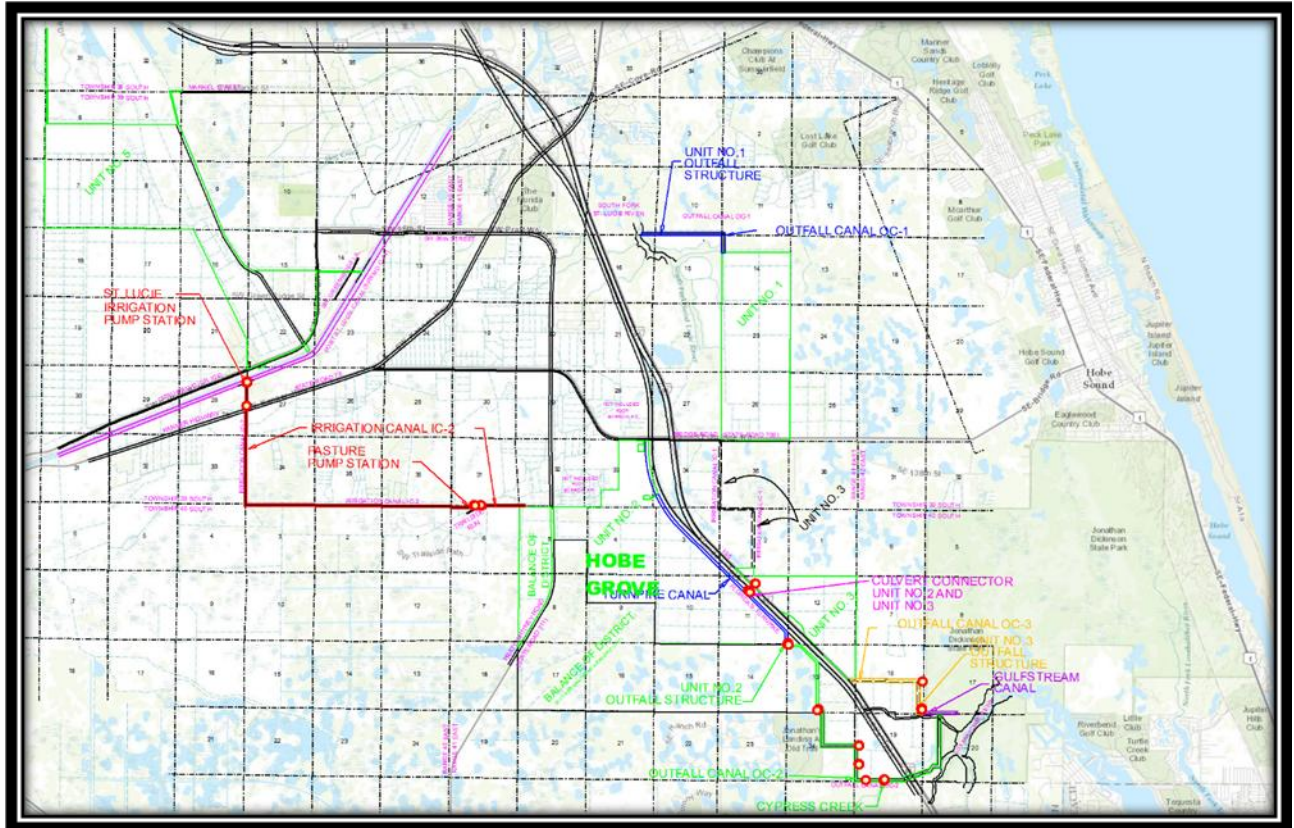


HOBE-ST. LUCIE CONSERVANCEY DISTRICT

2015 Facility Evaluation Report – Phase I



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07-18.7

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I. Introduction

On April 24th, 2013, this office was requested by the Hobe-St. Lucie Conservancy District (the District) to perform a review of the current condition of the Water Control Facilities for Units 1, 2, 3, and the “Balance of the District” under its jurisdiction and provide an evaluation of their current condition. The District further requested that the review be a two phased approach. Phase I will include water control facilities located in Unit 1, 2, and 3, and Phase II will include the “Balance of the District.”

Based on the review of these facilities, the general conditions of the canals were found to be good with aquatic weeds absent or at least less prevalent upstream than the downstream portions of the canal.

The St Lucie intake structure was found to be in good condition, however the intermediate “pasture pump” facility was found to be in fair to poor condition and is in need of attention. Shortly after this field visit the pumps were refurbished. The other irrigation canal IC-1 was found to be in good condition with some side slope erosion. Two of the three outfall structures were in good condition but the third, the outfall structure for Unit 2 “Cypress Creek Structure”, which was constructed in the 1960’s needed to be repaired, replaced, or removed.

The District files did not seem to be complete with several pipes and structures, either mentioned only in general terms or not reflected at all on the facility report or maps.

This specific issue was a concern during the 2004 hurricane season when several downstream blockages impacted District facilities and restricted flows. These structures continue to be a potential restriction in storm water discharges and a future maintenance concern.

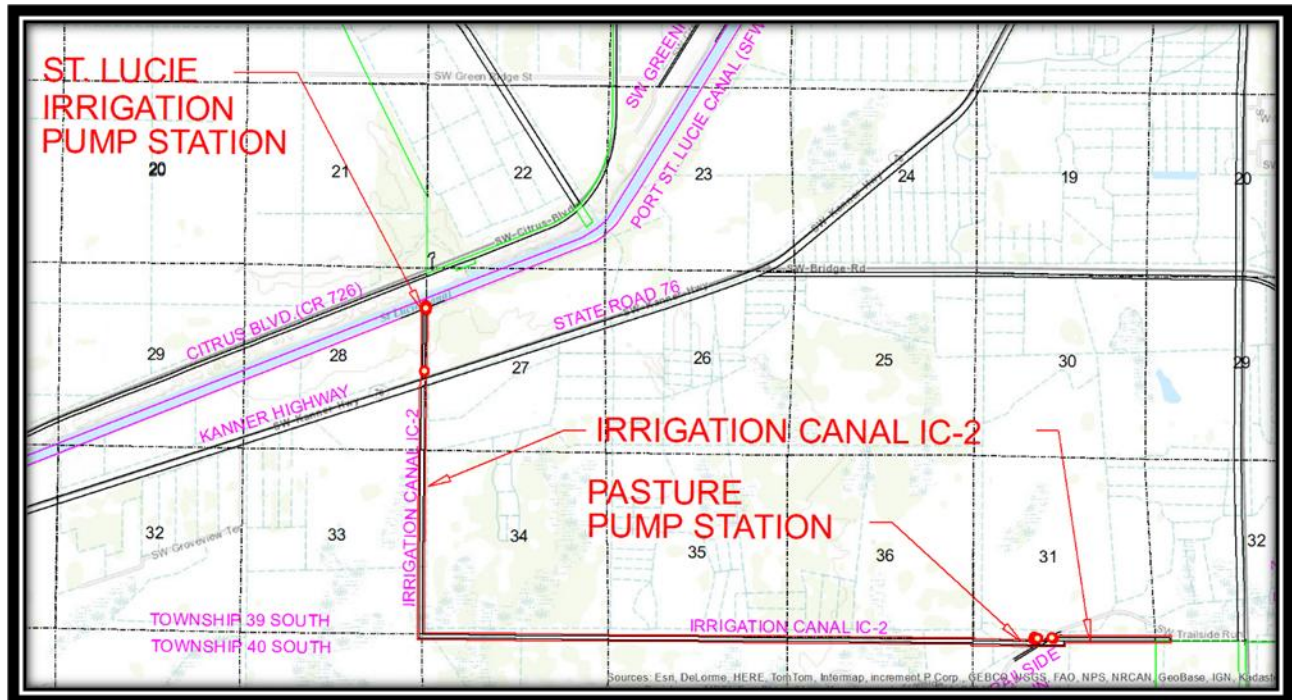
After evaluating the necessary repairs and replacement costs, it estimated that the District can be expected to expend approximately \$100,000 in the next five years.

To summarize, this office believes the following to be the major areas for the District to focus on.

1. Address the erosion around the St. Lucie Irrigation Pump Station outfall before damage is done to the infrastructure.
2. Address the leak at the Unit Number 3 Outfall Structure.
3. Continue an aggressive aquatic weed control program. St. Lucie Canal to Unit 2 (IC 2)

II. Surface Water Irrigation System

The canal IC 2, as designated on the District facility maps, provides irrigation water to a portion of the District. It draws water from the St. Lucie Canal, discharging to the west side of Unit 2.



A. *St. Lucie Irrigation Pump Station*

The intake structure is located on the St. Lucie Canal approximately 6 miles west of the Florida Turnpike and north of the Kanner Highway. The pump station consists of two 25,000 gallon per minute vertically mounted axial flow pumps with 150-horsepower electric motors. Drive shafts and gear heads connect the pumps with the motors. Pump operation is controlled by floats and timers. Timers are used to take advantage of off-peak electrical power rates. These motors and pumps were installed in their current configuration approximately 17 years ago. At that time the existing steel sheet pile fore-bay was improved with the installation of concrete walls. In 2013 both pumps were refurbished. A sound barrier wall was added facing the canal. The resulting structure is in good condition and would be expected to serve the District at least 15 more years into the future.

The motors are in good condition and should have an expected life of greater than 15 years. Both pumps were recently refurbished in 2013.

The pump house, a concrete block building with a removable roof, appears to be in good condition. The entire facility is enclosed in a 6 foot chain link fence which is also in good condition with the exception of the corrosion where it comes into contact with the concrete. Additional supports have been welded on to the fence to provide structural strength. In the future the fence posts will likely need replacement. It is recommended the posts be properly treated anywhere they come in contact with concrete. The only areas that

may be subject to improper access is from the St. Lucie Canal. As a result, The District may wish to consider adding additional security and warning measures to the structure on the portion facing the Canal.

St. Lucie Irrigation Pump Station



Recommended Maintenance:

Erosion around headwalls of pump discharge needs to be addressed (Short Term).



The fencing around the intake structure which was contacting the cement corroded near the contact point. A short term repair has been made by welding braces to the fencing. At this

time the repair is holding up fine, but should be watched for additional corrosion. Fencing should be budgeted for replacement (Mid to Long Term).



Flap gates in stilling well were replaced this year. A grease fitting was installed that will allow for the flap gates to be greased from the stilling well opening. Before greasing, the flap gate hinges required a maintenance person to go into the stilling well which is time consuming and challenging.



B. Kanner Highway Culvert

During a freeze that occurred in the past both pumps were running and water reportedly was observed flowing over the road. With the refurbishment of the pumps it can be expected that the pumps will be pumping closer to their design flow rates. A HEC-RAS and S2DMM analysis was performed which showed the two 42" Culverts and the Irrigation Canal (IC-2) are capable of providing conveyance for both pumps turned on. Regular maintenance is required.

The channel itself is in relatively good condition, and while some nuisance species were observed, it does not appear to impede the flow of the channel. The entire Channel recently was mechanically cleaned. Regular maintenance is required.



C. Pasture Pump Station

Approximately 5 miles downstream of the St Lucie Pump Station is a secondary pump station where the canal intersects with Trilside Drive and is referred to as the “Pasture Pump” in the various District reports. The Pasture Pump Station is a booster pump station located between the St. Lucie Canal Pump Station and HSLCD. This pump station is used to raise the head on the water pumped from the St. Lucie Canal. Two 25,000 gallon per minute pumps, with 50 horsepower electric motors are used to increase the water level in the canal. These pumps are belt driven. The Pasture Pump, draws water from the channel lifts it over an internal canal, not related to District works, and discharges into a structure and a single 48 inch RCP carries the discharge under the road to the continuation of the IC 2.

Both Pasture Pumps were refurbished earlier this year. This pumping station is protected on the west from floating debris by a wood grate and dock. The dock and grate system are wood and are in good condition.

The intakes to the pump wells, originally installed in the 1960’s, are also in need of repair and possibly may need to be replaced. As they were submerged it was not possible to inspect them directly.

The North motor is relatively new approximately (11 years old), however the south motor is estimated at approximately 35 years. While the south motor has been rewound twice over the past 35 years, its open design makes it prone to damage from the elements. For these reasons it is recommended the District budget for replacement of this motor within the next 10 years.

The pumps have a roof enclosure that while functioning, is in fair shape. The District should improve this structure in the near future, however, as mentioned it is functioning at a basic level.

The District has constructed a secure fence enclosure to protect the pumps and intake fore-bay. The Gate while locked was easily opened with a tug. It is recommended the fence gate posts be reinforced with additional concrete anchoring to make the lock effective or use a chain around fence posts to lock the fence.

The outfall, a single 48 inch culvert is in good condition.





Maintenance Recommendations:

Recommend a chain around the gate near the weed barrier to securely lock the gate.

D. Irrigation Culverts

Downstream of the Pasture Pump Station are three CMP risers, one of which diverts flow to the Thomas Produce fields to the south, while the other two maintain flows to an access point for Unit 2 to the East. These were recently replaced within the last year.



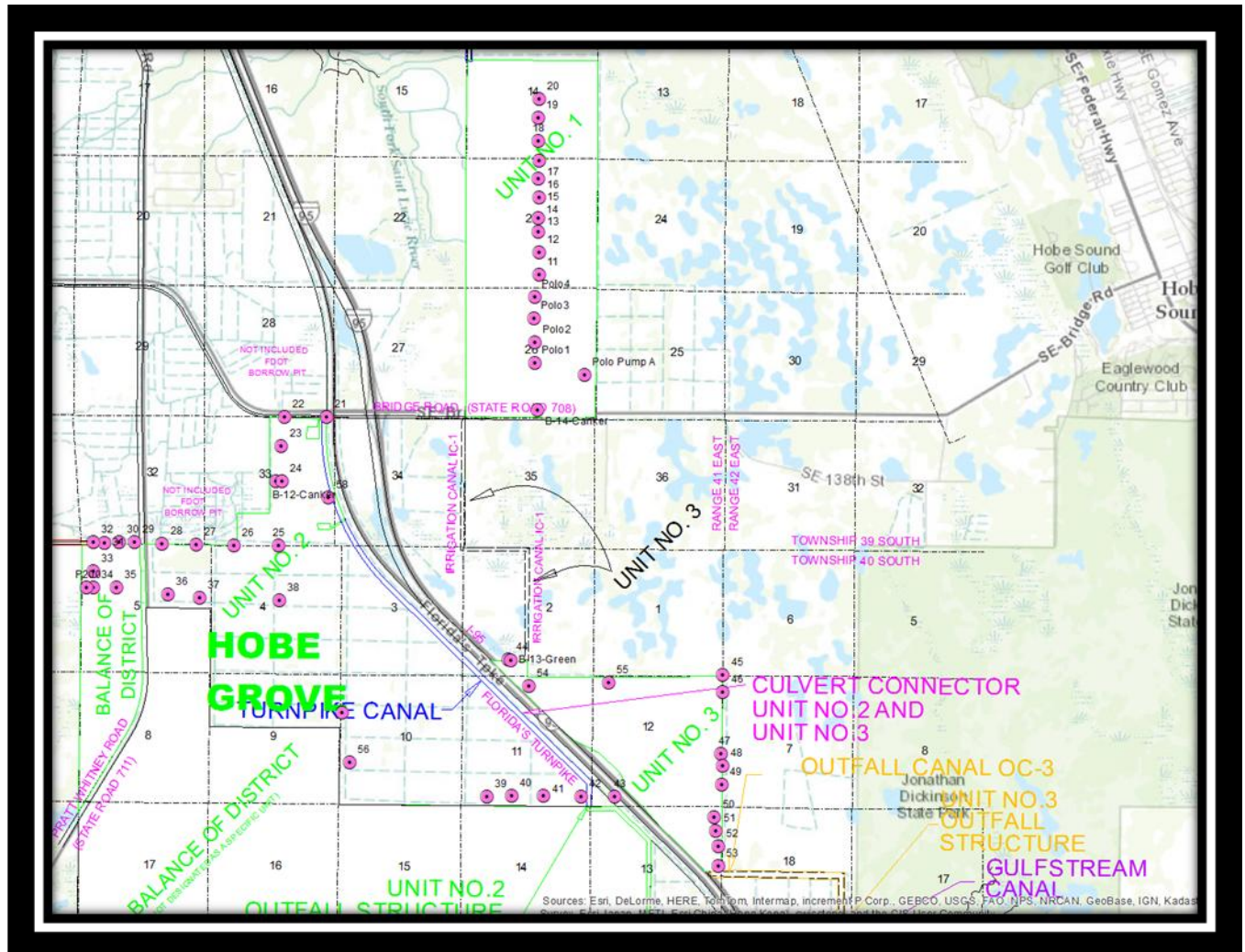
Irrigation Culverts (aerial view)



Irrigation Culverts

III. Ground Water Irrigation System

Map of Irrigation Wells and evaluation of the pumps.



The groundwater irrigation system is rarely used. Pump 48 in Unit 2 is regularly used. All of the Landowners in HSLCD have signed a High Level Maintenance Agreement whereby they are responsible for maintaining the HSLCD facilities on their land which includes the wells. The landowners are remiss in not maintaining the wells based on a field inspection of each. Board direction on the enforcement of the High Level Maintenance Agreements as it pertains to the wells is needed. The irrigation system in the sugar cane fields has recently been modified from the prior citrus operation. Additional acreage in Unit 2 is in the process of being converted to sugar production. Should there be a need for more irrigation water than the surface water irrigation system can provide then wells 39, 40, 41 and 42 can be utilized to provide an

additional 2,000 gpm. The irrigation piping on these wells will likely need to be replaced for them to work effectively.

One ongoing problem with many of the wells that were not working was a blown fuse on the power pole. Many of the District wells are not operational at this time but could become operational within a short period of time. Some wells were missing pumps and motors.

A. Unit 1

FAC_NAME	PUMP TYPE	WELL DIA	PUMP CAPACITY	WELL DEPTH	CASED DEPTH	Unit	Motor	Pump	Submersible	Working	Comments
11	ELT	8	362	90	70	1	yes	yes		no	
12	ELT	8	516	90	70	1	no	no		no	
13	ELT	8	615	90	70	1	no	no		no	
14	ELT	8	688	90	70	1	yes	yes		no	
15	ELT	8	548	90	70	1	yes	yes		no	
16	ELT	8	561	90	70	1	yes	yes		no	
17	ELT	8	594	90	70	1	yes	yes		no	
18	ELT	8	556	90	70	1	yes	yes		no	
19	ELT	8	521	90	70	1	yes	yes		no	
20	ELT	8	483	90	70	1	no	no		no	no picture, no gps location
Polo Pump A	CEN	0	275	0	0	1					
Polo1	TUR	10	500	110	70	1			yes		
Polo2	TUR	10	500	110	70	1			yes		
Polo3	TUR	10	500	110	70	1			yes		
Polo4	TUR	14	500	110	70	1			yes		

B. Unit 2

FAC_NAME	PUMP TYPE	WELL DIA	PUMP CAPACITY	WELL DEPTH	CASED DEPTH	Unit	Motor	Pump	Submersible	Working	Comments
21	ELT	6	822	90	70	2	yes	yes	no	no	motor wants to come on needs maintenance
22	SUB	6	489	90	70	2			yes	no	motor broken
23	ELT	6	704	90	70	2	yes	yes	no	yes	Broken pipes need to be fixed to use
24	SUB	6	427	90	70	2			yes	yes	in great condition, for pink grapefruit, filter
25	ELT	6	666	90	70	2	yes	yes	no	no	Fuse on pole blown, cover off put back on needs bolts
26	ELT	6	362	90	70	2	yes	yes	no	no	Fuse on pole blown
27	ELT	6	617	90	70	2	no	no	no	no	Fuse on Pole low, powerline bad
28	ELT	6	477	90	70	2	yes	yes	no	no	Fuse on pole blown
36	ELT	6	490	90	70	2	yes	yes	no	yes	needs packing
37	ELT	6	206	90	70	2	no	no	no	no	motor and pump were moved to 36
38	ELT	6	392	90	70	2	yes	yes	no	yes	in good condition
39	ELT	10	741	90	60	2				yes	piping is broken
40	ELT	10	680	90	60	2				yes	piping is broken
41	ELT	10	311	90	60	2				yes	piping is broken
42	ELT	10	0	90	80	2				yes	piping is broken
43	ELT	10	0	90	60	2	no	no	no	no	well caved in years ago IFAS experiment
55	TUR	10	819	130	126	2	yes	yes		no	Likely a Power issue
56	TUR	10	0	141	84	2	no	no	no	no	well is covered over since at least 1995 gps location off
57	TUR	10	607	120	96	2	no	yes	no	no	crossing is gone needs repiping
58	ELT	10	0	128	80	2	no	no	no	no	well needs to be replaced

C. Unit 3

FAC_NAME	PUMP TYPE	WELL DIA	PUMP CAPACITY	WELL DEPTH	CASED DEPTH	Unit	Motor	Pump	Submersible	Working	Comments
44	ELT	6	0	90	70	3					not observed
45	ELT	6	522	90	70	3	yes	yes		yes	
46	ELT	6	316	90	70	3			yes	yes	
47	ELT	6	481	90	70	3	yes	yes		yes	
48	ELT	6	621	90	70	3	yes	yes		yes	pump regularly used, fills water trucks
49	ELT	6	591	90	70	3	yes	yes		yes	
50	SUB	10	440	90	60	3			yes	no	switch gear frozen
51	ELT	10	427	90	60	3	yes	yes		yes	
52	TUR	6	522	90	60	3	yes	yes		yes	Pipe broken
53	SUB	6	362	90	60	3					
54	SUB	6	119	90	60	3			yes	no	

D. Balance of the District

FAC NAME	PUMP TYPE	WELL DIA	PUMP CAPACITY	WELL DEPTH	CASED DEPTH	Unit	Motor	Pump	Submersible	Working	Comments
29	ELT	6	666	90	70	Bal	yes	yes	no		
30	ELT	6	738	90	70	Bal	yes	yes	no		
31	ELT	6	0	90	70	Bal	No	Maybe	no		
32	ELT	6	0	90	70	Bal	yes	yes	no		Removed from Permit 4/11/14
33	ELT	6	636	90	70	Bal	yes	yes	no	no	Likely power problem
34	ELT	6	703	90	70	Bal	yes	yes	no	yes	
35	ELT	6	0	90	70	Bal	no	yes	no	no	no motor

UNIT NO.1
OUTFALL
STRUCTURE

SOUTH FORK
ST. LUCIE RIVER

OUTFALL CANAL OC-1

OUTFALL CANAL OC-1

UNIT NO. 1

NOT INCLUDED
FOOT
BORROW PIT

BRIDGE ROAD (STATE ROAD 708)

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Most of the internal canals in Unit 1 have been filled in and conveyance of storm water is a problem in heavy rains. The remaining internal canals in Unit 1 have serious canal bank erosion as a result of the cattle tearing up the banks to get down to water and then back out again.



Erosion from cattle

A. Outfall Canal 1 - OC-1

The south and west banks of the OC-1 outfall canal are heavily overgrown with vegetation encroaching into the canal itself. The canal must be maintained from the north and east banks using a long stick back hoe, which is more expensive to operate.

As with the OC-2 and OC-3 canals, the OC-1 canal currently provides the only means of positive outfall for this unit and as such, should remain a priority issue to ensure its proper functioning.



B. The 72" Culvert for water from State Lands



Intake from side



Intake from top

Just upstream of the outfall culvert there is an erosion problem and an old turbidity barrier that needs to be addressed.



C. Unit Number 1 Outfall Structure

The outfall structure for Unit 1 is of similar design and age as the Unit 3 outfall and in similar condition. The gate spindles were in good condition. The structure was fully open and currently is maintained in this position.



Upstream of Structure

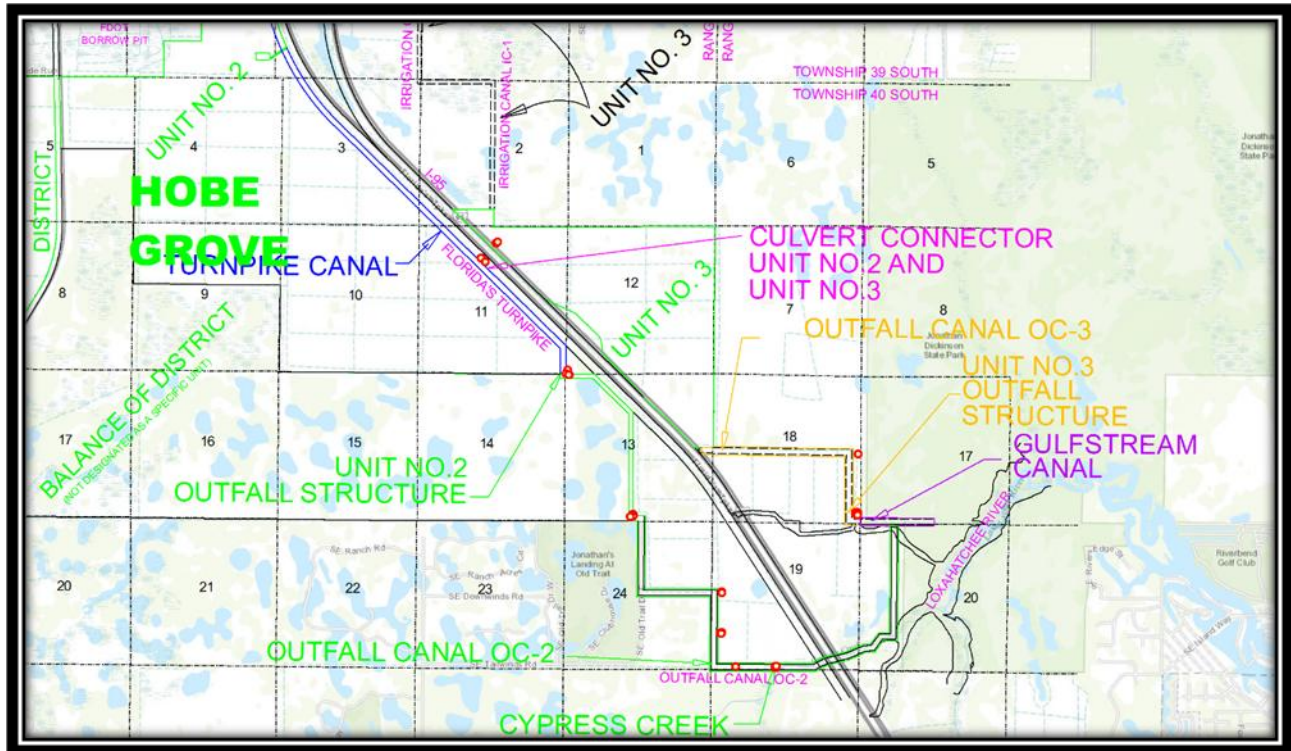


Downstream of structure



Old replaced structure downstream of structure OC-1

V. Unit Number 2



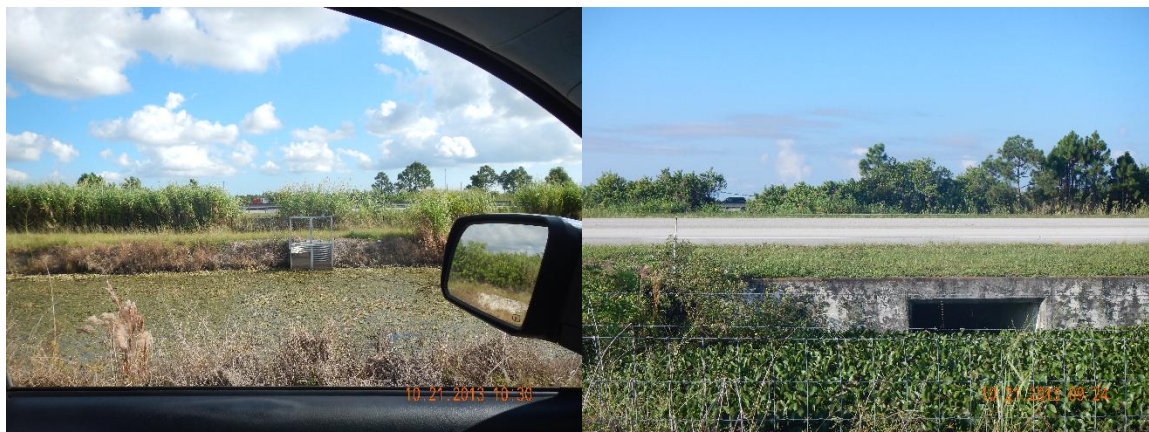
A. Turnpike Canal

Based on a field review this canal is in good condition.

B. Unit Number 2 Outfall Canal – OC-2

Canal is in good condition.

C. Culvert Interconnect between Unit 2 and Unit 3



Aquatic vegetation on both sides of the culvert could be cleared if conveyance presents a problem. At this same location two culverts with risers have been replaced for the Turnpike Canal to provide irrigation to the South.



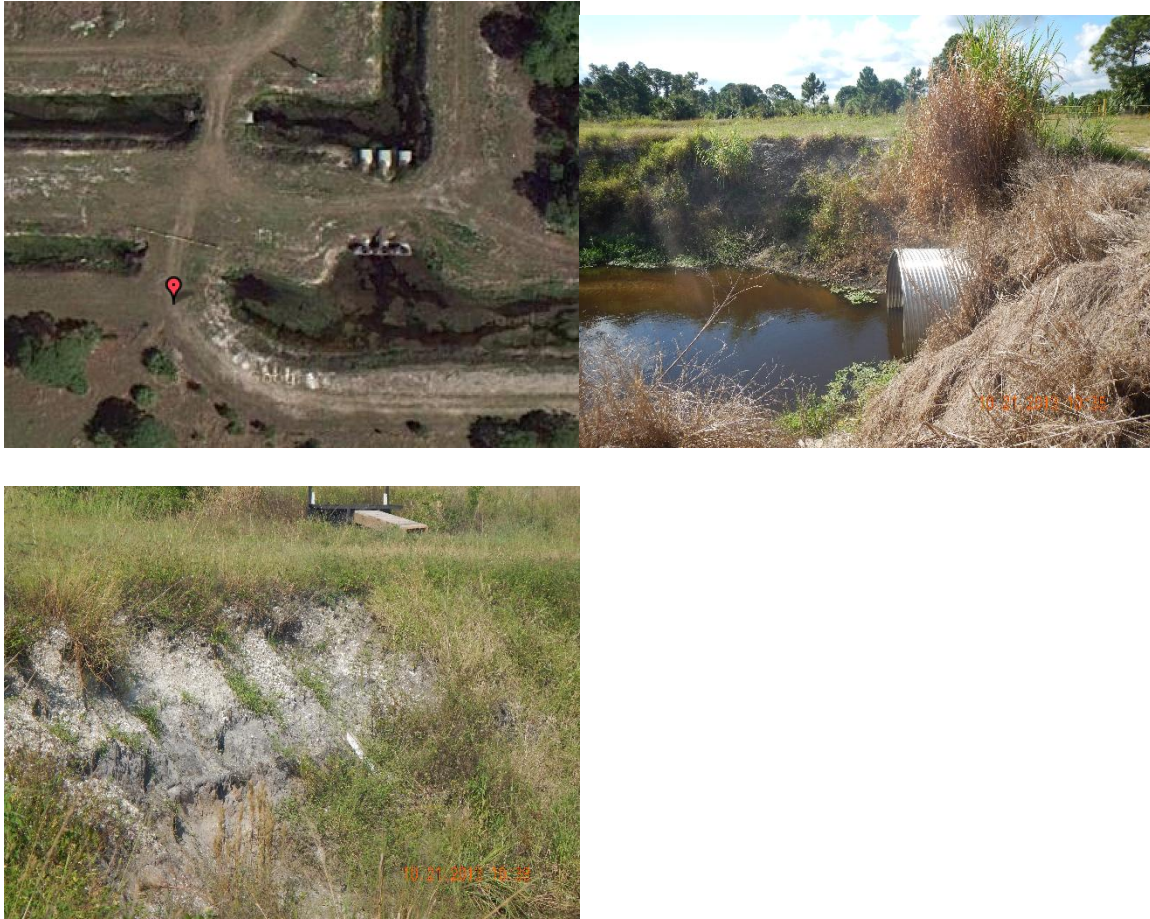
D. Unit Number 2 Outfall Structure



New Culverts upstream

New Culverts Downstream





The three 84" culverts in the pictures which head south were replaced in January. The flash board risers were moved to the north side of the structure. Some erosion on the banks is evident and should be repaired.

E. New Culvert Crossing SE corner of Balance of the District



Previous Culvert Crossing

New Culvert Crossing



North Side of New Culverts



South Side of New Culverts



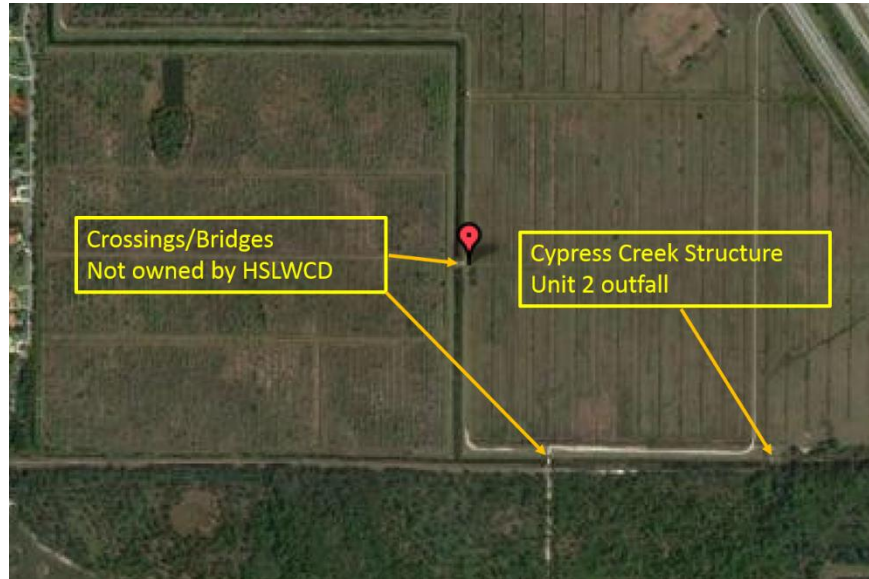
East side of Ninejem Culverts



West side of Ninejem Culverts

There are currently three crossings over the canal and a catwalk crossing associated with the Cypress Creek structure. This is Crossing Number 1. While preliminary review of District documents indicates that at least two crossings are required as part of prior agreements, their specific location, and need for a third is unclear. Obviously any culvert crossing or restriction in the canal has the potential to plug, and obstruct flows. This crossing (SE corner of Ninejem) was recently replaced with double 96" CAP shown in the pictures.

F. Canal Crossings 2, 3 and the Cypress Creek Structure



The canal appears to be in good condition but is accessible only from one side. This is generally not an issue but will require specialized equipment, such as a long stick back- hoe to maintain the banks. Due to the amount of berm material and vegetation on the opposite bank, the District would need to enter into an extensive long term program to clear these banks to be accessible from both sides, which may not be practical.

As with IC-2, the District will need to aggressively treat the canal to maintain aquatic weeds at a level that does not impact flow. It is recommended that the maintenance of this canal should be at a higher level of maintenance than the irrigation canal, since failure to do so may cause the numerous crossings and discharge structures to become plugged and as a result interrupt storm water discharges.

Crossings 2 and 3 are of unknown age, but are in fair condition. The older culvert pipe crossing known as the MacArthur crossing is in good condition. Other than the resulting constriction there are no issues anticipated for the foreseeable future. The third structure, which is a concrete bridge going to Indian Town Road, is constructed on concrete piers and while no fractures were observed there were some gaps observed in the decking. Due to the age of the structure, it is recommended that the District send a letter to SFWMD recommending they have this bridge repaired or removed.

The Cypress Creek outfall structure was in poor condition and in need of replacement or repair. The structure was supported, in part by steel uprights that were severely corroded with portions of the supports corroded through. In addition, these supports acted to catch floating debris as waters discharge through the structure, causing a blockage and additional stress on the structure. Because this structure and aquatic plant debris posed a significant concern to the functioning of the outfall facility, the supports and catwalk were removed.



North Crossing



Cypress Creek Canal West of Bridge



Cypress Creek Canal East of Bridge

Cypress Creek Structure



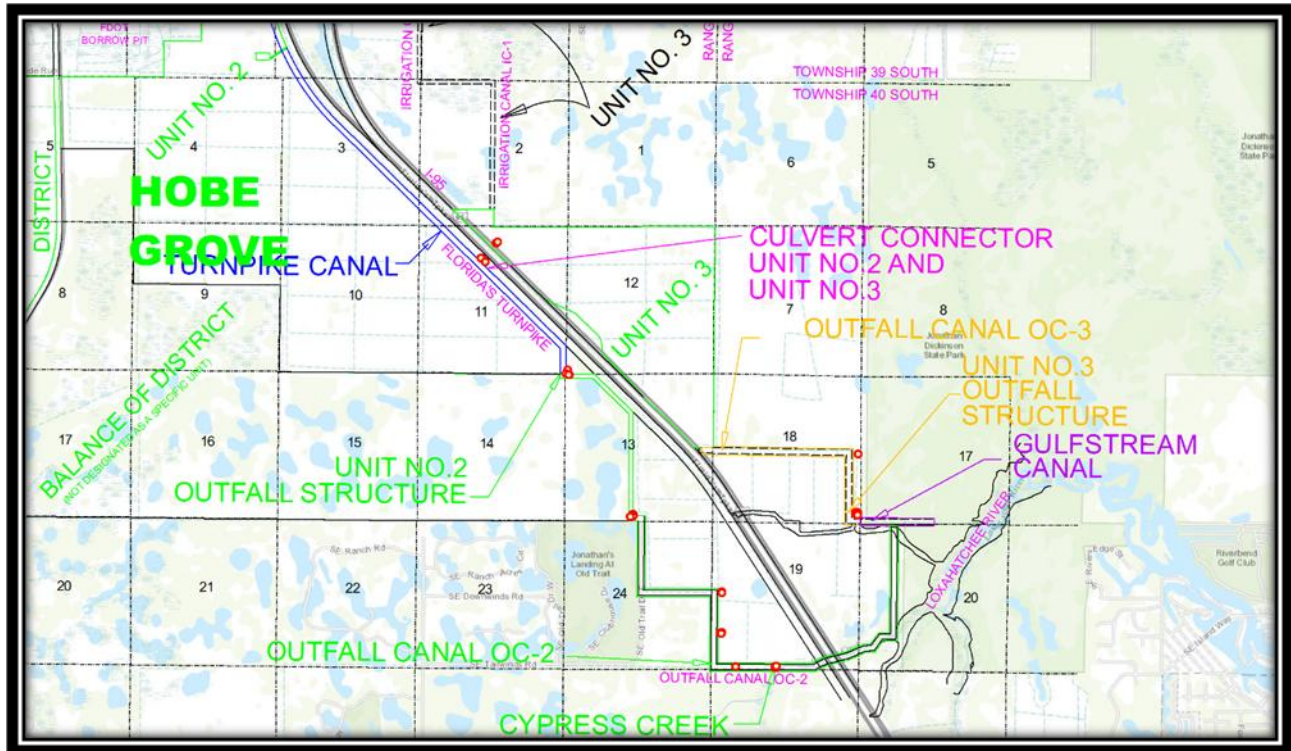


Structural components rusted through
Discharge



Historic Cypress Creek

VI. Unit Number 3



A. Unit Number 3 Outfall Canal

The Unit 3 outfall, commencing at the southeast corner of Unit 3, is in fair to good condition with aquatic weeds matting in isolated locations without currently impacting flows. However aggressive maintenance treatment on all canals shall remain a continuing issue.



Canal bank erosion

Canal bank erosion

B. Unit Number 3 Outfall Structure

The outfall structure was constructed in 1993 and appears to be in good condition however, it was observed that some wash outs along the edge of the structure are occurring. These wash outs should be repaired as soon as possible and additional erosion protection measures implemented to protect the structure from further erosion. Also cap repair is needed where the structure is leaking.

The spindles for the gates will also need to be replaced as they are bent and out of alignment. This likely occurred as a result of over tightening the gates, causing the aluminum spindles to bend. As a result, any effort to replace these spindles should also include installation of a lock nut, to prevent them from being damaged in the future.



Structure



Downstream Bank Erosion



Bent Stem



Bent Stem



Erosion upstream of Structure
sheetpile

leakage under concrete cap/corrodged

C. Unit 3 Interconnect IC-1

While this canal is easily accessible and the banks are in good condition, the overwhelming presence of water lettuce, make this canal of little use in moving water. The canal is no longer maintained for that purpose and is predominately maintained as an irrigation reservoir for Unit 3.

While the District may no longer consider moving irrigation water through this canal, having the capability to move storm water under emergency conditions may prove advantageous should the Unit 1 or Unit 3 canals exceed their capacity.

Should the District ever consider using this canal in the future for any purpose other than water storage, then mechanical removal of the aquatic weeds will be required.

VII. Findings and Recommendations

After refurbishing all of the large irrigation pumps and replacing several culverts the HSLCD infrastructure over all is in very good shape. Top priorities are:

1. Address the erosion around the St. Lucie Irrigation Pump Station outfall before damage is done to the infrastructure.
2. Address the leak at the Unit Number 3 Outfall Structure.
3. Repair, replace or remove the Unit Number 2 Outfall Structure.
4. Continue an aggressive aquatic weed control program. St. Lucie Canal to Unit 2 (IC-2)

There was a concern that only one of the 25,000 gpm pumps was able to run at one time at the St. Lucie Irrigation Pump Station and the Pasture Pump Station. An analysis was performed to determine the two existing 42" Kanner Highway culverts are adequate to convey the flow of

two pumps if properly maintained. An analysis of the demands could also be useful to determine the need for using two pumps.

It is recommended that the District consider real time monitoring and controls to be installed at the St. Lucie and Pasture irrigation pump stations. Currently setting the float controls on the pasture pump is a bit of an art due to the changing timing and volume of irrigation demands from the different users of irrigation. Utilizing historic stages and pump volumes, trigger levels can be set and changed more effectively when the power schedule is modified.

VIII. Estimated Maintenance Cost Table

HSLCD

Estimated Replacement Costs

Short Term
0 to 4 years

CANAL	Location	Project	Priority	units	unit cost	Estimated Costs
IC2	St. Lucie Irr Pump Station	Errision around outflow structure	7	1 LS	\$10,000	\$10,000
IC2	Kanner Hywy	desilt twin 48"	6	160 LF	\$50	\$8,000
IC2	Pasture Pump	Replace forebay grate and dock	3	300 SF	\$65	\$19,500
IC2	St. Lucie Irr Pump Station	replace fence posts that are corroding	5	1 LS	\$4,000	\$4,000
U3	Outfall structure	repair leak under concrete cap	1	1 LS	\$10,000	\$10,000
U3	Outfall structure	replace gate spindels	8	45 LF	\$170	\$7,650
U3	Outfall structure	install stops on gate spindels	9	3 EA	\$85	\$255
U3	Repair Errision	errision repair i.e. sandcement etc.	2	1 LS	\$20,000	\$20,000
U1	Outfall structure	errision repair	4	1 LS	\$20,000	\$20,000
U1	Outfall structure	install stops on gate spindels	10	3 EA	\$100	\$300
Total Estimated Short Term Cost						\$99,705

Mid Term
5 to 12 years

IC2	St. Lucie Irr Pump Station	add real time monitoring & controls	11	1 EA	\$25,000	\$25,000
IC2	Pasture Pump	add real time monitoring & controls	12	1 EA	\$25,000	\$25,000
Total Estimated Mid term Costs						\$50,000