Background

- Staff directed by BOCC to:
  1. Review conclusions of 2007 Alternative Water Supply Master Plan
  2. Enter into dialogue with SJRWMD to obtain expertise
  3. Design a long-term system (for surface water use)
  4. Analyze the usage of water in the County
  5. Bring board a proposal for feasibility study to develop surface water system, complete with necessary reservoir system
  6. Include a request for funding from SJRWMD
Background

• Staff directed by BOCC to:
  1. Review conclusions of 2007 Alternative Water Supply Master Plan
     ▪ Reviewed recommendations
     ▪ Updated costs
     ▪ Confirmed surface water still the recommended path forward
  2. Enter into dialogue with SJRWMD to obtain expertise
  3. Design a long-term system (for surface water use)
  4. Analyze the usage of water in the County
  5. Bring board a proposal for feasibility study to develop surface water system, complete with necessary reservoir system
  6. Include a request for funding from SJRWMD
Background

• Staff directed by BOCC to:
  1. Review conclusions of 2007 Alternative Water Supply Master Plan
  2. Enter into dialogue with SJRWMD to obtain expertise
     ▪ Numerous meetings with Governing Board Member and Water Supply Planning staff
     ▪ Will obtain further input upon SJRWMD review of draft analysis
  3. Design a long-term system (for surface water use)
  4. Analyze the usage of water in the County
  5. Bring board a proposal for feasibility study to develop surface water system, complete with necessary reservoir system
  6. Include a request for funding from SJRWMD
Background

• Staff directed by BOCC to:

1. Review conclusions of 2007 Alternative Water Supply Master Plan
2. Enter into dialogue with SJRWMD to obtain expertise
3. Design a long-term system (for surface water use)
   ▪ To be performed at future date
4. Analyze the usage of water in the County
5. Bring board a proposal for feasibility study to develop surface water system, complete with necessary reservoir system
6. Include a request for funding from SJRWMD
Background

- Staff directed by BOCC to:
  1. Review conclusions of 2007 Alternative Water Supply Master Plan
  2. Enter into dialogue with SJRWMD to obtain expertise
  3. Design a long-term system (for surface water use)
  4. Analyze the usage of water in the County
     - Per capita usage of 91 gpd/person* obtained from historical utility records
     - Agricultural usage obtained from SJRWMD Water Supply Plan
  5. Bring board a proposal for feasibility study to develop surface water system, complete with necessary reservoir system
  6. Include a request for funding from SJRWMD

*91 gpcd not used for planning purposes; to be discussed further in subsequent slides
Background

• **Staff directed by BOCC to:**

1. Review conclusions of 2007 Alternative Water Supply Master Plan
2. Enter into dialogue with SJRWMD to obtain expertise
3. Design a long-term system (for surface water use)
4. Analyze the usage of water in the County
5. Bring board a proposal for feasibility study to develop surface water system, complete with necessary reservoir system
   - Work Order No. 11 Approved by BOCC on April 22, 2014
6. Include a request for funding from SJRWMD
Background

- Staff directed by BOCC to:
  1. Review conclusions of 2007 Alternative Water Supply Master Plan
  2. Enter into dialogue with SJRWMD to obtain expertise
  3. Design a long-term system (for surface water use)
  4. Analyze the usage of water in the County
  5. Bring board a proposal for feasibility study to develop surface water system, complete with necessary reservoir system
  6. Include a request for funding from SJRWMD
     - To be requested upon BOCC and SJRWMD review of draft analysis
Project Phases – Original Work Order

- Phase 1 – This evaluation
- Phase 2 – Site selection, hydraulic modeling, land acquisition
- Phase 3 – Detailed design, permitting, construction
Project Phases - Revised

• Phase 1 – This evaluation
• Phase 2 – Modeling; potential pilot study
• Phase 3 – Negotiations with drainage district(s); preliminary permitting (local and state)
• Phase 4 – Negotiations with property owners; land acquisition
• Phase 5 – Final permitting and design
• Phase 6 – Construction
Key Assumptions

- Proposed surface water treatment plant to be co-located with North County WTP (no siting for new WTP included)
- Route piping along CR510 and 77th Avenue to take advantage of existing ROW
- Adequate water available in SRID to supply system (Phase 2 modeling needed to confirm)
Existing Conditions

- SRID canals flow from south to north
- Lateral C is main canal
- Withdrawal points ideally located just upstream (south) of control structures
- North County WTP in close proximity
Existing Conditions

• SRID canals flow from south to north
• Lateral C is main canal
• Withdrawal points ideally located just upstream (south) of control structures
• North County WTP in close proximity
Existing Control Structures

2-Gate Structure on Lateral L

3-Gate Structure on Lateral C
Why the SRID?

- Looked at IRFWCD also
  - Area around IRFWCD canals more densely populated
  - Withdrawal would be required downstream of control structures
  - Pump intake would be more susceptible to low water conditions
- Interconnection poses issues for tax payers
- Moving water against its current gradient can be expensive!
Reservoir Sizing

Surface Water Reservoir Feasibility Analysis
Reservoir Sizing

• 2035 Urban Service Area Population = 150,686
  ─ For comparison, BEBR 2035 medium density (county-wide) = 185,800
• 110 gallons per day, per person for planning purposes
  ─ Actual historical = 91 gpcd
  ─ 110 gpcd more closely aligns with industry averages
• Resulting 2035 demand = 16.58 million gallons per day
• Current CUP = 12.84 mgd (raw; relied on conservative gpcd and peaking factor to approximate shortfall)
Reservoir Sizing

- Anticipated potable shortfall = 3.74 mgd in 2035
- Added 10 percent redundancy (between UFA and surface water sources) = approximately 5 mgd

- POTABLE DEMAND FROM SURFACE WATER SUPPLY = 5 MGD
### Existing WTP Capacity

<table>
<thead>
<tr>
<th>WTP</th>
<th>Permitted Capacity (mgd)</th>
<th>Concentrate (mgd)</th>
<th>Consumptive Use (through 2021) (mgd)</th>
<th>Unusable Capacity(^2) (mgd)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Permit Limit</td>
<td>Needed(^1)</td>
<td>Allocation</td>
</tr>
<tr>
<td>North County</td>
<td>11.44</td>
<td>2.0(^3)</td>
<td>2.29</td>
<td>6.44</td>
</tr>
<tr>
<td>South County</td>
<td>8.57</td>
<td>1.5</td>
<td>1.71</td>
<td>6.40</td>
</tr>
<tr>
<td>Totals</td>
<td>20.01</td>
<td>3.5</td>
<td>4.00</td>
<td>12.84</td>
</tr>
</tbody>
</table>

\(^1\)Assumes 80% Recovery; 20% Concentrate
\(^2\)Capacity restricted by raw water limitation
\(^3\)N. County permit allows for increase to 3.0 mgd upon request to/approval by FDEP

To meet 2035 demand of 16.58 mgd with UFA supply, IRC would need CUP Allocation of 20.73 mgd (7.89 mgd shortfall at 80% recovery; 4 wells at 1,400 gpm)
Agricultural Demand

1/3 of 2035 Agricultural Demand anticipated to come from groundwater sources

Pro-rating demand by acreage = 5.8 mgd of groundwater in 2035

Table 6-1 SJRWMD Water Supply Plan Demand Summary by Type

<table>
<thead>
<tr>
<th>Category</th>
<th>Demand (mgd)</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010</td>
<td>2035</td>
</tr>
<tr>
<td>Agricultural (Table 7)</td>
<td>153.27</td>
<td>132.00</td>
</tr>
<tr>
<td>Potable (Table 11)</td>
<td>16.69</td>
<td>22.75</td>
</tr>
<tr>
<td>Golf Course Irrigation (Table 8)</td>
<td>4.92</td>
<td>10.69</td>
</tr>
<tr>
<td>Commercial/Industrial (Self-Supply) (Table 9)</td>
<td>0.08</td>
<td>0.53</td>
</tr>
<tr>
<td>Total</td>
<td>174.96</td>
<td>165.97</td>
</tr>
</tbody>
</table>

Surface Water Reservoir Feasibility Analysis
Agricultural Demand

- 1/3 of 2035 Agricultural Demand anticipated to come from groundwater sources
- Pro-rating demand by acreage = 5.8 mgd of groundwater in 2035

### Table 6-1 SJRWMD Water Supply Plan Demand Summary by Type

<table>
<thead>
<tr>
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<th>Demand (mgd)</th>
<th>2010</th>
<th>2035</th>
<th>Percent of Total</th>
<th>2010</th>
<th>2035</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural (Table 7)</td>
<td>153.27</td>
<td>132.00</td>
<td>87.60</td>
<td>79.53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potable (Table 11)</td>
<td>16.69</td>
<td>22.75</td>
<td>9.54</td>
<td>13.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Golf Course Irrigation (Table 8)</td>
<td>4.92</td>
<td>10.69</td>
<td>2.81</td>
<td>6.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial/Industrial</td>
<td>0.08</td>
<td>0.53</td>
<td>0.05</td>
<td>0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Self-Supply) (Table 9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>174.96</td>
<td>165.97</td>
<td>100</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Required Acreage

Inflows to the reservoir = Outflows from the reservoir + change in Storage

OR

Rainfall + Surface Water Diversions = Evaporation + Seepage + Demand + ΔStorage

*detailed discussion on model used to determine reservoir size is provided in Section 6 of the evaluation*
Required Acreage

- 5.02 mgd of potable storage
- 5.80 mgd of agricultural storage
- Reservoir size, including peaking factor, 10% buffer for perimeter roads and setbacks (10 ft. side water depth):
  - 64 acres for potable alone
  - 132 acres for potable and agricultural

*Surface Water Reservoir Feasibility Analysis*
Siting Considerations

• Existing Land Use
  – Low population density
  – Undeveloped
  – Agricultural preferred

Surface Water Reservoir Feasibility Analysis
Wetland Inventory

- Reviewed National Wetlands Inventory and U.S. Fish and Wildlife Service data
- SRID primarily categorized as freshwater forested/shrub wetland
- Small pockets of freshwater emergent wetlands present
- Detailed wetlands survey needed specific to site that is ultimately selected
Soil Inventory

- Desired foundation for reservoirs are soils with natural propensity to drain slowly
  - Oldsmar fine sand
  - Riviera fine sand
  - Pineda fine sand
- Minimize losses from seepage
Threatened and Endangered Species

- Reviewed data from Florida Natural Areas Inventory and the FWS Information, Planning and Conservation System
- Habitat present to support species of special concern: snowy egret, little blue heron, tricolored heron and white ibis
- Potentially present listed species
- Site-specific evaluation will be necessary once final site is selected

### Table 4.1 Federal and State Listed Species with the Potential to Occur within the Study Area

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Federal Status</th>
<th>State Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood stork</td>
<td>Mycteria americana</td>
<td>LE</td>
<td>NL</td>
</tr>
<tr>
<td>Scrub jay</td>
<td>Aphelocoma coerulescens</td>
<td>LT</td>
<td>NL</td>
</tr>
<tr>
<td>Gopher tortoise</td>
<td>Gopherus polyphemus</td>
<td>C</td>
<td>ST</td>
</tr>
<tr>
<td>Florida burrowing owl</td>
<td>Athene cunicularia floridana</td>
<td>N</td>
<td>SSC</td>
</tr>
<tr>
<td>Eastern indigo snake</td>
<td>Drymarchon couperi</td>
<td>LT</td>
<td>NL</td>
</tr>
<tr>
<td>Reddish egret</td>
<td>Egretta rufescens</td>
<td>N</td>
<td>SSC</td>
</tr>
<tr>
<td>Snail kite</td>
<td>Rostrohamus sociabilis plumbeus</td>
<td>LE</td>
<td>NL</td>
</tr>
<tr>
<td>Atlantic salt marsh snake</td>
<td>Nerodia clarkii temminckii</td>
<td>LT</td>
<td>NL</td>
</tr>
<tr>
<td>Piping Plover</td>
<td>Charadrius melodus</td>
<td>LT</td>
<td>NL</td>
</tr>
<tr>
<td>Florida grasshopper sparrow</td>
<td>Ammodramus savannarum floridanus</td>
<td>LT</td>
<td>NL</td>
</tr>
<tr>
<td>Red-cockaded Woodpecker</td>
<td>Picoides borealis</td>
<td>LE</td>
<td>NL</td>
</tr>
<tr>
<td>Crested caracara</td>
<td>Caracara cheriwayi</td>
<td>LT</td>
<td>NL</td>
</tr>
<tr>
<td>Florida sandhill crane</td>
<td>Grus canadensis floridanus</td>
<td>N</td>
<td>ST</td>
</tr>
<tr>
<td>Florida pine snake</td>
<td>Ptilopus melanocephalus nigricollis</td>
<td>N</td>
<td>SSC</td>
</tr>
<tr>
<td>American alligator</td>
<td>Alligator mississippiensis</td>
<td>FT(s)/A</td>
<td>NL</td>
</tr>
</tbody>
</table>
Pollutant Load Reduction

- Reviewed quarterly water quality data provided by SRID
- Limited water quality (nutrient) data available; no flow data available
- In lieu of flow data, used published event mean concentration data to calculate Nitrogen and Phosphorus loading from SRID
Pollutant Load Reduction

- Stormwater harvesting facility best management practices and published Basin Management Action Plan data for similar basins used to calculate credits and loading
- Site-specific flow data and additional WQ data recommended to refine calculations

### Table 8-4 TN and TP Load Reduction Estimates

<table>
<thead>
<tr>
<th></th>
<th>Demand from Reservoir</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.74 mgd</td>
</tr>
<tr>
<td>Average Flow Diverted to Reservoir (mgd)</td>
<td>4.3</td>
</tr>
<tr>
<td>Average Flow Diverted to Reservoir (ac-ft/yr)</td>
<td>4,817</td>
</tr>
<tr>
<td>Average Spill Outflow (mgd)</td>
<td>0.6</td>
</tr>
<tr>
<td>Average Spill Outflow¹ (ac-ft/yr)</td>
<td>672</td>
</tr>
<tr>
<td>% Load Removal</td>
<td>54</td>
</tr>
<tr>
<td>TN Load Removal (lb/yr)</td>
<td>20,995</td>
</tr>
<tr>
<td>TP Load Removal (lb/yr)</td>
<td>2,631</td>
</tr>
</tbody>
</table>

Notes: ¹¾ load removal is calculated based on an average annual flow of 7,682 ac-ft/yr.

### Table 8-5 Estimated Cost per Pound of Nutrients Removed

<table>
<thead>
<tr>
<th>Demand from Reservoir (mgd ADF)</th>
<th>Total Equivalent Annual Cost ($ Millions)</th>
<th>$/lb TN Removed</th>
<th>$/lb TP Removed</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.74</td>
<td>7.1</td>
<td>338</td>
<td>2,699</td>
</tr>
<tr>
<td>5.02</td>
<td>8.0</td>
<td>282</td>
<td>2,250</td>
</tr>
<tr>
<td>10.82</td>
<td>9.5</td>
<td>251</td>
<td>2,006</td>
</tr>
</tbody>
</table>
Aquifer Storage and Recovery

- Capture surface water, treat and inject into deep aquifer for storage
- Recover when needed, chlorinate and distribute to customers
- Minimal losses; high recovery
- Small surface footprint; minimal land acquisition
- Protected from surface contamination and threats
- No wildlife concerns
- Separation of injection zone from UFA withdrawal and nearby DIWs
Aquifer Storage and Recovery

Surface Water Reservoir Feasibility Analysis

Storage Volume Calculation per ASR well:

\[ V_{ASR} = \pi r^2 h = (3.14)(100\ ft)^2(100\ ft) = 31,416,000\ ft^3 = 118\ Mgal\ per\ well \]
Aquifer Storage and Recovery

Surface Water Reservoir Feasibility Analysis
## Conceptual Project Cost Estimates

<table>
<thead>
<tr>
<th>Demand from Reservoir (mgd ADF)</th>
<th>Total Capital Cost ($ Millions)</th>
<th>Equivalent Annual Capital Cost ($/1,000 gal)</th>
<th>Total Annual O&amp;M Cost</th>
<th>Total Equivalent Annual Cost</th>
<th>Unit Production Cost ($/1,000 gal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.74</td>
<td>80</td>
<td>4.9</td>
<td>2.2</td>
<td>7.1</td>
<td>5.17</td>
</tr>
<tr>
<td>5.02</td>
<td>81</td>
<td>4.9</td>
<td>3.1</td>
<td>8</td>
<td>4.37</td>
</tr>
<tr>
<td>10.82(^7)</td>
<td>104</td>
<td>6.3</td>
<td>3.2</td>
<td>9.5</td>
<td>2.41</td>
</tr>
<tr>
<td>5.02(^8)</td>
<td>80.0</td>
<td>4.9</td>
<td>3.6</td>
<td>8.5</td>
<td>4.61</td>
</tr>
</tbody>
</table>

Notes:
1. Side water depth of 10 feet is assumed for all water supply options.
2. Conceptual capital costs include pumping, transmission, reservoir, treatment, storage, land and ROW acquisition. Costs do not include estimates for off-site soil import. Conceptual capital costs further include a 75 percent construction allowance (50 percent contingencies, 20 percent non-construction capital costs and 5 percent mobilization/demobilization).
3. A service life of 25 years and an interest rate of 3.5 percent (Federal water resources planning discount rate for Fiscal Year 2014) was used in the analysis.
4. Conceptual O&M costs include equipment, staffing, power and chemical costs, where appropriate.
5. Total equivalent annual costs include annualized capital costs plus O&M costs.
6. Unit production cost is equal to Total Equivalent Annual cost divided by demand from reservoir (average annual rate of delivery of water).
7. Assumes agricultural portion of the total demand (5.8 mgd ADF) is not treated for potable use (remainder of 5.02 mgd ADF). This estimate does not include pumping and transmission to the agricultural end-user.
8. ASR finished water wellfield with chemical pretreatment system

- **Current Unit Production cost is $2.20/1,000 gallons**
## Current Rate Structure

<table>
<thead>
<tr>
<th>Volume (gallons)</th>
<th>Rate per 1,000 Gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 3,000</td>
<td>$2.20</td>
</tr>
<tr>
<td>3,001 – 7,000</td>
<td>$2.42</td>
</tr>
<tr>
<td>Over 7,000</td>
<td>$3.85</td>
</tr>
<tr>
<td>Greater than 13,000</td>
<td>$7.70</td>
</tr>
</tbody>
</table>
## Comparative Costs

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Comments</th>
<th>Additional Capacity (mgd)</th>
<th>Capital Costs</th>
<th>Capital Cost per mgd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reservoir – Potable</td>
<td>As outlined in CDM Smith Draft Report (December 2014)</td>
<td>5.02</td>
<td>$81,000,000</td>
<td>$16,135,458</td>
</tr>
<tr>
<td>Reservoir – Ag and Potable</td>
<td>As outlined in CDM Smith Draft Report (December 2014)</td>
<td>10.82</td>
<td>$104,000,000</td>
<td>$9,611,830</td>
</tr>
<tr>
<td>North County WTP Expansion</td>
<td>Calculated based upon physical production capacity added</td>
<td>7.91</td>
<td>$28,503,436</td>
<td>$3,603,469</td>
</tr>
<tr>
<td>North County WTP CUP Increase</td>
<td>Estimated cost to amend CUP to increase capacity (physical capacity already in place)</td>
<td>6.59</td>
<td>$750,000</td>
<td>$113,809</td>
</tr>
</tbody>
</table>
Pros and Cons of a Surface Water Reservoir

**PROS**
- Diversification of supply sources
- Diversion of runoff from River/Lagoon
- Reduced long-term demand on stressed UFA

**CONS**
- Exposure/vulnerability to contaminants
- Land acquisition requirements
- Costly treatment plant
- Evaporative losses
- Operational expense
## Pros and Cons of ASR

<table>
<thead>
<tr>
<th>PROS</th>
<th>PROS (cont.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Diversification of supply sources</td>
<td>• Easy to maintain and protect</td>
</tr>
<tr>
<td>• Diversion of runoff from River/Lagoon</td>
<td>• Co-locate wellfields</td>
</tr>
<tr>
<td>• Reduced long-term demand on stressed UFA</td>
<td>• Requirement to treat pre-injection</td>
</tr>
<tr>
<td>• Small footprint</td>
<td>• Costly treatment plant</td>
</tr>
<tr>
<td></td>
<td>• Recovery</td>
</tr>
</tbody>
</table>

*Surface Water Reservoir Feasibility Analysis*
Next Steps

• Incorporate BOCC comments
• Distribute to Stakeholders
• Discussion with/feedback from SJRWMD staff
• Determination on whether to proceed with reservoir or ASR
• Workshop with Stakeholders and BOCC
• Finalize report
• Phase 2
DISCUSSION
DETAILED PHASE 2 — IF NEEDED

1. Preparation of a modeling approach technical memorandum for submittal to and review/approval by SJRWMD prior to commencing modeling activities.

2. Unless already available from the local drainage districts and property owners, it is anticipated that survey services will be required during this Phase to identify critical elevations, distances and property boundaries. The survey data will be used in development of the project models.

3. A stormwater runoff and routing model will be needed to define the H&H of the SRID canal system. Consultant requested and received a copy of the recently updated H&H model (using the advanced Inter-Connected Pond Routing software) from the water improvement district for simulating surface water inflows into the reservoir. This H&H model will need to be capable of performing continuous simulations of surface water flow in the canal system over a 20 to 30 year time period to capture low, average and high flow conditions in the surface waters providing flow to the reservoir. If the SRID H&H model is a storm event based model, the model will need to be revised by Consultant to simulate continuous flows.

4. Upon approval of the approach, Consultant will develop an operations model utilizing STELLA, a widely used systems model for evaluating inflows, outflows and storage components of systems similar to that proposed by the County. The STELLA model will be used to perform a continuous simulation of the proposed reservoir operations over a 20 to 30 year period. The model will account for historical rainfall patterns as well as take into account surface water inflows from the SRID canals, evaporation, seepage and other releases from the reservoir (water supply and emergency overflow) on a daily basis over the 20 to 30 year time period.

5. Modeling results will be used to quantify the amount of surface water that can be anticipated during drought conditions, average rainfall conditions and during high rainfall periods. This information will then be utilized to refine the reservoir sizing evaluation performed in Phase 1. The result may be that the size of the reservoir presented in Phase 1 based on the maximum demand (population projection based) would be reduced based on actual, available flow.

6. The modeling summary will be submitted to SJRWMD for review and comment, and modeling will be updated if needed based on comments received.

7. Update recommended size of reservoir based on available flow and corresponding cost estimate.

8. Review of current utility rate structure based on revised reservoir size/AMTR size/cost estimate to determine if current rates are sufficient to support.