

# Project Name: Grove Land Reservoir & Stormwater Treatment Area

**Project Location:** Okeechobee and Indian River counties

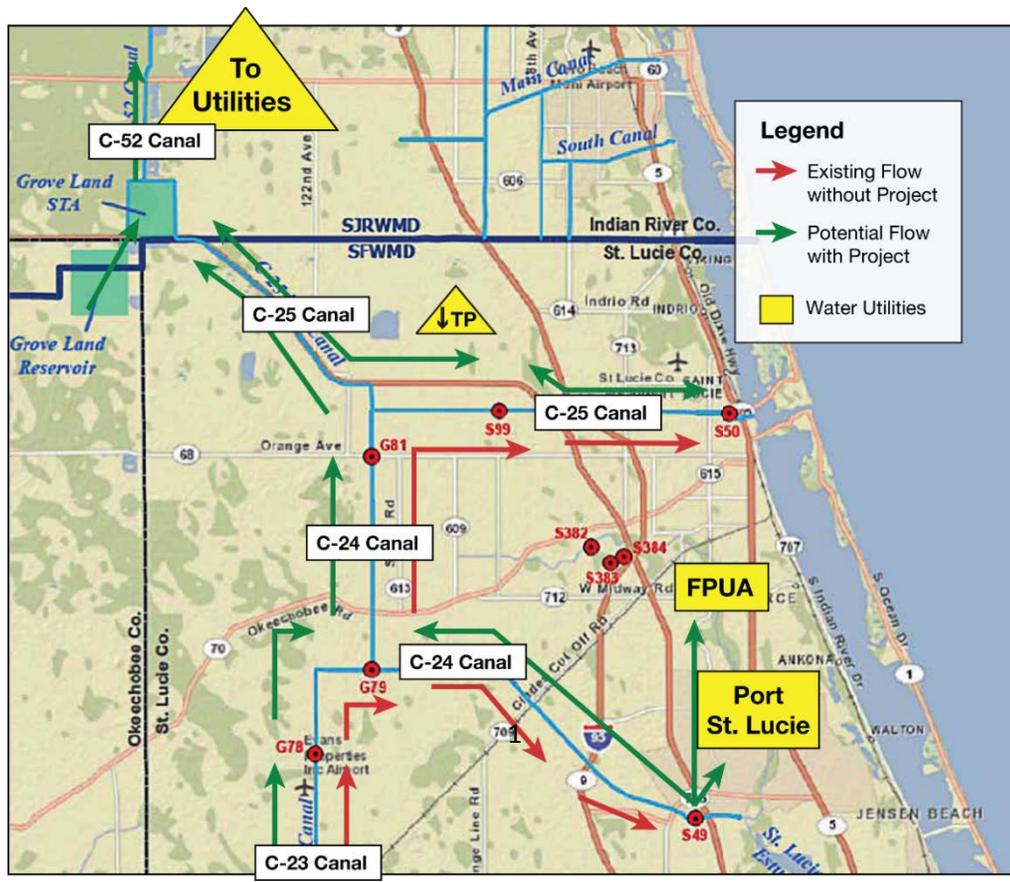
**Project Number:** 144

**Project Type:** Water Storage / Water Resource Development Project

## Description of project:

The proposed Grove Land Reservoir and STA (GLRSTA) is located in northern Okeechobee and southern Indian River counties on land owned by Evan's Properties, Inc. The project consists of a 5,000 acre reservoir, 2,000 acre storm water treatment area (STA), intake/discharge structures, conveyance improvements and other associated facilities. The GLRSTA Project is selling storage and treatment, not water. This regional water supply project, its water source, and ultimate water supply destinations are provided in **Figure 1**. The reservoir water supply would consist of excess stormwater runoff captured from the C-25, C-24, and C-23 basins via the C-25, C-24 and C-23 Canals owned by the South Florida Water Management District (SFWMD). The reservoir would also be able to store water flows from the C-52 watershed via the C-52 flow-way owned by the St. Johns River Water Management District (SJRWMD). As part of this Project, the hydraulic connection between these two water management districts would be re-established.

Water from the reservoir would enter the stormwater treatment area (STA) which would be sited north of the reservoir. The STA would reduce total phosphorus (TP) and total nitrogen (TN) concentrations. This treated water could be discharged to the SJRWMD C-52 flow-way (and subsequently north to the St. Johns River) or to the SFWMD's C-25 Canal (and subsequently



**Figure 1**

**Conceptual Diagram of the Grove Land Reservoir and Stormwater Treatment Area south to the C-24 and C-23 Canals) for water supply and environmental deliveries.**

The project is expected to provide a variety of benefits to water utilities, landowners and government agencies including

1. **Surface Water Augmentation.** Water users in the SJRWMD and the SFWMD would benefit as the Project provides supplemental water supplies using the St. Johns River, existing canals, and/or constructed conveyance infrastructure to move the water to surface or ground water storage areas in close proximity to water utilities and other users.
2. **Groundwater Recharge.** Water users and other water use permittees in the SJRWMD and the SFWMD would benefit as the Project's water is used for groundwater recharge allowing these entities to withdraw additional freshwater from the aquifer.

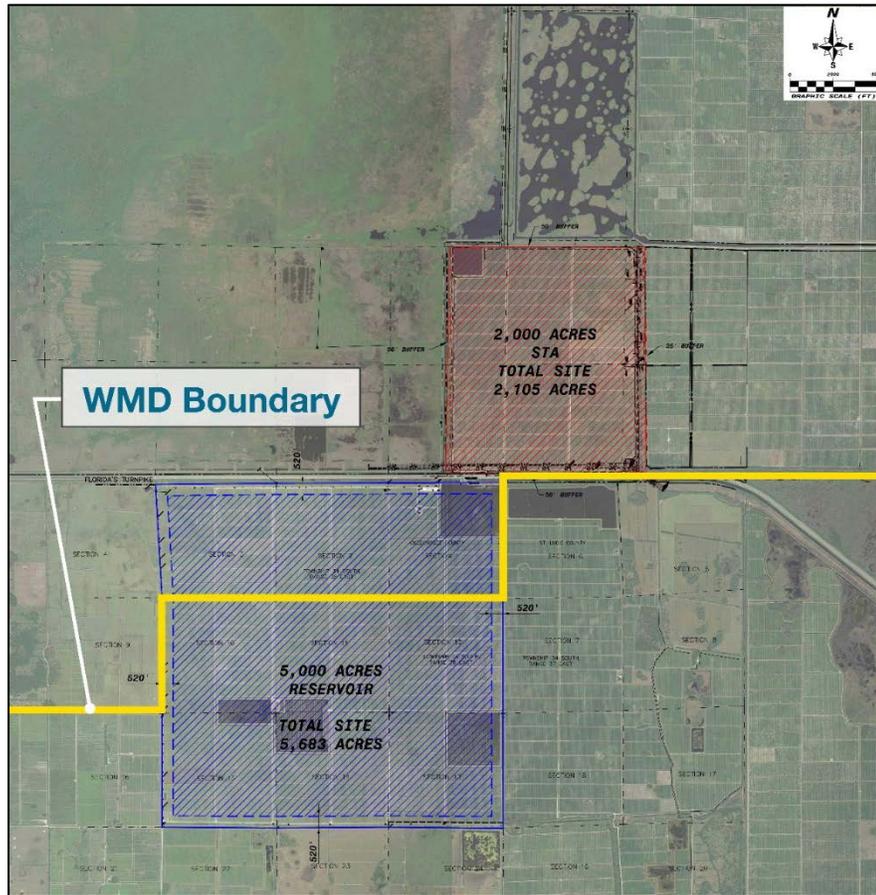
Other potential benefits include:

3. **Reduction or Improved Timing of Water Discharges to Estuaries.** The SFWMD and local communities from Ft. Pierce to Stuart would benefit as the Project is used to reduce or to change the timing of stormwater flows to the IRL and SLE to reduce environmental harm to coastal estuaries.
4. **Nutrient Reduction.** The SFWMD, the Florida Department of Environmental Protection (FDEP), local agencies and agricultural landowners in the St. Lucie Basin would benefit as the Project reduces the amount of total phosphorus (TP) and total nitrogen (TN) entering the IRL and SLE.
5. **MFL Compliance.** The SJRWMD would benefit as the Project provides additional freshwater to the St. Johns River that may help to maintain compliance with minimum flows and levels (MFLs) regulations.
6. **Water Management Flexibility.** The SJRWMD and the SFWMD would benefit as the Project improves the flexibility of managing water systems in the area.
7. **Replace Some Components of Indian River Lagoon – South CERP Project.** The Federal government would benefit as the Project provides the same benefits that would be provided by the proposed C-25 Reservoir and STA and a portion of the benefits provided by the C-23/24 Reservoir and STAs. The engineering design and construction of these projects have been indefinitely delayed.

**Planning-Level Project Details:**

The Project site, as depicted in **Figure 2**, is 7,788 acres of land historically used to grow citrus crops.

**Figure 2**  
**9Grove Land Reservoir and Stormwater Treatment Area Proposed Site**



The Grove Land Reservoir would be constructed on a 5,683 acre parcel where the north portion is located in the SJRWMD and the south portion is located in the SFWMD. The reservoir storage area would be 5,000 acres and the remaining 683 acres would be used for the perimeter embankment and roadway, seepage collection ditches, and a buffer zone to minimize seepage impacts on adjacent properties. The reservoir would have a storage capacity of 75,000 acre-feet. Water from the reservoir would enter the stormwater treatment area (STA) which would be sited north of the reservoir on 2,105 acres located in the SJRWMD. The effective treatment area of the STA would be 2,000 acres of water surface area and the remaining 105 acres would consist of embankments, canals, and other accessory features. The STA wetland treatment technology would consist of “floating aquatic vegetative tilling” or FAVT in the front-end of the system, and traditional submersed aquatic vegetation in the back-end.

The components of this project are as follows:

*Water Source to Reservoir:* To accommodate increased water flows through the C-25 Canal, the 8,140 foot section of the C-25 Canal southern extension beginning just north of the G-81 Structure to where it joins the main east-west section of the canal would need to be widened to a bottom width of 25 feet. In addition, the first 3,500 feet of the main canal as it heads east would be widened to a bottom width of 25 feet and deepened to a bottom elevation of 0.6 feet NGVD 1929. Finally, a 5,800 foot section of the C-25 Canal near the proposed reservoir would be enlarged.

Water would flow north along the C-25 Canal and through a new 12-foot by 16-foot box culvert road crossing placed under a private road over the canal near the southwest corner of the STA just west of the existing plug that separates the two water management districts. Water would pass through this culvert and enter the reservoir through a 700 cfs capacity inflow pump station that would be installed at the reservoir's northeast corner. This pump station would withdraw water from the C-25 Extension / Turnpike Canal.

*Reservoir to STA:* Untreated water would flow by gravity out of the north central part of the Reservoir through the Reservoir Outflow Gate into an existing canal that crosses north under the Florida Turnpike to the southwestern part of the STA. The water would enter the STA through the 230 cfs STA Inflow Pump Structure. Once in the STA, the water would flow by gravity to the northern end of the STA.

*Water Flow Out of the STA:* The treated water would move either north or south. If the water is sent to the Upper St. Johns River Basin, then it will move north. If the water is sent back through the C-25 Canal, then it will move south.

(1) North: The water would flow from the STA through the Upper St. Johns River Basin to the channelized St. Johns River at Lake Hell'n Blazes as depicted in **Figure 3**.

The water would leave the STA through the Outflow Gate located at the north end of the STA. The existing S-253 weir structure would be improved and a 210 cfs pump station would be constructed. The water would then flow north through the L-79 Canal to State Road 60. The L-79 channel and adjacent ground between the STA and State Road 60 would be cleared of vegetation in order to improve conveyance capacity.

North of State Road 60, the treated water would flow into the southwest corner of the Blue Cypress Water Management Area traveling along the western side, then through C-65 between L-76 and L-75, through S-96D and into the southeast corner of the Stick Marsh. The water would then flow northwest through the Stick Marsh. At the northwest corner of Stick Marsh, a 10 foot by 10 foot vertical lift gate would be constructed to discharge water into the St. Johns Marsh Conservation Area (SJMCA). After flowing through the SJMCA, the water would enter an unnamed channel that would carry it west to Lake Hell'n Blazes where it would join the channelized St. Johns River.

In 2014, the SJRWMD conducted a conceptual analysis using its HSPF (Hydrological Simulation Program – Fortran) Model to investigate the impact of water from the GLRSTA Project on the St. Johns River from Florida’s Turnpike in the upper reaches of the Upper St. Johns River to the inflow of Lake Harney at SR 46. The conclusions and caveats are as follows.

*The conceptual plan for the proposed GLRSTA was analyzed for four areas of concern: Long term hydrology in the affected project areas, flood control operations, environmental hydrologic criteria, and water quality. For the long term hydrology, the impacts were slight, since inflows to the project are matched by discharges through the two Water Management Areas. For flood control, there are two issues: the operation of the major flood control structures and the anticipated impact on SJID discharges. Both of these concerns may be easily addressable by including criteria for cutting off GLRSTA releases during large storm events and/or the approach of tropical storm systems, with the possibility of increased discharges after stages have dropped back below critical levels. For the environmental criteria and water quality performance, the initial analyses showed no negative impact, and the possibility of a net benefit to the St. Johns Marsh Conservation Area (SJMCA).*

*The modeling showed some losses in the Upper St. Johns, as the increased flow can at times push the river further out into its floodplains, thus increasing surface area subject to direct evaporation. Also, this will at times replenish the floodplain wetlands, allowing them to transpire more water. The losses are primarily downstream of the Water Management Areas, and amount to 10-11% of the GLRSTA releases at the Puzzle Lake, which is located just upstream of the inflow to Lake Harney. Losses downstream of the Upper Basin were not estimated in this preliminary analysis. The WSIS hydrodynamic model of Middle/Lower Basin is not suited to estimate such increases in evaporative losses, as it assumes a fixed footprint for the river. However, it is expected that these would be small, as there are only a few areas with significant floodplain wetlands where increased flows might be expected to cause increased surface area.*

*In all cases, the anticipated impacts were considered either relatively minor and readily addressable, or possibly beneficial. However, there are important caveats to remember:*

*(a) The long term evaporative losses estimated here are provisional, and could change, both due to improved model representation of the SJMCA in the future and to actual changes to the C-40 canal that are expected in the next couple of years.*

*(b) Acceptable criteria for cutting off discharges during storm events would need to be developed, in order to avoid pushing S-96D discharges above the design maximum (1400 cfs).*

*(c) Since only the SPF was examined in terms of impact on SJID stages and discharges, further analysis would be required to determine critical stages for cutting off GLRSTA releases to avoid problems here, which may be higher or lower than those developed in item (b). The lower of the two would necessarily be the binding one. If the SJID criteria are too tight for successful GLRSTA project operation, then physical alterations around the SJID discharge point may be worth considering.*

*(d) The water quality model has not been calibrated in the range of flows being considered here, so a way would need to be found to address the additional uncertainty.*

There are also a couple of general caveats regarding the limited scope of this analysis:

(e) The impacts and feasibility of acquiring the source water in the C-25 and adjacent basins has not been examined by SJRWMD.

(f) Increasing a downstream average flow by a given amount does not guarantee that average withdrawals of that amount will meet MFL criteria, as timing and duration are important factors. Therefore, any proposals for withdrawals by customers of GLRSTA would have to be evaluated in detail for MFL criteria and other possible CUP regulations.

(2) South: Treated water in the STA may also exit the STA via a second Outflow Gate located at the southeast corner of the STA. Here, a 10 foot vertical lift gate would be installed to discharge treated water to the C-25/C-24/C-23 Canal system. The water discharge would be located on the north side of the Turnpike but there is no existing structure at the discharge location to convey the water directly to the C-25 Canal on the south side of the Turnpike. Therefore, an existing flow-way (C-52E) in the SJID would convey the water east to a SJID canal at 122nd Ave. SW, which would then convey it south to the C-25 Canal. No improvements to the SJID canals are expected to be needed.

A summary of the GLRSTA components and their sizes is provided below.

**Table 1**  
**Summary of GLRSTA Improvements included in Cost**

<b>Improvement</b>	<b>Value</b>
<b>Cost Items Associated with Reservoir:</b>	
G-78 Pump Station (new)	260 cfs
G-81 Pump Station (new)	260 cfs
Reservoir Inflow Pump Station	700 cfs
Reservoir Outflow Gate Structure	(qty. 2) 20 ft & 20 ft
Reservoir Seepage Collection Pump	25 cfs
Reservoir Size	5,000 acres, 15 feet
<b>Cost Items Associated with STA:</b>	
STA Inflow Pump Station	230 cfs
STA Internal Water Control Structures	(qty. 26) gated culverts
STA Outflow Gate Structures (to C-52 and C-25)	(qty. 2) 10 ft vertical lift gate
STA Seepage Collection Pump	25 cfs
STA Size/Type	2,000 acre FAVT
<b>Cost Items Associated with Re-established WMD Connection:</b>	
S-253 Weir	To be improved
Pump Station at S-253 Weir	210 cfs
Lift Gate at NW corner of Stick Marsh	10 ft.

The Project would provide a raw water supply that would need to be treated to appropriate standards prior to use. The project costs do not include treatment or distribution.

### Project Yield:

The Grove Land Reservoir and Stormwater Treatment Area Project would be capable of providing an average annual daily water supply of 136 mgd. The values for potential water supplies/deliveries, flow attenuation, and nutrient removal are estimates commensurate with a preliminary feasibility study. There are likely times/periods when design values cannot be met due to operational issues, extreme weather, etc. However, meeting the estimated levels of delivery and treatment over the long term and at a statistically high percentage are expected. Similarly, the values used to estimate the benefits and costs for determining return on investment include various assumptions and risk factors that will have to be refined as project development proceeds.

### Estimated planning-level costs:

The estimated total capital and annual O&M costs of the Project and the Unit Production Cost are provided in Table 2.

**Table 2**  
**Total Estimated Capital and Annual O&M Costs (Conceptual Level)**  
**Of the Grove Land Reservoir and Stormwater Treatment Area, 2014 Dollars<sup>1,2</sup>**

Item	Value
<b>Capital Cost:</b>	
Reservoir	\$268,204,377
Stormwater Treatment Area	\$47,943,916
<i>Other Improvements:</i>	
Increase Capacity of Intake Water Sources (SFWMD)	\$29,582,149
Improvements at Upper St. Johns River Basin (SJRWMD)	\$10,553,956
<b>Total Capital Cost (w/o Land Costs)</b>	<b>\$356,284,397</b>
Reservoir Land Value	57,752,662
STA Land Value	21,391,757
<b>Total Capital Cost (w/Land Costs)</b>	<b>\$435,428,815</b>
<b>Annual O &amp; M Cost:</b>	
Reservoir	\$878,537
Stormwater Treatment Area	\$682,016
<i>Other Improvements:</i>	
Increase Capacity of Intake Water Sources (SFWMD)	\$129,881
Improvements at Upper St. Johns River Basin (SJRWMD)	\$233,804
Project Administration (includes estimated liability insurance premium)	\$775,774
<b>Total Annual O&amp;M Cost</b>	<b>\$2,680,012</b>

**Table 2**  
**Total Estimated Capital and Annual O&M Costs (Conceptual Level)**  
**Of the Grove Land Reservoir and Stormwater Treatment Area, 2014 Dollars<sup>1,2</sup>**

Item	Value
<b>Total Annualized Cost</b>	
Annualized Capital Cost over 50 years at 3.5% annual discount rate	\$18,563,012
Annual O&M Cost	\$2,680,012
<b>Total Annualized Cost w/Land Costs</b>	\$21,243,958
<b>Total Unit Cost w/ Land Costs (\$ per 1,000 gallons for 122 mgd x 0.90)</b>	<b>\$0.48</b>

<sup>1</sup> Costs do not include treatment and transmission costs, financing cost, contingency/financial risk and renewal and replacement

<sup>2</sup> August 2014 Financial Feasibility Study of the Grove Land Reservoir and Stormwater Treatment Area, Phase 2 Study – FINAL Report developed by Hazen & Sawyer 2013 costs updated to 2014

These costs were estimated based on the Project’s conceptual design and assume that 90 percent of the water made available by the Project can be used as a water supply. The estimated capital cost is \$435 million. The estimated annual O&M cost is \$2.7 million and the estimated unit production cost is \$0.48 per 1,000 gallons of water produced. These costs do not include treatment and transmission costs, financing cost, contingency/financial risk and renewal and replacement.

**Basis for planning-level costs:**

These planning level cost estimates were prepared using the August 2014 Financial Feasibility Study of the Grove Land Reservoir and Stormwater Treatment Area, Phase 2 Study – FINAL Report developed by Hazen & Sawyer 2013. The Report utilized recent cost estimates and bid prices for other CERP-related projects in south Florida, cost curves developed in the HDR 2009 study (**HDR 2009**), unit prices provided by contractors based on recent bids for similar projects, and vendor quotations for specific construction materials and equipment.

Excavation quantities and costs for earthwork construction were estimated based on the available topographic and soils information, superimposed on a preliminary drawing of the reservoir and STA layout.

**Estimated Implementation Schedule:**

It is estimated construction of this project could be completed in six years. Design would occur in Years 1 & 2, construction would take place in Years 3 through 5, and the project would be operational in Year 6.

**Water resource constraints:**

The following potential water resource constraints regarding the GLRSTA Project have been identified:

## **Regulatory**

1. The Project will need a SFWMD water use permit of at least 50 years and/or a SFWMD water reservation in order to secure the availability of water for the project.
2. The GLRSTA Project will need to comply with the water reservation for the North Fork of the St. Lucie River; the President's and Governor's Agreement for the CERP projects; the MFLs for the St. Lucie Estuary and the St. Johns River; and the Restricted Allocation Area Rule for the C-23, C-24 and C-25 Canal System.
3. The GLRSTA Project must not harm the permitted water quantities of existing legal users.
4. If water from the GLRSTA enters a part of the St. Johns River that has MFLs, and the water level or flow is below the MFL, then that GLRSTA water cannot be permitted for withdrawal. The GLRSTA would first need to satisfy all limiting MFLs and then provide additional water above the MFLs for permitted withdrawals. Locations of MFLs along St. Johns River are:
  - a. Lake Washington – MFLs are limiting factor on City of Melbourne's withdrawals from this lake;
  - b. SR 520 just northwest of Lake Poinsett - Proposed MFL is limiting factor for groundwater withdrawals and impacts the reliability of water supply to a proposed expanded Taylor Creek Reservoir (50 mgd);
  - c. SR 50 – MFLs would limit withdrawals during certain low flow conditions
  - d. Lake Monroe – MFLs have not yet constrained water withdrawals
  - e. SR 44 at Deland – MFLs are limiting factor on proposed water withdrawals from Yankee Lake project affecting reliability of yield. Water in St. Johns River is brackish north of this point.
5. Results of the State/Federal Numeric Nutrient Criteria rule development process may limit the ability to transfer water between basins in the future, which could limit the amount of source water, or increase the cost to treat water prior to basin transfer.

## **Surface Water Management**

6. The SFWMD, the SJRWMD and Grove Land Utilities, Inc. will need to produce a Project operations agreement.
7. The GLRSTA Project will need to be operated to manage flooding at receiving water bodies and to optimize water inflows and discharges from the Project.

## **Project feasibility:**

A conceptual evaluation of this GLRSTA Project conducted by Hazen and Sawyer, P.C. in association with Federico, Lamb and Associates, Inc. and AMEC has found the project to be technically feasible as long as a sufficient water supply can be legally obtained from the C-25, C-24 and C-23 Canals. This study was contracted by Grove Land Utilities, LLC. The project site property is owned by Evans Properties, Inc. which is the parent company of Grove Land Utilities, LLC.

### Permittability:

The GLRSTA Project is potentially permittable as a regional water supply project. The issues that will need to be addressed by the SFWMD and the SJRWMD are provided in the previous section under “Water Resource Constraints”.

### Cost-benefit analysis of yield:

A benefit-cost analysis of the GLRSTA Project was conducted by Hazen and Sawyer in association with Federico, Lamb and Associates and AMEC under contract with Grove Land Utilities, LLC. The results indicate that the present value of project benefits is greater than the present value of project costs. The estimated economic value of the benefits provided by the GLRSTA Project is provided in **Table 3**. These estimated benefits values are expressed in terms of dollar value per unit of benefit.

**Table 3**  
**Summary of Estimated Benefit Values Associated with the GLRSTA Project**

<b>Beneficiaries</b>	<b>Benefit</b>	<b>Value, 2013 dollars</b>
Water Utilities	Potable Water Supply	\$3.84 per 1,000 gallons
SFWMD / FDEP / State of Florida (a)	Total Phosphorus (TP) Reduction Benefit to receiving waters	\$124 per pound of TP removed
SFWMD / FDEP / State of Florida	Estuarine Water Discharge Reduction	\$176 per acre-foot of discharge reduction
MS4s, WCDs, CDDs, non-MS4s	Total Phosphorus (TP) or Total Nitrogen (TN) Reduction to receiving waters	\$240 per pound of TP or TN reduction
Federal Government	Avoided cost of CERP Projects	\$110 per year per acre-foot of water storage
Agricultural Irrigators using C-23, C-24 and C25 Canals for water source	Water Supply	\$0.10 per 1,000 gallons

Source: Financial Feasibility of the Grove Land Reservoir and Stormwater Treatment Area, Memorandum “Identification of Revenue Sources, Revenue Streams and Payment Metrics”, from Hazen and Sawyer, P.C., to Grove Land Utilities, LLC, May 9, 2014, Table 2.16, page 31 of 40.

**Other considerations** - None

### Potential partners and governance options:

Grove Land Utilities, LLC (GLU) was certificated by the Florida Public Service Commission (PSC) in 2012 as a water and wastewater utility with a service area that includes certain properties of its parent company, Evans Properties, Inc., in Okeechobee, Indian River and St. Lucie Counties. The proposed GLRSTA Project is comprised of an above-ground reservoir and a stormwater treatment area located on certain portions of these lands in northern Okeechobee and southern Indian River counties. The Project would be designed, permitted, constructed, operated and maintained by GLU through a public-private partnership with the South Florida Water Management District (SFWMD) and/or the St. Johns River Water Management District (SJRWMD). The partnership has yet to be defined. The GLRSTA Project is currently in the conceptual evaluation phase.

## **Funding sources:**

It is anticipated that the Project would be funded by the beneficiaries. The potential beneficiaries identified to date are:

1. Water utilities in the SJRWMD for additional surface water supply
2. Water utilities located near the GLRSTA Project
3. Existing and future water users located near the Project's groundwater recharge areas
4. State of Florida and its agencies including State Legislature, the SFWMD, the SJRWMD and/or the Florida Department of Environmental Protection
6. Local agencies and agricultural landowners in the St. Lucie River and Estuary Basin
7. Federal Government under the Comprehensive Everglades Restoration Plan (CERP)

## **References**

HDR 2009 HDR, "St. Lucie and Indian River Counties Water Resources Study, Final Summary Report", prepared for the SFWMD and the SJRWMD, November 2009.