

Water Preserve Areas Feasibility Study  
Selected Plan  
dblc design region (Dade-Broward Levee and Canal Area)

Levee, Canals, Earth and Sitework  
Submission to EN-C  
12 February 2001

1. Cost estimates are needed for design features associated with the Dade-Broward Levee and Canal Area within the Water Preserve Areas (WPA) Feasibility Study. This cost estimate will be used as the Selected Plan in the study.
2. The point of contact for this request is Mr. Keith Jones, at extension 1127. Let me know if I can be of more assistance.

Attachments Provided:

1. Spreadsheet Analysis Report - 3 pages
2. Geotechnical Data and Assumptions - 3 pages
3. 11" x 17" Layout Drawings - 4 pages
  - Site Layout (levees.dgn) - 2 pages (north and south) shows design and cross section location
  - Alignments/Locations (levees.dgn) - 2 pages (north and south) shows levee and canal centerlines, distances and areas used for calculation
4. Cross Section Profiles - 3 pages
5. Seep3a Design Region Scope - 1 page
  - Contains a comprehensive list of design and cost features

**Water Preserve Areas Feasibility Study  
Levees and Canals Summary of Material Quantities  
Dade-Broward Levee and Canal and/or dblc Design Region**

	Gross Volume cu-yds	Rock Volume cu-yds	Overburden Volume cu-yds
<b>Excavated Materials</b>			
Conveyance or Seepage Canals	7487268	5661388	1825880
F&W Littoral Shelves	0		
Intake and Discharge Basins	32047	26125	5922
Degraded Roads and Levees	0		
<b>Totals</b>	<b>7519315</b>	<b>5687513</b>	<b>1831802</b>
Amount reusable= <b>90%</b>	<b>6767384</b>	<b>5118762</b>	<b>1648622</b>
Amount spoil= <b>10%</b>	<b>751932</b>	<b>568751</b>	<b>183180</b>
<b>Quality Construction Material Required</b>			
Fill Material Requirements	<b>353466</b>		
<b>Spoil Material Disposal Areas</b>			
Wind Breaks	0		
Borrow Pits/Mined Lakes	0		
Fill Areas	0		
<b>Totals</b>	<b>0</b>		
<b>Spoil Material Generated</b>			
Excavated Materials	751932		
<b>Totals</b>	<b>751932</b>		

Notes:

**Water Preserve Areas Feasibility Study  
Levees and Canals Summary of Material Quantities  
Dade-Broward Levee and Canal and/or dblc Design Region**

**Excavation Requirements**

Rock at Elevation = **1.0** ft-NGVD and below

Conveyance or Seepage Canals	Length feet	Inside Slope 1V on ?H	Outside Slope 1V on ?H	Bottom Width feet	Average Ground ft-NGVD	Canal Invert ft-NGVD	Canal Cut Depth feet	Cross Section Area sqft	Gross Volume cu-yds	Rock Volume cu-yds	Overburden Volume cu-yds	InRoads Length cu-yds	InRoads Volume cu-yds
C-501 (reaches north to south)													
Reach #1	23570	2.0	1.0	100.0	6.9	-12.0	18.9	2426	2117647	1356148	761499		
Reach #2	31670	2.0	1.0	100.0	6.7	-12.0	18.7	2395	2808701	1822198	986503		
Reach #3	17735	2.0	1.0	100.0	6.4	-15.0	21.4	2827	1856881	1303194	553687		
<b>C-501 Total</b>	<b>72975</b>								<b>6783228</b>	<b>4481540</b>	<b>2301688</b>	<b>73021</b>	<b>6833333</b>
C-503 (reaches north to south)													
Reach #1	8840	1.0	1.0	75.0	5.1	-12.5	17.6	1630	533595	391170	142425		
Reach #2	10255	1.0	1.0	75.0	5.2	-12.5	17.7	1641	623196	453784	169413		
Reach #3	33890	1.0	1.0	70.0	5.2	-13.5	18.7	1659	2081963	1537916	544047		
Reach #4	12425	1.0	1.0	50.0	5.3	-14.0	19.3	1337	615493	448681	166813		
<b>C-503 Total</b>	<b>65410</b>								<b>3854248</b>	<b>2831550</b>	<b>1022698</b>	<b>65474</b>	<b>4817502</b>
C-4 Extension to S-520 Pool	370	1.0	1.0	30.0	4.4	-4.0	8.4	323	4420	2398	2022		
<b>New Conveyance Canal Totals</b>	<b>138755</b>								<b>10641897</b>	<b>7315488</b>	<b>3326409</b>	<b>138495</b>	<b>11650835</b>
<b>Existing Canals</b>													
Existing L-30 Canal	72975	2.0	2.0	50.0	6.7	-8.0	14.7	1167	3154628	1654100	1500528		
<b>Existing Canals Totals</b>	<b>72975</b>								<b>3154628</b>	<b>1654100</b>	<b>1500528</b>		
<b>Note1: Existing L-30 Canal is subtracted from totals because they are along the new alignment of C-501</b>													
<b>New Conveyance Canals minus Existing Borrow Canals</b>													
<b>Totals</b>									<b>7487268</b>	<b>5661388</b>	<b>1825880</b>		

F&W Littoral Shelves	Length feet	Width feet	Area Acres	Average Ground ft-NGVD	Invert ft-NGVD	Cut Depth feet	Cross Section Area sqft	Gross Volume cu-yds
<b>Totals</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>					<b>0</b>

Note: There are no Fish and Wildlife shelves along these canals because the additional area used would impact existing wetlands.

Intake and Discharge Basins	Area sqft	Area Acres	Average Ground ft-NGVD	Invert ft-NGVD	Cut Depth feet	Gross Volume cu-yds	Rock Volume cu-yds	Overburden Volume cu-yds
Pump Station S-520	47025	1.1	4.4	-14.0	18.4	32047	26125	5922
<b>Totals</b>		<b>1.1</b>				<b>32047</b>	<b>26125</b>	<b>5922</b>

Degraded Roads	Length feet	Width feet	Area Acres	Average Ground ft-NGVD	Surface Elevation ft-NGVD	Cut Depth feet	Cross Section Area sqft	Gross Volume cu-yds
<b>Totals</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>

Degrade Levees	Length feet	Inside Slope 1V on ?H	Outside Slope 1V on ?H	Top Width feet	Average Ground ft-NGVD	Top of Levee ft-NGVD	Levee Height feet	Cross Section Area sqft	Gross Volume cu-yds
<b>Totals</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0</b>

**Water Preserve Areas Feasibility Study  
Levees and Canals Summary of Material Quantities  
Dade-Broward Levee and Canal and/or dblc Design Region**

**Fill Material Requirements**

<b>Levees</b>	Length feet	Inside Slope 1V on ?H	Outside Slope 1V on ?H	Top Width feet	Average Ground ft-NGVD	Top of Levee ft-NGVD	Levee Height feet	Cross Section Area sqft	Gross Volume cu-yds	InRoads Length cu-yds	InRoads Volume cu-yds
L-503 West Reach #1	8805	3.0	3.0	12	5.1	8.5	3.4	75	24615		
L-503 East Reach #1	8700	3.0	3.0	12	5.1	8.5	3.4	75	24321		
L-503 West Reach #2	10255	3.0	3.0	12	5.2	8.5	3.3	72	27449		
L-503 East Reach #2	10255	3.0	3.0	12	5.2	8.5	3.3	72	27449		
L-503 West Reach #3	33890	3.0	3.0	12	5.2	8.5	3.3	72	90712		
L-503 East Reach #3	33890	3.0	3.0	12	5.2	8.5	3.3	72	90712		
L-503 West Reach #4	12820	3.0	3.0	12	5.3	8.5	3.2	69	32819		
L-503 East Reach #4	12425	3.0	3.0	12	5.3	8.5	3.2	69	31808		
Levee East of S-520 Pool	700	3.0	3.0	12	4.4	8.5	4.1	100	2583		
Levee West of C-4 Extension Canal	270	3.0	3.0	12	4.4	8.5	4.1	100	996		
<b>Totals</b>	<b>132010</b>								<b>353466</b>		

<b>Wind Breaks</b>	Length feet	Inside Slope 1V on ?H	Outside Slope 1V on ?H	Top Width feet	Average Ground ft-NGVD	Top of Levee ft-NGVD	Levee Height feet	Cross Section Area sqft	Gross Volume cu-yds
<b>Totals</b>	<b>0</b>								<b>0</b>

<b>Borrow Pits/Mined Lakes</b>	Area sqft	Area acres	Bottom Depth ft-NGVD	Finished Depth ft-NGVD	Fill Depth feet	Gross Volume cu-yds
		0.0			0.0	0
		0.0			0.0	0
<b>Totals</b>		<b>0.0</b>				<b>0</b>

<b>Fill Areas</b>	Length feet	Width feet	Area sqft	Area acres	Average Ground ft-NGVD	Finished Height ft-NGVD	Fill Depth feet	Gross Volume cu-yds
							0.0	0
							0.0	0
<b>Totals</b>	<b>0</b>						<b>0.0</b>	<b>0</b>

<b>Backfill Canals</b>	Length feet	Inside Slope 1V on ?H	Outside Slope 1V on ?H	Bottom Width feet	Average Ground ft-NGVD	Canal Invert ft-NGVD	Canal Cut Depth feet	Cross Section Area sqft	Gross Volume cu-yds
<b>Total Fill Areas</b>	<b>0</b>						0	0	<b>0</b>

\*\*\* Geotechnical Data and Assumptions to Use for  
Feasibility Level Cost Estimates (Amended 2/05/01)

**Design Region: dblc - Dade Broward Levee and Canal**

Notes:

1. Design region features for this area are mainly excavation of conveyance canals and construction of containment levees.
2. Containment levees are designed with minimal height so as minimize impacts on existing wetlands.
3. Overtopping of containment levees is a **remote event** and does not present a hazardous risk.

Compaction Factor for Sandy/Clay Overburden:

Answer: 0.85

Swell Factor for Sandy Overburden:

Answer: 1.10

Compaction Factor for Rock:

Answer: 0.85

Swell Factor for Rock:

Answer: 1.30

Material Makeup of Levee Embankment:

Answer: Material may be utilized from the sand and gravel overburden excavated for the seepage canals/Fish refugia. If additional material is required, crushed rock should be utilized. This material must be crushed to a maximum particle size of 3 inches or less in order to utilize for levee construction. **It is estimated that overburden exists from ground surface to elevation +1 ft NGVD. At elevation +1.0 ft NGVD and deeper, mostly hard limestone is in place.**

Special Levee Construction Design Criteria:

Foundation Treatment:

Answer: None

Seepage Control

Answer: None

---

\*\*\* Assumptions based upon limited subsurface information and prior projects, as of 2/05/01

Slope Protection:

Answer: Upstream and downstream embankment perimeter will be grassed for erosion protection.

Where the material will come from?

Answer: Material for L-503 will be obtained from:

1. Usable excavated material from adjacent conveyance canal C-503. This material will contain sand, clay, organic silt, peat and limestone according to available drill logs.
2. Usable excavated material from construction of other WPA features in a 10-20 mile proximity.

Excavation Procedure/Technique and/or Blasting Requirements (at this location only):

Note: Blasting may be prohibited in northern areas.

Answer: Assume some blasting of rock will be required (Rios from EN-G will supply blasting patterns/plan). After initial rock blasting some additional ripping will be required with backhoe with ripper attachment. Following blasting and ripping, normal excavation equipment may be utilized.

Percentage of Usable Excavated Material: Since the Levee L-503 will be designed as a levee and is not critical with respect to loss of life or much property damage should it fail, the percentage of usable excavated materials can be raised.

**Percentage of Usable Excavated Overburden Soil Material:**

Answer: Assume 90% of the material can be reused. The remaining 10% should be disposed of onsite or at an approved disposal area. Using excess unsuitable material to build wind breaks, boat ramps or to flatten interior slopes is recommended also. The distribution of overburden soil versus rock is detailed above in red.

**Percentage of Usable Excavated Rock Material:**

Answer: Assume 90% of the material can be reused. The remaining 10% should be disposed of onsite or at an approved disposal area. Using excess unsuitable material

to build wind breaks, boat ramps or to flatten interior slopes is recommended also. The distribution of overburden soil versus rock is detailed above in red.

Other Considerations:

A Rock Crusher and Grizzly may be utilized in order to reuse the rock for levee construction. Conveyor systems or multiple crushing plants may reduce the overall hauling costs.

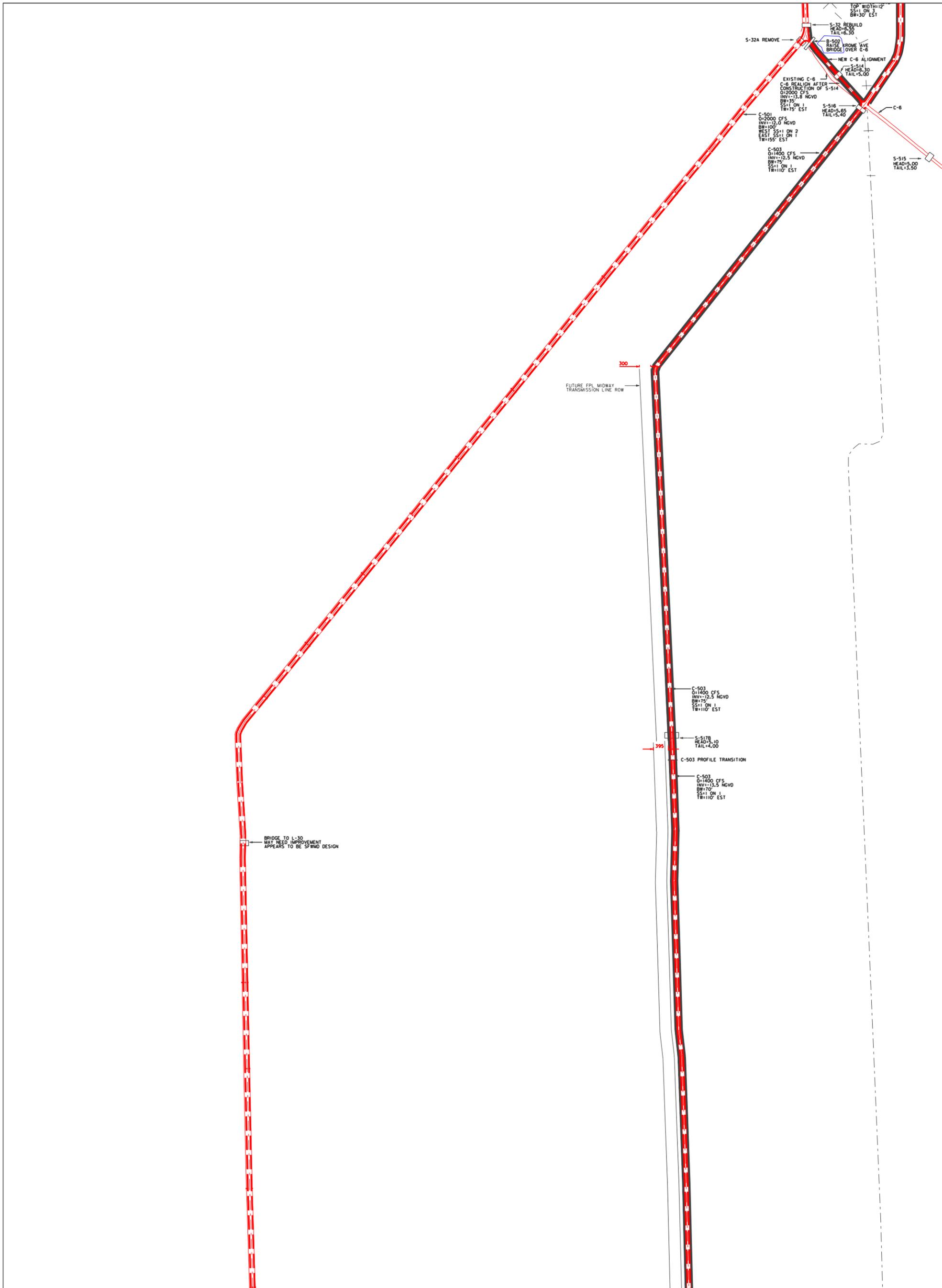
Assume overburden soils have a unit weight of 115 pcf while limestone has unit weight of 145 pcf for hauling purposes.

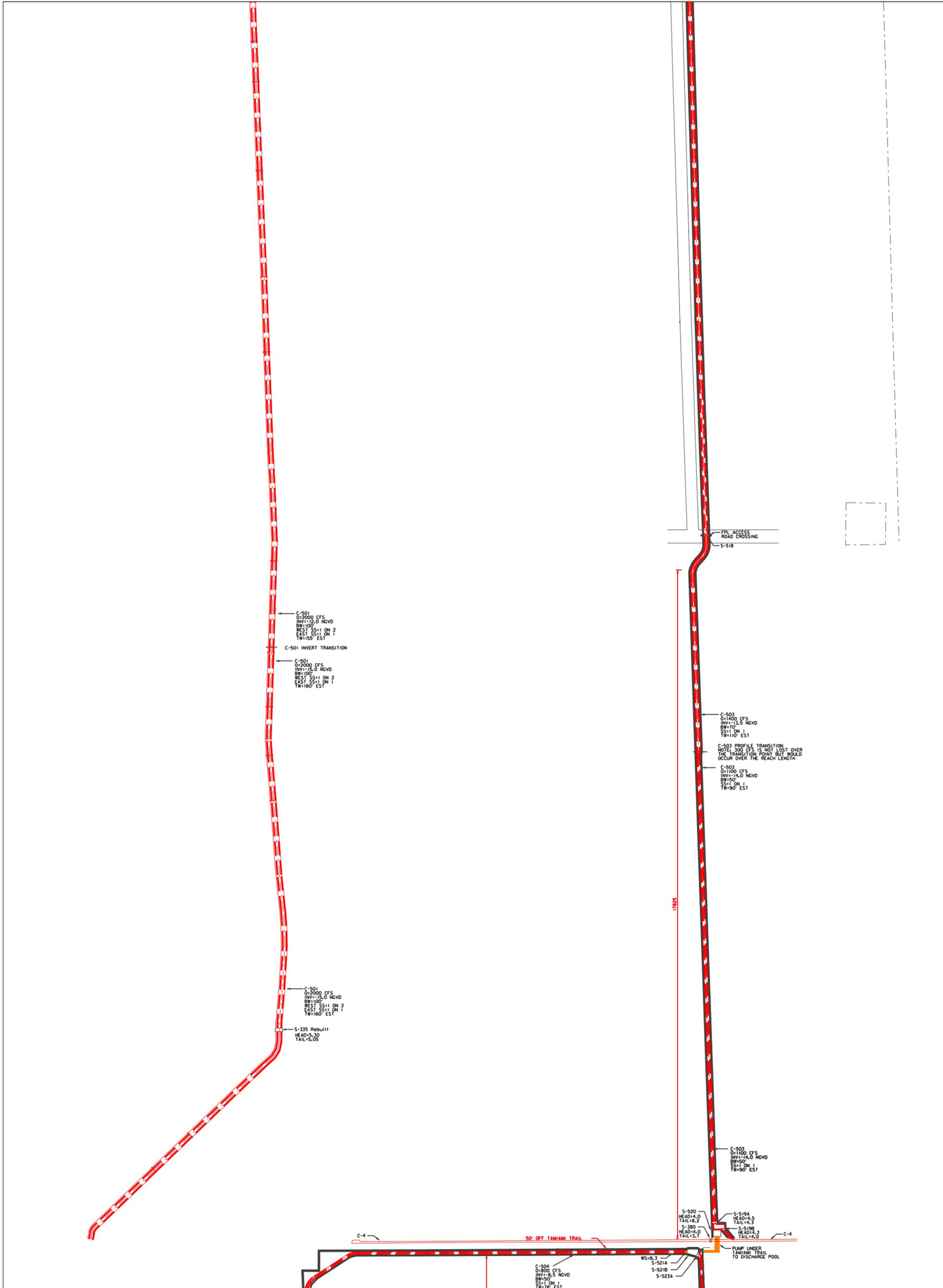
When constructing the levee, the Contractor will be required to utilize 12 inch lifts which then will be compacted down to 10 to 11 inches. Compaction requirements will be to 98% maximum dry density based upon standard proctor compaction tests or a nuclear density meter. Also, control of excessive moisture shall be the responsibility of the Contractor.

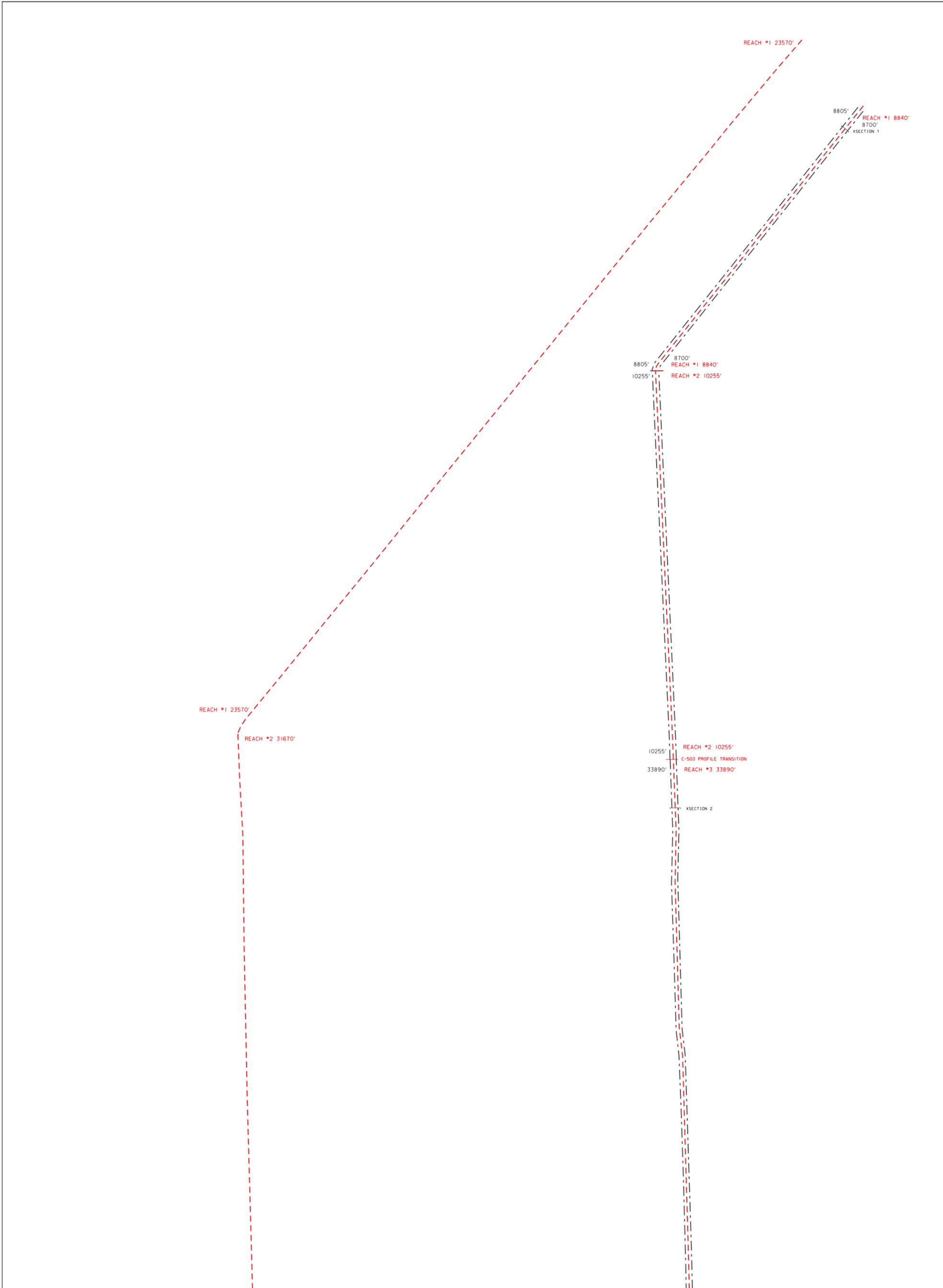
Geotechnical Instrumentation:

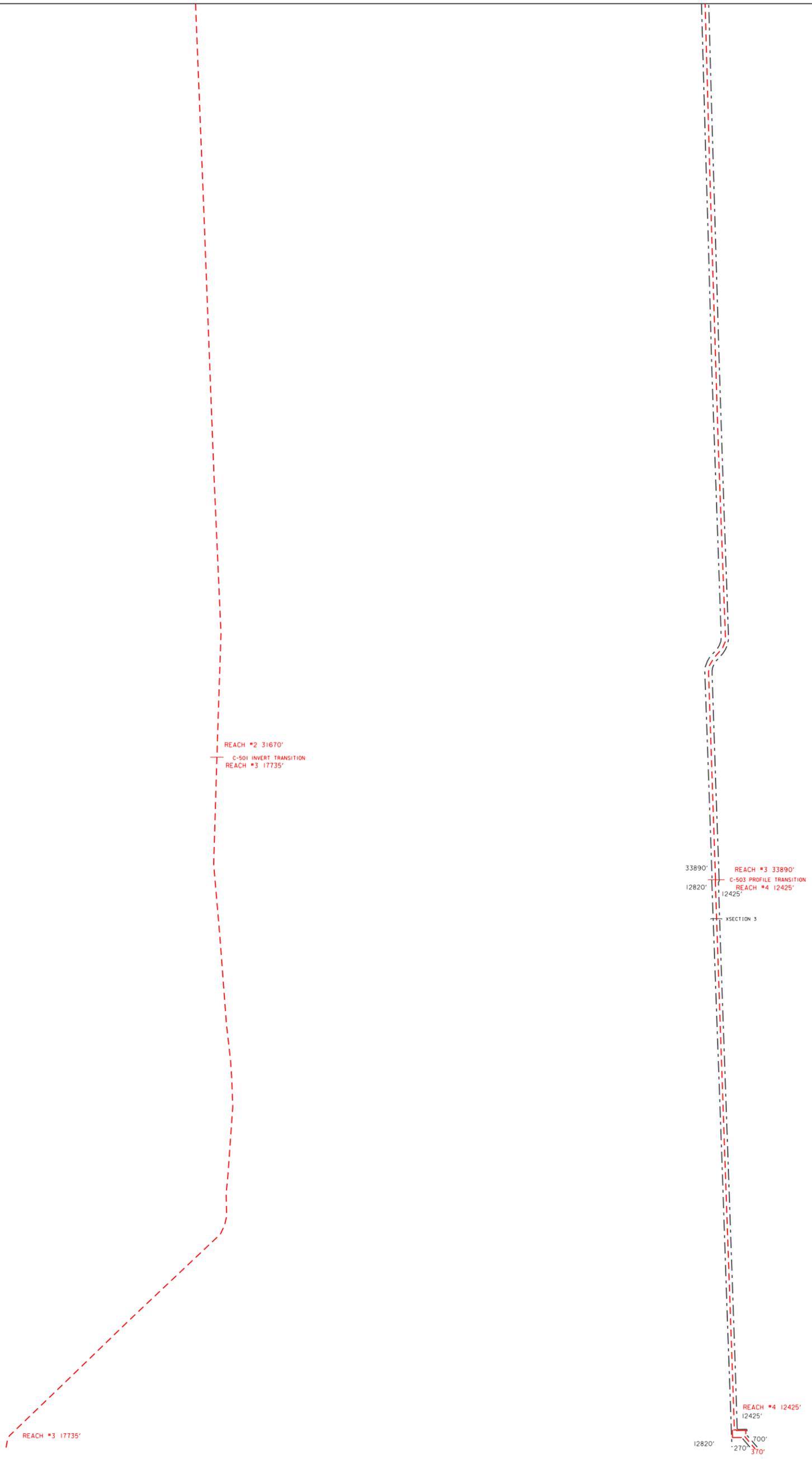
NOTE: This instrumentation is required for monitoring and operational safety of project features within the design region.

1. Shallow Depth Piezometers ( $\pm$  5.0 feet from natural grade)  
Answer: None
2. Medium Depth Piezometers (greater than 5.0 and less than 50 feet from natural grade) None
3. Deep Depth Piezometers (greater than 50 feet from natural grade) None
4. Inclinometers - None
5. Others

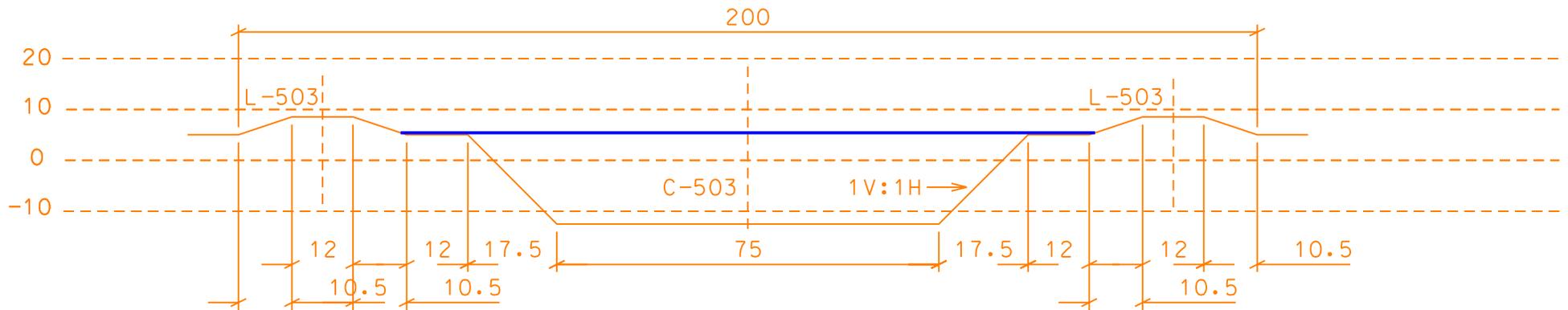








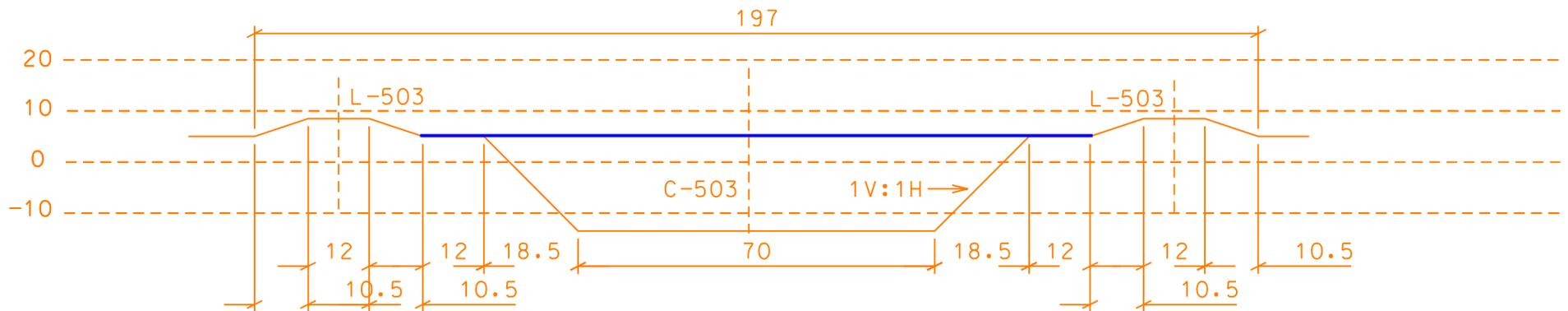
Xsection 1 of C-503 and L-503  
south of S-516 and C-6  
Looking South



Design Elevations (ft-NGVD)  
 Top of Levee/Berm L-503 8.5  
 C-503 Design Pool 5.4  
 Average Local Ground 5.0-5.5  
 C-503 Bottom -12.5

Preliminary Design Slopes  
 Levee/Berm Slopes = 1V:3H  
 C-503 Slopes = 1V:1H

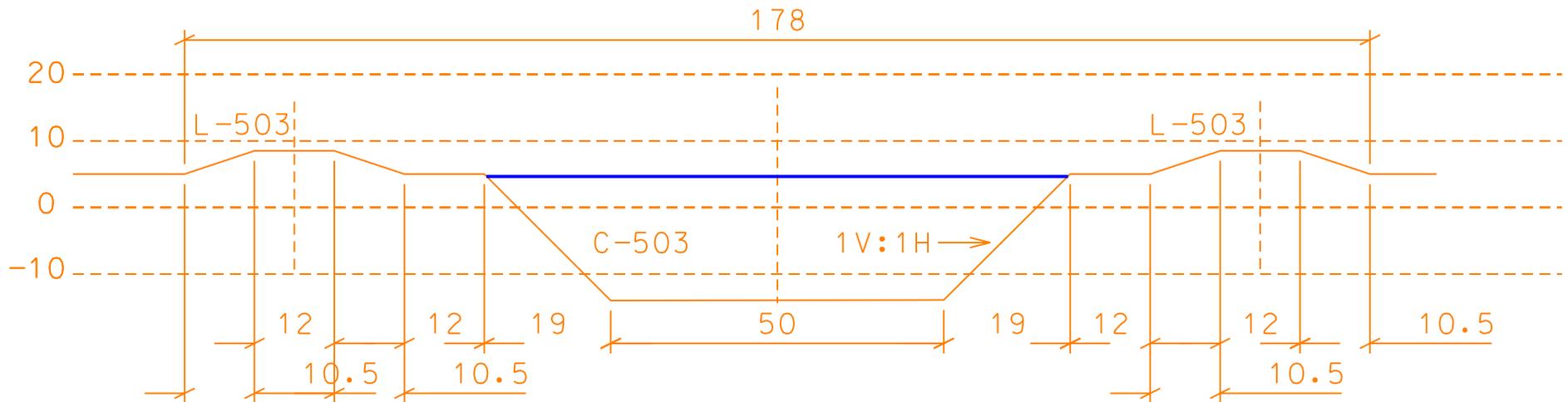
Xsection 2 of C-503 and L-503  
 in proximity of Wellfield Protection Canal  
 Looking South



Design Elevations (ft-NGVD)  
 Top of Levee/Berm L-503 8.5  
 C-503 Design Pool 5.2  
 Average Local Ground 4.5-5.5  
 C-503 Bottom -13.5

Preliminary Design Slopes  
 Levee/Berm Slopes = 1V:3H  
 C-503 Slopes = 1V:1H

Xsection 3 of C-503 and L-503  
north of S-520 and Tamiami Trail  
Looking South



Design Elevations (ft-NGVD)  
 Top of Levee/Berm L-503 8.5  
 C-503 Design Pool 4.7  
 Average Local Ground 4.5-5.5  
 C-503 Bottom -14.0

Preliminary Design Slopes  
 Levee/Berm Slopes = 1V:3H  
 C-503 Slopes = 1V:1H

Design Region: dblc (Dade-Broward Levee and Canal)

Design:

- a) Design conveyance canals, levees, gated culverts, gated spillways, tunnels, and a pump station.

Spillways:

1. S-335 Remove and rebuild

Gated Culverts:

1. S-517A Existing culvert, No change required
2. S-517B Wellfield Protection canal crossing under C-503
3. S-519A Discharge control from C-503 to pump station S-520
4. S-519B Discharge control from C-4 to pump station S-520

Ungated Culverts:

1. S-518 FPL maintenance access to Midway transmission line corridor that crosses C-503

Levees:

1. L-503W Western levee along C-503 length
2. L-503E Eastern levee along C-503 length

Canals:

1. C-501 Improved L-30 canal
2. C-503 New SDCS canal
3. C-4 Extension – From C-4 to S-519B into S-520 pool

Flow Barriers:

1. S-380E Dry season temporary flow barrier on C-4

Utilities:

1. High tension FPL power lines
2. Phone and electric
3. Fiber optics cable along Tamiami Trail

Issues:

1. The structure S-380E on C-4 is a dry-season only temporary flow barrier to divert flows to C-2. The configuration recommended will be an OHA pneumatic crest gate system manufactured by Obermeyer Hydro, Inc.  
<http://www.obermeyerhydro.com/>