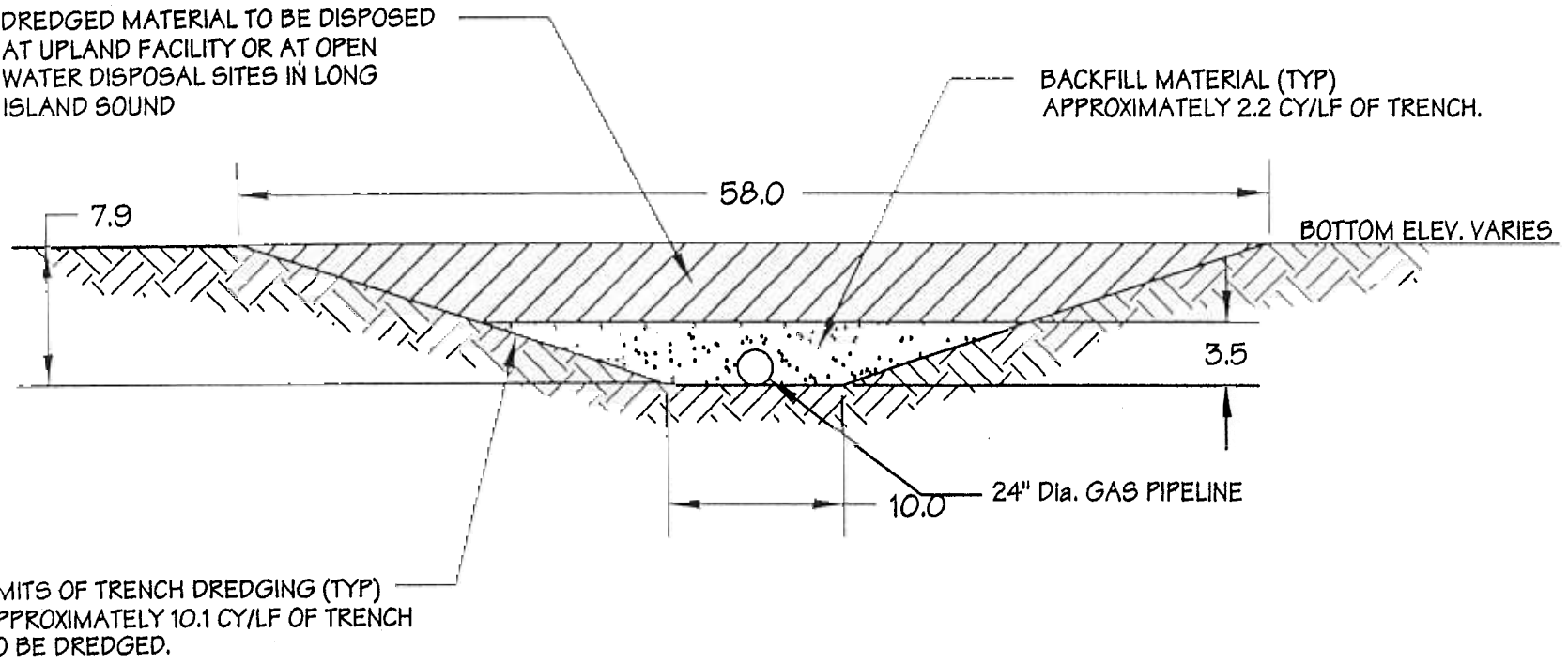
APPENDIX A

FIGURES

This page involves pipeline location information and is not available at this Internet site due to homeland security-related considerations. This portion of the Islander East consistency appeal administrative record may be reviewed at NOAA's Office of General Counsel for Ocean Services, 1305 East-West Highway, Silver Spring, Maryland.



PROPOSED TRENCH SECTION

SCALE: 1" = 10'

NOTES:
ALL DIMENSIONS SHOWN IN FEET

JOHN C. ROBERGE, PE, LLC
FOOT OF BROAD STREET STRATFORD, CT 06615
Tel (203) 377-0663 Fax (203) 375-6561
john.c.roberge@snet.net

ASSESSMENT OF ISLANDER EAST PIPELINE SEDIMENTATION IMPACTS

TOWN OF BRANFORD
NEW HAVEN COUNTY
CONNECTICUT

LONG ISLAND SOUND

Islander East Gas Tranemieelon Pipeline
PROPOSED TRENCH SECTION
SCALE: 1" = 10'

DATE: May 5, 2003

FIGURE 5

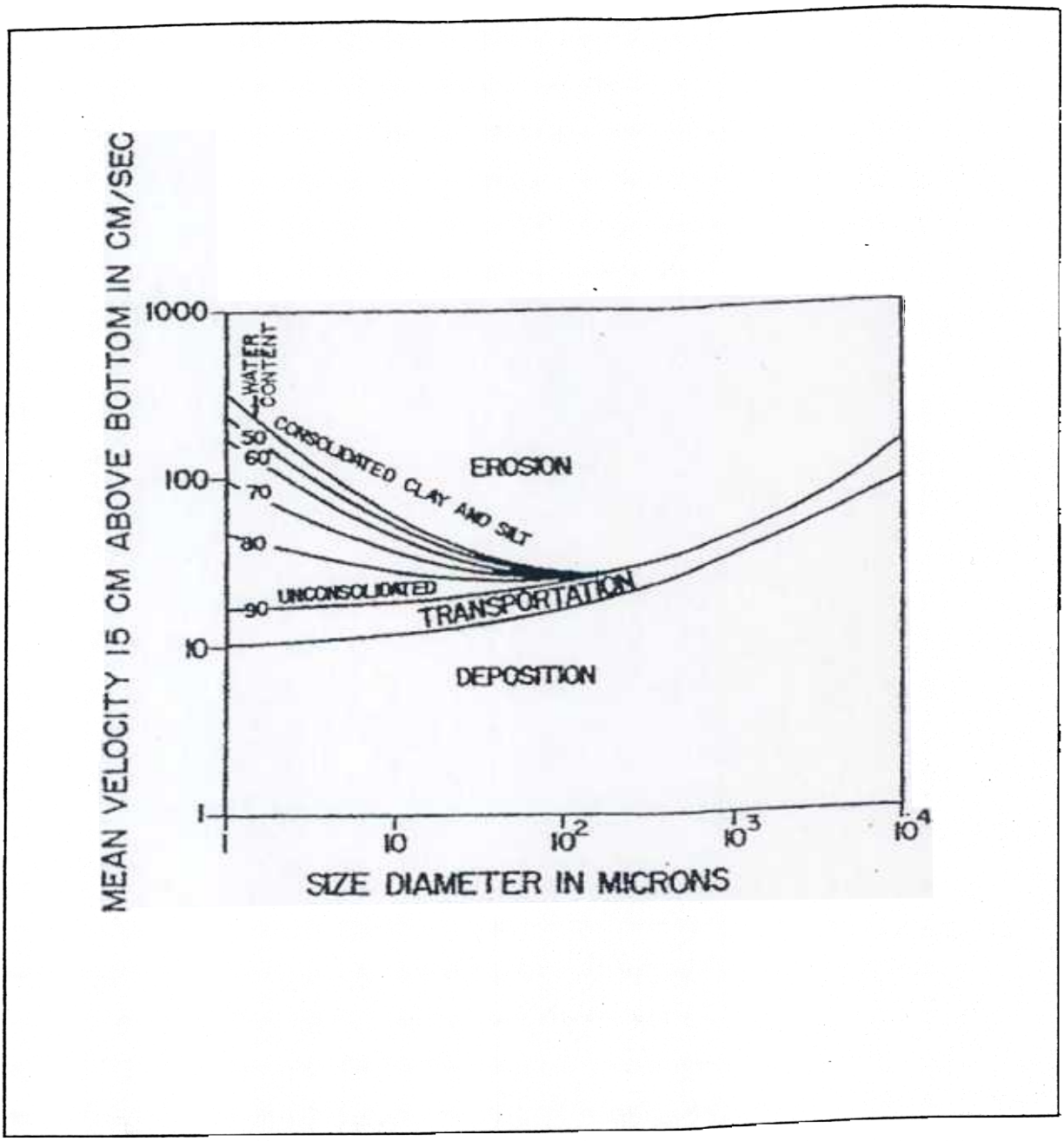


Figure 6 - Critical Erosion Characteristics for Sediments (Bohlen, Ref. 10)

Original Publication:

Basco, D.R., Bouma, A.H., and Dunlap, W.H.., "Assessment of the Factors Controling the Long-Term Fate of Dredged Material Deposited in Unconfined Subaqueous Disposal Areas, Dredged Material Research Program," Report D-074-8, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, 1974.

APPENDIX B

COMPUTATIONAL MODEL DATA

File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	ISLANDER EAST PIPELINE	Sheet No.	1 of
		Job No.	Branford 200242
Subject:	Construction Methods Assessment	Made By:	Roberge Date
	Sediment Dispersion Simulation	Chkd. By:	Date

PIPELINE STATION: MP 10.9 Ebb Flow Condition R = 1,684 g/s **Case 1**

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth,	Current	Distance From Trenching Operation, m							
m	m/s	5	20	80	100	200	300	400	1000
Flood									
4.00	0.57	671	168	42	34	17	11	8	3
Ebb									
6.00	0.72	354	89	22	18	9	6	4	2
Average									
5.00	0.66	464	116	29	23	12	8	6	2

Trenching Sediment Release Rate, R: 1684 g/s **Current Angle:** 82

Basin Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge,per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material coud settle at that position. Thickness of the settled material is directly related to plume concentration.

$$\text{Thickness (cm)} = \frac{C\ (mg/L) \times \text{Depth (m)}}{\text{Bulk Density (10000)}}$$

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m							
	5	20	80	100	200	300	400	1000
Flood	0.27	0.04	0.01	0.01	0.01	0.00	0.00	0.00
Ebb	0.14	0.04	0.01	0.01	0.00	0.00	0.00	0.00

Rev. No.
Made By Date

File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	ISLANDER EAST PIPELINE	Sheet No.	1 of
		Job No.	Branford 200242
Subject:	Construction Methods Assessment	Made By:	Roberge Date
	Sediment Dispersion Simulation	Chkd. By:	Date

PIPELINE STATION:	MP 10.9	Ebb Flow Condition	R = 445 g/s		Case 2

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth,	Current		Distance From Trenching Operation, m						
m	m/s	5	20	80	100	200	300	400	1000
Flood									
4.00	0.57	177	44	11	9	4	3	2	1
Ebb									
6.00	0.72	94	23	6	5	2	2	1	0
Average									
5.00	0.66	123	31	8	6	3	2	2	1

Trenching Sediment Release Rate, R: 445 g/s **Current Angle:** 82

Basis Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge,per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

Thickness (cm) = C (mg/L) x Depth (m) / Bulk Density (10000)

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m							
	5	20	80	100	200	300	400	1000
Flood	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Ebb	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00

Rev. No.
Made By Date

File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	**ISLANDER EAST PIPELINE**	**Sheet No.**	1 of
		Job No.	Branford 200242
Subject:	**Construction Methods Assessment**	**Made By:**	Roberge **Date**
	Sediment Dispersion Simulation	**Chkd. By:**	**Date**

PIPELINE STATION:	MP 10.9	Ebb Flow Condition	R = 243 g/s	Case 3

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth,	Current	Distance From Trenching Operation, m							
m	m/s	5	20	80	100	200	300	400	1000
Flood									
4.00	0.57	97	24	6	5	2	2	1	0
Ebb									
6.00	0.72	51	13	3	3	1	1	1	0
Average									
5.00	0.66	67	17	4	3	2	1	1	0

Trenching Sediment Release Rate, R:	243	g/s	**Current Angle:**	82

Basin Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench extavated by Bucket Dredge,per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

Thickness (cm) = C (mg/L) x Depth (m) / Bulk Density (10000)

Bulk Density (g/cc) : 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m							
	5	20	80	100	200	300	400	1000
Flood	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Ebb	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00

Rev. No.
Made By **Date**

File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	ISLANDER EAST PIPELINE	Sheet No.	1 of
		Job No.	Branford 200242
Subject:	Construction Methods Assessment	Made By:	Roberge Date
	Sediment Dispersion Simulation	Chkd. By:	Date

PIPELINE STATION: MP 10.9 Flood Flow Condition R = 1,684 g/s Case 4

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth,	Current	Distance From Trenching Operation, m							
m	m/s	5	20	80	100	200	300	400	1000
Flood									
4.00	0.57	671	168	42	34	17	11	8	3
Ebb									
6.00	0.72	354	89	22	18	9	6	4	2
Average									
5.00	0.66	464	116	29	23	12	8	6	2

Trenching Sediment Release Rate, R: 1684 g/s **Current Angle:** 265

Basis Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge,per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

$$\text{Thickness (cm)} = \frac{C\ (\text{mg/L}) \times \text{Depth (m)}}{\text{Bulk Density (10000)}}$$

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m							
	5	20	80	100	200	300	400	1000
Flood	0.27	0.04	0.01	0.01	0.01	0.00	0.00	0.00
Ebb	0.14	0.04	0.01	0.01	0.00	0.00	0.00	0.00

Rev. No.
Made By Date

File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	ISLANDER EAST PIPELINE	Sheet No.	1 of
		Job No.	Branford 200242
Subject:	Construction Methods Assessment	Made By:	Roberge Date
	Sediment Dispersion Simulation	Chkd. By:	Date

PIPELINE STATION: MP 10.9 Flood Flow Condition R = 445 g/s Case 5

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth,	Current	Distance From Trenching Operation, m							
m	m/s	5	20	80	100	200	300	400	1000
Flood									
4.00	0.57	177	44	11	9	4	3	2	1
Ebb									
6.00	0.72	94	23	6	5	2	2	1	0
Average									
5.00	0.66	123	31	8	6	3	2	2	1

Trenching Sediment Release Rate, R: 445 g/s Current Angle: 265

Basin Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge,per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

$$\text{Thickness (cm)} = \frac{C\ (\text{mg/L}) \times \text{Depth (m)}}{\text{Bulk Density (10000)}}$$

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m							
	5	20	80	100	200	300	400	1000
Flood	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Ebb	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00

Rev. No.
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File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	**ISLANDER EAST PIPELINE**	**Sheet No.**	1 of
		Job No.	Branford 200242
Subject:	**Construction Methods Assessment**	**Made By:**	Roberge Date
	Sediment Dispersion Simulation	**Chkd. By:**	Date

PIPELINE STATION:	MP 10.9	Flood Flow Condition	R = 243 g/s					Case 6

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth,	Current	Distance From Trenching Operation, m							
m	m/s	5	20	80	100	200	300	400	1000
Flood									
4.00	0.57	97	24	6	5	2	2	1	0
Ebb									
6.00	0.72	51	13	3	3	1	1	1	0
Average									
5.00	0.66	67	17	4	3	2	1	1	0

Trenching Sediment Release Rate, R: 243 g/s Current Angle: 265

Basin Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge,per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

Thickness (cm) = C (mg/L) x Depth (m) / Bulk Density (10000)

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m							
	5	20	80	100	200	300	400	1000
Flood	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Ebb	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00

Rev. No.
Made By Date

File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	**ISLANDER EAST PIPELINE**	**Sheet No.**	1 of
		Job No.	Branford 200242
Subject:	**Construction Methods Assessment**	**Made By:**	Roberge **Date**
	Sediment Dispersion Simulation	**Chkd. By:**	**Date**

PIPELINE STATION: MP 11.5 Ebb Flow Condition R = 1,684 g/s Case 7

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth,	Current	Distance From Trenching Operation, m							
m	m/s	5	20	80	100	200	300	400	1000
Flood									
5.10	0.57	527	132	33	26	13	9	7	3
Ebb									
7.10	0.72	299	75	19	15	7	5	4	1
Average									
6.10	0.66	380	95	24	19	10	6	5	2

Trenching Sediment Release Rate, R: 1684 g/s **Current Angle:** 82

Basin Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge,per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

$$\text{Thickness (cm)} = \frac{\text{C (mg/L)} \times \text{Depth (m)}}{\text{Bulk Density (10000)}}$$

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m							
	5	20	80	100	200	300	400	1000
Flood	0.25	0.04	0.01	0.01	0.01	0.00	0.00	0.00
Ebb	0.14	0.04	0.01	0.01	0.00	0.00	0.00	0.00

Rev. No.
Made By Date

File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	ISLANDER EAST PIPELINE	Sheet No.	1 of
		Job No.	Branford 200242
Subject:	Construction Methods Assessment	Made By:	Roberge Date
	Sediment Dispersion Simulation	Chkd. By:	Date

PIPELINE STATION: MP 11.5 Ebb Flow Condition R = 445 g/s Case 8

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth,	Current	Distance From Trenching Operation, m							
m	m/s	5	20	80	100	200	300	400	1000
Flood									
5.10	0.57	139	35	9	7	3	2	2	1
Ebb									
7.10	0.72	79	20	5	4	2	1	1	0
Average									
6.10	0.66	100	25	6	5	3	2	1	1

Trenching Sediment Release Rate, R: 445 g/s Current Angle: 82

Basis: Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge,per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositiioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

Thickness (cm) = C (mg/L) x Depth (m) / Bulk Density (10000)

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m							
	5	20	80	100	200	300	400	1000
Flood	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Ebb	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00

Rev. No.
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File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	ISLANDER EAST PIPELINE	Sheet No.	1 of
		Job No.	Branford 200242
Subject:	Construction Methods Assessment	Made By:	Roberge Date
	Sediment Dispersion Simulation	Chkd. By:	Date

PIPELINE STATION:		MP 11.5	Ebb Flow Condition		R = 243 g/s				Case 9
TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter									
Depth,	Current	Distance From Trenching Operation, m							
m	m/s	5	20	80	100	200	300	400	1000
Flood									
5.10	0.57	76	19	5	4	2	1	1	0
Ebb									
7.10	0.72	43	11	3	2	1	1	1	0
Average									
6.10	0.66	55	14	3	3	1	1	1	0

Trenching Sediment Release Rate, R:	243	g/s	Current Angle:	82

Basin Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge,per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

Thickness (cm) = C (mg/L) x Depth (m) / Bulk Density (10000)

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm									
Plume	Distance From Trenching Operation, m								
	5	20	80	100	200	300	400	1000
Flood	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Ebb	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00

Rev. No.
Made By Date

File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	**ISLANDER EAST PIPELINE**	**Sheet No.**	1 of
		Job No.	Branford 200242
Subject:	**Construction Methods Assessment**	**Made By:**	Roberge Date
	Sediment Dispersion Simulation	**Chkd. By:**	Date

PIPELINE STATION: MP 11.5 Flood Flow Condition R = 1,684 g/s **Case 10**

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth,	Current	Distance From Trenching Operation, m							
m	m/s	5	20	80	100	200	300	400	1000
Flood									
5.10	0.57	527	132	33	26	13	9	7	3
Ebb									
7.10	0.72	299	75	19	15	7	5	4	1
Average									
6.10	0.66	380	95	24	19	10	6	5	2

Trenching Sediment Release Rate, R: 1684 g/s **Current Angle:** 265

Basin Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge, per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

$$\text{Thickness (cm)} = \frac{\text{C (mg/L)} \times \text{Depth (m)}}{\text{Bulk Density (10000)}}$$

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m							
	5	20	80	100	200	300	400	1000
Flood	0.25	0.04	0.01	0.01	0.01	0.00	0.00	0.00
Ebb	0.14	0.04	0.01	0.01	0.00	0.00	0.00	0.00

Rev. No.
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JOHN C. ROBERGE, P.E., LLC

Project:	**ISLANDER EAST PIPELINE**	**Sheet No.**	1 of
		Job No.	Branford 200242
Subject:	**Construction Methods Assessment**	**Made By:**	Roberge Date
	Sediment Dispersion Simulation	**Chkd. By:**	Date

PIPELINE STATION: MP 11.5 | Flood Flow Condition | R = 445 g/s | Case 11

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth, m	Current m/s	Distance From Trenching Operation, m: 5	20	80	100	200	300	400	1000
Flood									
5.10	0.57	139	35	9	7	3	2	2	1
Ebb									
7.10	0.72	79	20	5	4	2	1	1	0
Average									
6.10	0.66	100	25	6	5	3	2	1	1

Trenching Sediment Release Rate, R: 445 g/s **Current Angle:** 265

Basin Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge,per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

Thickness (cm) = C (mg/L) x Depth (m) / Bulk Density (10000)

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m: 5	20	80	100	200	300	400	1000
Flood	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Ebb	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00

Rev. No.
Made By Date

File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	ISLANDER EAST PIPELINE	Sheet No.	1 of
		Job No.	Branford 200242
Subject:	Construction Methods Assessment	Made By:	Roberge Date
	Sediment Dispersion Simulation	Chkd. By:	Date

PIPELINE STATION: MP 11.5 Flood Flow Condition R = 243 g/s Case 12

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth,	Current	Distance From Trenching Operation, m							
m	m/s	5	20	80	100	200	300	400	1000
Flood									
5.10	0.57	76	19	5	4	2	1	1	0
Ebb									
7.10	0.72	43	11	3	2	1	1	1	0
Average									
6.10	0.66	55	14	3	3	1	1	1	0

Trenching Sediment Release Rate, R: 243 g/s Current Angle: 265

Basin Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge,per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

Thickness (cm) = C (mg/L) x Depth (m) / Bulk Density (10000)

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m							
	5	20	80	100	200	300	400	1000
Flood	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Ebb	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00

Rev. No.
Made By Date

File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	ISLANDER EAST PIPELINE	Sheet No.	1 of
		Job No.	Branford 200242
Subject:	Construction Methods Assessment	Made By:	Roberge Date
	Sediment Dispersion Simulation	Chkd. By:	Date

PIPELINE STATION: MP 12.0 Ebb Flow Condition R = 1,684 g/s Case 13

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth, m	Current m/s	Distance From Trenching Operation, m: 5	20	80	100	200	300	400	1000
Flood									
6.40	0.57	420	105	26	21	10	7	5	2
Ebb									
8.40	0.72	253	63	16	13	6	4	3	1
Average									
7.40	0.66	313	78	20	16	8	5	4	2

Trenching Sediment Release Rate, R: 1684 g/s **Current Angle:** 82

Basis Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge,per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

Thickness (cm) = C (mg/l) x Depth (m) / Bulk Density (10000)

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m: 5	20	80	100	200	300	400	1000
Flood	0.24	0.04	0.01	0.01	0.01	0.00	0.00	0.00
Ebb	0.14	0.04	0.01	0.01	0.00	0.00	0.00	0.00

Rev. No.
Made By Date

File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	ISLANDER EAST PIPELINE	Sheet No.	1 of
		Job No.	Branford 200242
Subject:	Construction Methods Assessment	Made By:	Roberge Date
	Sediment Dispersion Simulation	Chkd. By:	Date

PIPELINE STATION: MP 12.0 Ebb Flow Condition R = 445 g/s Case 14

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth,	Current	Distance From Trenching Operation, m							
m	m/s	5	20	80	100	200	300	400	1000
Flood									
6.40	0.57	111	28	7	6	3	2	1	1
Ebb									
8.40	0.72	67	17	4	3	2	1	1	0
Average									
7.40	0.66	83	21	5	4	2	1	1	0

Trenching Sediment Release Rate, R: 445 g/s Current Angle: 82

Basis Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge,per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

Thickness (cm) = C (mg/L) x Depth (m) / Bulk Density (10000)

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m							
	5	20	80	100	200	300	400	1000
Flood	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Ebb	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00

Rev. No.
Made By Date

File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	ISLANDER EAST PIPELINE	Sheet No.	1 of
		Job No.	Branford 200242
Subject:	Construction Methods Assessment	Made By:	Roberge Date
	Sediment Dispersion Simulation	Chkd. By:	Date

PIPELINE STATION:	MP 12.0	Ebb Flow Condition	R = 243 g/s	Case 15

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth,	Current	Distance From Trenching Operation, m							
m	m/s	5	20	80	100	200	300	400	1000
Flood									
6.40	0.57	61	15	4	3	2	1	1	0
Ebb									
8.40	0.72	37	9	2	2	1	1	0	0
Average									
7.40	0.66	45	11	3	2	1	1	1	0

Trenching Sediment Release Rate, R: 243 g/s **Current Angle:** 82

Basin Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

$$\text{Thickness (cm)} = \frac{C\ (\text{mg/L}) \times \text{Depth (m)}}{\text{Bulk Density (10000)}}$$

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m							
	5	20	80	100	200	300	400	1000
Flood	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Ebb	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00

Rev. No.
Made By Date

File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	ISLANDER EAST PIPELINE	Sheet No.	1 of
		Job No.	Branford 200242
Subject:	Construction Methods Assessment	Made By:	Roberge Date
	Sediment Dispersion Simulation	Chkd. By:	Date

PIPELINE STATION: MP 12.0 Flood Flow Condition R = 1,684 g/s Case 16

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth, m	Current m/s	Distance From Trenching Operation, m: 5	20	80	100	200	300	400	1000
Flood 6.40	0.57	420	105	26	21	10	7	5	2
Ebb 8.40	0.72	253	63	16	13	6	4	3	1
Average 7.40	0.66	313	78	20	16	8	5	4	2

Trenching Sediment Release Rate, R: 1684 g/s Current Angle: 265

Basin Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge,per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

Thickness (cm) = C (mg/L) x Depth (m) / Bulk Density (10000)

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m: 5	20	80	100	200	300	400	1000
Flood	0.24	0.04	0.01	0.01	0.01	0.00	0.00	0.00
Ebb	0.14	0.04	0.01	0.01	0.00	0.00	0.00	0.00

Rev. No.
Made By Date

File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	**ISLANDER EAST PIPELINE**	**Sheet No.**	1 of
		Job No.	Branford 200242
Subject:	**Construction Methods Assessment**	**Made By:**	Roberge **Date**
	Sediment Dispersion Simulation	**Chkd. By:**	**Date**

PIPELINE STATION:	MP 12.0	Flood Flow Condition	R = 445 g/s					Case 17

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth, m	Current m/s	Distance From Trenching Operation, m							
		5	20	80	100	200	300	400	1000
Flood									
6.40	0.57	111	28	7	6	3	2	1	1
Ebb									
8.40	0.72	67	17	4	3	2	1	1	0
Average									
7.40	0.66	83	21	5	4	2	1	1	0

Trenching **Sediment Release Rate, R:** 445 g/s **Current Angle:** 265

Basin Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge,per Islander East documents: Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

Thickness (cm) = C (mg/L) x Depth (m) / Bulk Density (10000)

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m							
	5	20	80	100	200	300	400	1000
Flood	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Ebb	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00

Rev. No.
Made By **Date**

File Ref. : compsht

JOHN C. ROBERGE, P.E., LLC

Project:	ISLANDER EAST PIPELINE	Sheet No.	1 of
		Job No.	Branford 200242
Subject:	Construction Methods Assessment	Made By:	Roberge Date
	Sediment Dispersion Simulation	Chkd. By:	Date

PIPELINE STATION:	MP 12.0	Flood Flow Condition	R = 243 g/s		Case 18

TURBIDITY PLUME CENTERLINE CONCENTRATION, mg/liter

Depth,	Current	Distance From Trenching Operation, m							
m	m/s	5	20	80	100	200	300	400	1000
Flood									
6.40	0.57	61	15	4	3	2	1	1	0
Ebb									
8.40	0.72	37	9	2	2	1	1	0	0
Average									
7.40	0.66	45	11	3	2	1	1	1	0

Trenching Sediment Release Rate, R: 243 g/s Current Angle: 265

Basis Construction and trenching MP 10.9 to MP 12.0 - Islander East Pipeline - Thimble Islands, CT

Trench excavated by Bucket Dredge,per Islander East documents. Excavation of 272 CF / LF of trench (or about 10CY/LF). Anticipate a bucket of about 10 CY capacity. Estimate cycle speed for bucket will be about 60 sec at this shallow site. The trench advance rate will be approximately 1.0 ft/min. Considering that anchors / spud repositioning every 120 LF of trench (est. length of work barge) and that repositioning will require approx. 45 minutes - Production will be approximately 44 LF/hr. Possible that thetrench will advance 270 LF during each Flood and Ebb tidal cycle.

Deposition potential was represented by the extent of the lines of constant C assuming that all of the suspended material could settle at that position. Thickness of the settled material is directly related to plume concentration.

$$\text{Thickness (cm)} = \frac{\text{C (mg/L)} \times \text{Depth (m)}}{\text{Bulk Density (10000)}}$$

Bulk Density (g/cc): 1.5

Deposited Sediment Layer Thickness, cm

Plume	Distance From Trenching Operation, m							
	5	20	80	100	200	300	400	1000
Flood	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Ebb	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00

Rev. No.
Made By Date

JOHN C. ROBERGE, P.E., LLC

Project:	Islander East Pipeline Construction	**Sheet No.**	1	of	
Location:	Branford, CT - Long Island Sound	**Job No.**	200242		
Subject:	SMB Hindcast Model with Shallow Water Correction - 100 Yr Wind / 100 Yr Depth	**Made By**	Roberge	**Date**	11/26/2002
		Chkd. By		**Date**	

Constants

		Units	
Gravity, g	9.81	m/s^2	
Surface Wind, Us	100.0	mi/hr	Ref: Handbook of Ocean and Underwater Engineering
	44.7	m/s	Myers, Holm, McAllister, ed, McGraw-Hill, 1969, p.8-5
Wind Stress Factor, Ua	76.1	m/s	$U_A = 0.71 U_S^{1.23}$

Variables

	Units	Reach #1	Reach #2
Wind Direction		South	SW
Fetch Distance, F	n.mi	20.4	54.0
	m	37780.8	100008.0
Average Water Depth,	ft	88.0	82.0
	m	26.8	25.0

Calculations

	Units	Reach #1	Reach #2
Wave Height, H	m	6.1	7.5
	ft	20.0	24.5

$$H = \frac{.283 U_A^{\,2}}{g} \tanh\left[.530\left(\frac{gd}{U_A^{\,2}}\right)^{3/4}\right] \tanh\left[\frac{.00565\left(\frac{gF}{U_A^{\,2}}\right)^{1/2}}{\tanh\left[.530\left(\frac{gd}{U_A^{\,2}}\right)^{3/4}\right]}\right]$$

Wave Period, T	Units	Reach #1	Reach #2
	sec	8.0	10.0

$$T = \frac{7.54 U_A}{g} \tanh\left[.833\left(\frac{gd}{U_A^{\,2}}\right)^{3/8}\right] \tanh\left[\frac{.0379\left(\frac{gF}{U_A^{\,2}}\right)^{1/3}}{\tanh\left[.833\left(\frac{gd}{U_A^{\,2}}\right)^{3/8}\right]}\right]$$

Duration, t	Units	Reach #1	Reach #2
	hrs	2.4	4.5

$$t = 8.93 \times 10^{-1}\left(\frac{F^2}{U_A}\right)^{1/3}$$

Rev. No.	Date
Made By	

JOHN C. ROBERGE, P.E., LLC

Project: Islander East Pipeline Construction | **Sheet No.** 2 | **of**
Location: Branford, CT - Long Island Sound | **Job No.** 200242

Subject: SMB Hindcast Model with Shallow Water Correction - 50 Yr Wind / 50 Yr Depth | **Made By** Roberge | **Date** 11/26/2002 | **Chkd. By** | **Date**

Constants

		Units
Gravity, g	9.81	m/s^2
Surface Wind, Us	90.0	mi/hr
	40.2	m/s
Wind Stress Factor, Ua	66.8	m/s

$$U_A = 0.71 U_S^{1.23}$$

Variables

	Units	Reach #1	Reach #2
Wind Direction		South	SW
Fetch Distance, F	n.mi	20.4	54.0
	m	37780.8	100008.0
Average Water Depth,	ft	85.0	79.0
	m	25.9	24.1

Calculations

	Units	Reach #1	Reach #2
Wave Height, H	m	5.4	6.7
	ft	17.8	22.0

$$H = \frac{.283 U_A^{\,2}}{g} \tanh\left[.530\left(\frac{gd}{U_A^{\,2}}\right)^{3/4}\right] \tanh\left[\frac{.00565\left(\frac{gF}{U_A^{\,2}}\right)^{1/2}}{\tanh\left[.530\left(\frac{gd}{U_A^{\,2}}\right)^{3/4}\right]}\right]$$

Wave Period, T	Units	Reach #1	Reach #2
	sec	7.6	9.6

$$T = \frac{7.54 U_A}{g} \tanh\left[.833\left(\frac{gd}{U_A^{\,2}}\right)^{3/8}\right] \tanh\left[\frac{.0379\left(\frac{gF}{U_A^{\,2}}\right)^{1/3}}{\tanh\left[.833\left(\frac{gd}{U_A^{\,2}}\right)^{3/8}\right]}\right]$$

Duration, t	Units	Reach #1	Reach #2
	hrs	2.5	4.7

$$t = 8.93 \times 10^{-1}\left(\frac{F^2}{U_A}\right)^{1/3}$$

Rev. No.
Made By Date

JOHN C. ROBERGE, P.E., LLC

Project: Islander East Pipeline Construction
Location: Branford, CT - Long Island Sound
Sheet No. 3 **of**
Job No. 200242

Subject: SMB Hindcast Model with Shallow Water Correction - 2 Yr Wind / 2 Yr Depth
Made By Roberge **Date** 11/26/2002
Chkd. By **Date**

Constants

		Units	
Gravity, g	9.81	m/s^2	
Surface Wind, Us	50.0	mi/hr	Ref: Handbook of Ocean and Underwater Engineering
	22.4	m/s	Myers, Holm, McAllister, ed, McGraw-Hill, 1969, p.8-5
Wind Stress Factor, Ua	32.4	m/s	$U_A = 0.71 U_S^{1.23}$

Variables

	Units	Reach #1	Reach #2
Wind Direction		South	SW
Fetch Distance, F	n.mi	20.4	54.0
	m	37780.8	100008.0
Average Water Depth,	ft	82.0	77.0
	m	25.0	23.5

Calculations

	Units	Reach #1	Reach #2
Wave Height, H	m	2.9	3.9
	ft	9.4	12.9

$$H = \frac{.283 U_A^2}{g} \tanh\left[.530\left(\frac{gd}{U_A^2}\right)^{3/4}\right] \tanh\left[\frac{.00565\left(\frac{gF}{U_A^2}\right)^{1/2}}{\tanh\left[.530\left(\frac{gd}{U_A^2}\right)^{3/4}\right]}\right]$$

Wave Period, T	Units	Reach #1	Reach #2
	sec	6.0	7.5

$$T = \frac{7.54 U_A}{g} \tanh\left[.833\left(\frac{gd}{U_A^2}\right)^{3/8}\right] \tanh\left[\frac{.0379\left(\frac{gF}{U_A^2}\right)^{1/3}}{\tanh\left[.833\left(\frac{gd}{U_A^2}\right)^{3/8}\right]}\right]$$

Duration, t	Units	Reach #1	Reach #2
	hrs	3.2	6.0

$$t = 8.93 \times 10^{-1}\left(\frac{F^2}{U_A}\right)^{1/3}$$

Rev. No.
Made By Date

JOHN C. ROBERGE, P.E., LLC

ject:	Islander East Pipeline Construction	Sheet No.	1	of	
		Job No.	200242		
Subject:	Erosion Potential of Dredge Mounds	Made By	Roberge	Date	12/05/02
	MP 10.95 - 100 Yr Return	Chkd. By		Date	

MAXIMUM WATER PARTICLE VELOCITIES BENEATH DESIGN WAVE
MP 10.95 - Water Depth = 13 ft (MLW) - Breaking Conditions (Depth Limited)
100 Yr Return Period

SITE CONDITIONS :

H wave =	16.6	ft	
T wave =		sec	
L wave =		ft	(See NOTE)
d, depth =		ft	

Depth, Ft	Umax, Ft/sec
13.0	12.37
12.5	12.37
12.0	12.38
11.5	12.39
11.0	12.40
10.5	12.41
10.0	12.43
9.5	12.45
9.0	12.47
8.0	12.53
7.0	12.60
6.0	12.68
5.0	12.77
4.0	12.88
3.0	13.00
2.0	13.13
1.0	13.27
0.0	13.43

Maximum Water Particle Velocities will occur in coincidence with the passing of the wave crest and / or trough. Design must consider the relative direction of the water particle motion.

NOTE : d / Lo { For Design Conditions} = 0.0254

Wavelength at Site, L, can be determined from Tables Showing Functions of d / L for Increments of d /Lo.

Rev. No.		File Ref.: orbvel
...le By	Date	

JOHN C. ROBERGE, P.E., LLC

Project:	Islander East Pipeline Construction	Sheet No.	1	of	
		Job No.	200242		
Subject:	Erosion Potential of Dredge Mounds	Made By	Roberge	Date	12/05/02
	MP 11.5 - 100 Yr Return	Chkd. By		Date	

MAXIMUM WATER PARTICLE VELOCITIES BENEATH DESIGN WAVE
MP 11.5 - Water Depth = 16.7 ft (MLW) - Breaking Conditions (Depth Limited)
100 Yr Return Period

SITE CONDITIONS :

H wave =	21.4	ft	
T wave =	10.0	sec	
L wave =	224.0	ft	(See NOTE)
d, depth =	16.7	ft	

Depth, Ft	Umax, Ft/sec
16.7	13.84
16.0	13.84
15.5	13.84
15.0	13.85
14.5	13.86
14.0	13.88
13.5	13.89
13.0	13.91
12.0	13.96
10.0	14.08
8.0	14.25
6.0	14.46
5.0	14.59
4.0	14.72
3.0	14.87
2.0	15.03
1.0	15.20
0.0	15.38

Maximum Water Particle Velocities will occur in coincidence with the passing of the wave crest and / or trough. Design must consider the relative direction of the water particle motion.

NOTE : d / Lo { For Design Conditions} = 0.0326

Wavelength at Site, L, can be determined from Tables Showing Functions of d / L for Increments of d /Lo.

Rev. No.		File Ref.: orbvel
Made By	Date	

JOHN C. ROBERGE, P.E., LLC

Project:	Islander East Pipeline Construction	Sheet No.	1	of	
		Job No.	200242		
Subject:	Erosion Potential of Dredge Mounds	Made By	Roberge	Date	12/05/02
	MP 12.0 - 100 Yr Return	Chkd. By		Date	

MAXIMUM WATER PARTICLE VELOCITIES BENEATH DESIGN WAVE
MP 12.0 - Water Depth = 21 ft (MLW) - Non-Breaking Conditions
100 Yr Return Period

SITE CONDITIONS :

H wave =	24.5	ft	
T wave =		sec	
L wave =		ft	(See NOTE)
d, depth =		ft	

Depth, Ft	Umax, Ft/sec
21.0	13.86
20.0	13.86
18.0	13.90
16.0	13.97
14.0	14.08
12.0	14.22
11.0	14.30
10.0	14.40
9.0	14.50
8.0	14.61
7.0	14.73
6.0	14.87
5.0	15.01
4.0	15.16
3.0	15.32
2.0	15.49
1.0	15.66
0.0	15.85

Maximum Water Particle Velocities will occur in coincidence with the passing of the wave crest and / or trough. Design must consider the relative direction of the water particle motion.

NOTE : d / Lo { For Design Conditions} = 0.0410

Wavelength at Site, L, can be determined from Tables Showing Functions of d / L for Increments of d /Lo.

Made By Date

File Ref.: orbvel

JOHN C. ROBERGE, P.E., LLC

Project:	Islander East Pipeline Construction	Sheet No.	1	of	
		Job No.	200242		
Subject:	Erosion Potential of Dredge Mounds	Made By	Roberge	Date	12/05/02
	MP 10.95 - 50 Yr Return	Chkd. By		Date	

MAXIMUM WATER PARTICLE VELOCITIES BENEATH DESIGN WAVE
MP 10.95 - Water Depth = 13 ft (MLW) - Breaking Conditions (Depth Limited)
50 Yr Return Period

SITE CONDITIONS :

H wave =	16.6	ft	
T wave =	9.6	sec	
L wave =	191.0	ft	(See NOTE)
d, depth =	13.0	ft	

Depth, Ft	Umax, Ft/sec
13.0	12.29
12.5	12.29
12.0	12.30
11.5	12.31
11.0	12.32
10.5	12.33
10.0	12.35
9.5	12.37
9.0	12.40
8.0	12.46
7.0	12.53
6.0	12.62
5.0	12.72
4.0	12.83
3.0	12.96
2.0	13.11
1.0	13.26
0.0	13.43

Maximum Water Particle Velocities will occur in coincidence with the passing of the wave crest and / or trough. Design must consider the relative direction of the water particle motion.

NOTE : d / Lo { For Design Conditions} = 0.0276

Wavelength at Site, L, can be determined from Tables Showing Functions of d / L for Increments of d /Lo.

Rev. No.	Date	File Ref.: orbvel
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JOHN C. ROBERGE, P.E., LLC

Project:	Islander East Pipeline Construction	**Sheet No.**	1	of	
		Job No.	200242		
Subject:	Erosion Potential of Dredge Mounds	**Made By**	Roberge	**Date**	12/05/02
	MP 11.5 - 50 Yr Return	**Chkd. By**		**Date**	

MAXIMUM WATER PARTICLE VELOCITIES BENEATH DESIGN WAVE
MP 11.5 - Water Depth = 16.7 ft (MLW) - Breaking Conditions (Depth Limited)
50 Yr Return Period

SITE CONDITIONS :

H wave =	21.4	ft	
T wave =	9.6	sec	
L wave =	215.0	ft	(See NOTE)
d, depth =	16.7	ft	

Depth, Ft	Umax, Ft/sec
16.7	13.72
16.0	13.72
15.5	13.73
15.0	13.73
14.5	13.75
14.0	13.76
13.5	13.78
13.0	13.80
12.0	13.85
10.0	13.98
8.0	14.16
6.0	14.39
5.0	14.53
4.0	14.67
3.0	14.83
2.0	15.00
1.0	15.19
0.0	15.38

Maximum Water Particle Velocities will occur in coincidence with the passing of the wave crest and / or trough. Design must consider the relative direction of the water particle motion.

NOTE : d / Lo { For Design Conditions} = 0.0354

Wavelength at Site, L, can be determined from Tables Showing Functions of d / L for Increments of d /Lo.

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JOHN C. ROBERGE, P.E., LLC

Project:	Islander East Pipeline Construction	Sheet No.	1	of	
		Job No.	200242		
Subject:	Erosion Potential of Dredge Mounds	Made By	Roberge	Date	12/05/02
	MP 12.0 - 50 Yr Return	Chkd. By		Date	

MAXIMUM WATER PARTICLE VELOCITIES BENEATH DESIGN WAVE
MP 12.0 - Water Depth = 21 ft (MLW) - Non-Breaking Conditions
50 Yr Return Period

SITE CONDITIONS :

H wave =	22.0	ft	
T wave =	9.6	sec	
L wave =	239.0	ft	(See NOTE)
d, depth =	21.0	ft	

Depth, Ft	Umax, Ft/sec
21.0	12.30
20.0	12.31
18.0	12.34
16.0	12.41
14.0	12.51
12.0	12.65
11.0	12.73
10.0	12.82
9.0	12.92
8.0	13.03
7.0	13.15
6.0	13.27
5.0	13.41
4.0	13.55
3.0	13.71
2.0	13.87
1.0	14.04
0.0	14.23

Maximum Water Particle Velocities will occur in coincidence with the passing of the wave crest and / or trough. Design must consider the relative direction of the water particle motion.

NOTE : d / Lo { For Design Conditions} = 0.0445

Wavelength at Site, L, can be determined from Tables Showing Functions of d / L for Increments of d /Lo.

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JOHN C. ROBERGE, P.E., LLC

Project:	Islander East Pipeline Construction	Sheet No.	1	of	
		Job No.	200242		
Subject:	Erosion Potential of Dredge Mounds	Made By	Roberge	Date	12/05/02
	MP 10.95 - 2 Yr Return	Chkd. By		Date	

MAXIMUM WATER PARTICLE VELOCITIES BENEATH DESIGN WAVE
MP 10.95 - Water Depth = 13 ft (MLW) - Non-Breaking Conditions
2 Yr Return Period

SITE CONDITIONS :

H wave =	12.9	ft	
T wave =	7.5	sec	
L wave =	146.0	ft	(See NOTE)
d, depth =	13.0	ft	

Depth, Ft	Umax, Ft/sec
13.0	9.19
12.5	9.19
12.0	9.20
11.5	9.21
11.0	9.23
10.5	9.25
10.0	9.27
9.5	9.30
9.0	9.33
8.0	9.41
7.0	9.50
6.0	9.61
5.0	9.74
4.0	9.89
3.0	10.06
2.0	10.24
1.0	10.45
0.0	10.67

Maximum Water Particle Velocities will occur in coincidence with the passing of the wave crest and / or trough. Design must consider the relative direction of the water particle motion.

NOTE : d / Lo { For Design Conditions} = 0.0451

Wavelength at Site, L, can be determined from Tables Showing Functions of d / L for Increments of d /Lo.

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JOHN C. ROBERGE, P.E., LLC

Project:	Islander East Pipeline Construction	**Sheet No.**	**of**
		Job No.	
Subject:	Erosion Potential of Dredge Mounds	**Made By**	**Date**
	MP 11.5 - 2 Yr Return	**Chkd. By**	**Date**

MAXIMUM WATER PARTICLE VELOCITIES BENEATH DESIGN WAVE
MP 11.5 - Water Depth = 16.7 ft (MLW) - Non-Breaking Conditions
2 Yr Return Period

SITE CONDITIONS :

H wave =	12.9	ft	
T wave =	7.5	sec	
L wave =	163.0	ft	(See NOTE)
d, depth =	16.7	ft	

Depth, Ft	Umax, Ft/sec
16.7	7.87
16.0	7.87
15.5	7.88
15.0	7.89
14.5	7.90
14.0	7.91
13.5	7.93
13.0	7.95
12.0	8.00
10.0	8.13
8.0	8.32
6.0	8.55
5.0	8.68
4.0	8.83
3.0	8.99
2.0	9.17
1.0	9.35
0.0	9.56

Maximum Water Particle Velocities will occur in coincidence with the passing of the wave crest and / or trough. Design must consider the relative direction of the water particle motion.

NOTE : d / Lo { For Design Conditions} = 0.0580

Wavelength at Site, L, can be determined from Tables Showing Functions of d / L for Increments of d /Lo.

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JOHN C. ROBERGE, P.E., LLC

Project:	Islander East Pipeline Construction	Sheet No.	1	of	
		Job No.	200242		
Subject:	Erosion Potential of Dredge Mounds	Made By	Roberge	Date	12/05/02
	MP 12.0 - 2 Yr Return	Chkd. By		Date	

MAXIMUM WATER PARTICLE VELOCITIES BENEATH DESIGN WAVE
MP 12.0 - Water Depth = 21 ft (MLW) - Non-Breaking Conditions
2 Yr Return Period

SITE CONDITIONS :

H wave =	12.9
T wave =	7.5
L wave =	180.0
d, depth =	21.0

Depth, Ft	Umax, Ft/sec
21.0	6.76
20.0	6.76
18.0	6.79
16.0	6.86
14.0	6.96
12.0	7.09
11.0	7.17
10.0	7.26
9.0	7.36
8.0	7.46
7.0	7.58
6.0	7.70
5.0	7.84
4.0	7.98
3.0	8.13
2.0	8.30
1.0	8.47
0.0	8.65

Maximum Water Particle Velocities will occur in coincidence with the passing of the wave crest and / or trough. Design must consider the relative direction of the water particle motion.

NOTE : d / Lo { For Design Conditions} = 0.0729

Wavelength at Site, L, can be determined from Tables Showing Functions of d / L for Increments of d /Lo.

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