STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

TECHNICAL REPORT COVERSHEET

650-050-38
ENVIRONMENTAL
MANAGEMENT
08/22

SR 710 Pond Siting Report

Florida Department of Transportation

District One

Design Services for SR 710

Limits of Project: From US 441 to L-63 Canal

Okeechobee County, Florida

Financial Management Number: 419344-3

ETDM Number: 11092

Date: 8/7/2024

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated May 26, 2022 and executed by the Federal Highway Administration and FDOT.

Authorized Signature

Jennifer Nunn
Print/Type Name

Vice President
Title

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Address

Winter Park, FL 32789
Address

Jennifer Nunn Digitally signed by Jennifer Nunn Date: 2024.08.07 14:48:43-04'00'

Seal

To: Phil Menke (FDOT Project Manager)

By: Jennifer Nunn, P.E. (The Balmoral Group)

Checked By: Greg Seidel, P.E. (The Balmoral Group)

Memorandum Date: August 7, 2024

Subject: Technical Memorandum: PD&E Pond Siting Memo Update
Financial Project ID No. 419344-3-32-01
SR 710 from US 441 to L-63N Canal
Okeechobee County, Florida

In May of 2012, the Florida Department of Transportation (FDOT) published a Pond Siting Report (PSR) for a Project Development and Environment (PD&E) Study that was conducted for SR 710 from US 441 to CR 714 (SW Martin Highway) in Okeechobee and Martin Counties, which included the project segment. Since that time, the FDOT has identified the need to modify the proposed alignment of SR 710 from US 441 to the L-63N Canal to improve highway operations, safety, and regional mobility. In 2018, The Balmoral Group submitted a Phase 2 Design to meet these needs. In response to public comments received from Okeechobee Utility Authority (OUA) during the August 30th, 2018 public hearing, the proposed alignment was modified and shifted north. This Memorandum presents a comparison between the 2018 Phase 2 Design and the 2023 OUA wellfield avoidance realignment.

1. Project Description

The proposed roadway improvements remain unchanged from 2018 to 2023, consisting of a new four-lane suburban typical section. The roadway includes two 12-foot wide travel lanes in each direction, separated by a raised 30-foot wide grassed median. This roadway section will also feature four-foot shoulders to the inside of the travel lanes and seven-foot paved shoulders adjacent to the outside travel lanes to function as a bike lane. Type E curb and gutter will be provided along the median and outside edges of the roadway with a closed stormwater conveyance system. The total length of the project is 3.8 miles. The project also includes a widening of the existing bridge over the L-63N Canal and a new bridge culvert over Taylor Creek. Acquisition of ROW will be required for the new roadway alignment and stormwater ponds.

The 2023 OUA wellfield avoidance realignment of the road affects just under 1 mile of the project length. Starting east of Taylor Creek, the centerline of the road shifts north of the original design, before converging with the original alignment east of the proposed Pond 2 site. The maximum difference between the two alignments is 275 feet, occurring near Station 536+00. Refer to **Figure 1** for a comparison of the original and realigned roadway design.

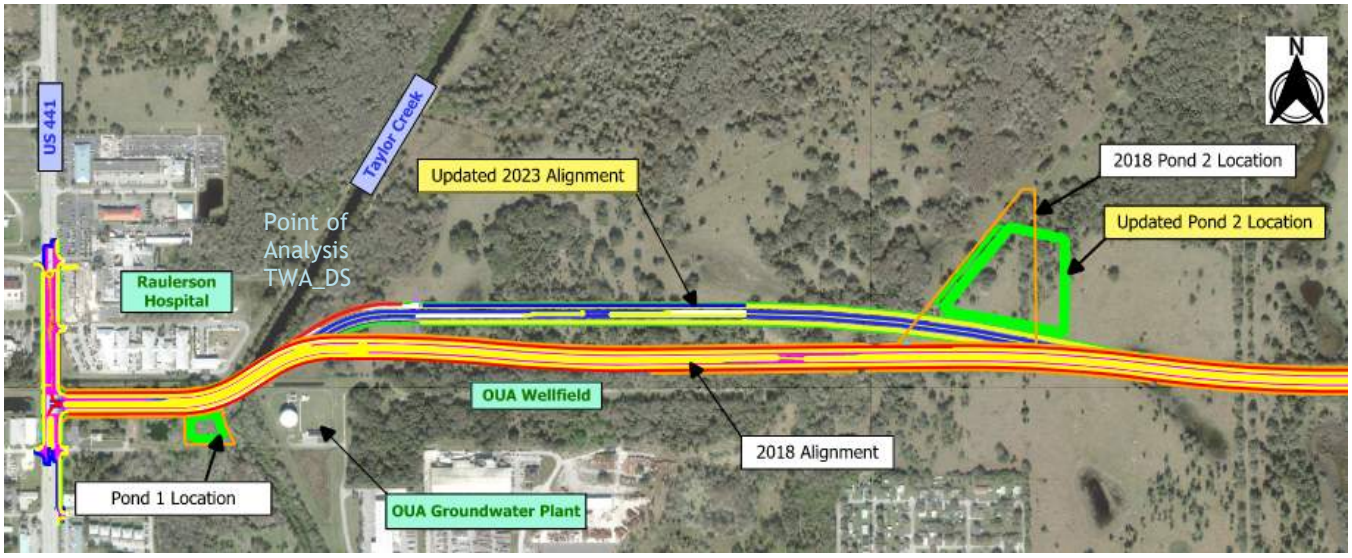


Figure 1: Comparison of 2018 to 2023 Roadway Design with Pond Locations

2. Pond Modifications

As a result of the northern shift of the roadway alignment, the proposed location of Pond 2 required redesign. The high point in the roadway also shifted with the new alignment to coincide with the proposed bridge culvert at Taylor Creek, which resulted in a control structure modification to accommodate the increase in required treatment volume due to the increased amount of contributing impervious area. As a result, there was a decrease in the amount of impervious area routed to Pond 1. However, no control structure nor pond design modifications were required for Pond 1. The new Pond 2 location is shown in **Figure 1**. See **Attachment 1** for revised Pond 1 and 2 Design Calculations.

2.1. Pond Design

The original Pond 2 was 8.25 acres, measured from the outside top of berm. The updated Pond 2 is 7.43 acres. The Normal Water Level (NWL) elevation set at 19.60 ft-NAVD was maintained with the redesign. Updated Pond 2 geometry is shown in **Attachment 2**.

The littoral zone and pond bottom elevations of 13.60 ft-NAVD and 1.60 ft-NAVD respectively were not changed with the redesign. A littoral zone area of 0.90 acres was required for the updated pond, with 1.11 acres being provided.

2.2. Control Structure Design

For the 2018 design, a treatment volume of 4.21 ac-ft was required, controlled by the total drainage area of 26.44 acres. The change in the roadway alignment also resulted in profile changes, which shifted the divide between Basins 1 and 2 west towards Taylor Creek, and routed more area to Pond 2. For the updated design, a treatment volume of 4.37 ac-ft is

required, controlled by the total drainage area of 28.49 acres. Due to this, a control structure modification is required to raise the treatment volume weir 0.1 feet to elevation 20.50 ft-NAVD. The weir width, structure type and grate elevation remained the same as the 2018 design. The orifice size was also unchanged. The Pond 2 outfall location is similar to the 2018 design, which is via a spreader swale to the downstream wetland of CD 3. This wetland ultimately overtops into Taylor Creek. There are no change to the Pond 1 control structure; it remains unchanged from the 2018 design and discharges to Taylor Creek.

2.3. POND PERFORMANCE

See **Table 1** for a comparison of performance between the 2018 and 2023 pond designs.

Table 1: Comparison of Pre and Post Tailwater (TW) Discharges

	Required TV (ac-ft)	Provided TV (ac-ft)	Berm Elev. (ft-NAVD)	25yr/72hr Stage (ft-NAVD)	Provided Freeboard (ft)
Pond 2	4.37	4.95	24.50	21.95	2.55

Note TV = Treatment Volume

Table 2 compares the total inflow into the downstream point of analysis and model tailwater for TWA_DS, which is downstream of the proposed Pond 2 site for the pre and post 25yr/72hr event to demonstrate attenuation criteria is still met.

Table 2: Comparison of Pre and Post TW Discharges

Tailwater Node (Downstream Point of Analysis)	25Y72H		
	Pre-Development Peak Inflow (cfs)	Post-Development Peak Inflow (cfs)	Difference (Post - Pre)
TWA_DS	4,172	4,170	-2.25

2.4. REQUIRED RIGHT-OF-WAY

A 9.51 acre parcel take with one property owner was required for the 2018 Pond 2 design. For the updated Pond 2, a 9.32 acres parcel take is required. The same property owner is affected with the Pond 2 redesign as was originally affected in 2018. The parcel area take includes the entire pond footprint, required area necessary to tie down to existing ground and the outfall swale west of the pond site.

2.5. CONVEYANCE

The proposed roadway conveyance system will utilize a closed system to convey runoff to Pond 2. Previous conveyance calculations will be revised for the updated alignment and updated Pond design as design progresses.

3. Conclusion

The 2023 modified Pond 2 design provided a comparable pond shape to the 2018 design, that meets freeboard and treatment volume requirements. Water quality treatment and attenuation criteria is still met with the new pond shape. Due to changes in the roadway alignment and profile, the Pond 2 basin area increased, which required a control structure modification to raise the pond's treatment volume weir. All other control structure geometry remained unchanged. A slight reduction in required right-of-way is achieved with the updated Pond 2 shape. Pond 2 is outside of the County-defined 400-feet wellfield protection area (per Okeechobee County LDC Section 6.02.00), and therefore specific pre-treatment as a result of the wellfield is not required.

Design criteria for discharge to the L-63N and Taylor Creek outfalls was coordinated with SFWMD during the design effort in 2017; since that effort, the L-63N has been listed as impaired for nutrients in addition to the previously identified Taylor Creek. As currently proposed, the design accomplishes pre-post Total Phosphorous removal, but exceeds the overall Total Nitrogen post-development loading by 55.1 kg/year to Lake Okeechobee. As part of the design process, nutrient removal options will be explored, which include: converting the required treatment volume within the wet detention pond to wet retention volume, utilizing nutrient removal technology within the wet ponds, utilize nutrient removal credits from the SR 15 (FPID 439032-1) currently under construction, partner with water quality projects within the basin to provide compensatory nutrient removal, and/or coordinate with stakeholders to see if funding can be provided for septic to sewer conversions.

Attachment 1
Pond Calculations

TREATMENT VOLUME CALCULATIONS FOR PROPOSED CONDITION

PROJECT: SR 710 - Pond 1 PREPARED: MRM 7/12/2023

LOCATION: OKEECHOBEE COUNTY, FLORIDA CHECKED: JAN 7/12/2023

Dry Retention Online Pond Treatment Calculations:

Required

Existing SR 15 (US 441) Pond within Project Extents

Only includes project limits along SR 15 (US 441)

Existing Imperv. Area along SR 15 to Remain =	3.81 Ac
Existing Imperv. Area redirected to SR 710 Pond 1 =	0.24 Ac
Total Existing Impervious Area to Existing Pond =	4.05 Ac
Proposed Impervious Area to Existing Pond=	4.20 Ac
Total New Imperv. along SR 15 =	0.39 Ac
Net Additional Imperv. Area to Exist. SR 15 Pond 1=	0.15 Ac

Includes Widening along SR 15 & Proposed SR 710 Development

Total Existing Impervious Area =	4.05 Ac
Total Proposed Impervious Area =	7.73 Ac
Total New Imperv. Area =	3.68 Ac
50% of 2.5" runoff from impervious area =	0.38 Ac-Ft
Required Treatment Volume =	**0.38 Ac-Ft**

Provided

Exist. Imperv. Area redirected from SR 15 =	0.24 Ac
Additional Impervious Area =	2.64 Ac
Total impervious area to Pond 1 =	**2.88 Ac**
Total Drainage area =	**4.51 Ac** *(Excluding Pond Area)*
50% of 2.5" runoff from impervious area =	0.30 Ac-Ft
50% of 1" runoff from drainage area =	0.19 Ac-Ft

Treatment Volume = Greater of 50% of 2.50" times percent imperviousness or 50% of 1.0" over drainage area.

Provided Treatment Volume = 0.30 Ac-Ft

Pond Storage Calculations (Dry Retention - Pond 1):

Elev. (NAVD ft)	h ft	Area sf	Area ac	Inc. Volume Ac-ft	Cum. Volume Ac-ft	Cum. Volume Cu-ft	Comments
22.50	1.0	32,899	0.76	0.616	1.834	79,889	Outside Edge of Berm
21.50	1.0	20,788	0.48	0.453	1.218	53,056	Top of Pond
20.50	1.0	18,667	0.43	0.405	0.765	33,323	
19.50	1.0	16,647	0.38	0.360	0.360	15,682	
18.50	0.0	14,727	0.34	0.000	0.000	0	Pond Bottom

SHGT El. = 14.5 feet

Provided Treatment Capacity within Pond

Control Structure Weir Elev. =	**19.60**
Treatment Capacity Provided =	**0.40 Ac-Ft**
Treatment Depth =	1.10 ft

TREATMENT VOLUME CALCULATIONS FOR PROPOSED CONDITION

PROJECT: SR 710 - Pond 2 PREPARED: MRM 7/12/2023

LOCATION: OKEECHOBEE COUNTY, FLORIDA CHECKED: JAN 7/12/2023

Wet Detention Online Pond Treatment Calculations:

Required:

Basin 2 Impervious Area Summary

Existing impervious area =	0.00 Ac
Proposed impervious area =	20.96 Ac
2.5" runoff from impervious area =	4.37 Ac-Ft
Required Treatment Volume =	**4.37 Ac-Ft**

Provided:

Total Impervious area going to Pond 2 =	**20.96 Ac**
Total Drainage area =	**28.49 Ac** *(Excluding Pond Area)*
2.5" runoff from impervious area =	4.37 Ac-Ft
1" runoff from drainage area =	2.37 Ac-Ft

Treatment Volume = Greater of 2.50" over Impervious area or 1.0" over drainage area

Provided Treatment Volume = 4.37 Ac-Ft

Pond Storage Calculations (Wet Detention - Pond 2):

Elev. (NAVD ft)	h ft	Area sf	Area ac	Inc. Volume Ac-ft	Cum. Volume Ac-ft	Cum. Volume Cu-ft	Comments
25.50	1.0	323,651	7.43	6.93	36.14	1,574,258	Outside Edge of Berm
24.50	0.5	280,091	6.43	3.19	29.21	1,272,388	Top of Pond
24.00	1.0	276,170	6.34	6.24	26.02	1,133,301	
23.00	1.0	267,458	6.14	6.05	19.78	861,486	
22.00	1.0	259,182	5.95	5.86	13.73	598,166	
21.00	1.0	250,906	5.76	5.67	7.88	343,122	
20.00	0.4	242,629	5.57	2.21	2.21	96,355	
19.60	0.0	239,144	5.49	0.00	0.00	0	NWL

Provided Treatment Capacity within Pond

Control Structure Weir Elev. =	**20.50**
Treatment Capacity Provided =	**4.95 Ac-Ft**
Treatment Depth =	0.90 ft

ORIFICE SIZING FOR PROPOSED CONDITION

PROJECT: SR 710 - Pond 2 PREPARED: MRM DATE: 7/12/2023

LOCATION: OKEECHOBEE COUNTY, FLORIDA CHECKED: JAN DATE: 7/12/2023

Pond 2 Orifice Calculations

Size the orifice to discharge no more than 0.5 inch over the basin in 24 hours (min. = 3").

1/2" of the required detention volume = (0.5 in.* (Total DA - Water Area)/12in/ft)

Total Drainage area = 28.49

1/2" runoff from drainage area = 1.19 Ac-Ft

Elev. (NAVD ft)	Pond Volume Ac-ft
20.00	2.21
19.60	0.00

Elev. = 19.80 ft. provides 1.11 Ac-Ft

Orifice Equation:

Orifice Discharge Treatment Volume = 1.19 ac-ft

Orifice Discharge Treatment Volume = 51700.64 ft^3

Recovery Time (t) = 24.00 hr

Conversion Factor (CF) = 3600.00 sec/hr

$$Q = \frac{TV}{2\,t\,CF}$$

Q = 0.299 cfs

Elevation of Required Treatment Volume = 19.80 ft

Flow line Elevation = 19.60 ft

h = Depth of water between top of treatment vol. and flow line

h = 0.20 ft

Orifice Equation: $$A = \frac{Q}{C\sqrt{2\,g\,h}}$$

A = 0.139 ft^2

$$D = \sqrt{\frac{4\,A}{\pi}}$$

D = 0.42 ft = 5.05 in dia

Use 5.00 inch orifice

PERMANENT POOL VOLUME CALCULATIONS FOR PROPOSED CONDITION

PROJECT: SR 710 - Pond 2 PREPARED: MRM 7/12/2023

LOCATION: OKEECHOBEE COUNTY, FLORIDA CHECKED: JAN 7/12/2023

Pond Storage Calculations (Wet Detention - Pond 2):

Elev. (NAVD) (ft)	h ft	Area sf	Area ac	Inc. Volume Ac-ft	Cum. Volume Ac-ft	Cum. Volume Cu-ft	
19.60	6.0	239,144	5.49	31.05	83.32	3,629,201	NWL (PPV)
13.60	12.0	211,627	4.38	52.27	52.27	2,276,881	Littoral Zone Bottom
1.60	0.0	167,851	3.85	0.00	0.00	0	Pond Bottom

Mean Depth of Pond (MD) = 15.2 ft

Littoral Zone Criteria

Lesser of: 20% of Wet Det Area or 2.5% of Total Basin Area (Including Pond)

Required Littoral Zone Area

Detention Area = 7.43 ac
Total Basin Area = 35.92 ac

20% Pond Area = 1.49 ac
2.5% of Total Area = 0.90 ac

Required Littoral Zone Area = 0.90 ac

Provided Littoral Zone Area 1.11 ac *(Area at NWL - Area at Littoral Zone Bottom)*

Anoxic Depth Criteria

Required Permanent Pool Volume (PPV)

$$FR = \frac{DACR}{WS}$$

Drainage Area to Pond (DA) = 28.49 ac
Runoff Coefficient (C) = 0.77
Wet Season Rainfall Depth (R) = 52 in
Length of Wet Season (WS) = 153 days

Average Flow Rate (FR) = 0.62 ac-ft/day

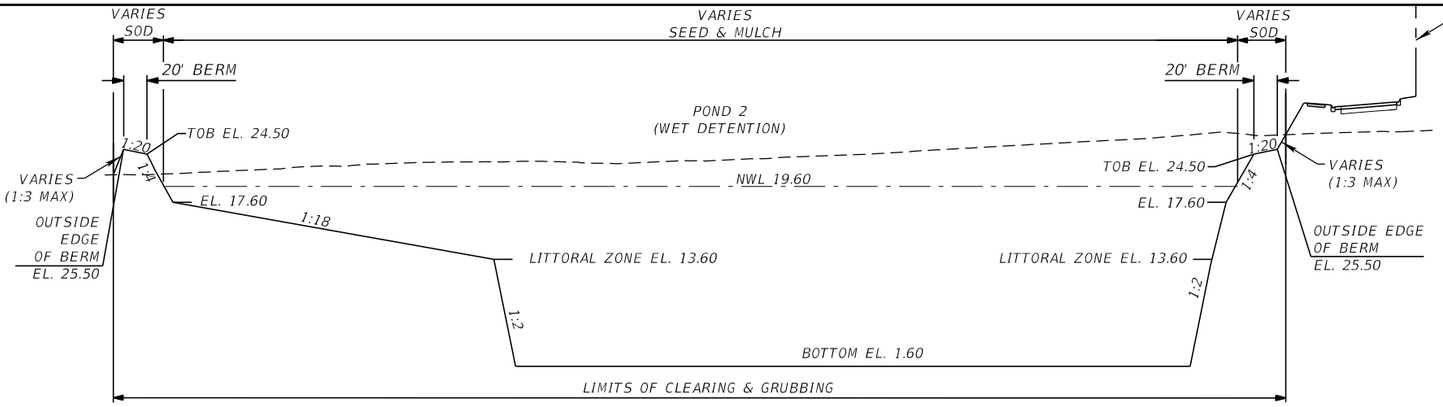
$$PPV = (RT)\ (FR)$$

Residence time (RT) = 21 days

Required PPV = 12.96 ac-ft

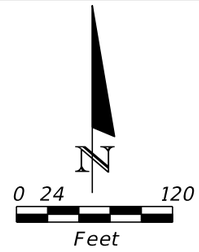
Provided Permanent Pool Volume 83.32 ac-ft

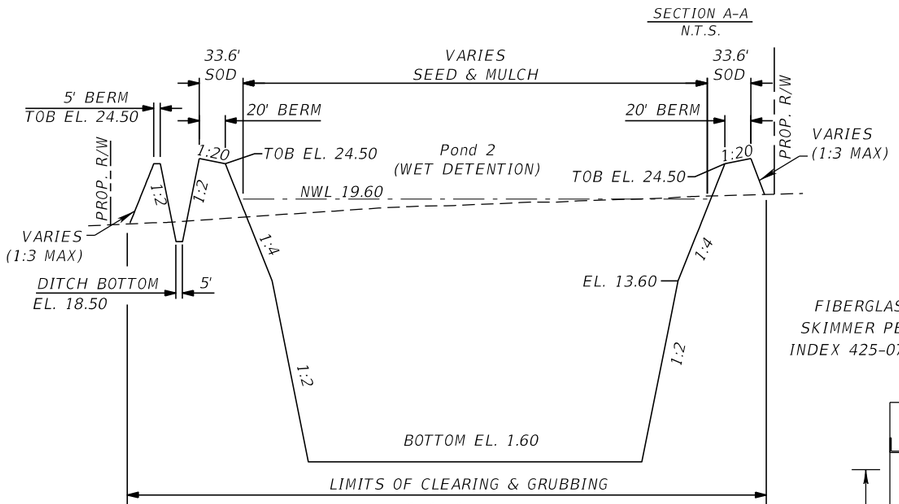
Attachment 2
Pond Geometry

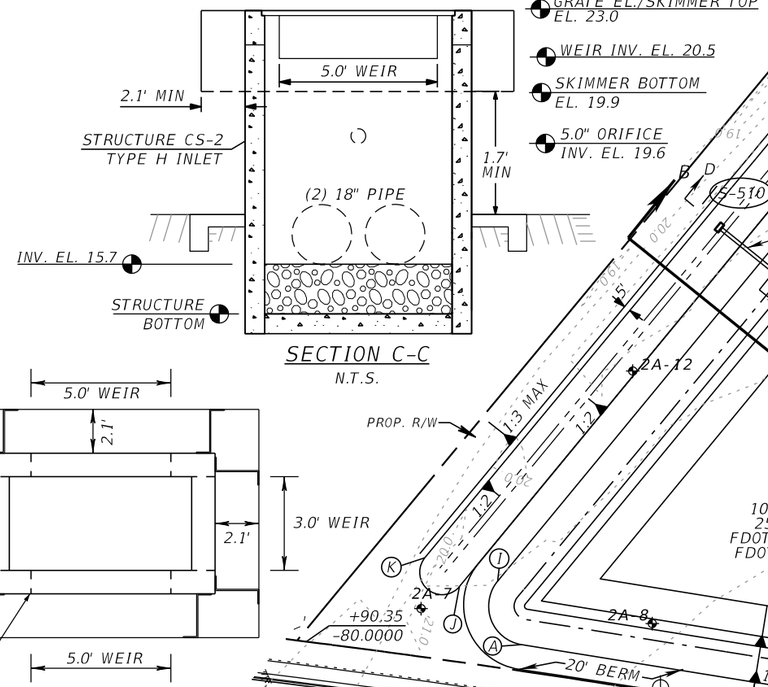


POND 2 CONTROL POINTS (FROM ℄ CONST. SR 710)

STA. (OFF)	LENGTH	RADIUS
A. 554+52.77 (100.02' LT)	A-B 233.4'	N/A
B. 556+83.42 (99.91' LT)	N/A	B-C 8,437.0'
C. 560+72.87 (100.93' LT)	N/A	C-D 30.0'
D. 561+02.69 (137.20' LT)	D-E 497.1'	N/A
E. 560+00.94 (623.31' LT)	N/A	E-F 30.0'
F. 559+73.83 (647.20' LT)	F-G 263.6'	N/A
G. 557+29.31 (653.15' LT)	N/A	G-H 30.0'
H. 557+03.97 (637.89' LT)	H-I 570.8'	N/A
I. 554+27.97 (145.59' LT)	N/A	I-A 30.0'
J. 554+00.07 (137.53' LT)	N/A	J-K 17.3'
K. 553+71.16 (155.75 LT)	K-L 566.5'	N/A
L. 556+49.31 (641.65' LT)	N/A	L-M 16.5'
M. 556+75.91 (625.21' LT)	M-J 566.6'	N/A

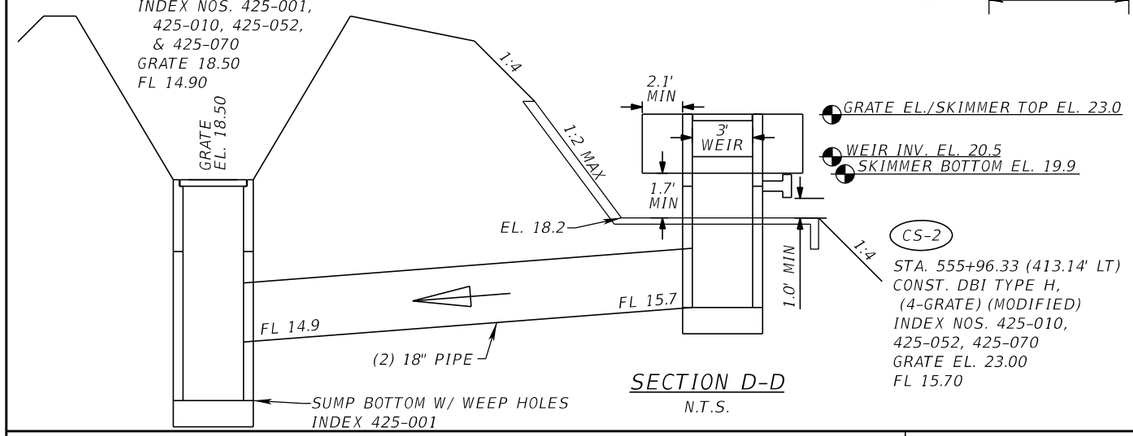






S-510

STA. 555+51.78 (439.89' LT)
CONST. DBI TYPE H, (4-GRATE) WITH SUMP BOTTOM & WEEP HOLES
INDEX NOS. 425-001, 425-010, 425-052, & 425-070
GRATE 18.50
FL 14.90



SECTION D-D
N.T.S.

CS-2

STA. 555+96.33 (413.14' LT)
CONST. DBI TYPE H, (4-GRATE) (MODIFIED)
INDEX NOS. 425-010, 425-052, 425-070
GRATE EL. 23.00
FL 15.70

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

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Certificate of Authorization No. 26123
E.O.R.: Gregory S. Seidel, P.E. No. 47571

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 710	OKEECHOBEE	419344-3-52-01

POND DETAILS
POND 2

SHEET NO.

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