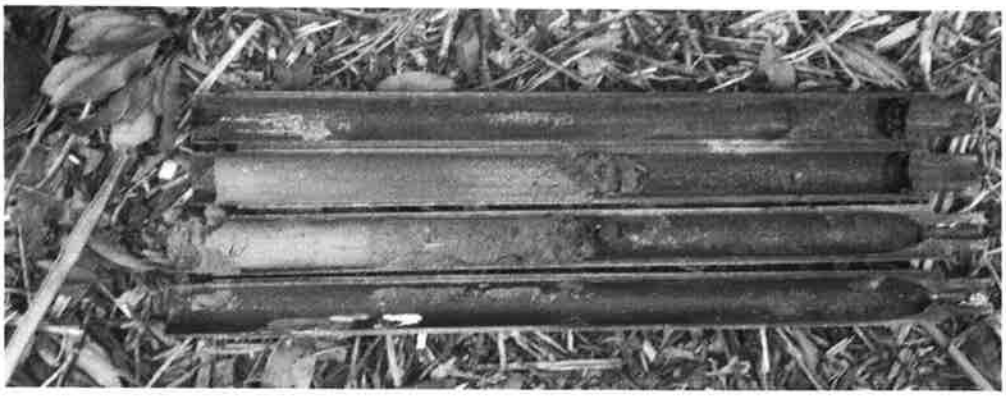
Notes:

ENGINEERING AND TECHNICAL SERVICES

ENGINEER

BORING PHOTOGRAPHS

ets ENGINEERING AND TECHNICAL SERVICES	ENGINEERING AND TECHNICAL SERVICES P.O. BOX SS 5589 NASSAU, BAHAMAS 242-356-0500			PROJECT:	BORING	B11
					HARBOUR ISLAND MARINA	
				LOCATION:	B11	
					Harbour Island, Eleuthera	
Drillin CO:	ETS	START DATE:	10/5/2019	CASING:	HQ	



DEPTH 4 TO 6 FT BELOW GRADE

DEPTH 8 TO 10 FT BELOW GRADE

DEPTH 14 TO 16 FT BELOW GRADE

BORING / SAMPLE LOG

BORING #: B12

ENGINEERING AND TECHNICAL SERVICES
P.O. BOX SS 5589
NASSAU, BAHAMAS

PROJECT: Harbour Island Marina

LOCATION: Harvour Island, Eleuthera

SHEET: 1 **OF:** 2

DRILLING CO:	ETS	START DATE:	6/5/2019	CASING:	COORDINATES:		
DRILLER:	MW	WATER DEPTH	23ft	SAMPLER:			
ENGINEER:	LK	HAMMER WT:	140	CORE BARREL:			
Drill Rig:		FALL:	30	SEABED ELEV:			

BORING RECORD

Depth (ft)	Sample No.	Depth Range (feet)	Samp. Type	0-12 / 0-6	12-24 / 6-12	24-36 / 12-18	36-48 / 18-24	48-60 / N/A	Pen. (inch)	Rec. (inch)	RQD (%)	SPT "N" / UCS	FIELD DESCRIPTION AND REMARKS
1	1	0.0-2.0	SS	4	8	12	50/2"	N/A	22	18	N/A	20	TOP SOIL AND LIMESTONE
3	2	2.0-4.0	SS	50/2"				N/A	2	2	N/A	50	LT. TAN SANDY LIMESTONE
5	3	4.0-6.0	SS	13	24	17	15	N/A	24	18	N/A	41	LT. TAN SANDY LIMESTONE
7	4	6.0-8.0	SS	15	17	19	20	N/A	24	24	N/A	36	LT. TAN SANDY LIMESTONE
9	5	8.0-10.0	SS	10	8	12	14	N/A	24	20	N/A	20	LT. TAN SANDY LIMESTONE
11	6	10.0-12.0	SS	10	8	8	9	N/A	24	12	N/A	16	LT. TAN SANDY LIMESTONE
		WASH		DRILLED OUT									
15	7	14.0-16.0	SS	5	1	3	15	N/A	24	20	N/A	4	LT. TAN SANDY LIMESTONE
		WASH		DRILLED OUT									
20	8	19.0-21.0	SS	36	50/3"			N/A	9	4	N/A	50	LT. TAN SANDY LIMESTONE
		WASH		DRILLED OUT									
25	9	24.0-26.0	SS	12	12	13	15	N/A	24	20	N/A	25	LT. TAN SANDY LIMESTONE
29	10	28.0-30.0	SS	15	16	10	15	N/A	24	18	N/A	26	LT. TAN SANDY LIMESTONE

Proportions Used: trace = < 5%, few = 5-10%, little = 15-25%, some = 30-45%, and = 50-100%

Notes:

ENGINEERING AND TECHNICAL SERVICES

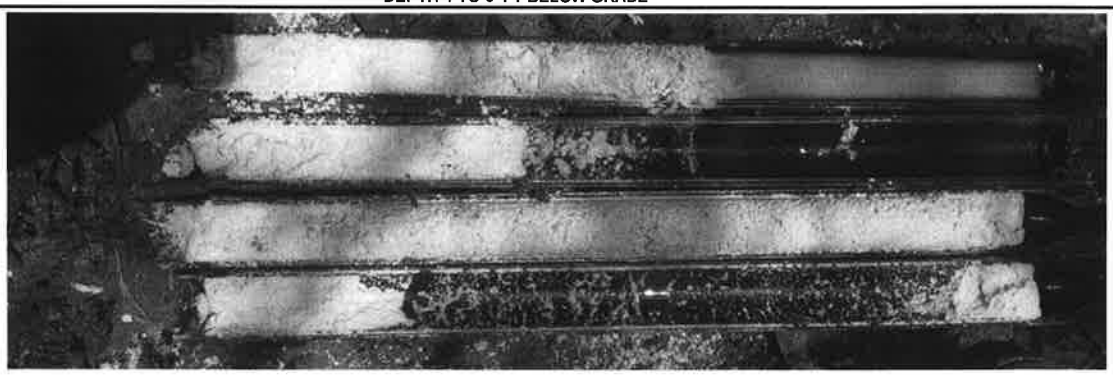
ENGINEER

BORING PHOTOGRAPHS

					BORING	B12
ets ENGINEERING AND TECHNICAL SERVICES	ENGINEERING AND TECHNICAL SERVICES P.O. BOX SS 5589 NASSAU, BAHAMAS 242-356-0500			PROJECT: LOCATION:	HARBOUR ISLAND MARINA B12 Harbour Island, Eleuthera	
Drillin CO:	ETS	START DATE:	6/5/2019	CASING:	HQ	

DEPTH 0 TO 2 FT BELOW GRADE

DEPTH 4 TO 6 FT BELOW GRADE



DEPTH 8 TO 10 FT BELOW GRADE

APPENDIX F – Observed Species

Photo 1. Coconut grove behind the dune ridge

Photo 2. Termite nest affixed to coconut tree

Photo 3. Ratwood

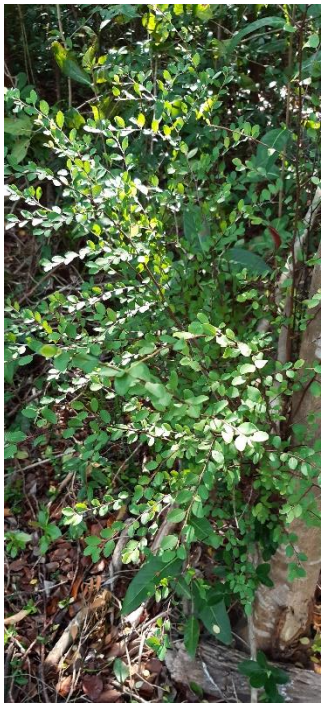


Photo 4. Yellow Elder

Photo 5. Mature Gum elemi and Sapodilla trees, with Sapodilla seedlings dominating shrub layer.

Photo 6. Low Rattlebox

Photo 7. Sapodilla seedlings

Photo 8. Wild Indigo in disturbed areas

Photo 9. Tamarind

Photo 10. Rams Horn (in flower), Sea Grape and Sea Ox Eye Daisy

Photo 11. Jumbey dominating previously cleared areas

Photo 12. Agave sp.

Photo 13. Rice Plant

Photo 14. Narrow leaved Blolly (protected)

Photo 15. Snake plant (invasive)

Photo 16. Sabal Palm

Photo 17. Mastic seedlings

Photo 18. Heavy Leaf litter and rich humus on forest

Photo 19. Bird nest

Photo 20. Hermit Crab

Photo 21. Interior broadleaf coppice forest

Photo 22. Planted Cabbage Palm

Photo 23. Gum Elemi

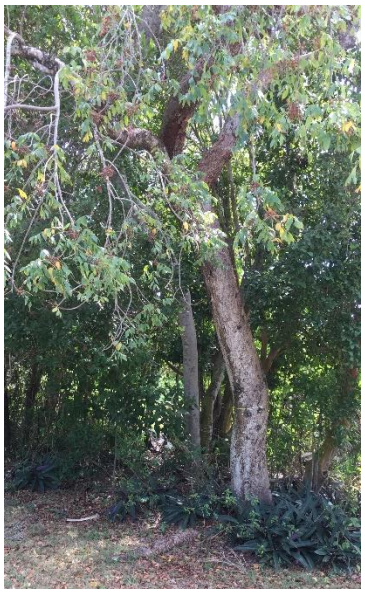


Photo 24. Pigeon Plum and Gum Elemi

Photo 25. Coppice forest along roadside

Photo 26. Coppic forest along roadside

Photo 27. Broad Leaved Blolly, Pigeon Plum and Coconut along roadside

Photo 28. Casuarina (invasive) dominated vegetation along old airstirp road

Photo 29. Casuarina dominated vegetation along old airstrip road

Photo 30. Seagrape beneath Casuarina (invasive)

Photo 31. Casuarina (invasive) dominating canopy, Dogwood, Seagrape, Cinnecod and Jumbey in understory

Photo 32. Narrow Leaved Blolly (protected) beneath Casuarina (invasive) along old airstrip road.

Photo 33. Recently disturbed area with the Casuarina dominated coppice regrown with Jumbey

Photo 34. Casuarina and Poincianna dominating canopy, Cinnecord and Seagrape in understory

Photo 35. Australian Pine (invasive) along coastline

Photo 36. Invasive Australian Pine and Hawaiian Inkberry

Photo 37. Sand Fly Bush

Photo 38. Seagrape, Sea ox Eye Daisy and Sand Fly Bush

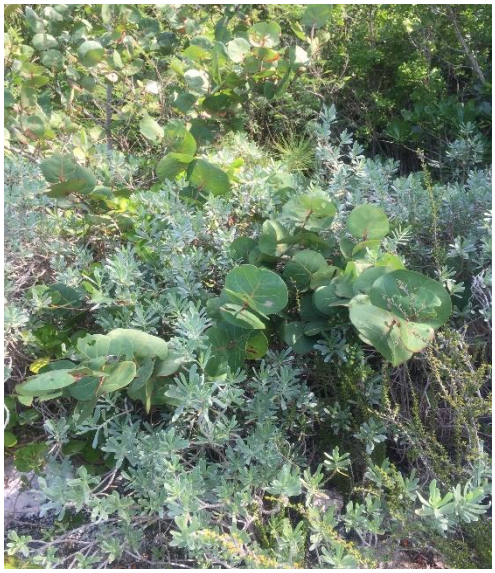


Photo 39. Hawaiian Inkberry (invasive) and Sand Fly Bush

Photo 40. Beaded Periwinkle

Photo 41. Sea purslane

APPENDIX G – Avian Survey Report

Briland Club avian survey report with notes on plants
Observers: Dr. Ancilleno Davis and David Dean

1.0 AVIAN SURVEYS

Avian surveys were conducted on October 1st, 2020 to identify the presence, abundance and habitat utilization of avian species within the boundaries of the Briland Club and Harbour Island.

1.1 Methodology

The assessment comprised four (4) hours of active avian and ecological observations on the Briland Residences property Sept 30th through October 1st, 2020. Six hours of surveys were conducted in Harbour Island On October 2nd, 2020. Morning and afternoon surveys were conducted on between 6:55 AM and 6:18 PM. The species identified in each area of the property were identified and are listed in the table below. Taxonomy is based on *The Clements Checklist of Birds of the World*, August 2019 edition. Status is based on the International Union for Conservation of Nature (IUCN). These results are based on a small sample size and do not represent the total expected diversity at the site. In particular, many migrant warbler species that reside in the Bahamas over the winter were not detected during these surveys but may use the site. several resident species detected on Harbour Island may use the site but were not detected during this survey.

The Birds are described based on their range of occurrence, Conservation and management status and how frequently they were detected during the study. Range is described as Permanent Resident Breeding (PRB) for birds that remain in the Bahamas throughout the year and reproduce; Resident Non-Breeding (RNB) birds occur within the Bahamas throughout the year with the exception of their breeding period; Summer Resident Breeding (SRB) birds only occur in the Bahamas during their breeding season which is during the summer; Winter Resident (WR) birds Occur in the Bahamas throughout the winter months from October to May and leave to breed in North America; Endemic birds (**E**) occur only within the Bahamas or Caribbean.

Conservation status is based on the International Union for the Conservation of Nature (IUCN) classifications and specific regulations of the species in the Laws of the Bahamas. IUCN classifications include: species of Least Concern (LC) for whom no conservation intervention or management is required and the species is not expected to decline or be lost in the foreseeable future; Near Threatened (NT) species whose populations may decline drastically without significant protection or constant management; Vulnerable (VU) species are likely to become endangered if the risks facing the species in the wild are not addressed; Unassessed (UA) species have not received a formal evaluation from the IUCN and are generally not considered

species of conservation concern. In addition to the IUCN categories, Species that are specified in the Wild Birds Protection Act Chapter 249 of the Statute Laws of the Bahamas are designated as Managed (MA).

Area of detection is separated into categories of Beach Club (BC) when only detected on the subject property; Harbour Island (HI) when only detected on Harbour Island outside the Briland Club and Both (BO) when detected both inside and outside the boundaries of the property. The results are summarized in the table below.

1.2 Results

1.2.1 Species Observed

1.2.1.1 Species diversity

A total of thirty-three (33) species were recorded on Harbour Island during the survey period (Table 2) however only twenty-four (24) of those species were detected on the Briland Club property. Nine (9) species recorded on Harbour Island were not found on the Briland Club property and nine species found within the property were not found elsewhere on Harbour Island. There were 15 species that were foud both on the property and in other areas of Harbour Island.

The majority of recorded species were Permanent resident species which breed in the islands of the Bahamas and are of low conservation concern. Eighteen of the species detected were permanent resident species which breed in the Bahamas. The Brown Pelican may be found in the Bahamas year-round but has not been known to breed here. Barn Swallows are found in the Bahamas during their migration but do not remain in the country over winter. The other species are winter residents that stay in the Bahamas during the north american winter. The only near-threatened species detected was the White Crowned Pigeon which is managed as a hunted species in the Bahamas.

Table 1 Avifauna survey abbreviations

TABLE KEY:		
RANGE	**STATUS**	**Area of Detection**
PRB = Permanent Resident Breeding	**LC** = Least Concern (IUCN)	**BC** = Briland Club
RNB = Resident Non-Breeding	**NT** = Near Threatened (IUCN)	**HI** = Harbour Island
SRB = Summer Resident Breeding	**VU** = Vulnerable (IUCN)	**BO** = Both
WR = Winter Resident	**MA** = Managed (Regulated – Bahamas)	
E = Endemic (Distribution)	**D** = Declining	
MI = Migrant	**UA** = Unassessed	

Table 2 Bird species detected on the Harbour Island Sept. 30 to October 2nd 2020 along with geographic range, conservation status and number of observations during the study.

Common name	Scientific Name	Range	Status	Observations
American Kestrel	*Falco sparverius*	PRB	LC	BO
American Oystercatcher	*Haematopus palliatus*	PRB	LC	HI
American Redstart	*Setophaga ruticilla*	WR	LC	BO
Bahama Woodstar	*Nesophlox evelynae*	PRB E	LC	BO
Bananaquit	*Coereba flaveola*	PRB	LC	BO
Barn Swallow	*Hirundo rustica*	MI	LC	HI
Black-and-White Warbler	*Mniotilta varia*	WR	LC	HI
Black-bellied Plover	*Pluvialis squatarola*	WR	LC	HI
Black-throated Blue Warbler	*Setophaga caerulescens*	WR	LC	HI
Black Whiskered Vireo	*Vireo altiloquus*	SRB	LC	BC
Brown Pelican	*Pelicanus occidentalis*	PR	LC	BC
Cape May Warbler	*Setophaga tigrina*	WR	LC	BO
Common Ground-dove	*Columbina passerine*	PRB	LC	BO
Eurasian Collared-Dove	*Streptopelia decaocto*	PRB	LC	HI
Gray Kingbird	*Tyrannus dominicensis*	SRB	LC	BO
Greater Antillean Bullfinch	*Melopyrrha violacea*	PRB	LC	BO
Green Heron	*Butorides virescens*	PRB	UA	HI
Hairy Woodpecker	*Dryobates villosus*	PRB	LC	BC
House Sparrow	*Passer domesticus*	PRB	LC	HI
Laughing Gull	*Leucophaeus atricilla*	PRB	LC	BO
Magnificent Frigatebird	*Fregata magnificens*	PRB	LC	HI
Mangrove Cuckoo	*Coccyzus minor*	PRB	LC	BC
Northern Mockingbird	*Mimus polyglottos*	PRB	LC	BO
Northern Parula	*Setophaga americana*	WR	LC	BC
Pine Warbler	*Setophaga pinus*	WR	LC	BC
Prairie Warbler	*Setophaga discolor*	WR	LC	BC
Smooth-billed Ani	*Crotophaga ani*	PRB	LC	HI
Spotted Sandpiper	*Actitis macularius*	WR	LC	BC
Thick-billed Vireo	*Vireo crassirostris*	PRB-E	LC	BO
Western Spindalis	*Spindalis zena*	PRB-E	LC	BC
White-crowned Pigeon	*Patagioenas leucocephala*	PRB	NT MA	BC
Yellow-throated Warbler	*Setophaga dominica*	WR	LC	BO

1.2.1.2.1 Permanent Resident Breeding

Permanent Resident Breeding species refers to the resident species that live and breed year-round in the Bahama Islands. A total of eighteen (18) species were found in this category during the surveys on Harbour Island.

Figure 1 Common Ground-Dove (Columbina passerina bahamensis)

1.2.1.2.2 Summer Resident Breeding

Summer Resident Breeding refers to migrant species that breed in The Bahamas during summer months from April to October and spend the rest of the year in other regions. Two species were found in this category during the surveys. Gray Kingbirds were seen feeding offspring in the large fig trees near "The Haunted House". These birds will nest on elevated platforms, ladders, trees and buildings. Their fledglings leave within 3 months and nests tend to fall apart on their own over the course of the following year. Black-whiskered Vireos were also only detected in the area near the haunted house. They occurred both in the fig trees as well as the trees along the edge of the area shaded by the fig trees.

Figure 4 Gray Kingbird (Tyrannus dominicensis) (photo taken in New Providence

1.2.1.2.3 Winter Resident Non-Breeding

Winter Resident Non-breeding species refers to the annual non-breeding fall/winter migrants which pass through the Bahama Islands from North America en route to southern regions or which remain in the Bahamas. Six (6) species in this category were recorded within the Briland Club area with an additional 4 on Harbour Island. Those species found on the Briland Club property include the American Redstart, Cape May Warbler, Northern Parula, Pine Warbler, Prairie Warbler, and Yellow-throated Warbler. These birds are protected internationally via the Migratory Bird Treaty with the United States of America and Canada and locally by the Wild Birds Protection Act.

1.2.1.2.4 Resident non-breeding species

Resident non-breeding birds spend most of their lives in the Bahamas but leave to breed in another location or have not been seen breeding in the Bahamas. The Brown Pelican is the only species detected in this category.

1.2.1.2.5 Endemic Species

Endemic species are found only in a restricted geographic area. Endemism must be described at scale. Some species are only found in a small area, on a particular island, or within a region like the Caribbean. The Thick-billed Vireo found at the site is a regional endemic that lives year round in the Bahamas and Turks and Caicos, but may migrate to the north coast of Cuba. The Western Spindalis was detected in the Haunted House area. It is endemic to the Bahamas archipelago including the Turks and Caicos Islands and Cuba. The Bahama Woodstar hummingbird is found throughout the Bahamas and occasionally in south Florida. These three species were all found on the Briland Club property, but the Bahama Woodstar was only found in the mature forest areas and not near the Haunted House.

1.2.1.3 Conservation Status

1.2.1.3.1 Protected Species

All of the species observed are protected under the Wild Birds Protection Act (Statute Law of The Bahamas, Chapter 249). In addition to the local laws, all migratory birds listed above are protected under international treaties and conventions such as the Migratory Bird Treaty Act of the United States.

1.2.1.3.2 Species of Concern

"*Near Threatened*" (NT) by the IUCN classifies a species that may be considered *threatened* with extinction in the *near* future, although it does not currently qualify for the *threatened* status.

White-crowned Pigeons (*Patagioenas leucocephala*), are designated a Near-threatened species by IUCN and are managed as a hunted species in the Bahamas. Hunting is allowed with a permit and limits and regulations are determined by the Government of the Bahamas.

1.2.2 Habitat Utilization

The site surveyed included; rocky coastal edges and blackland coppice areas in the center of the property; a large landscaped area with mature ficus trees called “The Haunted House” a marina and dock currently under construction (unsurveyed); and a small patch of coconut trees adjacent to a mature dune and sandy beach. No permanent or ephemeral wetlands were found in the study area except a cistern which was open and held standing water near the main road that separates the beach strip from the rest of the forested area. Various native fruit trees were present, but there was little fruit to be seen except on the Coccoloba sp.. The fig trees near the haunted house had fruit on the trees and the floor below. These fruit along with insects serve as food resources for the birds throughout the property. The birds detected on the property did not appear to be in transition through the property but were using the property and potentially residing there for most of the day. The exceptions are the Brown Pelican and Laughing Gulls. No

species were seen at active nests or engaged in nesting behavior, though Gray Kingbirds seldom nest far from foraging areas. It can be assumed that those seen feeding their offspring would have nested nearby in the past few months.

The ficus trees near the Haunted mansion were the most active location on the property, however, that location was low in resident bird diversity. The age of the ficus trees makes them a historically stable "stopover" location for migratory birds. When many such locations are available at various distances between the northern and southern limits of the migration pathway, this creates a "migration corridor". Although the ficus trees are in fruit now (September, October), it is imperative that the rest of the property is also maintained at a similar level of diversity to support the bird community year round. The other fruit and flowering trees will provide varying but consistent food availability

2.0 Vegetation survey

The original work proposal did not include a detailed plant survey, however, a plant list is included below of plant species identified in the surveyed areas. Visual identification of the trees within the study area was conducted during avian surveys. All trees positively identified were listed and classified as Native (NA, 28 species), Nonnative (NN, 11 species), or Invasive (IN, 7 species), based on information in Currie et al. (2019) and the Global Invasive Species Database (www.iucngisd.org). A total of forty-six plant species were identified in the study area.

The trees on the Briland Club property are primarily native with a few non-invasive ornamental and invasive plants. The Nonnative species found on the property include decorative horticultural species. These species are not protected or expected to gain protection under the updated laws and appear to have previously been maintained for esthetic purposes. They do not pose an ecological threat to the neighboring biodiversity. Most native plants located on the site are relatively abundant compared to the surrounding area and are not currently of high conservation concern. All species within the native category should be assumed to be afforded some measure of protection via the Forestry Act and the Conservation and Protection of the Physical Landscape of the Bahamas Act. Most of them are also large trees and may require special permits to remove them. Several large mahogany trees in the forested areas are high value trees and cannot be replaced commercially.

Seven invasive plant species are found on the property. Most of the coppice understory was free of invasive species but the previously cleared roads were overgrown with weeds. These invasive species are Indian Almond, Brazilian Pepper, Casuarina, Oyster Plants, Poinciana, Hawaiian Seagrape and Snake Plants. All of the listed invasive species have significant impact on native biodiversity when allowed to proliferate. In general, they do not provide meaningful benefit to native birds or other wildlife and should be removed and destroyed where possible and feasible.

The native trees listed all have significant importance for wildlife use and in traditional or folkloric medicine. Many trees in the are are listed as protected trees in the Conservation and Protection of the Physical Landscape of the Bahamas Regulations, 1997. The lawful removal of these trees requires a permit by law. The application and permitting process is also included in the regulations.

Table 3. Plant species identified on the in study site during surveys in May 2020

Species	Scientific name	Status	Briland Club
Allamanda	Allamanda sp	NN	x
Almond	Terminalia catappa	IN	x
Bougainvillae	Bougainvillae	NN	x
Brazilian Pepper	Schinus terebinthifolius	IN	x
Butterfly pea	Centrosema virginianum	NA	x
Castor Plant	Ricinus communis	NA	x
Casuarina	Casuarina sp.	IN	x
Cerasee (bittermelon)	Momordica charantia	NA	x
Cinnecord	Acacia choriophylla	NA	x
Coconut Palm	Cocos nucifera	NN	x
Weeping Fig	Ficus benjamina	NN	x
Wild fig	Ficus Citrifolia	NN	x
Five Finger	Tabebuia bahamensis	NA	x
Gum Elemi (Gumbo Limbo)	Bursera simarouba	NA	x
Hibiscus	Hibiscus sp.	NN	x
Iron Wood	Krugiodendron ferreum	NA	x
Jamaican Dogwood	Piscidia piscipula	NA	x
Broad Leaf Blolly	Guapira obtusata	NA	x
Mango	Mangifera indica	NN	x
Mastic	Sideroxylon foetidissimum	NA	x
Neem	Azadirachta indica	NN	x
Oyster Plant	Tradescantia spathacea	IN	x
Pigeon Plum	Coccoloba diversifolia	NA	x
Poinciana	Delonix regia	IN	x
Poisonwood	Metopium toxiferum	NA	x
Rain Lilly	Zephyranthes primulina	NN	x
Ram's Horn	Pithecellobium keyense	NA	x
Royal Palm	Roystonea borinquena	NN	x
Salve bush	Solanum erianthum	NA	x
Sapodilla	Manilkara zapota	NN	x
Scaevola (Hawaiian)	Scaevola taccada	IN	x
Scaevola (Native Inkberry)	Scaevola plumieri	NA	x
Sea Oxeye	Borrichia arborescens	NA	x
Sea Purslane	Sesuvium portulacastrum	NA	x
Seagrape	Coccoloba uvifera	NA	x
Seaside Mahoe	Thespesia populnia	NA	x

Seven Year Apple	Genipa clusiifolia	NA	x
Small-leaved blolly	Guapira discolor	NA	x
Snake plant (mother in law's tongue)	Sansevieria trifasciata	IN	x
Snow Berry	Chiococca alba	NA	x
Strong Back	Bourreria succulenta	NA	x
Thatch palm	Leucothrinax morrisii	NA	x
Wild Thyme	Rachicalis americana	NA	x
bamboo grass	Lasiacis divaricata	NA	x
Wild Tamarind	Lysiloma latisiliquum	NA	x
Woolly Booger	Corchorus hirsutus	NA	x

In addition to these species, I partially reviewed the master plant list provided by Tyler Nielsen via email on October 5th, 2020. I have discussed initial thoughts with Mr. Nielsen. A full desktop evaluation of your plant list can be conducted at a later date if desired.

Thank you for this opportunity. This report constitutes the completion of the proposed work. Please remit final payment upon receipt.

4.0 References

2019. Currie, Dave et al. The Natural History of the Bahamas: a field guide. Cornell University Press, Ithaca.

2003. Raffaele, Herbert et al. Field Guide to the Birds of the West Indies. Helm Field Guides. Christopher Helm. London

1998. White, Anthony W. A Birders Guide to the Bahama Islands (including Turks and Caicos). American Birding Association, Inc. Colorado, USA.

APPENDIX H – Curriculum Vitaes

FRANKLYN O. HALL

Curriculum vitae

Nationality: Bahamian - Date of birth:07th December 1968
Gender: Male – Contact: Cell:242-5565135Home:242-6770818
Email:franklynhall@hotmail.com
Address: 26 St. Albans/Sherman Drive, Cable Beach E. PO Box CB11492, Nassau Bahamas

AREAS OF EXPERTISE

- Project Management, Horizontal Construction, Infrastructure and Utilities
- Land Use and Development
- Environmental Management, Impact Assessment, Water Resource Management
- GISMapping/Marine and Terrestrial Ecosystem Management

SYNOPSIS

Currently residing in Nassau, Bahamas,I am an innovative professional engineer, environmental and project manager respectively, with a strong background in water resource management and marine ecosystem management. A most recent project involved conducting an environmental reconnaissance survey on the island of Grand Bahama for the recent oil spill, due to hurricane Dorian and an assessment of the structural damage to residential and commercial structures, as a result of the same disaster. I have also worked on many past and recent marine and coastal based projects, where I was the senior person responsible for managing all environmental and marine based activities.

KEY COMPETENCIES

- Leading and managing complex projects, and identifying key skills necessary for development and execution of tasks and assignments.
- Coordinating and facilitating multi-stakeholder processes.

QUALIFICATIONS

MA	Social Policy, 2000, University of York (UK). Dissertation: Social Impacts of Tourism in Developing Countries
PG Dip	Environmental Economics and Environmental Management, 1999, University of York (UK).
BSc	Mechanical Engineering Technology, 1996 Savannah State University (Savannah Ga).

LANGUAGES

English: 1st Language
Spanish: Good.

INSTITUTIONAL MEMBERSHIPS AND ACHIEVEMENTS

- Member of Society of Operation Engineers (SOE) United Kingdom and registered Incorporated Engineer
- Member of Society of Professional Engineers (UK) and registered Professional Engineer
- Certified Environmental Professional (National Registry of Environmental Professionals). U.S.A.
- Certificate – Principles for Reviewing Environmental Impact Assessments (IDB) 2019

COMPREHENSIVE PROFESSIONAL EXPERIENCE

Time frame	Location/ scope	Organization	Position	Description
April 2019 to Present	Harbour Island	4M – Harbour Island Marina	Environmental Consultant of Record	Environmental Management and Consultancy Services, Preparation of EIA, EMP and project documentation
Nov 2018 to Present	West End Grand Bahama	Washington Development Co.	Environmental Consultant of Record	Responsible for EIA and EMP preparation, for development of hotel and marina construction project
December 2017 to 2019	Paradise Island Bahamas	Independent (ISG)	Project Manager	Management of operations for landscape development, chemical application/disposal and irrigation quality control for commercial and residential facilities.
August 2017 to December 2017	Harbour Island, Bahamas	Coastal Systems International	Environmental Consultant	Responsible for preparation of EIA document and environmental site monitoring and reporting f
January 2017 to April 2017	South Cat Cay Development	Coastal Systems International	Environmental Consultant	Responsible for environmental site monitoring and report for all marine and terrestrial based activities, and control of EMP document
May 2016 To October 2016	Flamingo Cay Bahamas	Coastal Systems International Miami, Fla	Environmental Consultant	Responsible for designing and carrying out a Terrestrial Environmental Survey for the development of remote island in Southern Bahamas. Collection and processing of GPS data for native flora and fauna survey, and habitat mapping
July 2015 to Sept 2015	Nassau Bahamas	Blue Illusions Ltd	Lead Environmental Consultant	Assessment of marine mammal facility and conducting Environmental Impact Assessment study, for remote island with marine mammal based activities.
January 2013 to October 2015	Nassau Bahamas	Miya Bahamas Ltd	Site and Field Supervisor	Management of all field related activities for rehabilitation and upgrades to water supply, system (Non-Revenue Water Project. Quality control management for water infrastructure and new installation.
Dec 2010 to Nov 2012	Abaco Bahamas	Abaco Club Ritz Carlton	Manager Utilities/Engineer	Managed water distribution operations, waste water treatment facilities, new construction of infrastructure facilities, inspection and quality control. Staff training, site safety and control. Involved jointly with finance department in development of budgets, and development of system for billing based on water consumption, for residential home owners.
Dec 2005 to Nov 2010	Abaco Bahamas	Abaco Club Ritz Carlton	Project Manager/Infrastructure & Utilities	Managementfor the installation all horizontal construction works, including water, sewer, electrical and communications. Management of construction to high end residential and commercial structures, quality control and inspections
Jan 2004 to Nov 2005	Nassau Bahamas	Consolidated Water Company Ltd	Asst. Project Manager	Managed proper installation inspection of HDPE water mains, well pumps and disposal well for 12.5 million/gal per day reverse osmosis, salt water desalination plant.

BOOKS

Hall, F. (2014) Environmental Issues and Challenges in Developing Countries. Kindle Publishing

NIELSEN
landscape architects

TYLER NIELSEN

EDUCATION

Masters of Landscape Architecture
University of Colorado | Denver, CO

Bachelor of Arts, Fine Arts & Political Science
University of Colorado | Boulder, CO

PROJECT EXPERIENCE

Tyler brings expertise of creative planning, urban design, landscape architecture and community outreach experience to Nielsen Landscape Architects. As a LEED accredited professional, his passion for and expertise in sustainable planning and design informs all aspects of the studio's work. Tyler's diverse hospitality and resort planning and design experience includes local experience with the Soni Group, RETI, and the Starwood Group.

Tyler is an expert in creating and implementing beautiful designs in the subtropical Caribbean region. As a part of Tyler's previous experience, he led the effort to enhance and revitalize the Golden Rock Inn located in Nevis Island.

Tyler has a strong horticultural knowledge of subtropical plants. Using this knowledge he successfully design and oversaw the installation of many estate gardens located throughout the Caribbean region. These gardens can be found in Mustique, St. Kitts, and the Bahamas.

PROFESSIONAL AFFILIATIONS

State of Florida Register Landscape Architect #6667067
Council of Landscape Architectural Registration Boards
US Green Building Council LEED accredited professional
American Society of Landscape Architects member

www.nielsenlandarch.com

Curriculum Vitae

Agnessa L. Lundy, B.A., M.Res. Candidate

Senior Environmental Scientist

Agnessa provides comprehensive environmental management duties for CCS, serving as project leader for the environmental compliance process in the production of environmental baseline studies (EBS), environmental impact assessments (EIA) and environmental management plans (EMP) for regulating and permitting agencies.

Representative Experience

Environmental Assessments

Caribbean Coastal Services Ltd.
Marine Lead for environmental team in the preparation and submission of environmental assessments for research and development projects throughout The Bahamas and the Caribbean.

Environmental Management

Bahamas National Trust, New Providence Office
Project manager for Community Based Conch Management in the Family Islands pilot in East Grand Bahama; Reversing the Decline of Bahamian Coral Reefs 10-year project; Conchservation Campaign.

Assisting with the development of a sustainable financing for the Science & Policy Department through the BNT Dive Tag Program, Expanding Research Permit fees to all National Parks in The Bahamas, Preparing grant proposals

Support the development of the BNT GIS Unit

Fundraising for the "Conchservation Campaign", "Reversing the Decline of Bahamian Coral Reefs", "Community Based Conch Management in the Family Islands" projects.

Project Advisor for University of the Bahamas student, Ms. Tika Penn, "Mangrove restoration in Adventure Learning Center"

Profile

Education

Masters by Research Student,
Conservation Biology
Manchester Metropolitan University (UK),
2017 – present

Queens College Center for Continuing Education, Competitive Grant Writing
2019

Conservation Leadership in the Caribbean (CLiC) Fellows Program
Grenada, 2016

B. Arts, Marine Science, Minor Biology, Minor Agriculture
University of Hawai'i Hilo,
Hawaii, 2009

Associate of Arts in Biology w/ Agriculture
College of The Bahamas
Nassau, Bahamas, 2005

Certifications

PADI Specialty Diver – Coral Nursery, PADI Advanced Open Water Scuba Certification, PADI Emergency First Responder, Certified Reef Check Eco Diver

Atlantic and Gulf Rapid Assessment Benthic Certification (Advanced)

Class B Boat Captain, certified in Standards of Training, Certification and Watchkeeping for Seafarers (STCW),

Grant writing, Proposal development, Drafting contracts

Knowledgeable in Geographic Information Systems, Large format printing (HP), Proficient in Microsoft Office suite and ArcGIS10.1 Software, QGIS Software

Professional Memberships

Member of the Bahamas Spiny Lobster Working Group

Agnessa Laurelle Lundy, B.A., M.Res. Candidate

Senior Environmental Scientist

The Nature Conservancy Northern Caribbean Program Conservation Coordinator
Project Manager for Fostering Watershed Conservation in the Pine Islands of the Bahamas; Grand Bahama Environmental Project.

Building a National Network of Marine Protected Areas – the Bahamas Pilot demonstration

Incorporating climate change and mangrove restoration into conservation planning

Spatial Data manager for The Bahamas and Turks and Caicos Islands (Northern Caribbean) – GIS

Assisted with the following environmental projects throughout The Bahamas:
- Coral nursery installation and monitoring;
- Implementing a Model Marine Reserve in the South Berry Islands Marine Reserve;
- Expanding Marine Protections Across The Bahamas;
- Mitigating the Threats of Invasive Alien Species - lionfish and casuarina;
- General outreach and education to build support for the expansion of The Bahamas National Protected Areas System;
- Spiny Lobster Fishery Improvement Project

Representative on the following committees.
- National Coastal Awareness Committee;
- National Invasive Species Strategy Committee;
- Biodiversity Committee;
- National Blue Flag Jury;
- National Implementation Support Partnership;
- National Steering Committee

Atlantis Paradise Island
As an Aquarist, initiating the mangrove donation program by establishing a black mangrove nursery and initiating the first red and black mangrove donation to the Victoria Pond Restoration project. Assisted with collecting marine life for exhibits and lead tours with the Sea Keeper Adventurer Programs.

Maintained exhibits in the Coral and Beach tower animal exhibits, and the Coral Towers Quarantine.

Assisted with collecting marine life for exhibits and lead tours

Presentations & Appearances
Current Status of Conch Salad Conch in The Bahamas
Community Based Conch Management in the Family Island
Connecting Coral Resilience with Coral Rehabilitation
Bahamians in Science and the Environment
Coral Nurseries and Reef Restoration
Anyone can work in Conservation Queen Conch and Conservation
Why expand the Andros West Side National Park?

Presentations&Appearances
Ecological spillover from a marine protected area replenishes an over-exploited population across an island chain https://doi.org/10.1111/csp2.17
Andrew S. Kough, Carolyn A. Belak, Claire B. Paris, **Agnessa Lundy** Heather Cronin, Gaya Gnanalingam, Sam Hagedorn, Rachel Skubel, Amanda C. Weiler, Allan W. Stoner

Mulitplex microsatellite PCR panels for the neotropical red mangrove, *Rhizophora mangle*: combining efforts towards a cost-effective and modifiable tool to better inform conservation and management https://doi.org/10.1007/s12686-020-01138-8 John Paul Kennedy, Hayley Craig, Antonella Jara-Cavieres, **Agnessa Lundy**, Richard F. Preziosi, Jennifer K. Rowntree

Expanding The Bahamas Marine Protected Areas Network To meet The Bahamas 2020 declaration. https://bit.ly/3nVw4oU Lakeshia Anderson, Craig Dahlgren, Lindy Knowles, Lashanti Jupp, Shelley Cant-Woodside, Shenique Albury-Smith, Casuarina McKinnery-Lambert, **Agnessa Lundy**

Bonefish Pond Mangrove "Restoration": Monitoring Bonefish Pond. *Poster.* Lindy Knowles, Craig Dahlgren, Janeen Bullard, Felicity Burrows, **Agnessa Lundy**

Power of Her 2020 "*Game Changer*" Award Receipt

BRON POSSIBILITIES UNLIMITED

METRICS CCS ENCO POWERED BY BRON

Curriculum Vitae

Mark Daniels, B.Sc., M.Sc.

Associate Principal - Environmental

Mark provides comprehensive environmental management duties for CCS, serving as project leader for the environmental compliance process in the production of environmental baseline studies (EBS), environmental impact assessments (EIA) and environmental management plans (EMP) for regulating and permitting agencies.

Representative Experience

Environmental Management

Crystal Palace Resort & Casino Demolition
Environmental consultant for the demolition, implosion and cleanup of the former resort. Project lead for production of Environmental Management Plan and Explosives Safety Plan.

Enhancing Coastal Protection for Climate Change Resilience: Conducted field activities for a series of technical baseline studies for Green Climate Fund (GCF) Enhanced Direct Access (EDA) through the Caribbean Community Climate Change Centre (CCCCC) in six pilot countries.

Baha Mar Main Pier
Environmental lead for benthic assessments/data collection and production of EBS and EMP for modifications to the Main Pier.

Long Cay Redevelopment
Project lead for production of EIA and EMP. Government liaison for permitting process.

Bahamas Lodge Development
Terrestrial specialist, government liaison and project leader for production of EIA and EMPs.

Walker's Cay
Terrestrial surveys, data collection and habitat mapping. Project lead for production of EBS.

Davis Harbor
Habitat mapping and production of EBS for modifications to marina.

Bird & Cat Cay
Environmental lead for terrestrial and marine surveys, habitat mapping, and production of EBS, EIA and EMPs.

Profile

Education

M. Science, Botany
Miami University
Oxford, Ohio,

B. Science, Biochemistry
University of The West Indies
Kingston, Jamaica,

AS. Biology w/ Chemistry
College of The Bahamas
Nassau, Bahamas,

Professional Experience

Caribbean Coastal Services Ltd.
Nassau, Bahamas
Associate Principal - Environmental
Senior Environmental Scientist

The Bahamas National Trust
Nassau, Bahamas
Retreat Curator & New Providence Parks Manager

Miami University
Oxford, Ohio
Research Assistant

Leon Levy Native Plant Preserve
Eleuthera, Bahamas
Preserve Manager

The Bahamas National Trust
Nassau, Bahamas
New Providence Park Warden

Lucayan Tropical Farms
Nassau, Bahamas
Micropropagation Lab Technician

Mark Daniels, B.Sc., M.Sc.
Associate Principal - Environmental

Adelaide Creek
Terrestrial survey and risk assessment for proposed development within Adelaide Creek system

Lighthouse Point
Terrestrial surveying, data collection and production of vegetation maps.

Little San Salvador
Terrestrial surveying, data collection, production of vegetation maps and environmental baseline study (EBS).

Orange Creek
Terrestrial surveying, data collection and production of vegetation maps.

Alligator Point
Terrestrial surveying, data collection and production of vegetation maps.

Integrated Coastal Zone Management (ICZM) Project - Andros
Terrestrial specialist for coastal surveys conducted at 7 proposed sites on Andros Island.

Protected Area Management

Mann Island
Project lead for terrestrial surveys, vegetation mapping, invasive species removal and petroleum waste cleanup.

Harrold and Wilson Ponds
Coordinator for invasive cattail (*Typha domingensis*) removal and management.

Bonefish Pond
Coordinator and project lead for mangrove cleanup, restoration and monitoring activities.

Retreat Gardens
Day to day management of Garden operations and curation of palm collection. Project coordinator for infrastructure development, utility repairs, building renovations, fundraisers, workshops, community meetings and Garden additions.

Levy Preserve
Day to day management of Garden operations and curation of native plant collection. Project coordinator for infrastructure [...]

Professional Experience cont.

Trauma and Emergency Medical Services Ltd.
Nassau, Bahamas
Physician's Assistant/EMT-B

Professional Memberships
Bahamas National Trust (Ambassador, Member)

Society for Conservation and Study of Caribbean Birds (SCSCB)

Certifications
PADI certified Open Water Diver

Emergency Medical Technician – B

Continuing Education
Highly Effective Teams (HET)
The Nature Conservancy,

Centre for Agriculture and Bioscience International (CABI) – Invasive Species CBA,

Tropical Botany Taxonomy
Florida International University,

Emergency Medical Technician B
Florida Medical Training Institute,

Publications
Geographical ecology of dry forest tree communities in the West Indies
Journal of Biogeography

A Floristic Study of a former land bridge in The Bahama Archipelago
Diss. Miami University

ANCILLENO ORLANDO DAVIS, PHD

P.O. Box FH14101, Nassau, Bahamas | +1 242 826-0405 (mobile) | ancilleno@scienceandperspective.com

EDUCATION

Miami University, Oxford OH, USA
Ph.D. in Ecology, Evolution and Environmental Biology **2018**
Dissertation: Understanding, enhancing and engaging with citizen science bird monitoring in eBird

Miami University, Oxford OH, USA
Graduate Certificate in Advanced Studio Art **2018**

Miami University, Oxford OH, USA
Graduate Certificate in College Teaching **2018**

Miami University, Oxford OH, USA
Graduate Certificate in Applied Statistics **2017**

University of Maryland Eastern Shore, Princess Anne MD, USA
M.Sc. in Marine Estuarine and Environmental Science **2006**
Thesis: Epifloral and epifaunal assemblage of Fucus vesiculosus L. (Bladder wrack) in Indian River Inlet, Delaware, USA

University of Maryland Eastern Shore, Princess Anne MD, USA
B.Sc. Environmental Science **2005**
Area of Concentration: Marine Science
Magna cum Laude

University of The Bahamas, Nassau N.P., Bahamas
A.A. Biology with Chemistry **2001**

AWARDS

Lavatus Powell Diversity Award – Graduate Students of All Nations (organization nomination)	January 2016 & January 2017
Lavatus Powell Diversity Award – Graduate student (individual nomination)	January 2016 & January 2017
Future Voices Sustainability Art Contest	May 2015 – December 2015
Marine Estuarine and Environmental Science Fellowship award	August 2005 – December 2006
Kirtland's Warbler Research and Training Program Scholarship	August 2003 – May 2005
Marilu Tolo Scholarship	August 1998 – December 2001

AVIAN ECOLOGY

New Providence, Bahamas
Avian Ecologist - SEV consulting **2020**
Conducted wild bird surveys for private clientele

Blue Lagoon Island, Salt Cay Important Bird Area, Bahamas
Sustainability Coordinator and Ecologist **2019**
Conducted wild bird surveys regularly. Tripled the bird diversity record for Salt Cay in one year

Science and Perspective, Bahamas
CEO/OWNER, Ecologist **December 2018 - present**
Conduct environmental surveys and community assessments including over 1000 bird surveys in 2019 using various eBird.org protocols.

Miami University, Oxford OH
Laboratory Instructor - Ornithology **2018**
Taught wild bird identification and survey methods, conducted more than one hundred field surveys for wild birds in the Ohio area

Miami University, Oxford, OH, USA

Primary Investigator – Habitat, observer and bird diversity in eBird records — **August 2015 – December 2018**
Generate habitat maps and analyze citizen-science bird records for the island of Grand Bahama to determine the impact of habitat, observer diversity and avian species occurrence on the biodiversity record.

Kingston, Jamaica
Support instructor - Caribbean Birding Trail professional bird guide training — **June 2015**
Support the training of regional bird guides in bird surveys and ethical guiding and conduct surveys in Trelawny and Kingston Jamaica to assess the bird community

BirdsCaribbean, Virginia, USA; Bahamas; Caribbean
Director-At-Large — **October 2012 – present**
Promote and implement multilingual bird related education, training and conservation throughout the Caribbean; translate and review articles for the Journal of Caribbean Ornithology; Coordinate regional meetings with across political, linguistic and cultural borders with diverse partners

The Bahamas National Oil Spill Response Team
Logistic coordinator/Terrestrial, Avian and Marine Survey Observer — **April 2010 – May 2010**
Collaborated with local and international scientists, government agencies and military personnel to conduct pre-impact ecosystem assessment of the Cay Sal Bank, in response to the Deep Water Horizon Oil Spill. Facilitated research and training meetings for oil spill response team members. Collected data on bird diversity and behavior in the Cay Sal Bank

TEACHING EXPERIENCE

Miami University, Oxford OH
Laboratory Instructor – Introductory Biology — **2018**
Followed established procedures and format; administered grades

Miami University, Oxford OH
Laboratory Instructor - Ornithology — **2018**
Developed teaching materials and examinations, following established format, administered grades

Laboratory Instructor – Introductory Biology — **2017**
Followed established procedures and format, administered grades

Assistant Instructor – Tropical Marine Ecology — **2015**
Delivered ecosystem content and supported student learning and in water safety; trained students in ecosystem survey methods

Instructor – Social Media 101 (Institute for Learning in Retirement) — **2015**
Developed syllabus and adaptive course content to introduce nontraditional students to modern social media

Instructor – Photography, Conservation and Culture in the Bahamas (Study Abroad, USA – Bahamas) — **2015**
Developed syllabus and overall course structure in collaboration with Art faculty; planned, coordinated and lead students on multi-island study abroad workshop

Teaching Assistant – Tropical Marine Ecology — **2013**
Delivered ecosystem content and supported student learning and in water safety; trained students in ecosystem survey methods

Bahamas Reef Environment Educational Foundation, San Salvador Island, Bahamas
Instructor Teacher Training Workshop 2011 – Coral Reef Ecology, Sustainability, and Water Safety — **2010**
Developed course content and teaching materials to meet student needs; supported student safety in water

Instructor Teacher Training Workshop 2009 – Coral Reef Ecology, Terrestrial Ecology, and Water Safety — **2008**
Developed course content and teaching materials to meet student needs; supported student safety in water

University of the Bahamas, Nassau N.P., Bahamas

Lecturer – Introductory Biology (Non-Majors) **2010**
Developed course content and teaching materials to meet established curriculum requirements

University of Maryland Eastern Shore, Oxford OH
Lab Instructor – Marine Botany **2006**
Taught practical procedures and methods for Marine Botany, administered grades

Instructor - Biology Lab **2005**
Followed established syllabus and format, administered grades

Supplemental Instructor – Calculus Based Physics **2005**
Provided alternative teaching methods for physics students

Supplemental Instructor – Economics (Micro/Macro) **2005**
Provided alternative teaching methods for economics students

Professional Association of Dive Instructors (PADI)
Open Water SCUBA Instructor/ CPR and First Aid Instructor **2009**
Safely deliver and evaluate standardized, measures-based content focused on mastery

ReefCheck, Tropical Western Atlantic
Instructor **2009**
Taught local groups how to conduct a ReefCheck coral reef ecosystem survey using SCUBA or snorkel gear

Atlantic and Gulf Rapid Reef Assessment (AGRRA)
Instructor **2011**
Taught local groups how to conduct AGRRA marine assessments, coral and fish Identification

LEADERSHIP EXPERIENCE

BirdsCaribbean, Virginia, USA; Bahamas; Caribbean
Director-At-Large **October 2012 – present**
Promote and implement multilingual bird related education, training and conservation throughout the Caribbean; translate and review articles for the Journal of Caribbean Ornithology; Coordinate regional meetings with across political, linguistic and cultural borders with diverse partners

Bahamians Educated in Natural and Geospatial Sciences
Founder – Primary Coordinator **February 2011 – present**
Connect Bahamian students and scientists with educational and professional opportunities in science, locally and internationally; foster an interdisciplinary network of scientists in the Bahamas

Graduate Students of All Nations, Miami University, Oxford OH, USA
Founder - President **August 2015 – present**
Support and advocate for international students and scholars' social, economic, and academic success through collaboration with on-campus support services and local businesses

Graduate Council, Miami University, Oxford OH, USA
Graduate Students of Color/ Graduate Students of All Nations representative **August 2015 – present**
Support and advocate for graduate students of color and international students and scholars' social, economic, and academic success via evaluation of graduate school petitions and discussions of university policy.

Center for American and World Cultures Advisory Council, Miami University, Oxford OH, USA
Member – Graduate Student Representative **August 2015 – present**
Support and advocate for international students and scholars' social, economic, and academic success through collaboration with on-campus support services and local businesses

Midwest Ecology and Evolution Conference
Steering Committee - Social Media and Website Coordinator **May 2015 – May 2016**
Developed and coordinated digital website content and integration with social media and email publicity of the event; coordinated transfer of content to subsequent conference committee

Biology Graduate Student association, Miami University, Oxford OH, USA

Graduate Student Representative to the Biology department Visibility and Web Committee — **May 2014 – May 2015**
Support Biology Department use of digital media via web pages and social media, to promote student work and program offerings.

Biology Graduate Student association, Miami University, Oxford OH, USA
Graduate Student Representative to the Biology department faculty meetings — **May 2014 – May 2015**
Provide Graduate student perspective on topics of concern in faculty meetings and report to Biology Graduate Student Association on topics discussed in the meetings.

The Nature Conservancy (TNC)
Conservation Coordinator — **July 2008 – August 2012**
Coordinated conservation capacity building, outreach, and education projects in the Bahamas. Recruited or trained Bahamian researchers to collect ecosystem data in marine environments. Coordinated with National Ministries to deliver appropriate educational content to agents and schools throughout the country.

The Kerzner Marine Foundation's (KMF) "The Blue Project"
Coordinator — **July 2008 – August 2012**
Established and monitored appropriate goals, timelines and budgets to improve national capacity for conservation of native coral reefs and associated ecosystems. Coordinated conservation capacity building, outreach, and education projects in the Bahamas. Recruited or trained Bahamian researchers to collect ecosystem data in marine environments. Coordinated with National Ministries to deliver appropriate educational content to agents and schools throughout the country.

The College of the Bahamas Job Placement and Career Advisory Committee
Science and Environment Industry Representative – Elected Vice Chair (August 2010- June 2011) — **September 2009 – June 2011**
Established student engagement and training goals, coordinated national career day for college and high school students with interdisciplinary team. Collaborated with industry and government agency leadership to determine national goals for capacity building and education.

The Bahamas Million Tree Campaign
Coordinator — **August 2008 – December 2009**
Collaborated with Ministry of Environment, Bahamas National Trust, The Nature Conservancy and Commercial Plant growers to develop a nationwide native plant discount program and collect volunteer data from local groups and individuals that planted native species. Coordinated tree plantings with local government and official opposition ministers in public parks nationwide.

The Khaled bin Sultan Living Oceans Foundation (LOF) - Global Reef Expedition
Bahamas Coordinator — **August 2010 – December 2011**
Drafted application for the Bahamas to be the first country on the Global Reef Expedition. Collaborated with The LOF, government ministries, NGO's and commercial partners to develop local itineraries, priorities and best practices for marine research. Coordinated local scientists to participate in data collection including developing training programs where necessary to develop needed capacity. Conducted data collection and entry using AGRRA protocols. Facilitated import of specialized equipment for visiting scientists.

The Bahamas First Coral Nurseries – New Providence, Bahamas
Project Leader — **August 2010 – August 2012**
Assessed and adapted US National Oceanic and Atmospheric Administration and Coral Restoration Foundation techniques and procedures for application in the Bahamas. Used Geospatial Information Systems to determine feasible locations for coral nursery implementation. Collaborated with TNC, KMF, BNT and Bahamas Department of Marine Resources to raise funds for training, supplies and implementation. Coordinated local and international scientists for training and nursery establishment. Maintained nursery records and assessed coral growth.

The Bahamas National Coastal Awareness Committee
Social Media Chair — **January 2011 – May 2012**
Represented The Nature Conservancy and scientific community on the committee. Established communication priorities around the selected theme. Developed and coordinated outreach and communication via Social Media.

The Bahamas National Biodiversity Sub-committee to the Bahamas Environment Science and Technology (BEST) Commission

Ecologist/ TNC Representative **January 2011 – May 2012**
Represented The Nature Conservancy and scientific community on the committee. Along with the committee evaluated species introductions, infractions against CITES regulations, proposed large-scale agricultural and sustainable energy developments and oil exploration regulations.

The Bahamas National Oil Spill Response Team
Logistic coordinator/Terrestrial, Avian and Marine Survey Observer **April 2010 – May 2010**
Collaborated with local and international scientists, government agencies and military personnel to conduct pre-impact ecosystem assessment of the Cay Sal Bank, in response to the Deep Water Horizon Oil Spill. Facilitated research and training meetings for oil spill response team members.

Center for American and World Cultures
Graduate Assistant **October 2014 – August 2016**
Develop and manage media database, social media and website content; develop and distribute event publicity materials to partners and public; compile and share international student feedback when appropriate

RESEARCH EXPERIENCE

Miami University, Oxford, OH, USA
Primary Investigator – Habitat, observer and bird diversity in eBird records **August 2015 – December 2019**
Generate habitat maps and analyze citizen-science bird records for the island of Grand Bahama to determine the impact of habitat, observer diversity and avian species occurrence on the biodiversity record.

USA; Jamaica; Bahamas
Study skin preparation **2001-present**
Prepared ornithological specimen skins for scientific study, including species, gender and reproductive state of specimen and teaching students correct mounting procedure.

Community Conch – Berry's Conch Project - Berry Islands, Bahamas
Field Technician **June 2009**
Conducted towed snorkeler and SCUBA transect surveys for conch (*Lobatus gigas*) along with biometrics to determine conch population size, distribution and demographics

Kerzner Marine Foundation – August 2008 REA of Coral Reef Communities around New Providence and Rose Island
AGRRA coral survey scientist **August 2008**
Completed training in field identification of native coral and fish. Conducted surveys of benthic communities while on SCUBA following the AGRRA methodology.

University of Maryland Eastern Shore, Indian River Inlet, DE and Princess Anne, MD
Researcher - Epifauna and epiflora of Fucus vesiculosus in Indian River Inlet. **August 2005 – December 2006**
Conducted water quality analysis and taxonomic identification of macroalgae, microalgae, and crustaceans associated with Fucus vesiculosus (Bladder wrack) in the Delmarva Peninsula.

Field and Lab Technician – UMES Precision Agriculture Project **August 2005 – December 2006**
Conducted drone flights using fixed wing and helicopter style remote controlled aircraft to collect visual data on agricultural fields. Used ArcGIS to orthorectify and classify images for use in precision agriculture studies. Trained graduate and undergraduate students in the use of Unmanned Aerial Vehicles and digital imaging equipment and software. Developed procedure manuals for common lab activities.

Abaco Parrot Project – Abaco Island, Bahamas
Field and GIS Technician **May 2003 – August 2004**
Worked closely with the endangered, endemic Bahama Parrot (*Amazona leucocephala bahamensis*). Searched for and monitored nests, conducted surveys of nesting activity and assessments of nesting habitat. Used ArcGIS to view maps and plan research activities with lead investigators. Supported international researchers in the identification of native plants and Spanish-English translation of written materials and verbal communication with partners from Puerto Rico.

Kirtland's Warbler Recovery Effort – Andros and Eleuthera Islands, Bahamas
Field Technician **May 2003 – August 2004**

Observation, capture, identification, banding and measurement of native/migrant bird species, specifically the endangered Kirtland´s warbler (*Dendroica kirtlandii)* Identification and measurement of native plant species. Data analysis and presentation. Recruitment of new students into the program

United States Fish and Wildlife Service (USFS) – Huron Manistee National Forest, Mio, MI, USA
Summer Intern **June 2002 – August 2002**
Delivered public lectures on the ecology of the Bahamas. Assisted researchers in radiotelemetry and capture of Massasauga rattlesnakes (Sistrurus catenatus) and Box turtles (Terrapene sp.). Survey endangered Kirtland's Warblers as part of annual census. Enter survey data into Arc View GIS database.

OTHER EMPLOYMENT EXPERIENCE

Blue Lagoon Island, Salt Cay, Bahamas
Sustainability coordinator **January 2019 – Present**
Assess and evaluate organizational sustainability to establish targets, develop and implement training to achieve multi-level sustainability goals.

Dolphin Cay, Atlantis, Paradise Island, Bahamas
Dolphin Trainer **July 2008 – August 2008**
Observe and report on dolphin and sea lion behavior. Prepare food according to animal needs and veterinary staff recommendations.

SCUBA diver **April 2007 – July 2008**
Maintain safe, hygienic environment in dolphin and sea lion habitats. Small engine maintenance and repair. Forklift operation.

Bahamas Humane Society, Bahamas
Kennel Care Technician/ Veterinary Assistant **July 2008 – August 2008**
Dog and cat obedience training using positive reinforcement and Least Reinforcing Stimuli. Kennel cleaning and maintenance. Inspect animals for injury and administration of medication. Humane and ethical care of animals was the priority.

PUBLICATIONS

***Davis, A.**, McCarty J.(2018). Combining citizen science and open source geospatial techniques improves habitat knowledge for Bahamian birds. Submitted to Journal of Caribbean Ornithology.*

*Rivera-Milán, F. F., Collazo, J. A., Stahala, C., Moore, W. J., **Davis, A.**, Herring, G., ... Bracey, W. (2005). Estimation of density and population size and recommendations for monitoring trends of Bahama parrots on Great Abaco and Great Inagua. Wildlife Society Bulletin, 33(3). https://doi.org/10.2193/0091-7648(2005)33[823:EODAPS]2.0.CO;2*

***Davis, Ancilleno**. 2006. Epifloral and epifaunal assemblage of Fucus vesiculosus L (bladderwrack) in Indian River Inlet, Delaware, USA.* Master's Thesis

*Currie, D., J.M. Wunderle, Jr., D.N. Ewert, M. Anderson, **A. Davis**, and J. Turner. 2005. Winter habitat distribution of birds in central Andros,* The Bahamas: implications for management. Caribbean Journal of Science *41:75-87.*

*Currie, D., J.M. Wunderle, Jr., D.N. Ewert, **A. Davis**, and Z. McKenzie. 2005. Winter avian distribution in six terrestrial habitats on southern Eleuthera, The Bahamas.* Caribbean Journal of Science *41:88-100.*

Bahamas Reef Environment Educational Foundation. "Take Care of the Coral Reefs!" (translator/voice actor)

INVITED TALKS AND PRESENTATIONS

***Davis, Ancilleno** (July 29th 2019) Social media 101 for Conservation engagement. BirdsCaribbean Regional Meeting, July 25th to July 29th 2019, Gosier, Guadeloupe.*

***Davis, A.**, Tossas, A. (July 27th 2019) Mentorship workshop. BirdsCaribbean Regional Meeting, July 25th to July 29th 2019, Gosier, Guadeloupe.*

Davis, A., *Meister, K. (July 26th 2019) Private Island Partnerships for Conservation: Blue Lagoon Case Study. BirdsCaribbean Regional Meeting, July 25th to July 29th 2019, Gosier, Guadeloupe.*

Davis, A.*, Eneas, K. (July 26th 2019) ABC'S of Engagement with Conservation Data: Dubstep Remix. BirdsCaribbean Regional Meeting, July 25th to July 29th 2019, Gosier, Guadeloupe.*

Davis, Ancilleno *(June 3rd 2017) Changing Faces of International Bird Conservation. The Kirtland's Warbler Festival, Roscommon, MI.*

Davis, Ancilleno *(2017) Keynote presentation: Preserving "Our Michigan" Birds in the Bahamas, an Overview of Bahamian and Caribbean Conservation and the Importance of Citizen Science. Detroit Audubon Annual Earth day Celebration and Teach-In: "Soaring to New Heights" April 22nd 2017.*

Davis, Ancilleno *(2017) Lost in transition: Studying working and living across boundaries. 14th annual Miami English Graduate and Adjunct Symposium, Friday March 10 2017. Miami University, Oxford, OH.*

Davis, Ancilleno *(2016) Transitions: How International Students Experience and Survive American Academia. Race Class Gender and Sexuality Symposium, Wright State University, Dayton, OH.*

Davis, A.*, Loring, G. (2015) Cornucopia, Utopia, Dystopia: public sculpture and interactive experience. Miami University, Oxford, OH. https://www.facebook.com/MUcornucopia; https://twitter.com/MUcornucopia*

Davis, Ancilleno *(2015) The Caribbean Birding Trail: Local Experts Lead the Way. Miami Valley Audubon, May 11th 2015, Oxford, OH*

Palmeri, J., Kashtan, A., Mina, L., Hasan, A., Bui, H., ***Davis, A.*** *and Cimasko, T. (2015). Dead Weight? Addressing On-Campus Racial Politics in the Class room in the Wake of the 'Concerned Faculty Member' Letter. Race Class Gender and Sexuality Symposium, Miami University, Oxford, OH.*

Davis, Ancilleno *(2014) A Birder's Migration (Talk March 7th and Photography Exhibit March 3rd-28th) MacMillan Hall, Miami University, Oxford, OH.*

Davis, Ancilleno *(2014) Local Science, Internationally: Something for Nothing. 11th Annual Miami English Graduate and Adjunct Symposium, March 14th, 2014, Miami University, Oxford, OH.*

Davis, A.*, The Kerzner Marine Foundation, The Nature Conservancy (2012) The Blue Project: Coral Conservation, Monitoring and Capacity Building. Poster presentation at the International Coral Reef Symposium, Cairns Australia, 2012*

LANGUAGES

English – native language
Spanish – speak, read and write fluently
American Sign Language – basic
Python programming language – intermediate
R programming language – advanced
JavaScript – intermediate

SOFTWARE

Adobe Suite: Acrobat Pro XI; Photoshop CS6; Adobe Illustrator
ENVI 5.4
ESRI Arc Suite: ArcGIS; ArcMap
Google: Blogger; Docs; Fusion Tables; Google Earth Pro; Hangouts; Sheets; Sites; Slides
Microsoft Suite: Access; Excel; Outlook; PowerPoint; Publisher; Word
QGIS

MEMBERSHIPS

Bahamians Educated in Natural and Geospatial Sciences - Founder
BirdsCaribbean – Director-at-Large
Graduate Students of All Nations – Founder/ President
PADI – Professional Association of Dive Instructors – Open Water Instructor

CERTIFICATIONS

PADI – Open Water SCUBA instructor

Emergency First Response First aid and CPR instructor
Reef Resilience Trainer
ESRI ArcGIS certificate
Rotomotion UAV pilot certificate
BirdsCaribbean certified Bird Guide

JANEEN MARLO BULLARD

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25 Turnquest Alley
Nassau, Bahamas

With over 15 years of experience in the scientific and environmental field I can bring forth a plethora of skill sets that arrange from multi-tasking, planning and coordination, management of personnel and time as well as confidential handling of sensitive information and resources. I am dedicated and hardworking, with a passion for excellence. I possess skills in project management, educational & public outreach and research & development.

EDUCATION

MS Tuskegee University, Biology (Concentration in Plant and soil Science) 2004
Thesis: The Effects of Superoptimal CO2 on the Growth, Yield, Gas Exchange, Stomatal Conductance and Starch of Sweet Potato and Peanut.

BS Tuskegee University, Marine Biology 1999

EXPERIENCE

Environmental Specialist (2011 – Present)

Projects

- Adelaide Creek Development Project; Nassau, The Bahamas Environmental Impact Assessment (EIA), Environmental Management Plan (EMP) and Marine Assessment
- Exuma International Airport Infrastructure Project, Exuma, The Bahamas Environmental and Social Baseline Assessment (ESBA)
- Community Based Conch Management in the Family Islands, Establishing community-based management of a marine protected area Stakeholder Management Plan (SMP), EBA
- Rose Island Development; Rose Island, The Bahamas Marine Assessment EIA
- Paradise Island Benthic Assessment, The Bahamas EBA
- Coco Cay Island Development, Coco Cay, The Bahamas Environmental Management (EM), Botanical, Marine and Avian Assessments (EBA)
- Ocean Cay, Bimini, The Bahamas; Environmental Management, Coral Relocation Monitoring, Public Outreach, Rapid Ecological Assessment (REA)
- The Harbor View Marina Project, Nassau, The Bahamas EBA
- The Staniard Creek Bridge and Causeway Replacement Central Andros, The Bahamas, EMP
- Briland Residence and Marina, Harbour Island, The Bahamas, Botanical, Avian and Marine Assessment for EIA

- South Andros Water Improvement Project, EMP, EM
- Barbuda Airport, Antigua and Barbuda, Herpetological Assessments for EIA
- North Windermere Island, Eleuthera, The Bahamas; Botanical, Avian and Marine Assessment for EIA
- The Pointe Marina Development: Nassau, The Bahamas; EMP, EM
- Lynyard's Cay Development; Abaco, The Bahamas; Botanical and Avian Assessment for EIA
- North Abaco Port; Abaco, The Bahamas; Botanical and Avian Assessment for EIA
- Orchid Bay; Abaco, The Bahamas; Botanical, Avian and Marine Assessment for EIA
- Airport Gateway Project, New Providence, The Bahamas; EM
- White Bay Cay, Exuma Cays, The Bahamas; Marine Assessment and Coral Relocation
- White Bay Cay, Exuma Cays, The Bahamas; Landscape Palette
- Normans Cay, Exuma Cays, The Bahamas; Botanical, Avian and Marine Assessment for EIA
- Stocking Island, Exuma Cays, The Bahamas; Botanical, Avian and Marine Assessment for EIA
- February Point, Exuma, The Bahamas; Botanical, Avian, Botanical and Marine Assessments for EIA
- Deep Water Cay, Grand Bahama, The Bahamas; Wetland Assessment
- Matt Lowe Cay, Abaco Cays, The Bahamas; Botanical and Avian Assessment for EIA
- Governor's Harbour Amy Base, Eleuthera, The Bahamas; Botanical and Avian for EIA
- Abaco Forestry, Abaco, The Bahamas; Botanical and Avian Assessment for EIA
- The Pointe, New Providence, The Bahamas; Botanical and Marine Assessment for EIA
- Norman's Cay, Exuma Cays, The Bahamas; Botanical and Avian Assessment for EIA
- Ocean Cay, Bimini, The Bahamas, Botanical and Avian Assessment for EIA
- Coco Cay, Berry Islands, The Bahamas; Botanical, Avian and Marine Assessment for EIA
- LNG Pipeline, New Providence, The Bahamas; Botanical Assessment for EIA
- White Bay Cay, Exuma, The Bahamas; Marine Assessment for EIA
- Old Fort Bay Town Center, New Providence, The Bahamas; Avian Assessment, EIA and EMP
- Bimini Bay, Bimini, The Bahamas, Marine Assessment for EIA
- Hurricane Hole Marina, Paradise Island, The Bahamas; Marine and Stakeholder Assessment, EIA
- Sandals, Exuma, The Bahamas, Avian Assessment for EIA
- Finley Cay, New Providence, The Bahamas; Marine Assessment EIA
- Ferguson Road, New Providence, The Bahamas; Botanical Assessment for EIA

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info@caribbeancoastal.com | www.caribbeancoastal.com

- Elbow Cay, Abaco, The Bahamas, Botanical, Avian and Marine Assessment for EIA
- Hermitage, Exuma, The Bahamas; Botanical and Avian Assessment for EIA
- Governor's Harbour Army Base, Eleuthera, The Bahamas; Avian Assessment for EIA

Project Coordinator

- Cane Toad Eradication, Lyford Cay, Nassau, The Bahamas
- Cane Toad Eradication, Marsh Harbour, Abaco, The Bahamas

Parks Planner and Community Liaison Officer (2006-2011) Bahamas National Trust, Nassau, Bahamas

Duties

- Develop proposals to government for the establishment of new National Parks.
- Grant writing
- Develop General Management Plans for existing National Parks.
- Work with surrounding communities to gain support for the importance of establishing new National Parks.
- Project Management for the establishment of the Leon Levy Native Plant Preserve, Eleuthera, The Bahamas.
- Manage all daily details and education of staff for educational programs.
- Organize all special events for the Education Department.
- Liaise with corporate sponsors in order to further fund educational programs.
- Develop marine education lesson plans and activities (on and off site) for grade levels K-12 and college students.
- Attendance and professional presentations at events both locally and abroad.
- Development of the National High School Marine Science Curriculum.

Research Assistant (2001-2004) Tuskegee University, Tuskegee, AL

- Developed and maintained research projects in conjunction with Tuskegee University and NASA.
- Aided in the daily maintenance and running of a greenhouse.
- Organized and taught Environmental and General Biology courses.

Marine Mammal Trainer (1999-2001) Dolphin Encounters, Blue Lagoon, Bahamas

- Trained Atlantic Bottlenose Dolphins in educational and interactive programs.
- Assisted in developing marine conservation and educational programs.

AUTHOR

The Bahamas Sixth National Report on Biological Biodiversity to The Convention on Biological Diversity (present)

Zoning and Management Plan for the East Grand Bahama National Park (present)

Co-Author of the "Andros Sustainable Development Masterplan" (2014)

Author of the "Critical Situation Analysis of Invasive Alien Species for The Bahamas" (2013)

PRESENTATIONS AND INVITED LECTURES

Policies, Strategies and Best Practices for Managing Invasive Alien Species (IAS) in the Insular Caribbean March 31st – April 4th 2014 Trinidad. Port of Spain, Trinidad & Tobago. The Cane Toad Invasion: Its Origin, Status and The Bahamas' Response to prevent spread.

Policies, Strategies and Best Practices for Managing Invasive Alien Species (IAS) in the Insular Caribbean March 31st – April 4th 2014 Trinidad. Port of Spain, Trinidad & Tobago. Developing a National IAS Strategy focused on IAS prevention – a case study of the Bahamas' 2003 -2013 experience.

Bahamas Natural History Conference 2016 The Cane Toad Invasion: Its Origin, Status and The Bahamas' Response to prevent spread

Bahamas Natural History Conference 2018 Citizen Science and Community Involvement can help! Invasive Cane Toads (*Rhinella marina*) control in The Bahamas continues.

PROFESSIONAL TRAINING

2019 IDB Principles of the Review of Environmental Impact Assessments

2019 The Perry Institute of Marine Science, AGRRA Benthic Survey Techniques

2018 Georgia Tech Professional Education Center – OSAHA Approved Trainer

2017 Conservation Training Introduction to Resilience for Development

2017 Inter-American Development Bank Project Management Techniques for Development Professionals

2015 IICA, Efficient use of Rainwater and Runoff in Agricultural Activities, Chitre, Panama

2015 IICA, Agro-Eco Tourism Training Workshop

2014 Commercial Training Center of Department of Commerce, Hainan Province, China Climate Change on Tropical Island and Economic Development for Developing Countries

2013 The Nature Conservancy, Coral Reef Restoration

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2013 The Nature Conservancy, AGRRA Coral Surveys

2010 The Bahamas National Trust, Business Writing

2010 The Bahamas National Trust, Public Presentation

2009 The Nature Conservancy, Bush Fire Management

2009 The Nature Conservancy, Invasive Species Management

2009 College of The Bahamas, Mangrove Forest Ecology, Management and Restoration

2008 International Fund for Animal Welfare, Certificate of Completion for Whale Watch Guide Training

2006 National Association of Interpretation, Certified Interpretive Guide 2006 Tuskegee University, 1st Place Graduate Oral Presentation Sigma Xi 2005 Tuskegee University, Certificate of Effective Leadership

1995 Auburn University, NAUI Scuba Certified

PROFESSIONAL AFFILIATIONS

SEEDS-Ecological Society of America

Sigma Xi Scientific Research Society

Beta Kappa Chi Honor Society

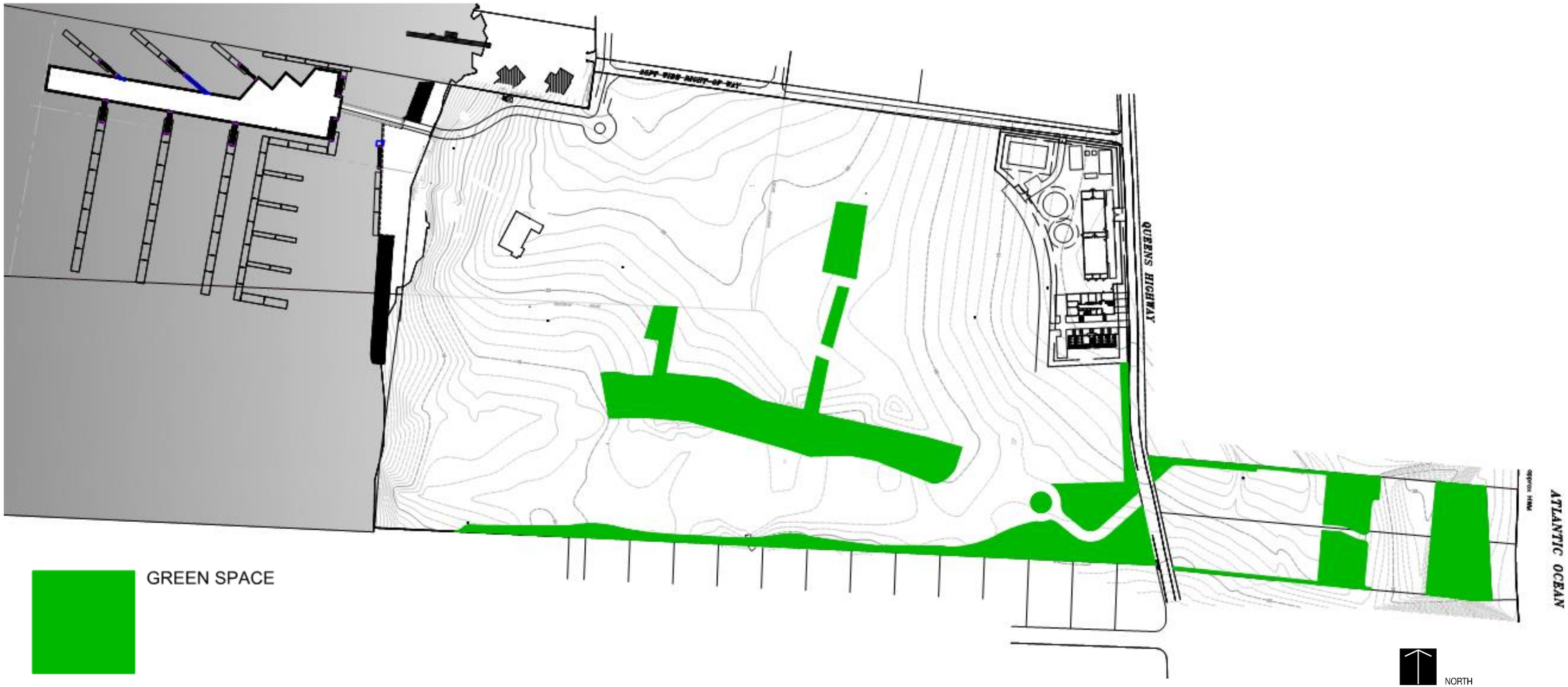
National Association for Interpretation

National Marine Educators Association Name of Organization

REFERENCES

Available upon request

APPENDIX I – Green Space



4M HARBOUR ISLAND LTD. 4M HARBOUR ISLAND 2 LTD. TO SUPPORT MARINA PACKAGE: FOR PERMITTING HARBOUR ISLAND, THE BAHAMAS	DRAWING TITLE : TREE DISPOSITION PLAN	SCALE: AS SHOWN	CHECKED: SN	Island Dimensions & Development Company LTD. Consulting Civil, Structural & Environmental Engineers, Project Managers, Cost Engineers, Land Planners & Developers, License Contractors	Farrington House, Gladstone Road, P. O. Box EE-15036, Nassau, Bahamas, Tel#: (242)-341-6318/25, Fax#: (242)-361-6312
		DATE: OCTOBER 03, 2020	DRAWN: JT		SHEET No. L104
		JOB NO.: 0000-20	APPROVED: TN		