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REVISED SHORELINE PLANTING PLAN FOR THE CHERRY FARM SITE ALONG THE NIAGARA RIVER NORTH TONAWANDA, NEW YORK

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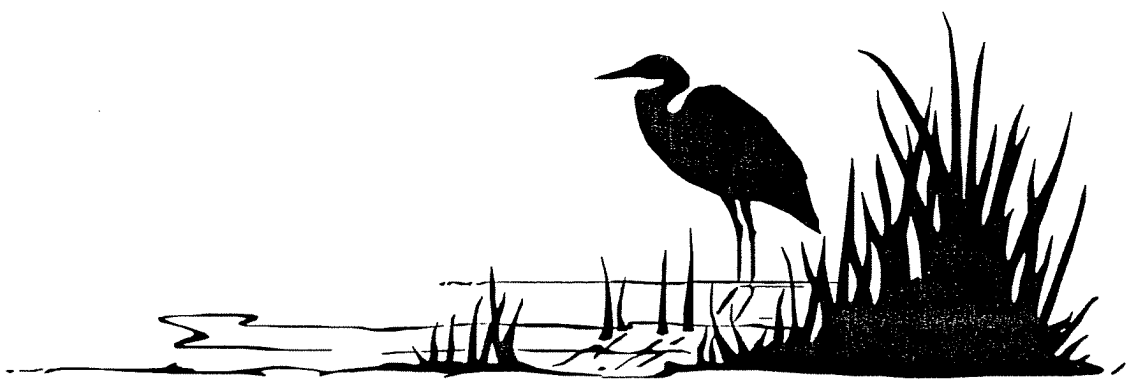

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1.0 INTRODUCTION

This document is intended to provide a revised shoreline planting plan for the Cherry Farm Site, located on the Niagara River in the Town of Tonawanda, New York. The planting plan was revised to address the lack of sufficient growth of required vegetation on the inside of the barrier islands and on the shoreline (upper embankment) area. The revised plan was prepared after a site visit was conducted on April 16, 1999 by representatives of the New York State Department of Environmental Conservation (NYSDEC), the U.S. Army Corps of Engineers (ACOE), Parsons Engineering Science Inc. (Parsons) and Beak Consultants Incorporated (Beak). Several planting design concepts were tentatively agreed to at the meeting. The use of coconut coir logs to prevent washout of soil substrate and shrub wattles (fascines) to provide additional shoreline protection and diversity was discussed and approved, pending a site survey and preparation of final plans. The remainder of this document details the results of the survey, present the revised planting plan and plant and material specifications, provides site-specific figures for planting details and discusses construction monitoring.

2.0 FIELD SURVEY

2.1 Instrument Survey

An instrument survey was conducted of the planting site by Beak on April 16, 1999. The survey established stationing along the shore-line from the southernmost gabion wall to the end of the northern-most gabion wall. Stationing stakes were set at numerous locations along the survey line. A total of eight elevational cross-sections were also done from the shoreline to the top of the barrier islands (three each at the north and south islands and two at the middle island). Key data recorded included the elevation and width of the existing emergent vegetation zone, water level and observed high water mark. The elevations were set to several previously surveyed points on the site. The locations of zones of established emergent vegetation on the northern barrier island were also surveyed.

Locations were surveyed in for the placement of both coir logs and fascines, as determined by site conditions. The coir log locations were determined by the amount of topsoil remaining on the barrier island. Sufficient soil had to be present to be relocated to provide a suitable depth for the replanting of emergent vegetation. Fascines were located both within the coir log locations and along the barrier island shoreline on a more random basis to provide additional habitat and wind and wave protection. The results of this survey are presented as figures in Appendix A.

2.2 Woody Plant Survival Survey

A woody plant survival study was conducted by Beak on April 19, 1999. The species, number surviving, number apparently dead and the percent survival were noted. As the season is still early, and some plants may still not have budded out, the survival number may be lower than the actual value. Beak plans to conduct a final count at the time of the implementation of the proposed work. The results of this survey are presented below.

The woody plant species were assessed for their survival along the eastern upper embankment area of the Cherry Farm Site. Seven species were identified within the embankment area planting zone: speckled alder (*Alnus incana)*, red-osier dogwood (*Cornus stolonifera*), eastern

cottonwood (*Populus deltoides*), staghorn sumac (*Rhus typhina*), black willow (*Salix nigra*), willow shrubs (*Salix sp.*), and an unknown species. Staghorn sumac and the unknown species were not identified in the original planting specifications and may have propagated naturally.

The survival of the woody plant species was determined using the observed species only (see table below). Survival of the planted species ranged from 35% for the black willow to 92% for the speckled alder.

Observed Woody Vegetation Survival Along the Upper Embankment Area

Species Scientific Name	Common Name	Live	No Buds*	Total	Survival**
Alnus incana	speckled alder	49	4	53	92%
Cornus stolonifera	red-osier dogwood	519	237	756	69%
Populus deltoides	eastern cottonwood	17	5	22	77%
Salix nigra (post)	black willow (post)	18	34	52	35%
Salix sp.	willow (shrub)	234	56	290	81%
	TOTAL	837	336	1173	

- **Number with no buds provides the maximum potential number of dead plants. A site inspection at a later date indicated that some plants with no buds initially evident were producing buds.*
- *** Survival is a minimum value, as it is based on early survey data*

3.0 SITE PLANTING PLAN

3.1 Upper Embankment Zone

The upper embankment zone is defined as the area from the upper edge of the emergent vegetation planting zone and extend up the slope of the cap to the perimeter drain. If the area bordered a gabion wall, the zone began at the inner edge of the gabion.

Within this zone, dead black willow posts flagged for removal (white with red polka dot flagging). Live posts to be transplanted further down the slope were also flagged (yellow/white) and a stake with identical flagging was placed to denote the relocation point. New black willow post locations will be placed as per the planting typical (Figure 4, Appendix C). Holes will be excavated for each post to a depth of 2.5 feet. Posts will not be driven in. Fertilizer tablets will be added as per planting specification (Appendix B). Posts must have been cut while the tree was in dormancy, and kept in a cool, dark environment in water until planting.

Woody plants that were mowed last fall will be monitored throughout the Spring season to determine survival rates.

3.2 Emergent Zone

Two species, hardstem bulrush (*Scirpus acutus*) and broad-leaf cattail (*Typha latifolia*) will be planted to replace poor or failed plantings along the inner edge of the three barrier island.

At the southern and middle barrier islands, coir logs will be placed in specific locations, as staked and flagged (orange/black) in the field. The original Beak design concept was to use the elevation of the existing emergent vegetation to set the elevation of the planting zone, given that emergent plants survived within that zone. Successful emergent vegetation was found between elevations of 564.5 feet to 566.2 feet, as is seen in the table below. In 1998, the Niagara River elevation at the site averaged about 565.5 feet in August and September.

Table 1: Zone of Successful Emergent Vegetative Growth

(Elevation in feet)

	South Island -A			Middle Island -B		North Island - C			Average
	Cross Section			Cross Section		Cross Section			
	1	2	3	1	2	1	2	3	
Top	565.5	565.6	565.7	565.6	565.4	565.8	566.1	566.2	565.7
Bottom	565.0	565.0	565.0	564.8	564.6	564.8	564.7	564.5	564.8

However, data from the ACOE, Detroit District web site indicate that water levels in Lake Erie in April of this year were 22 inches (1.8 feet) below levels recorded in April 1998. Lake Erie water levels have a very strong effect on water levels in the Niagara River at the project site. In fact, water levels measured during the Beak survey were 563.3 feet to 563.4 feet, clearly below the successful emergent vegetation zone of 1998. Part of this lower water level was attributed to strong and persistent easterly winds; however, most was probably related to the overall Lake Erie water level. The water level in Lake Erie is predicted to rise only 0.2 to 0.3 feet by July (Source, Canadian Hydrographic Service). It is clear that exact water elevations cannot be precisely predicted, as they are influenced by rainfall, prevailing wind direction and strength and other unknown factors. However, under the assumption that the easterly winds contributed to the reduction seen in the Niagara River, and that Lake Erie water levels will rise 0.2 to 0.3 feet, Beak expects that the annual low water level during this growing season is the level recorded during the Beak survey (April 16, 1999) and that the average annual levels will be somewhat higher.

Under this predicted scenario, Beak is proposing to lower the planting zone for the emergent species approximately 1.0 foot, using the existing vegetative growth zone as the benchmark. The average existing vegetative zone is between 565.7 and 564.8 feet (see Table above). Using the upper elevation as the reference elevation, the 1999 planting zone will begin one (1.0) foot lower, averaging 564.7 (top of planting zone), which is just below the bottom edge of the existing zone. Due to the fact that the slope flattens considerably at this elevation, and a full foot drop would

extend into the channel itself, a total horizontal width of six (6) feet of emergent planting is proposed. In areas where coir log installation is planned, Beak will set the elevation of the top of the coir log at different elevations, depending on the specific slope in those locations. Topsoil fill behind the coir log will be placed such that it will not exceed a bottom elevation of an average of 563.7 feet. The use of the coir log will provide additional substrate for planting and still maintain an aquatic channel of reasonable width (see Appendix C, Barrier Island A, Cross Section No.1). In areas where no coir log is planned, the six-foot wide planting zone will begin at the bottom elevation of the existing emergent zone (as surveyed in the field) and extend six feet further downslope, measured horizontally (see Appendix C, Barrier Island C, Cross Section No.1).

After topsoil is placed behind the coir logs, fascines (shrub wattles) will be installed as indicated by field staking (white/blue). In order to increase woody plant diversity and maximize the potential for success, Beak proposes that a number of species be used, depending on availability and condition, to be selected from the list of species indicated in the following table.

TABLE 2 Name	Habitat Value	Size/ Form	Root Type	Rooting Ability From Cuttings	Tolerance 1/ to flooding	Tolerance 2/ to drought
Cornus amomum Silky dogwood	Very good	Small shrub	Shallow fibrous	Very good	Medium	High
Cornus sericea ssp. Stolonifera Red Osier Dogwood	Very good	Medium to small shrub	Shallow	Very good	High	Medium
Salix X cotteti Bankers willow	Good	Small shrub	Shallow	Very good	High	Medium
Salix discolor Red willow	Good	Large shrub	Shallow	Very good	High	High

1/ Tolerance to flooding:
High — Severely damaged after 10 to 30 days of flooding
Medium — Severely damaged after 6 to 10 days of flooding
Low — Severely damaged after 1 to 5 days of flooding

2/ Tolerance to drought: Resistance to drought (relative to native vegetation on similar sites) is High, Medium, or Low

Each fascine will be made up of one species. It is required that bankers willow be one of the species used. The selection of the other species to be used by the contractor will be subject to approval by the environmental inspector.

Once the fascines are installed, broad-leaf cattail will be planted up to the upper elevation limit of existing emergent vegetation, per the specifications found in Appendix B. In areas outside the coir logs along these two islands, hardstem bulrush will be planted within the predicted emergent vegetation planting zone.

Along the inner edge of the northern barrier island, planting of the two species will be done within the predicted emergent vegetation planting zone. Species will be planted in blocks (i.e. 3 - 8 linear feet of cattail followed by 3 - 8 feet of bulrush).

All planting zones will be covered with a ½ inch mesh of coconut fiber erosion control mat. This will act to retain soil moisture and provide additional protection from geese, a major potential source of plant mortality. Once the plant begins to grow through the mesh, its root stock should be sufficient to allow it to re-sprout if the top is clipped by geese grazing.

Planting should be scheduled at a time when water levels are sufficient to provide saturated soil conditions for at least the lower end of the planting zone. Persistent and strong winds from the eastern quadrant will typically lower the water level, and planting under such conditions should be avoided.

3.3 Submergent Zone

Wild celery (*Vallisneria spiralis*) will be planted in both the southern and northern planting zones as defined in the original planting plans. Planting will be done from a boat to ensure that the specified planting density can be obtained. The boat should be maintained in a manner that will allow plants to be dropped vertically into the substrate. Planting can be done as soon as plants are available as per the original planting specifications. Planting density will be maintained at the same density as was specified in the original planting plan, a minimum of three winter buds per of

two foot square. A total of 10,800 wild celery plants will be planted in the southern planting area and 3,510 wild celery plants will be planted in the northern area.

4.0 BIRD CONTROL

Four methods will be employed to reduce the loss of plants to feeding by birds, especially geese, as follows: 1) installation of an iridescent foil barrier tape; 2) use of two distress call sound units; 3) use of erosion matting over plantings; and 4) proposal to locate and destroy nests on the site by oiling the eggs. Each is described in detail below.

The first method will be the installation of a visual/sound deterrent tape, called Irri-Tape, manufactured by Bird-X, Inc. The tape will be installed linearly one foot above the bottom of the emergent vegetation planting zone. A second line of tape will be placed one foot above the top of the planting zone. Tape will also be placed across the ends of the two lines, thus effectively boxing in the planting area. The iridescent foil tape uses light to produce flashes and wind to create a loud metallic sound to irritate birds' senses.

The second deterrent is the use of two electronic sound devices, which intermittently produce loud bird distress calls. The selected device is Super Bird XPeller, Model SBXP-R, designed for geese and gulls. The units will be placed after on-site testing to obtain the best coverage.

The third method requires the use of ½ inch bio-degradable erosion control matting to cover the plantings. The use of this mat will allow the soil to retain moisture, reduce drying by direct sunlight and provide sufficient light to allow growth. During this critical early growth period the plants will be hidden from any geese that are not deterred by the above two devices, until a better root mass and stem is developed. Even if the top of the plant is eaten by the goose, the remaining roots and stem may be sufficient to allow re-growth.

The final method proposed, subject to approval by the NYSDEC, is to control plant mortality by geese is to locate geese nests on the site and oil the eggs. Once the eggs fail to hatch, the adults may leave the area. Even if the adults do not leave, grazing would be reduced as the number of goslings on the site would be reduced. As noted, permission for this action will have to be obtained from the appropriate agencies.

5.0 CONSTRUCTION MONITORING

Construction and planting monitoring will be done by Beak and Parsons to ensure that plants and other materials are installed properly. A final evaluation of plant survival will also be done to determine actual survival of previously planted woody plants. Beak will provide surveying equipment to assist in the determination of required elevations and resulting planting zones. The following items will be inspected during installation.

Coconut Coir Log Installation:

Location and elevation of each installed coir log;

Staking, tying and construction of keyway trench; and

Type, depth of fill and top elevation of fill placed behind coir log.

Fascine Installation:

Angle of placement and orientation of the live cuttings;

Backfill material/rock and stone material;

Fertilizer, method and quantity applied;

Preparation of trenches in cut and fill slopes;

Stock handling and preparation;

Remove unacceptable material, use fresh stock for replacement installations; and

Angle of placement and orientation of fascines.

Emergent Plantings:

Condition of plants before planting;

Proper installation, areas planted, and density;

Installation of erosion control matting, as per manufacturers specifications; and

installation of bird control devices, as per plan specifications.

Black Willow Post Installation:

Size and condition of new willow posts;

Location of new posts and transplants;

Depth of augured holes, and type of backfill; and

Use of proper fertilizer.

A final inspection should be held one year after installation is completed. Healthy growing conditions should exist. In determining healthy growing conditions in all areas, overall leaf development in woody plants should be evident. A percent survival of the emergent species (by species) should be determined on a linear measurement along the shoreline, as the vertical growth zone may be limited. Due to the range in elevation of the installed fascines, robust growth in any part of the fascine will be considered as indicative of success. Success of the submerged planting will be evaluated by a dive survey, which will estimate the percent cover in the two planting areas.

6.0 REFERENCES

United States Department of Agriculture, Soil Conservation Service. 1992. Engineering Field Handbook, Chapter 18, Soil Bioengineering for Upland Slope Protection and Erosion Reduction. United States Department of Agriculture 210-EHF, 10/92. 53 p.

APPENDIX A

TREE & SHRUB SURVIVAL

wht/red polk = relocate post

36 paces = 100'

STATION	Plant ID	SPECIES	Live	Health	Dead	Reason for death /HEALTH
0+00 - 0+29		NO spp found				
0+30		Alnus rugosa	X	FAIR		
0+30.5		C. americanum	X	Poor		Small
0+35		C. "	X	Poor		"
0+37.		C "	X	Poor		"
0+40		"	X	"		"
0+43		"	X	"		"
0+44		"	X	"		"
0+48		C. stolonifera	X	Good		
0+48		C. americanum			X	?
0+50		P. deltoides			X	Cut post
0+52		Salix sp.	X	Poor		
0+62		C. stolonifera	X	Fair		browzed
0+66		Salix nigra (tiny)	X	Fair		
0+66		C. americanum	X	Poor		
0+79		C. stolonifera	X	Fair		
0+81		C. stolonifera	X	Poor		Small
0+86		Alnus rugosa	X	Fair		
0+90		C. stolonifera	X	Poor		"
0+92		C. "	X	Fair		Browzed
0+99		C. "	X	Poor		small / browzed
1+01		C. americanum	X	Poor		small browzed
1+06		P. deltoides	X	Poor		
1+10		C. stolonifera	X	Poor		
1+14		"	X	Poor		browzed / cut? (tall 1°)
+25		"	X	Fair		small
1+26		C. americanum	X	Poor		small / browzed
1+27		"	X	"		
1+27		Alnus rugosa	X	Fair		
1+34		C. stolonifera	X	Fair		
1+36		"	X	"		
1+40		Salix nigra post	X	Fair		
1+51		C. stolonifera	X	Fair		Lge. oak
1+52		S. sp	X	Poor		browzed
+56		P. deltoides	X	Good		small / planted to high
1+60		S. sp	X	Poor		"
1+60		"	X	Poor		"
1+74		C. americanum	X	Poor		small
1+75		S. sp	X	Fair		
+79		C. stolonifera	X	Fair		
+79		Alnus rugosa	X	Poor		lack of H2O

TREE & SHRUB SURVIVAL

STATION	Plant ID	SPECIES	Live	Health	Dead	Reason for death
1+78		C. Americana	X	FAIR		
1+80		Salix nigra Post	X	FAIR		
1+85		C. stolonifera	X	FAIR		browsed
1+86		Alnus rugosa	X	Good		
2+00		P. deltoides			X	? (planted to large)
2+08		C. stolonifera	X	FAIR		Browsed
2+12		Salix nigra Post	X	Good		
2+20		C. stolonifera	X	FAIR		Browsed
2+24		C. stolonifera	X	FAIR		"
2+29		Alnus rugosa	X	FAIR		
2+30		C. stolonifera	X	FAIR		Browsed
2+37		"	"	"		"
2+39	2+39-1	Salix nigra			X	REPLACE
2+45	2+45-2	"			X	REPLACE
2+46		C. stolonifera	X	Poor		small / browsed
2+51		"	X	"		"
2+53		"	X	FAIR		Browsed
2+55		"	X	Poor		"
2+62		"	X	FAIR		"
2+64		ALNUS rugosa	X	FAIR		
2+65		C. stolonifera	X	Poor		"
2+69		P. deltoides	X	Good		
2+73		C. stolonifera	X	Poor		small / browsed
"		"	"	FAIR		Browsed
2+81	2+81-3	Salix nigra Post			X	REPLACE
2+81		C. stolonifera	X	Poor		small / browsed
2+88		C. stolonifera	X	Poor		"
2+89		"	X	"		"
"		"	X	"		"
2+93		"	X	FAIR		"
3+01		ALNUS rugosa	X	Poor		Browsed
3+02		C. stolonifera	X	Poor		small
3+05		"	X	"		"
3+07		"	X	FAIR		Browsed
3+07		"	X	Poor		"
3+11		"	X	"		small
3+13		Salix nigra Post	X	Fair		
3+16		C. stolonifera	X	Poor		"
3+16		"	X	"		"
3+16		"	X	"		"
3+20		P. deltoides	X	FAIR		

TREE & SHRUB SURVIVAL

STATION	Plant ID	SPECIES	Live	Health	Dead	Reason for death
3+21		C. stolonifera	X	Poor		small
3+25		"	X	Poor		Browsed
3+26		"	X	"		"
3+30		"	X	"		"
3+30		"	X	"		"
3+32		"	X	"		"
3+35		"	X	"		"
3+37		ALNUS rugosa	X	Poor		Broken/Browsed
3+40		C. Stol.	X	Fair		
3+40		"	X	Poor		small
3+45		S. nigra Poor	X	Good		
3+46		C. Stolonifera	X	Poor		mowed
3+47		"	X	"		small
3+52		"	X	Fair		Browsed
3+53		"	X	Poor		mowed / Browsed
3+55		"	X	Fair		
3+56		ALNUS rugosa	X	Good		
3+57		C. Stolon	X	Fair		
"		"	X	"		
3+60		"	X	"		
3+61		"	X	Poor		small
"		"	X	"		"
3+65		"	X	Good		"
3+65		"	X	Poor		mowed
"		"	X	"		small
3+68		"	X	"		"
3+71		"	X	"		"
3+73		P. deltoides			X	?
3+74		C. Stolonifera	X	Poor		small
3+75		"	X	Poor		small
3+79		"	X	Fair		Browsed
3+81		"	X	"		
3+81		"			X	small / browsed
3+92		"	X	Fair		
3+33		S. nigra Post	X	Good		
3+86		C. Stolon.	X	Good		
"		"	X	Poor		small Browsed
3+90		S. sp.			X	small
3+91		S. sp	X	GOOD		
3+92		C. Stolon	X	Fair		Brush
3+92		ALNUS rugosa	X	Good		
3+95		C. Stolon	X	Good		Browsed
3+96		S. sp	X	Poor		

3+98	C. stolon	Live Healthy Dead		why
4+00	S. SP	X	Poor	small mound
4+00	C. Stolon	X	Poor	Browsed
4+02	C. Stolon	X	"	"
4+03	"	X	"	"
4+06	"	X	Good	Braved
4+ 8	S. Nigra	X	Poor	small
4+8	C. stolon.	X	Poor	Could be moved toward R.S.
4+14	"	X	Poor	small/ braved
4+15	"	X	Good	
4+ 17	"	X	Poor	small
"	"	X	"	Browsed
4+19	"	X	"	washed out
4+24	"	X	"	Braved
4+26	"	X	Good	" /small
4+28	Alnus rugos	X	Fair	
4+29	S. nigra Post (4+24-4)	X		Remove - Not over Gabion
4+31	C. Stolon	X	Poor	small/Braved
4+34	"	X	Poor	"
4+35	"	X	"	
"	"	X	"	
4+36	S.SP	X	Good	
4+39	C. stolon	X	Good	Braved
4+41	"	X	Poor	small
4+43	"	X	Good	Braved
4+43	S. SP	X	Poor	small
4+46	C. Stolon	X	Poor	moved /Braved
4+47	"	X	Fair	Braved
4+48	S. SP	X	Poor	Braved
4+49	C. stolon	X	Poor	small/mound
4+51	"	X	"	"
4+59	"	X	Good	
4+60	"	X	Poor	
4+61	"	X	Fair	
4+65	S. Nigra Post (4+66-5)	X		Braved
4+69	C. stolon	X	Fair	Remove - Not our gabion
4+70	"	X	"	
4+75	"	X	Good	
4+75	"	X	Fair	
4+82	"	X	Good	
4+92	S. SP.	X	Poor	
4+94	C. stolon	X	Poor	Braved
4+89	"	X	Good	
4+90	"	X	Poor	
4+92	"	X	"	small
4+97	"	X	Good	" /Braved
5+01	S.SP	X	Good	

TREE & SHRUB SURVIVAL

STATION	Plant ID	SPECIES	Live	Health	Dead	Reason for death
5+06		C. stolon	X	Poor		Small
5+07		"	X	Good		Browsed
5+10		"	X	Poor		Small / Browsed
5+15		"	X	Poor		"
5+17	5+17-6	S. nigra Post			X	Remove - Not behind gabion
5+17		C. stolon			X	MOWED
5+21		"	X	Good		Browsed
5+25		S. sp			X	?
5+28		C. stolon	X	"		
"		"	X	Fair		
5+35		"	X	Good		
5+36		"	X	Poor		Browsed
5+42		"			X	mowed
5+43		"	X	Poor		small / Browsed
5+45		S. sp			X	Browsed
5+46		C. stolon	X	Good		Browsed
5+50		"	X	Poor		Browsed
5+52		S. sp	X	Fair		
5+54		C. stolon			X	mowed
5+58		C "	X	Fair		
5+60		S. sp	X	Poor		
5+62		C. stolon	X	Good		
5+71		S. sp	X	Poor		
5+74		C. stolon	X	Good		Browsed
5+77		Rhus typhina	X	Fair		
5+79		C. stolon	X	Poor		
5+86		"	X	"		Small
5+87		"	X	"		" / Browsed
5+87		S. sp			X	? (mowed)
5+89		C. stolon	X	Good		Browsed
5+93		"	X	Poor		Small / Browsed
5+96		"	X	Good		"
6+00		Alnus rugosa	X	Good		
"		C. stolon	X	Poor		Small / Browsed
"		"	X	"		"
6+02		"	X	Good		Browsed
6+06		"	X	"		"
6+06		"	X	Fair		
6+11		"	X	Poor		"
6+14		"	X	"		"
6+16		"	X	Good		"
6+18		"			X	Browsed

Gr 25				
Gr 26	S. sp	X	Poor	Browned
Gr 27	C. stolon	X	Good	"
Gr 30	"	X	Poor	small / Browned
	"	X	Fair	Browned
Gr 31	S. sp	X	Poor	dry / browned
Gr 33	C. stolon	X	Poor	Browned
"	"	X	"	"
Gr 35	"	X	"	"
"	"	X	Fair	"
Gr 37	"	X	Good	"
Gr 41	"	X	Fair	"
"	"	X	"	"
"	"	X	Poor	"
Gr 43	S. sp	X	Fair	
Gr 44	C. stolon	X	Good	"
"	"	X	Fair	"
Gr 47	"	X	Poor	"
Gr 51	"	X	"	"
"	"	X	"	"
Gr 56	Alnus rugosa	X	Good	
Gr 57	C. stolon	X	"	"
Gr 58	"	X	Fair	"
Gr 60	"	X	"	"
Gr 64	"	X	"	"
Gr 65	"	X	"	"
Gr 70	"	X	Good	"
"	"	X	Poor	"
"	"	X	"	"
Gr 73	"	X	"	"
Gr 74	"	X	"	"
Gr 75	"	X	Fair	"
"	"	X	"	"
Gr 77	"	X	Good	"
Gr 78	S. sp	X	Fair	
Gr 91	C. stolon	X	Poor	"
"	"	X	"	
Gr 85	"	X	Fair	"
Gr 86	"	X	Poor	"
Gr 87	"	X	Poor	"
Gr 94	"	X	"	"
Gr 98	"	X	Poor	"
Gr 90	Alnus rugosa	X	Fair	"
Gr 91	C. stolon	X	Poor	"
Gr 93	"	X	Poor	"
Gr 94	"	X	"	"
Gr 95	"	X	Good	"
Gr 96	"	X	Poor	"
Gr 96	"	X	"	"
Gr 99	"	X	"	"

TREE & SHRUB SURVIVAL

	STATION	Plant ID	SPECIES	Live	Health	Dead	Reason for death
	7+01		C. stolon.	X	FAIR		
	7+03		"	X	Good		
	7+03		P. deltoides	X	Good		
	7+06		C. stolon	X	Poor		
	7+07		"	"	"		
	7+09		A. rugosa	"	FAIR		
	7+12		C. stolon	X	Good		
	7+11		S. sp	X	Poor		
	7+11		S. sp.	X	FAIR		root sprouting
	7+12	7+12-7	S. nigra Post			X	2
	7+13		S. sp	X	Poor		
	7+13		"	X	"		
2	7+14		"	X			
5	7+16		"	X			
	7+16		C. stolon	X	Poor		
	7+16		S. sp			X	
6	7+18		"	X			
6	7+20		"	X			
4	7+22		"	X			
2	"		"			X	
5	7+23		"	X			
1	"		"			X	
6	7+25		"	X			
2	"		"			X	
	"		Alnus rugosa	X	Good		
	7+25		Salix nigra Post				
	"		C. stolon.	X	Poor		
10	7+25→7+29		S. sp	X			
1	"					X	
	7+29		P. deltoides	X	Fair		
	"		C. stolon	X	Poor		
13	7+29-7+35		S. sp	X			
1	"		S. sp			X	
	7+35		Alnus rugosa	X	Fair		
	"		C. stolon	X	Poor		
16	735-7+40		S. sp	X			
2	"		"			X	
2	7+38		Alnus rugos	X			
2	"		C. stolon. Tua				
7	7+40-7+45		S. sp	X			
2	7+44		Alnus rugosa	X			

7+45	Salix nigra Post (7+45-8)		X	Planted to high (water)
7+45 -	A. rugosa	X Fair		
7+48	C. stolonifera	X Good		
"	"	X Poor		
7+50	"	X "		
7+51	P. deltoides	X Good		
7+52	C. stolon	X Poor		
- 7+54	"	X Fair		
7+56	A. rugosa	X "		
- "	C. stolon	X "		
7+59	"	X Poor		
- 7+60	"	X Poor/Fair		
- 7+62	"	1-X	1-X	
7+63	Alnus rugosa	X Fair		
7+63	C. stolon	X Poor		
7+67	"	X "		
7+68	"			
- 7+70	"	X "	X	moved
- 7+72	"	X Good		
- 7+74	"	X Poor		
- 7+75	"	X 1-Poor 2 Fair		
7+75 - 7+80	"	X Fair		
7+81	"	X Good		
- 7+83	"	X Fair		
7+85	"	X "		
7+85	Salix nigra Post (7+85-9)		X	Above water table
- 7+87	C. stolon	X Poor		
- 7+88	"	X "		
- 7+94	"	X "		
- 7+96	"	X Good		
- 7+99	"	X Poor		
- 8+00 - 8+10	"	X Fair		
- 8+10 - 8+20	"	X " /Poor		
8+20 - 8+25	"	X "		
8+25 - 8+35	"	X Poor/rest Fair		
- 8+35 - 8+45	"	X Fair/Poor		
8+45 - 8+50	"	X "		
8+50 - 8+60	"	X "		
- 8+60 - 8+70	"	X "		
8+70 - 8+75	"	X "		
- 8+75 - 8+85	"	X "		
- 8+85 - 8+95	"	X "		
8+95 - 9+00	"	X "		
- 9+00 - 9+10	"	X "		
9+04	Alnus rugosa	X Fair		

TREE & SHRUB SURVIVAL

STATION	Plant ID	SPECIES	Live	Health	Dead	Reason for death
9+10 - 9+20		C. stolon.	X	Poor/Fair		
9+15		P. deltoides	X	Good		
9+19		Alnus rugosa			X	2
9+20 - 9+25		C. stolon.	X	Poor/Fair		
"		S. sp	X	"		
9+25 - 9+35		C. stolon	X	"		
9+25 - 9+35		S. sp	X			
"		S. sp			X	herbivory of lower bark
"		Alnus rugosa	X			
9+25		Salix Nigra Post	X	Poor		very small sprout at base
9+30	9+30-10	"			X	Above water table
9+35 - 9+45		C. stolonifera	X	Poor		
"		S. sp	X			many sprouting from base
"		"			X	herb. seen at base
"		Alnus rugosa	X	Fair		
9+40	9+40-11	Salix Nigra Post			X	
"		unknown	X	Fair		
9+45		Alnus rugosa	X	Fair		
9+45 - 9+50		S. sp	X			
"		"			X	
9+48		P deltoides	X	Fair		
9+50	9+50-12	Salix Nigra Post			X	Above water table
9+50 - 9+60		C. sp	X			
"		"			X	mowed / herbivory
"		C. stolon	X			
		Alnus rugosa				
9+60	9+60-13	SAlix Nigra Post			X	? - not Planted step sprouting from base
9+58		"	X	Fair		
9+60 - 9+75		S. sp	X	Fair/Poor		
"		"			X	mowed / herbivory
"		Alnus rugosa	X	Fair		
9+68		P. deltoides			X	?
"		C. stolonifera	X	Fair/Poor		herbivory
9+75	9+75-14	S. Nigra Post			X	?
9+75 - 9+85		C. stolonifera	X	Poor/Fair	1- Dead	
9+75 - 9+85		"	X	"		
"		Alnus Rugosa				
9+85 - 9+95		C. stolon.	X			
9+96 - 10+00		"	X	"		
"		A. rugosa	X	Poor		mowed
"		S. sp	X	Fair		
10+00 - 10+10		C. stolon	X	Poor/Fair		
10+10 - 10+20		"	X	"		
10+20 - 10+25		"	X	"		
1 - 10+25		UNKNOWN	X	"		

TREE & SHRUB SURVIVAL

STATION	Plant ID	SPECIES	Live	Health	Dead	Reason for death
13+75-13+00		UNKNOWN	X	Fair		
12+83		P. deltoides	X	Poor		
12+93		Alnus incana	X	Fair		
"		Rhus typhina	X	Fair		
13+00-13+15		UNKNOWN	X	"		
"		C. stolons	X			
"		"			X	mowed
13+04		S. NIGRA Post	X	Good		
13+18	13+18-A	"			X	
13+25	13+25-20	"			X	laying on side out of ground
13+33	13+33-21	"			X	
13+25-13+50		C. stolon	X			
"		"			X	
"		UNKNOWN				
13+29		Rhus typhina	X	Fair		
13+32		Alnus rugosa	X	Good		
13+50-13+75		C. stolon	X			
"		"			X	mowed / brambl
"		UNKNOWN	X			
13+52		P. deltoides	X	Good		
13+62		S. nigra Post	X	FAIR		
"		Rhus typhina	X	Poor/fair		mowed
13+75-14+00		C. stolon	X			
"		"			X	
"		UNKNOWN	X			
"		Rhus typhina	X	Poor		
"		S. sp.	X	Poor		
"		"			X	?
13+77	13+77-22	S. Nigra Post				
13+79	13+79-23	"			X	?
13+94	13+94-24	"			X	?
14+00-14+25		C stolon	X			
"		"			X	
"		UNKNOWN	X			
"		S. sp	X			
"		Rhus typhina	X	Fair		
14+06		P. deltoides	X	Poor		Rock-rub
14+20		S. Nigra Post	X	Good		
14+25-14+50		C. stolon-fern	X			
"		"			X	
"		Rhus typhina	X			

4 - 10+25 - 10+35	C. STOLON	X		
2 - dead	"			
6 - 10+35 - 10+45	"			X — mowed
4		X		
				X — mowed
10+45 - 10150	S. sp	X		
2 - "	C. stolon	X		
2 - "	"			X - mowed
5 - 10+50 - 10+60	"			
3 - "	"	X		
4 - 10+60 - 10+70	"	X		X
2 - "	"			
2 - 10+70 - 10+75	"	X		X - mowed
1 "	"			
1 "	S. sp.	X		X mowed
11 - 10+75 - 11+00	C. STOLON	X		
5 - "	"			
3 - "	UNKNOWN	X	Poor	X mowed
11 - 11+00 - 11+25	C. STOLON	X		
4 - "	"			
2 - "	S. sp	X		X mowed
1 - "	"			
11 - 11+25 - 11+50	C. STOLON	X		X "
2 "	"			
1 - "	S. sp	X		X mowed
11+43	S. Nigra Post	(11+43 - 15)		X B
19 - 11+50 - 11+75	C. STOLON	X		
2 "	"			
11+70	S. Nigra Pos	(11+70 - 16)		X mowed
11 - 11+75 - 12+00	C. STOLON	X		X ? Above water table
4 - "	"			
11+90	P. deltoides	X	Good	X mowed
11+96	S. NIGRA POST	X	Fair	look pruned ?
14 11+00 - 11+25	C. stolon	X		
4 "	"			
12+12	ALNUS rugosa	X	Good	X mowed / braced
12+27	S. NIGRA POST	(12+27 - 17)		
5 - 12+25 - 12+50	C. STOLON	X	Poor	X above water table
3 - "	"			
12+50	S. NIGRA POST	(12+50 - 18)		X mowed
3 - 12+51	Rhus typhina	X	Good	X above water table
32 12+50 - 12+75	C. stolon	X		
3 "	"			
12+63	ALNUS rugosa	X	Poor	X mowed
12+75	S. Nigra Post	X	Good	
12+60	UNKNOWN	X	"	
6 - 12+75 - 13+00	C. STOLON	X		
3 "	"			X mowed

2- 14+25-14+50	PINUS Logos	X	FAIR	
3- "	UNKNOWN	X	"	
14+43 (14+43-25)	S. NIGRA Post	X		X above ALD Gradle
6- 14+50-14+75	C. STOLON.	X		X
2- "	"			X ?
14+54	P. deltoides			X
14+70	S. NIGRA Post (14+70-26)			X (All mowed down)
8- 14+75-15+00	C. STOLON			X "
10 15+00-15+25	"			X
12 15+25-15+50	"	X		X "
5 "	"			X
15+50-15+75	"			X "
9 "	"			
7 "	"			
3- "	"	X		X "
	UNKNOWN			
3- 15+75-16+00	C. STOLON	X		
8- "	"			
3- "	UNKNOWN			X "
2 16+00-16+25	C. STOLON	X		X "
10- "	"			
4- "	UNKNOWN	X		X "
2- 16+25-16+50	C. STOLON	X		
7- "	"			
2- "	UNKNOWN	X		X "
2- 16+50-16+75	C. STOLON	X		
7 "	"			
"	UNKNOWN	X		X "
5- 16+75-17+00	C. STOLON	X		
1- "	"			
1- "	UNKNOWN	X		X "
1	S. SP.	X		
1 17+00-17+25	C. STOLON	X		
2- "	"			
3- "	UNKNOWN	X		X "
5- 17+25-17+50	C. STOLON	X		
6- "	"			
4- 17+50-17+75	"			X "
3- "	"	X		
2 "	"			X "
3 17+75-18+00	UNKNOWN	X	FAIR.	
9 "	C. STOLON	X		
2 18+00-18+25	"			X "
11- "	"	X		
2 18+25-18+50	"			X "
12 "	"	X		
				X "

6	18+50-18+75	C. stolon	X			
9	"	"		X		mowed
5	18+75-19+00	"	X			
7	"	"		X	"	
	18+93 (18+93-27)	S. nigra post		X	above H_2O level	
6	19+00-19+25	C. stolon	X			
10	"	"		X	mowed	
1	"	UNKNOWN	X			
	19+23	ALNUS rugosa	X	X		
	19+09 (19+09-28)	S. nigra post		X	above water table	
2	19+25-19+50	C. stolon	X			
10	"	"		X	mowed	
2	"	S. sp	X			
	19+40	S. NIGRA POST	X Poor			
	19+45	P. deltoides	X fair			
3	19+50-19+75	C. stolon	X			
3	"	"		X	mowed	
3	"	UNKNOWN	X			
1	19+53	P. deltoides	X Good/fair			
	19+60	S. NIGRA POST	X "			
	19+66	ALNUS rugosa		X	mowed	
2	19+75-20+00	C. stolon	X			
2	"	"		X	mowed	
1	19+79 (19+79-29)	S. nigra post		X		
1	19+90	ALNUS rugosa	X Poor			
2	20+00-20+25	C. stolon	X			
1	"	"		X		
1	20+04 (20+04-30)	S. nigra post		X	?	
	20+09	P. deltoides	X Poor			
3	20+25-20+50	C. stolon	X			
1	"	"		X	mowed	
1	"	S. sp		X	mowed	
1	ALNUS rugosa		X Poor			
1	20+28 (20+28-31)	S. NIGRA POST		X		
1	20+38 (20+38-52)	"		X		
	20+40	P. deltoides	X			

4 20+50 - 20+70 C. stolon. X Fair/good
4- " UNKNOWN (Salix)? X
1- 20+51 (20+51-33) S. NIGRA POST X ?

4 20170 - 21+30 C. STOLON X
4 "
1- Alnus rugosa X
1- " X
21+00 Salix Nigra Post X
(21+00-34)

APPENDIX B

COCONUT COIR LOG MATERIAL SPECIFICATIONS

PART 1 GENERAL

A. Provide the labor and material required to install 170 ft of 12 in coconut coir log.

PART 2 MATERIALS

A. Manufactured from 100% non-sorted coir (coconut) fiber. Coconut Coir Log shall be a fabricated cylinder, encased in a seamless tube of synthetic fiber mesh. Fiber interior shall be packed tightly into the mesh and shall have a minimum density of 9 pounds per cubic foot. Mesh shall have approximately 2 in rhombic mesh openings with interwoven and braided mesh junctions to prevent misalignment. Synthetic fiber mesh twine shall have yarn tensile strength of 220 lb. And a UV-resistance of 300 Kly per year.

B. Mesh:

The synthetic mesh is a seamless tube of 100% multi-filament polymer fiber knitted yarn with interwoven junctions (i.e., knotless). The yarn is 0.09 in (2.2mm) in diameter with rhombic mesh openings of 1.77 in (45 mm). The yarn has a tensile strength of 220 lb. (100 kg) and a UV-resistance of 300 Kly per year.

PART 3 EXECUTION

- Excavate a keyway trench in the existing bank material 12 in below the top design elevation of coir logs as determined by Place four fertilizer tablets on the fill and fill the remainder of the hole with water Beak. The keyway trenches at both ends will be excavated on a 45 degree angle with the Barrier Island extending inward until excavation is no longer needed. Bend the coir log at that point and lay the remainder parallel to the Barrier Island.

- The remainder of the coir log will be laid parallel to the Barrier Island with the top of the coir log to design elevation.

- Butt and tie the end of the coir logs in areas that have more than one coir log per section.

- Stake the coir log as per Detail Figure 1 (Appendix C) with 2 in by 2 in by 4.0 ft. hardwood stakes.

- Tie the stakes together with nylon cord as recommended by the manufacturer.

LIVE FASCINES AND MATERIAL SPECIFICATIONS

PART 1 GENERAL

Provide the labor and material required to install 27 bundles of live fascines.

PART 2 MATERIALS

The following plant species material will be used to make fascine bundles. Each fascine bundle will have a diameter of 4 to 6 in by 6.0 ft long. Fascine bundles shall be composed of a mix of single species fascines using the recommended species list provide in Table 1 at the end of this section.

The cuttings are placed in bundles with the butt ends in opposite directions and wired together every 12 to 15 in.

Provide five 10 gram OSMO Coate slow release fertilizer tablets per bundle

Species List:

Salix cotteti (Bankers willow) - Required

Select one or more from following list (subject to final approval by Parsons)

Cornus amomum	(Silky dogwood)
Cornus sericea ssp. Stolonifera	(Red osier dogwood)
Salix discolor	(Red willow)

PART 3 EXECUTION

3.1 INSTALLATION

- Fascines should be prepared immediately before installation and must be stored in a moist, shady location;
- A shallow trench as deep as the diameter of the fascine is dug at a 30 degree angle with the lower end of the bundle abutting the coir log at the 565.0 ft elevation;
- Place the bundles in the trench. Tamp three stakes 1 ½ in by 1 ½ in by 2.0 ft long through the bundles;
- Place five (5) fertilizer tablets per fascine bundle, spaced equally along bundle;
- Leave the tips of the stakes 6 in above the soil;
- Cover the bundles with soil from above and tamp firmly to eliminate air pockets;
- To minimize drying of the soil, trenching should not precede placement of the bundles by more than one hour; and
- Twigs at the top of the bundles should protrude above the soil;

3.2 ESTABLISHMENT PERIOD

The following inspections shall be made by Beak and/or Parsons, with corrective measures to be done by a contractor. Inspections should be made after the soil bioengineering measures have been installed. The following schedule is recommended:

- Inspect twice a month for the first 2 months. Inspections should note insect infestations, soil moisture, and other conditions that could lead to poor survivability. Immediate action, such as the application of supplemental water, should be taken if conditions warrant.
- Inspect monthly for the next 6 months. Systems not in acceptable growing condition should be noted and, as soon as seasonal conditions permit, should be removed from the site and replaced with materials of the same species and sizes as originally specified.
- Needed reestablishment work should be performed every 6 months during the initial establishing period. This will usually consist of replacing dead material.
- Extra inspections should always be made during periods of extended drought. Damaged sections should always be repaired immediately.

This inspection schedule will apply to all plantings.

EMERGENT BED PLANTING AND PROTECTIVE MATTING INSTALLATION

PART 1 GENERAL

A. Provide the labor and materials required to plant the emergent beds and biodegradable erosion control matting over the previously constructed planting beds.

PART 2 MATERIALS

A. Emergent Plants:

1. Provide fresh, healthy emergent plants;
2. Minimum density will be 2.0 x 2.0 ft squares within a 6.0 ft wide zone. Each planting location will contain at least 3 rootstocks;
3. Provide one 10 gram slow release fertilizer tablet per plant or as recommended by manufacturer and approved by Engineer.

B. Biodegradable Erosion Control Matting:

1. Biodegradable mesh for erosion control, composed of organic fiber, as sold by (but not limited to) Bon Terra or Jute Mat. The material must have approximately 1/2 in bar mesh openings between the fibers. The surface area coverage required in 900 ft x 6.0 ft wide.
2. Staple the material according to manufacturer's directions, or as approved by the engineer.

PART 3 EXECUTION

A. Planting (Barrier Island A)

1. Plant broad-leaf cattail inside the coir log creation areas on 2.0 x 2.0 ft centers, using 3 rootstocks per location, within 6.0 ft wide zone.

   From Station 4+43 - 4+63
   From Station 5+13 - 5+53
   From Station 5+75 - 6+15

   Plant bulrush in the emergent planting zone on the remainder of the island, using the same grid pattern and density, within a 6.0 ft wide zone.

B. Planting (Barrier Island B)

1. Plant broad-leafed cattail inside the coir log creation areas on 2.0 x 2.0 ft centers and 3 rootstocks per location, within a 6.0 ft wide zone.

   From Station 9+96 - 10+26
   From Station 10+79 - 11+29

   Plant bulrush in the emergent planting zone on the remainder of the island, using the same grid pattern and density, within a 6.0 ft wide zone.

C. Planting (Barrier Island C)

1. Randomly space blocks of narrow-leafed cattail and bulrush in 3.0 - 8.0 ft long plant areas in the emergent planting zone. Plant each block with cattails or bulrush (do not mix species) in a 2.0 x 2.0 foot spacing, and using the same grid pattern, density, within a 6.0 ft wide zone.

   There is currently emergent vegetation growing between stations 17+10 and 18+27. Randomly plant bulrush in spots to fill in any large holes that may be present.

D. Plant all plants into the existing bank material or created areas and fertilize as described.

E. After the plants have been planted, place the biodegradable erosion control material over the planted emergent beds.

Emergent Plant Material Required

Island A

Grid Spacing = 2'
Total length of coir log section (ft.) = 100
Coir Log bend Compen. per log (sqft) = 3
Number of Coir Log Sections = 3

Length of Planting Zone (ft) =	310
Width of Planting Zone(ft) =	6
Area of Planting Zone (sqft) =	1860
Planting Square Area (sqft) =	2
Number of Planting Squares =	930
Plants per Square =	3
Individual Plants Required =	2790

Typha latifolia		*Scirpus acutus*	
area (sqft)	**No. Required**	area (sqft)	**No. Required**
591	**887**	1269	**1904**
	32%		**68%**

Island B

Grid Spacing = 2'
Total length of coir log section (ft.) = 70
Coir Log bend Compen. per log (sqft) = 3
Number of Coir Log Sections = 2

Length of Planting Zone (ft) =	200
Width of Planting Zone(ft) =	6
Area of Planting Zone (sqft) =	1200
Planting Square Area (sqft) =	2
Number of Planting Squares (Density) =	600
Plants per Square =	3
Individual Plants Required =	1800

Typha latifolia		*Scirpus acutus*	
area (sqft)	**No. Required**	area (sqft)	**No. Required**
414	**621**	786	**1179**
	35%		**66%**

Island C

Grid Spacing = 2'

Length of Planting Zone (ft) =	390
Width of Planting Zone(ft) =	6
Area of Planting Zone (sqft) =	2340
Planting Square Area (sqft) =	2
Number of Planting Squares (Density) =	1,170
Plants per Square =	3
Individual Plants Required =	3510
Total Emergent Plants Required =	**8,100**

Typha latifolia		*Scirpus acutus*	
area (sqft)	**No. Required**	area (sqft)	**No. Required**
1170	**1755**	1170	**1755**
	50%		**50%**

Total Number of Emergent Plants per Species =	*Typha latifolia*	*Scirpus acutus*
	3,263	**4,838**

TOTAL EMERGENT PLANTS = 8,100

Total Length of Planting = 900

WILLOW POST PLACEMENT AND RELOCATION

PART 1 GENERAL

A. Provide the labor and material required to replace the dead black willow posts and relocate the live black willow posts.

PART 2 MATERIALS

A. Provide live black willow posts *(Salix nigra)* 4.0 ft long with a minimum top diameter of 1.5 in to 2.0 in and a maximum top diameter of 4.0 in.

Black willow is shortly expected to break dormancy. If the willow posts are not cut by early May, there will be a high mortality rate. To achieve a satisfactory survival of the posts, they must be cut now and stored in a cool area with the butt in water up to 2.0 ft deep. The contractor must provide a certificate from the nursery that the posts were cut and stored in a manner that will promote the highest possible success.

B. 10 gram OSMO Coate or equivalent fertilizer tablets.

PART 3 EXECUTION

- Auger a 6 in or larger hole, minimum depth of 2.5 ft
- Locate the new holes and posts parallel to the existing dead willow posts, adjacent to the retaining wall, staggering the holes in a 2.0 to 5.0 ft zone.
- Place the post in the augered hole and back approximately 1.0 ft with soil material. Place four fertilizer tablets on the fill and fill the remainder of the hole with water. When the water in the hole has settled, continue filling the remainder of the hole with soil material and water.
- Relocate live and rooted willow post by preparing receiving hole suitable in size to accept a transplanted, rooted, on-site willow post. The size of the receiving hole will be determined by size of the transplanted root wad. Excavate the rooted willow post under the direction of the environmental inspector such that the existing root system is preserved and protected. Immediately transplant the post into the prepared hole. Place four fertilizer tablets on the fill and fill the remainder of the hole with water. Backfill as necessary with the excavated topsoil.

NIAGARA RIVER

WILD CELERY
PLANTING AREA NO 1

N

0400

1400

GABION WALL

2400

BARRIER ISLAND "A"

3400

4400

CROSS SECTION

5400

CROSS SECTION

6400

CROSS SECTION

7400

8400

8420

UPPER EMBANKMENT AREA

LAND FILL

20'

40'

40'

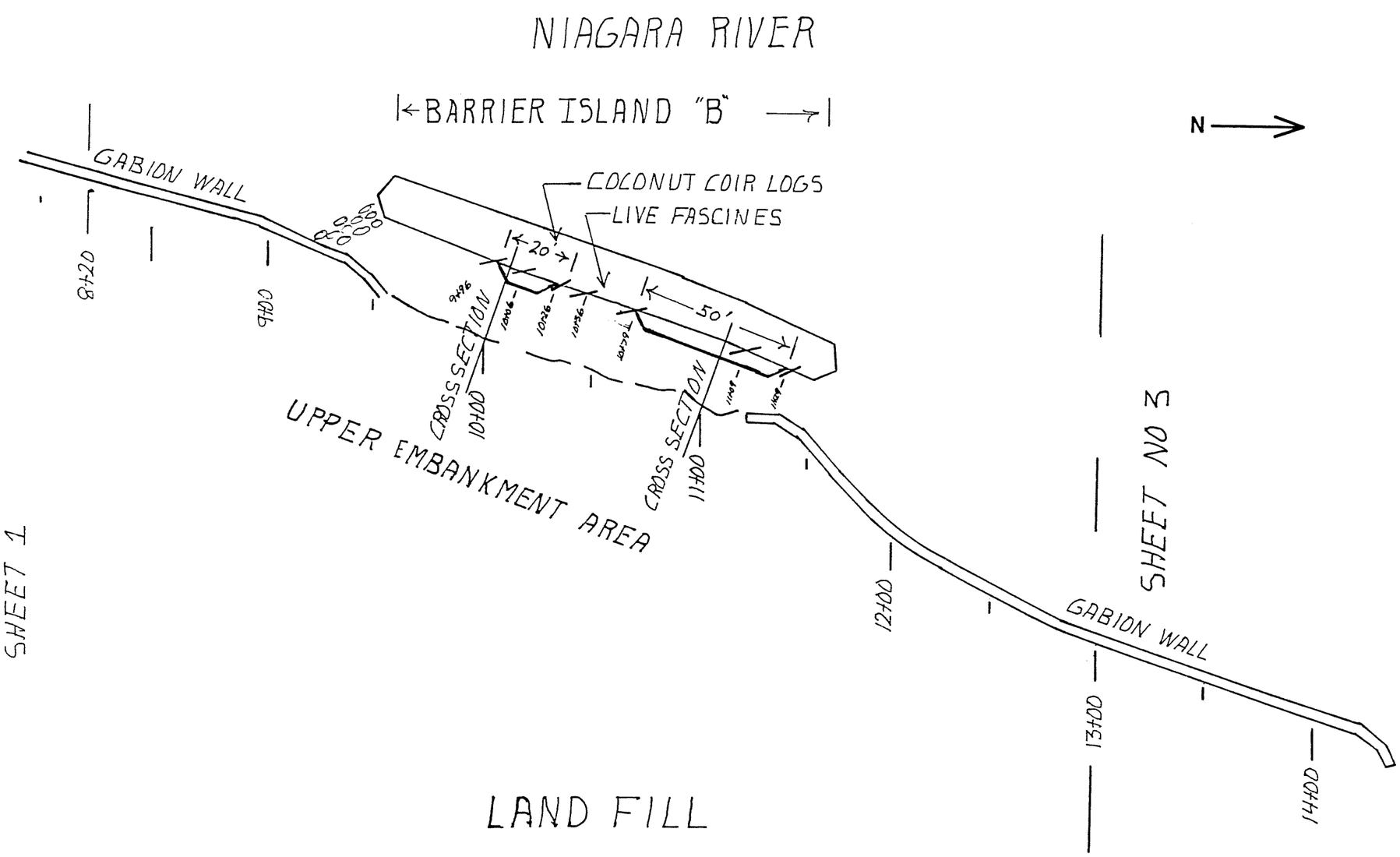
COCONUT COIR LOG
LIVE FASCINES

WATER LINE

SHEET NO. 2

SCALE: 1" = 50'

DRAWING 1



SCALE: 1" = 50'

DRAWING 2

NIAGARA RIVER

BARRIER ISLAND "C"

GABION WALL

LIVE FASCINES

13+00

14+00

15+00

CROSS SECTION

16+00

17+00

CROSS SECTION

18+00

CROSS SECTION

19+00

20+00

22+00

N

NO MATTING IN THIS AREA
(EXISTING VEGETATION)

WATER LINE

WILD CELERY
PLANTING AREA NO 2

UPPER EMBANKMENT AREA

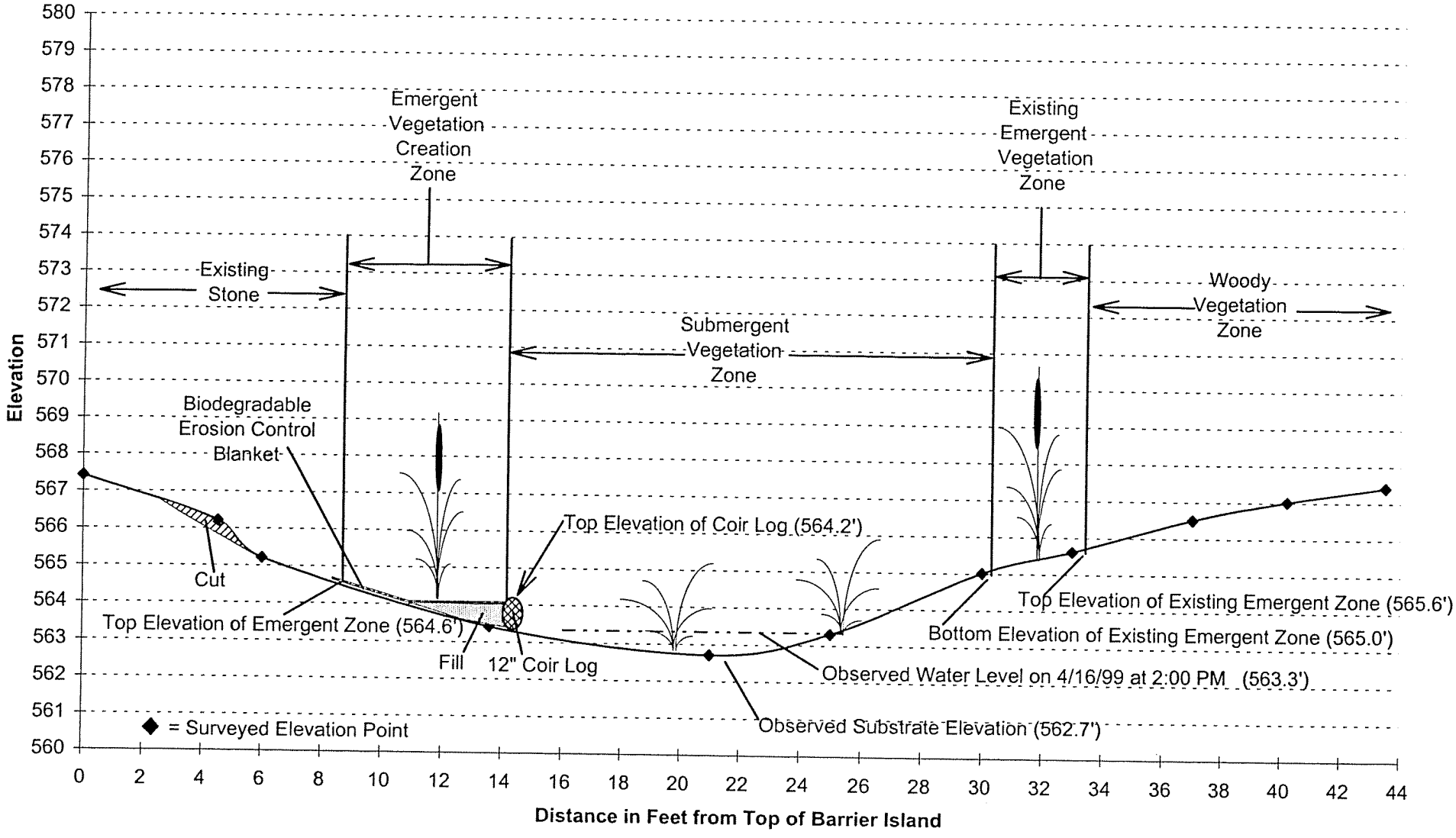
LAND FILL

SHEET 2

SCALE: 1" = 50'

DRAWING 3

Barrier Island A Cross Section No. 1 Station 4+50



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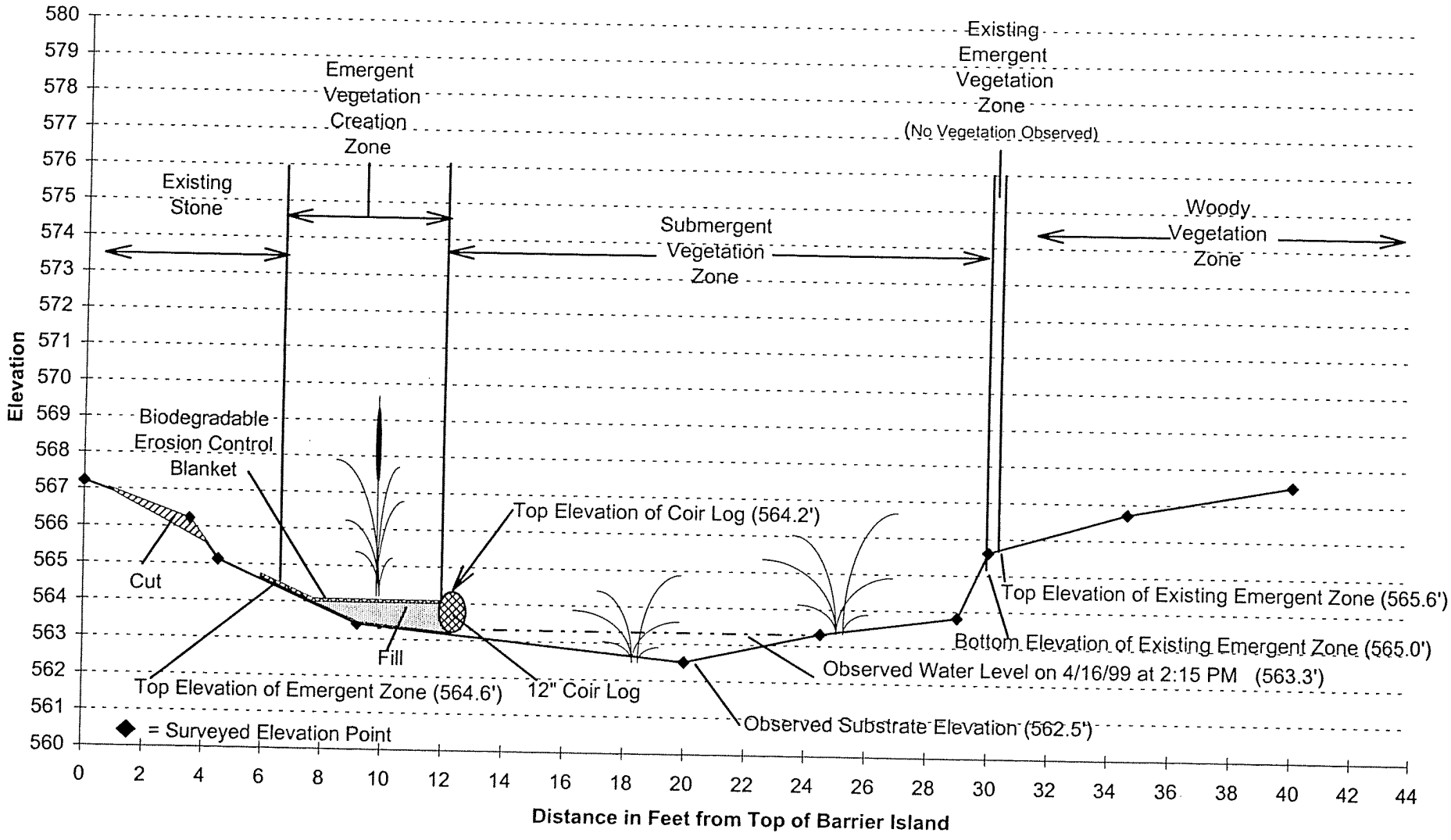
sheet:A-1

Barrier Island A Cross Section No. 2 Station 5+50



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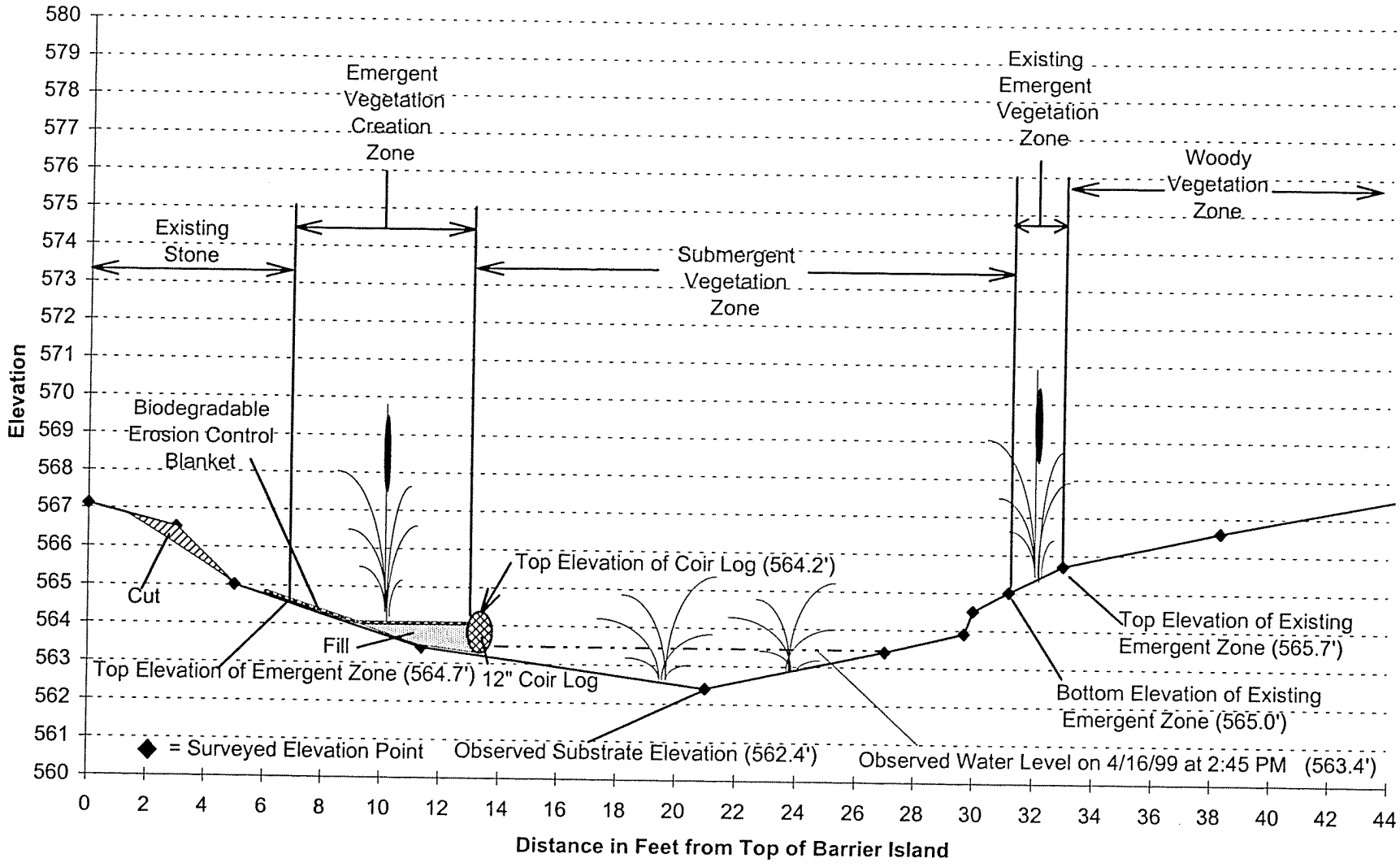
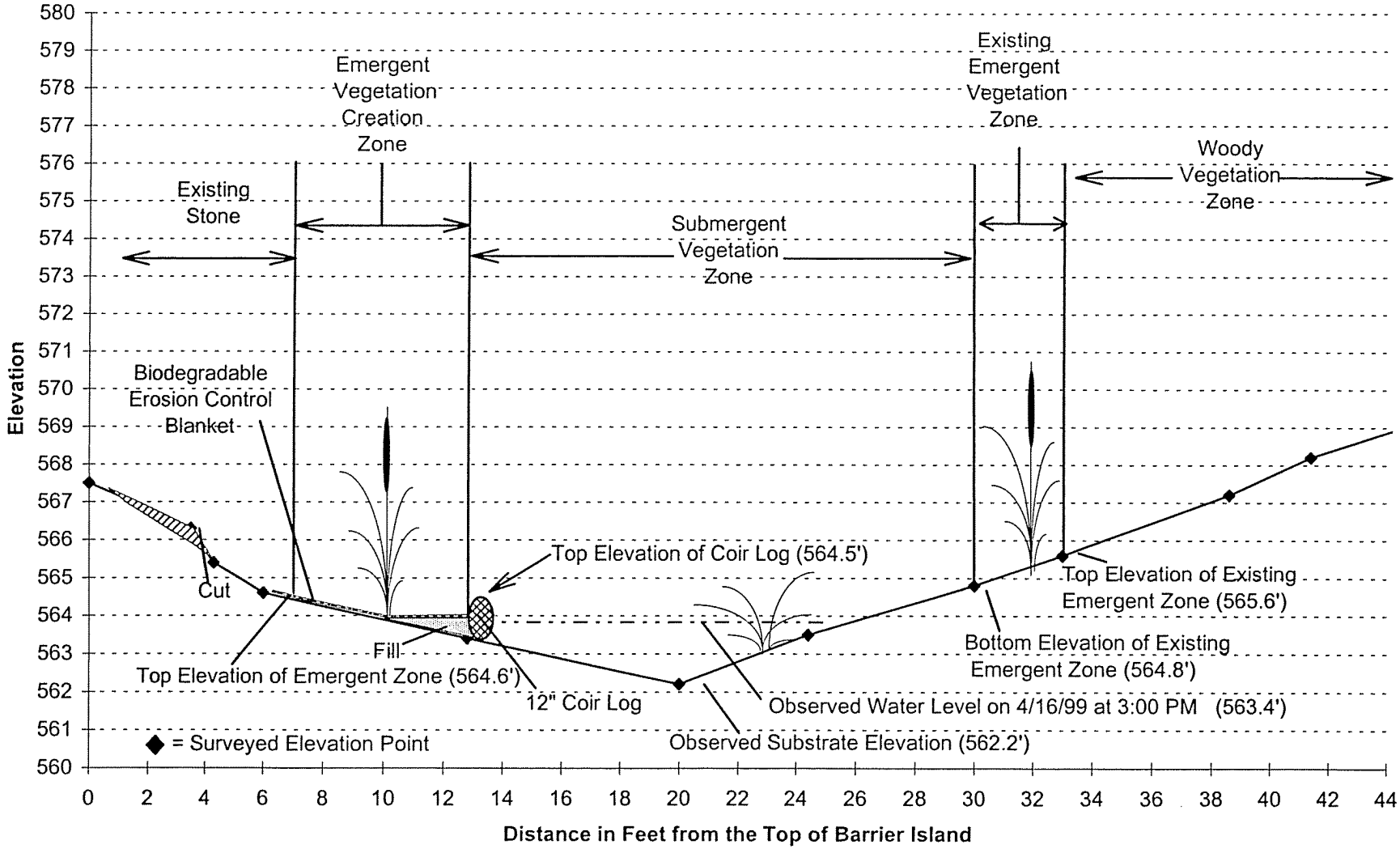
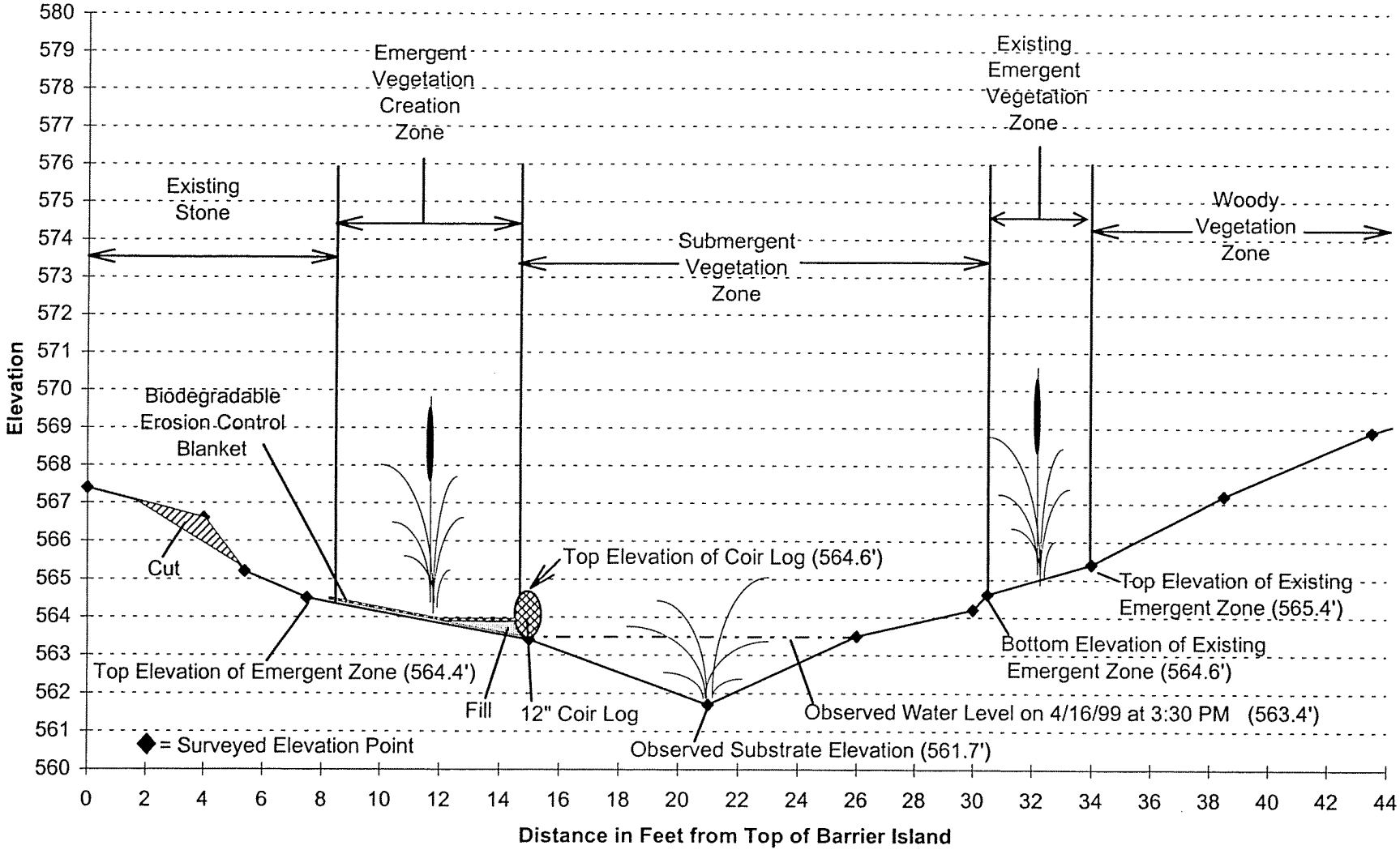
Barrier Island A Cross Section 3 Station 6+50



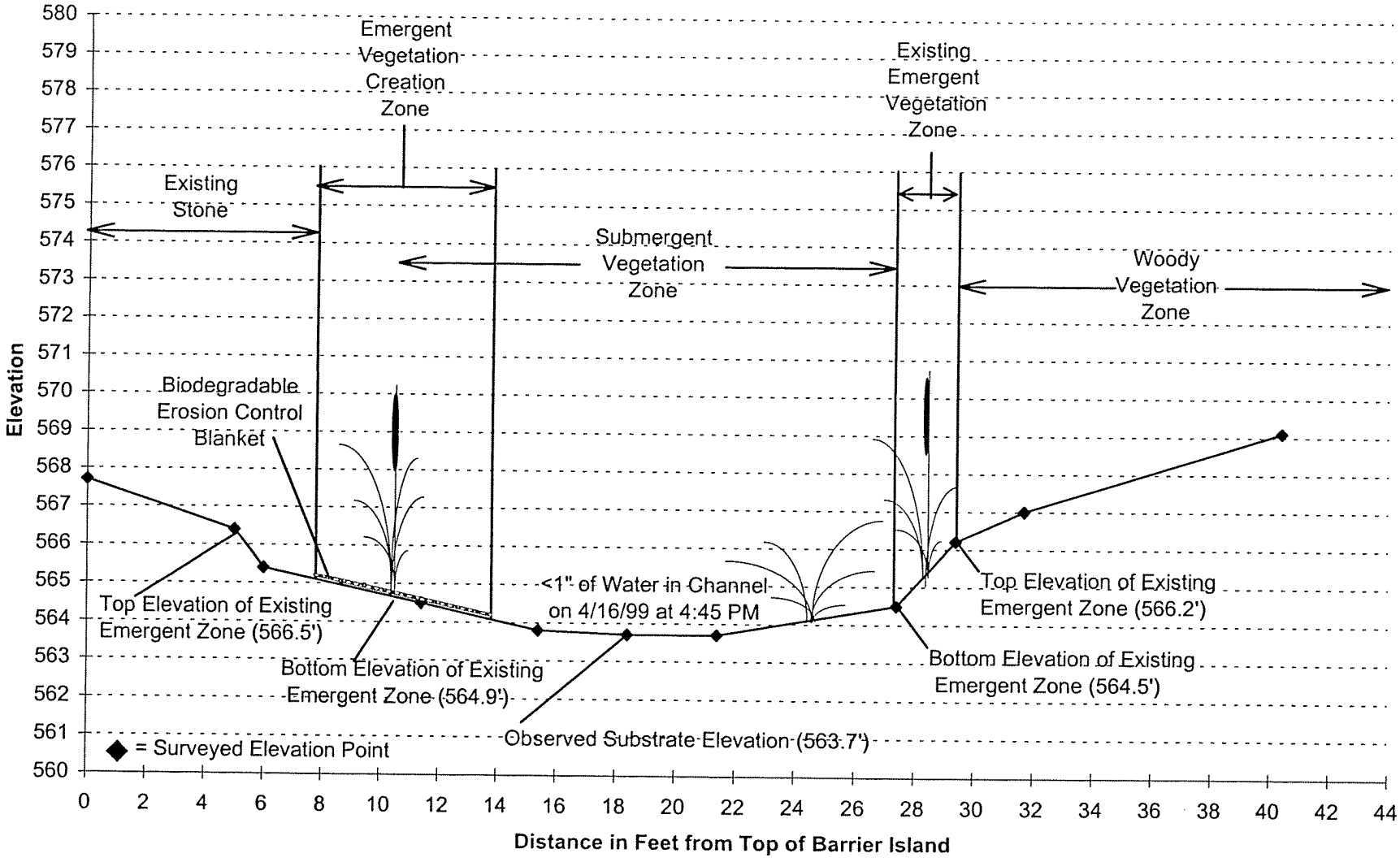
Barrier Island B Cross Section 1 Station 10+00



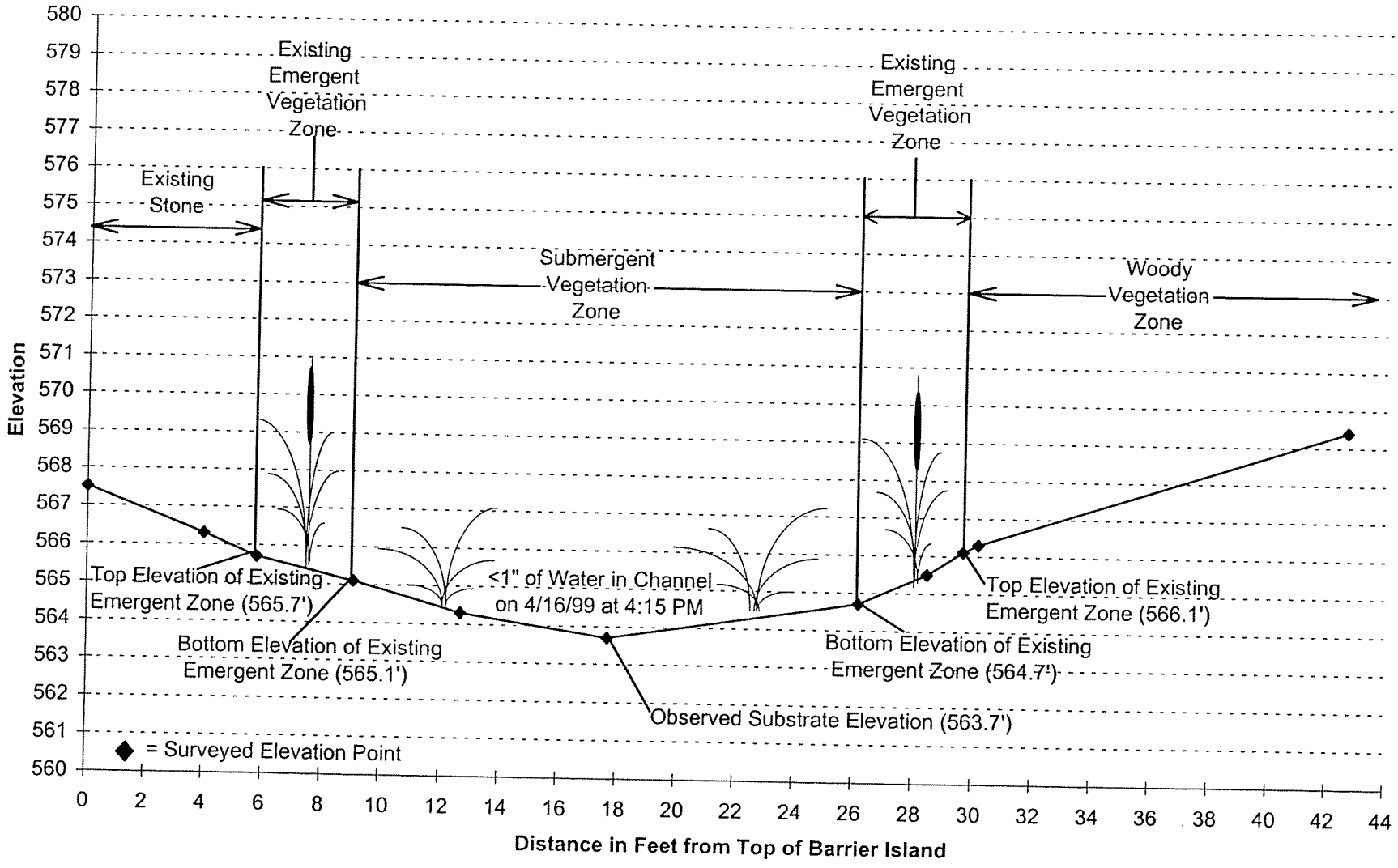
Barrier Island B Cross Section 2 Station 11+00



Barrier Island C Cross Section 3 Station 19+00



Barrier Island C Cross Section 2 Station 17+50



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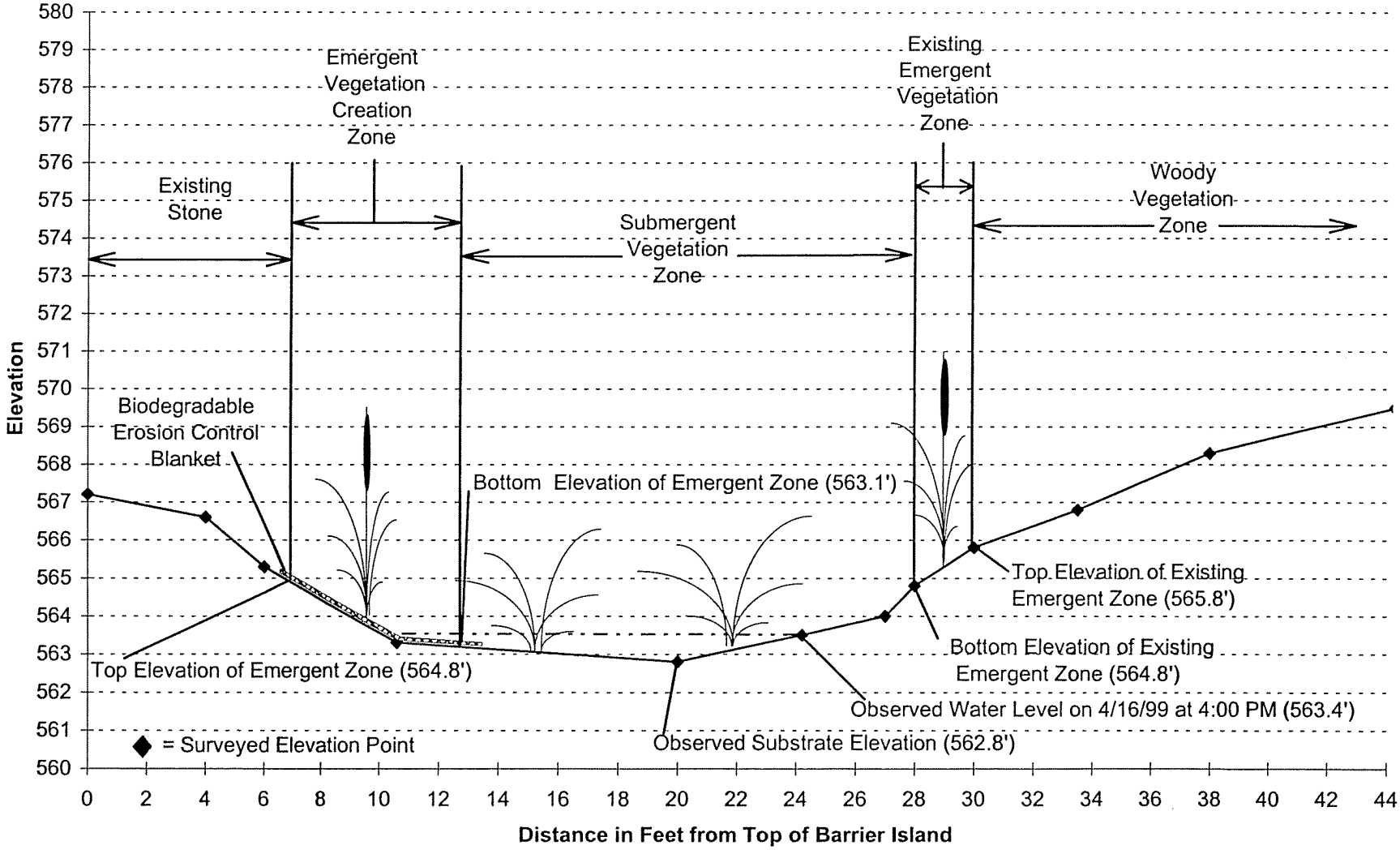
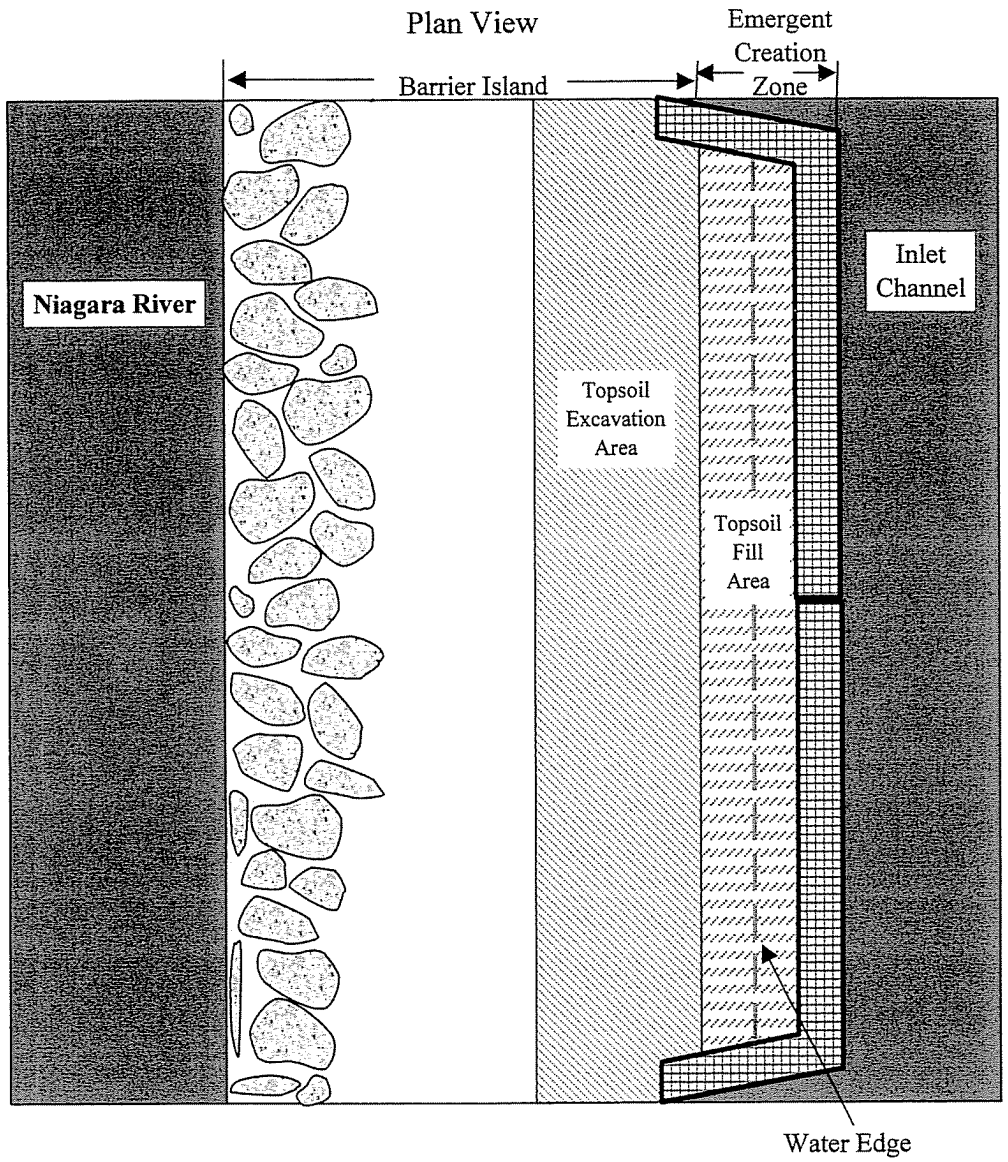
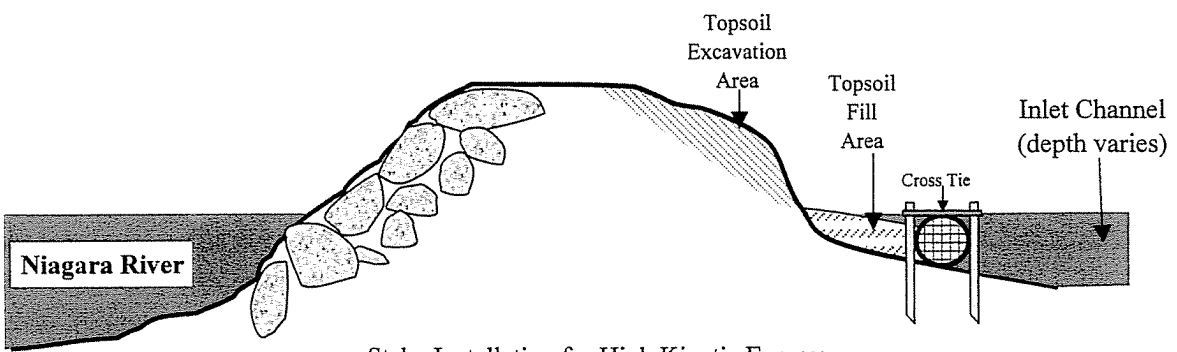
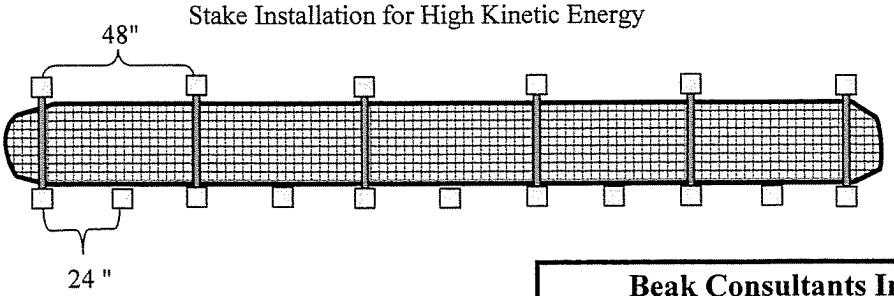
Barrier Island C Cross Section 1 Station 15+50









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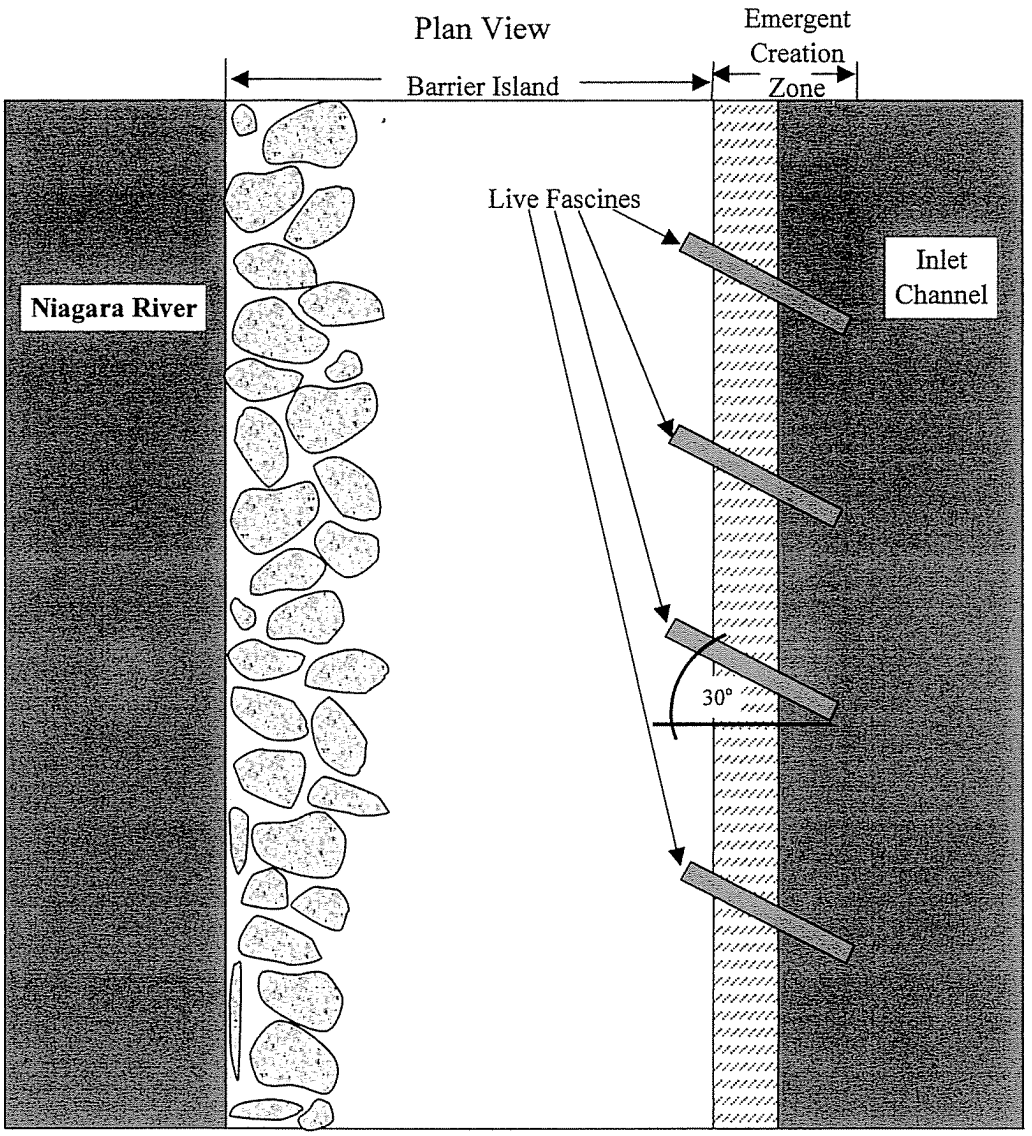
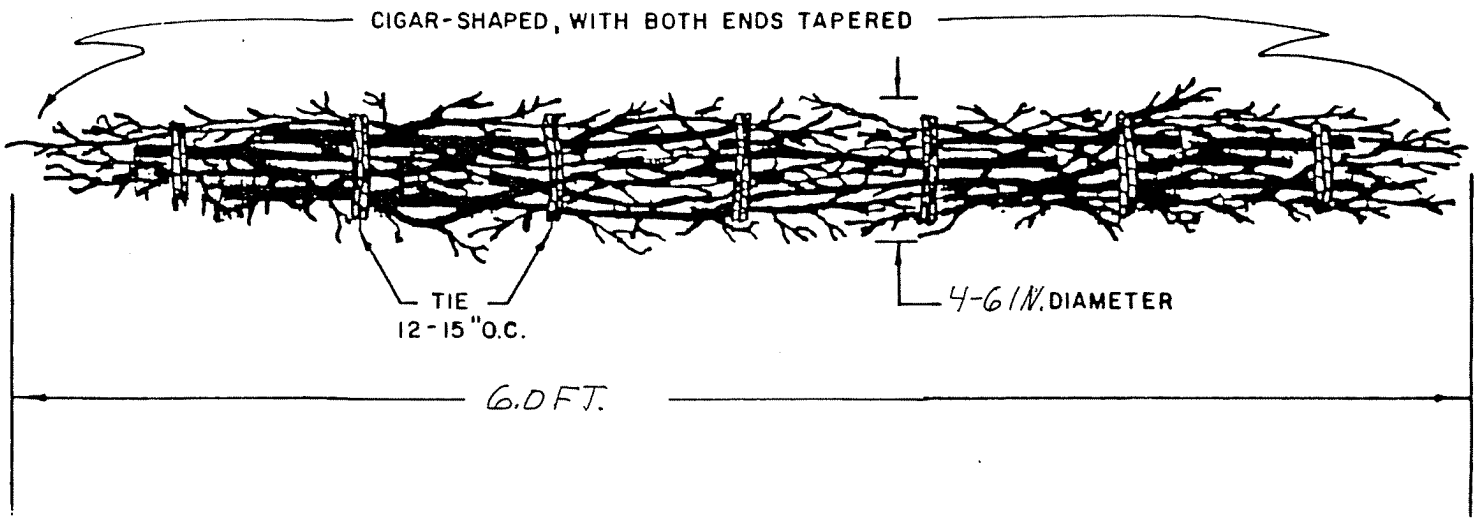
Detail Figure 1.	Cherry Farm Planting Plan Typical Coir Log Placement

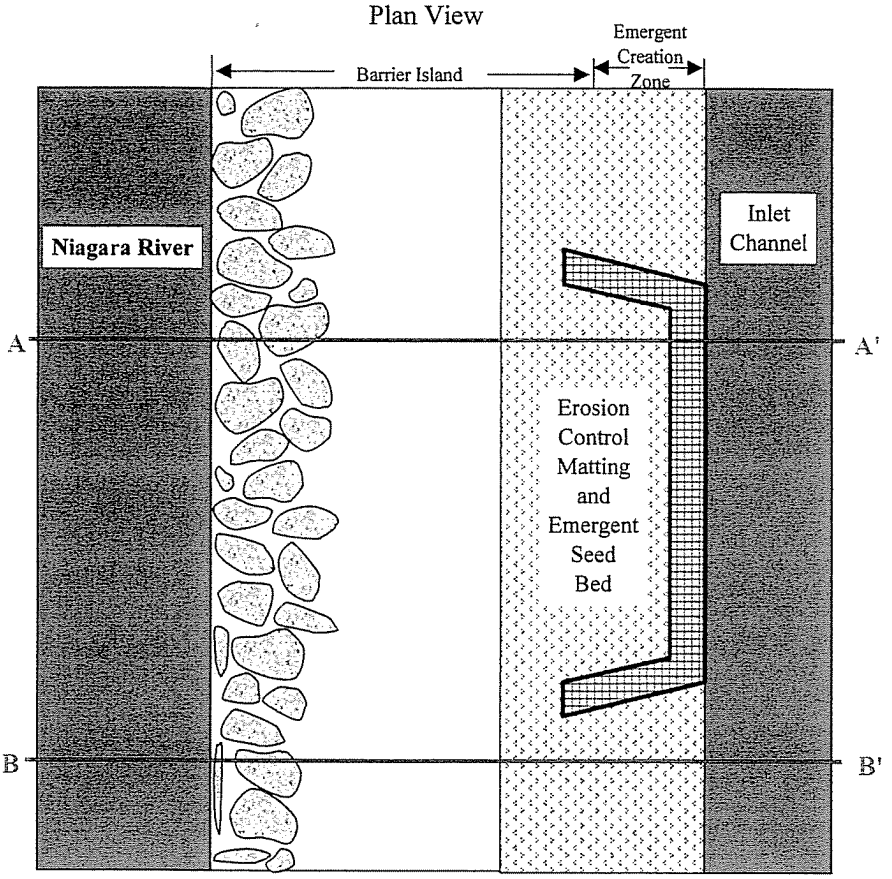


Live Fascine Construction

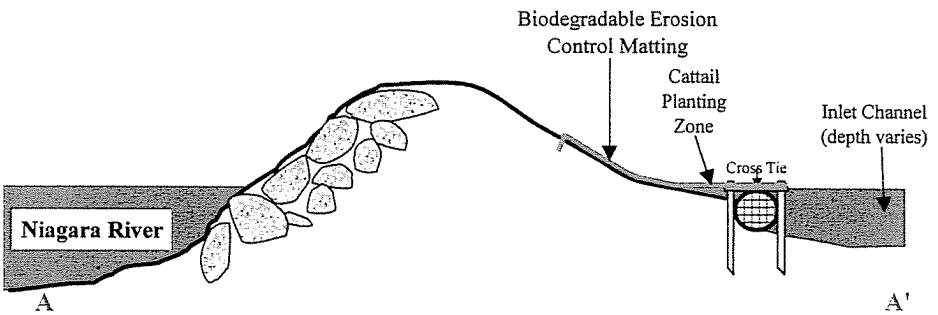


Beak Consultants Incorporated	
Detail Figure 2.	Cherry Farm Planting Plan Live Fascines and Material Specifications

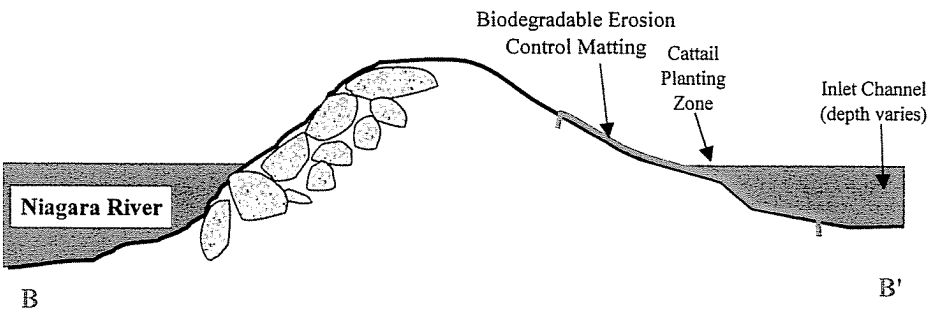
Plan View



Barrier Island Cross-Section A-A'



Barrier Island Cross-Section B-B'



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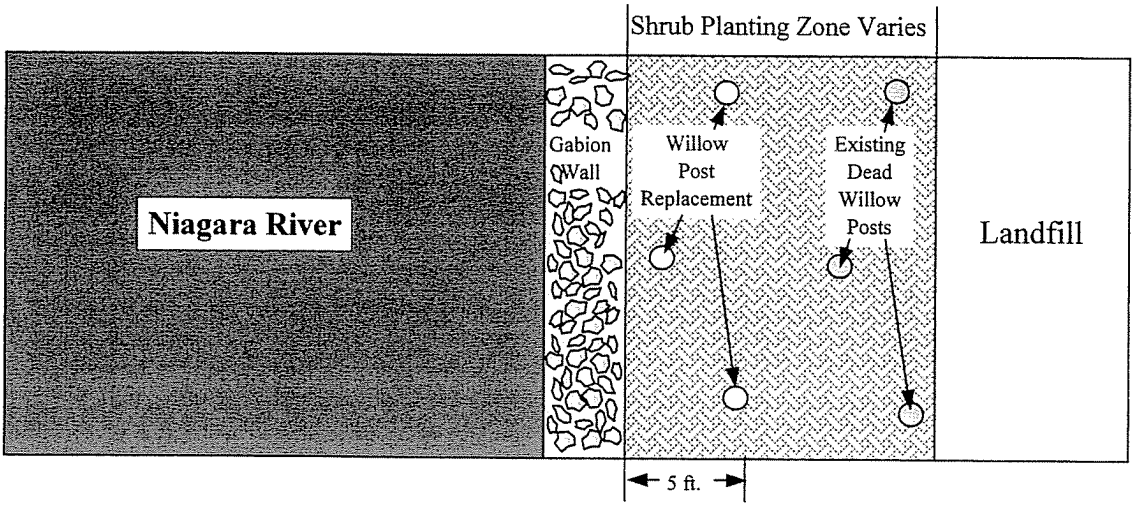
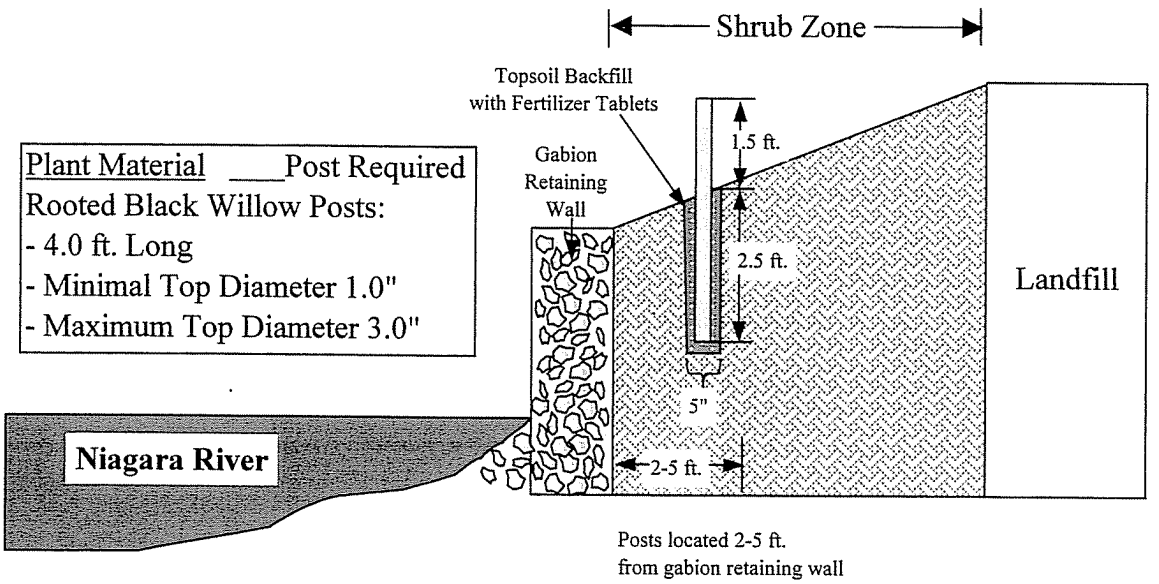
Detail Figure 3. Cherry Farm Planting Plan Emergent Bed Planting and Protective Matting Installation

Typical Plan View



Typical Cross-Section



Plant Material ___Post Required
Rooted Black Willow Posts:
- 4.0 ft. Long
- Minimal Top Diameter 1.0"
- Maximum Top Diameter 3.0"

Posts located 2-5 ft.
from gabion retaining wall

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Detail Figure 4. Cherry Farm Planting Plan
Blackwillow Post Relocation and Planting Plan