



*Building tomorrow's  
water supply system today*

## EPX PROJECT

EAST WATER TREATMENT PLANT EXPANSION PROJECT

The City of Boynton Beach provides water to over 100,000 customers, located both inside and beyond the City limits. Two changes have recently arisen that will place greater pressures on the City's water supply: a growing population, and a requirement from the South Florida Water Management District (SFWMD) to seek alternative water sources to reduce the City's reliance on the surficial aquifer. To address these changes, plans are being developed by the City's Utilities Department. This document has been prepared to provide an overview of the East Plant Expansion (EPX) Project to the City Commission and City Management. It addresses the need for additional water supply and the plan developed by the Utilities Department to see Boynton Beach into the future. Before this plan can be fully implemented, it is essential that the City management fully understand the investment and vision that this plan represents. Technical information supporting the plan presented within this summary is available in the Utilities Department. The background to these plans and a summary of the proposed solution is presented in the following memorandum.

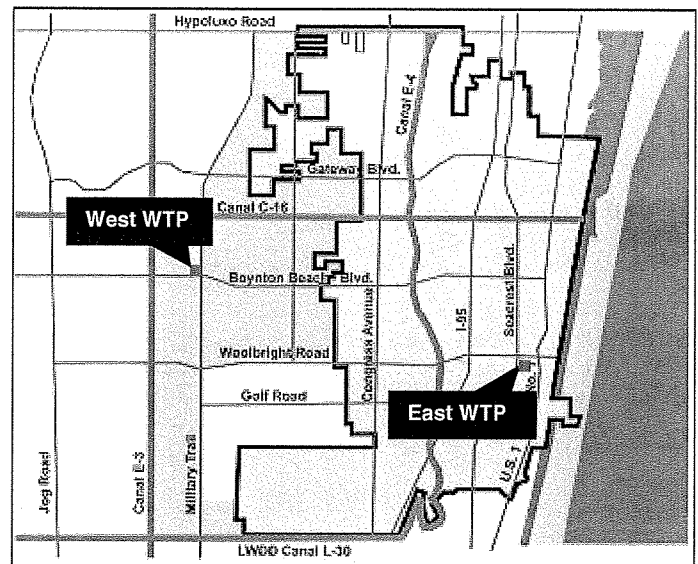
### Existing Water System

The City serves its customers from two water treatment plants (see Exhibit 1)—the East Water Treatment Plant (WTP) located at Woolbright Road and Seacrest Boulevard (permitted to produce approximately 19 million gallons per day [mgd] of water), and the West WTP located at Boynton Beach Boulevard just west of Military Trail (permitted to produce approximately 10 mgd). Currently all of the raw water is

# Project Update (June 2005)

### EXHIBIT 1

Location of the City's East and West WTPs, City Limits (yellow), and addition areas serviced by Water Utility (green)



withdrawn from the surficial aquifer. This geological unit, located approximately 100 to 200 feet below ground, produces large quantities of high-quality water. However, because current demand from the surficial aquifer cannot be sustained, the SFWMD (the agency that regulates the amount of water that can be withdrawn from the City's wellfields) has reduced the allocation of many of the municipalities in South Florida including the City. Beginning in 2008, the City's withdrawal allocation will be reduced to a level which will no longer be adequate to meet the projected water demand.

### EPX Team Meets the Challenge of Finding New Water Supply

Early in 2004, the City of Boynton Beach embarked on a major improvement project at the City's East Water Treatment Plant

(WTP). The project, named the East Plant Expansion (or EPX for short) involves planning for the future water supply for the City's approximately 100,000 customers.

Proposed modifications to the East WTP combined with an alternate water source will allow the City to meet future water supply demands and also satisfy the requirement by the SFWMD to reduce the reliance on the surficial aquifer.

The City's current water use permit (WUP) requires that future water is supplied from an alternative water source, the most likely being the Floridan aquifer, which lies approximately 1,000 feet below ground and contains water that is brackish, or slightly salty. Shifting from the shallow surficial aquifer to the deeper Floridan aquifer means developing a totally new wellfield, raw water piping network, and building a new WTP to process the brackish water. All of this represents a significant investment for the City. To ensure the best solution, the City assembled a team of the most highly qualified consultants. This Team consists of the following firms, each responsible for different technical components.

- **CH2M HILL, Inc.:** Wellfield location, well site selection, well construction
- **Metcalf and Eddy:** Raw water transmission pipe lines
- **Kimley-Horn and Associates, Inc.:** Water treatment, water plant site, well pumping equipment
- **Arcadis:** Concentrate disposal

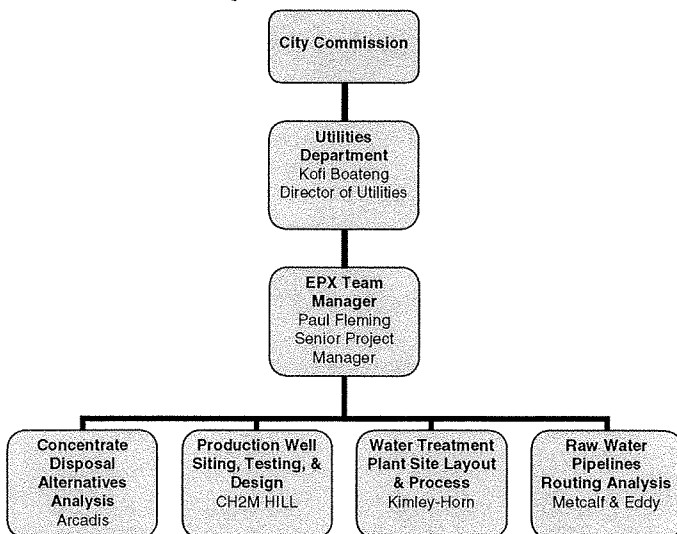
The EPX Team first began reviewing potential sources of water (canals, ocean, and the Floridan aquifer) and methods of treatment that each would require. The Upper Floridan aquifer was determined to be the best source of water, requiring the least amount of treatment and also costing the least to develop.

The Floridan aquifer begins at a depth of approximately 800 feet below ground. Exhibit 3 illustrates a cross section of the local geology and indicates the three different formations the City utilizes. The figure also illustrates the proximity of the Upper Floridan aquifer to the surficial Aquifer (the City's current source of drinking water). Water quality in the upper portion of the aquifer is brackish (a mixture of fresh and salt water) and becomes increasingly salty with depth. Although water withdrawn from the Floridan aquifer will require more treatment than water withdrawn from the surficial aquifer, treatment requirements are less than for salty ocean water. The quantity of water that can be withdrawn from the Upper Floridan aquifer is not currently regulated. In addition, the Floridan aquifer is far more drought-resistant than the currently used surficial aquifer.

### Potential Well Locations Identified

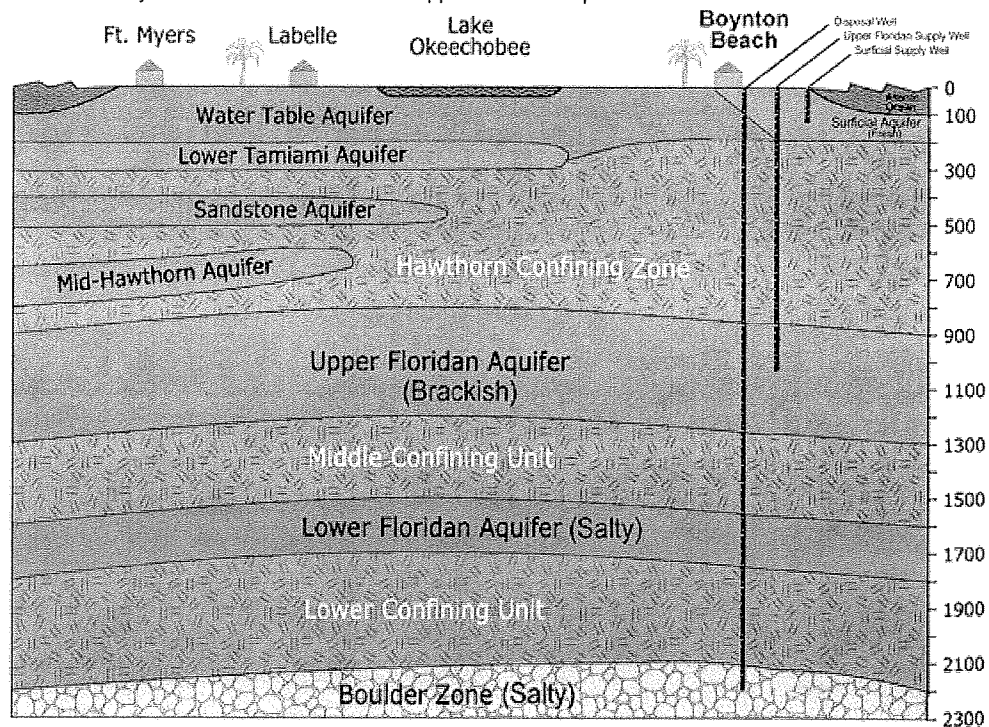
The EPX team began searching for locations for Floridan aquifer supply wells during Stage 1 of the planning process. A preliminary groundwater model was used to simulate

**EXHIBIT 2**  
EPX Team Organization Chart



**EXHIBIT 3**

The EPX Project Will Use Wells from the Upper Floridan Aquifer



the potential response in the aquifer to the proposed groundwater withdrawal. The model indicated that the future Floridan aquifer supply wells should be located west of Interstate 95 to limit potential adverse impacts on water quality from the Atlantic Ocean, and to other users at the Floridan aquifer. For this reason, a north-south well siting along Congress Avenue was chosen. Further, the model indicated that the wells should be spaced approximately 3,000 feet apart to reduce the threat of saltier water being pulled into the wells from the lower portions of the aquifer (upconing). Potential well locations were then evaluated considering the following criteria:

- Spacing requirements identified in the groundwater model
- Current land owner ship and /or ease of acquiring access
- Proximity of sites to a feasible pipeline route

- Access to potable water for testing
- Access to a method of water disposal
- Obtain sufficient sites to provide for system build-out needs

After a regulatory and field review, 15 locations were identified that meet the established criteria. Of the 15 potential well sites, 4 are owned by the City, 3 are owned by Palm Beach County School Board, 2 are owned by Palm Beach County Parks Department, and 6 are located on private, undeveloped land. Exhibit 4 illustrates the locations of the 15 proposed well sites and the raw water distribution piping network.

### Test Well Construction Begins

Currently, the EPX Team is in the process of constructing test wells on Sites PW-1 (within the Quantum Office Park) and PW-8 (Boynton Beach Tennis Center). These sites were selected because they were immediately accessible (owned by the City) and at the extreme ends of the proposed wellfield.



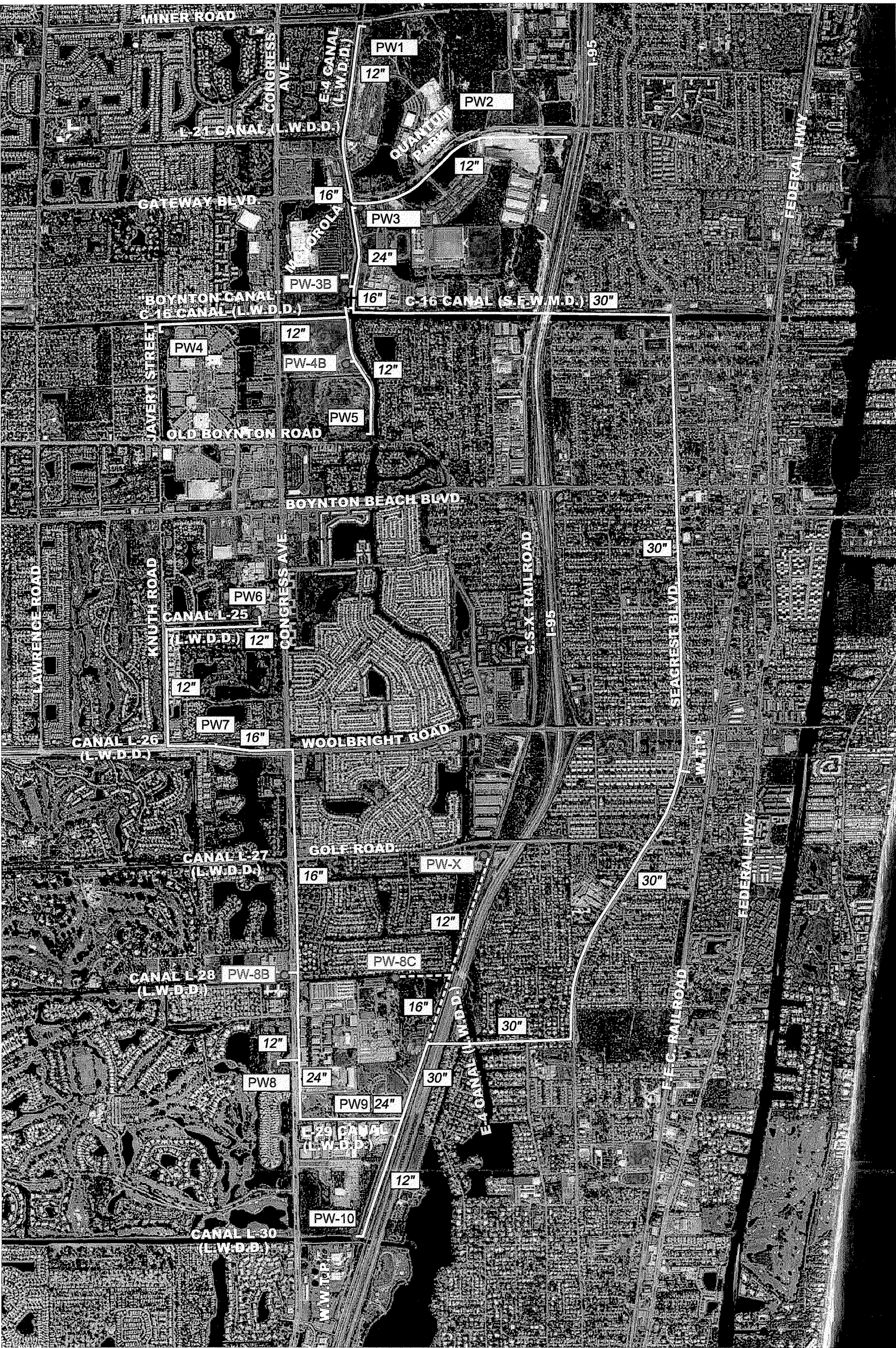
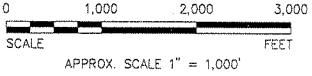


EXHIBIT 4  
Proposed Upper Floridan Aquifer Production Well and Raw Water Pipe-Line Locations

**LEGEND:**

- PROPOSED WELL LOCATION
- ALTERNATIVE WELL LOCATION
- PROPOSED PIPE ROUTE
- 24" = PRELIMINARY PIPE SIZE





Data from the testing program will provide information about the quantity of water that can be extracted from the wells, potential impact on other users of the aquifer, anticipated quality of the water, and the number of wells needed.

After completion of the test well program, the EPX Team will confirm the proposed well sites required. The City will then need to finalize access to the parcels of land not owned by the City. Access agreements will be in the form of land acquisition (purchase) or preparation of a dedicated easement. Within the proposed well sites, the City will construct a production well and associated piping, an emergency power generator, and an onsite fuel supply for the generator. Although each parcel will need to use approximately 100' x 50' to accommodate construction, the final site improvements will only occupy an area 30' x 30'. A conceptual illustration of a typical well site layout is shown on Exhibit 5.

### Raw Water Piping Routing .

Concurrent with the well siting analysis, the EPX Team evaluated various alternatives for routing the raw water piping from the proposed Floridan aquifer production wells back to the East WTP. A new raw-water pipeline will be required because of the location of the proposed wellfield and the fact that water from the Floridan Aquifer

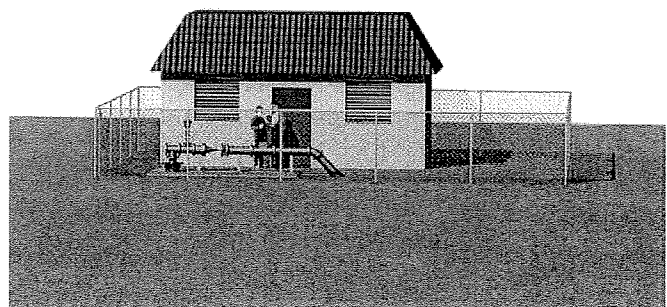
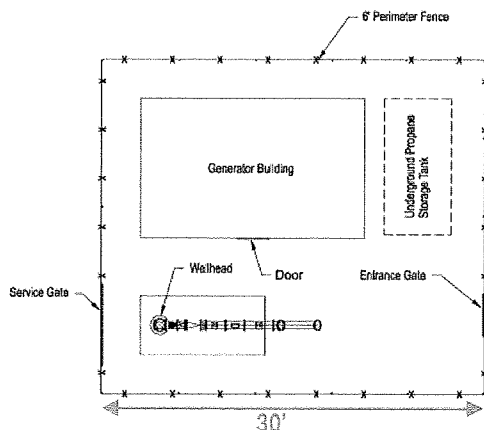
would be incompatible with the existing unlined ductile iron pipe. In establishing the preferred routing, the following criteria were used:

- Avoid using major roadway rights-of-way where ever possible
- Attempt to use easements wherever possible, including those owned by the Lake Worth Drainage District (LWDD), SFWMD, and CSX Rail Road
- Attempt to create a redundant system to permit partial wellfield operation in the event of a segment failure
- Attempt to install piping in right-of-way rather than under pavement where ever possible
- Identify projects where future utilities work will permit efficiency by simultaneous construction (Sanitary Basin 356 Conveyance and Central Seacrest Corridor Projects)

The preferred pipe route (see Exhibit 4) meets the established criteria and results in approximately 12 miles of new raw water conveyance pipe. Of the proposed piping, only 5.5 miles lies within road right-of-way and only 1.9 miles of that lies within a major roadway. Although Exhibit 4 illustrates the anticipated pipe route, the final raw water main cannot be determined or designed until the locations of the production wells

#### EXHIBIT 5

##### Production Wellhead and Generator Building Conceptual Design



are finalized and easements for the pipeline are obtained.

### **Water Treatment Process and Concentrate Disposal**

Water at the new WTP will be treated using low-pressure reverse osmosis (LPRO) technology. This water treatment process is almost identical to that currently in place at the City's West WTP, with primary differences being a higher operating pressure and more corrosion-resistant materials due to the brackish nature of Floridan aquifer water. This treatment process is well proven and has been in use at many WTPs, some for over 15 years. Exhibit 6 illustrates the existing site plan for the East WTP and how it may be modified during future expansions.

The LPRO treatment process produces two streams of water: drinking water and concentrate. This concentrate stream, which is up to 20 percent of the original raw water, contains those salts that were present in the raw water, but now in a concentrated form that is considered a waste product. Disposal of the concentrate stream must be reliable and continuous since the water plant cannot produce drinking water if its flow of concentrate is interrupted. The EPX Team undertook a rigorous analysis of methods that could be used to dispose of

the concentrate stream. Initial screening of options available to the City Boynton Beach included only those that were able to be permitted, designed, and implemented in the time available to meet the EPX project schedule (see Exhibit 7).

The evaluation resulted in the highest rated option being a Class I injection well located at the East WTP. This concentrate disposal technique is a proven technology and would be similar to the Injection Well operated at the West WTP to dispose of the concentrate. To address the need for continu-

ous and reliable discharge of concentrate, surface water discharge appears to be the best solution. Two options were selected as alternate discharge locations, including, discharge to the marine wetland portion of Jaycee Park and the Boynton Beach Inlet.

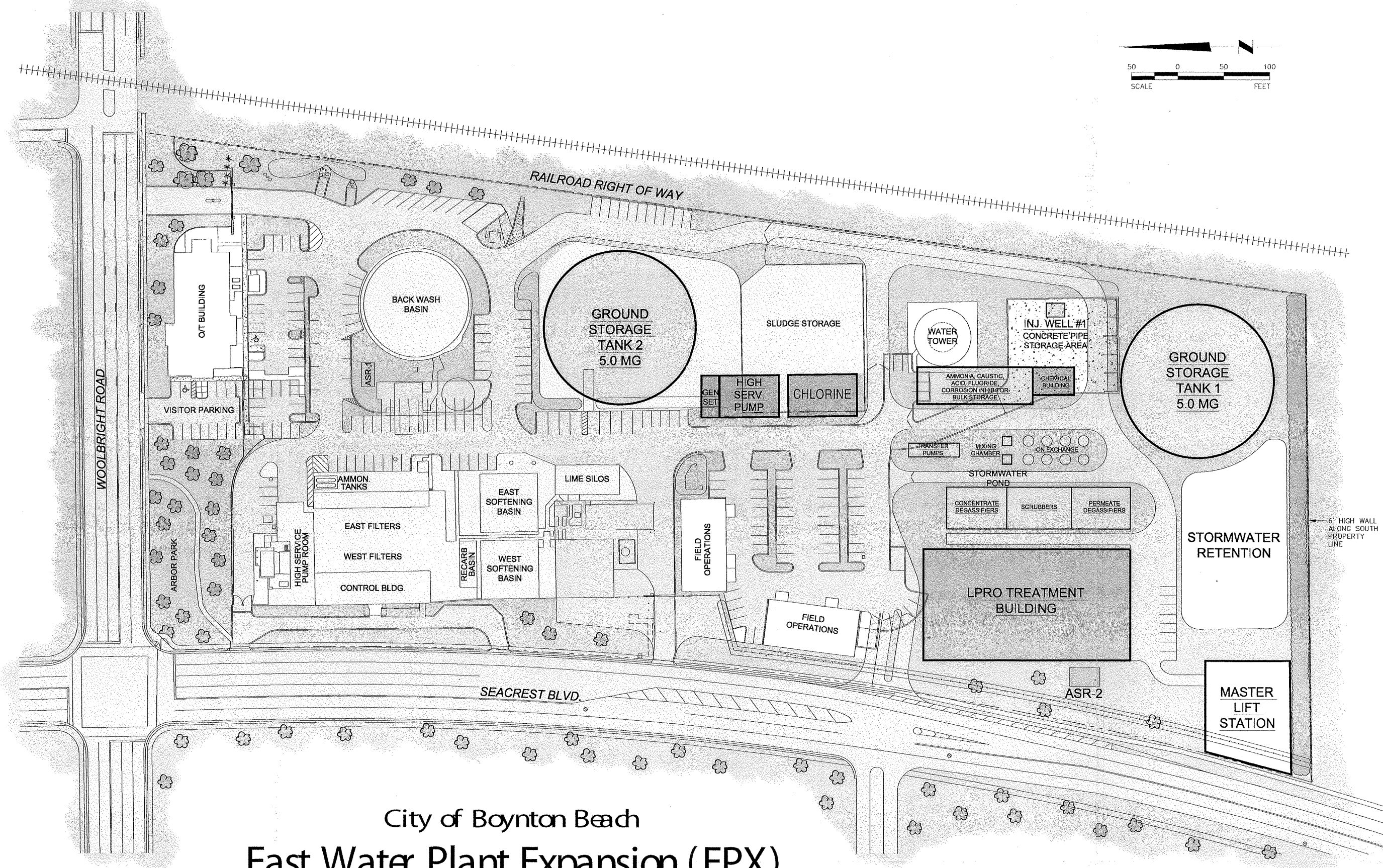
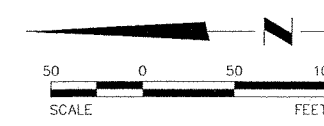
### **The Path Forward**

Following the planning stages of the project, several activities need to occur for the project to continue on course. During this year, two test wells and two dual-zone monitor wells are being constructed to evaluate aquifer yield and water quality. This information will be necessary prior to determining the exact number and locations of the permanent production wells. During the test well construction phase, the City will need to finalize site acquisition activities for the proposed production wells that are not located on City controlled parcels. In addition, the City will also need to negotiate easement or right-of-way agreements for the new raw water pipe lines required to bring the water from the wells to the East WTP.

Due to the limited availability of potential well sites, preliminary site acquisition agreements are required on all well sites identified.

### **Anticipated Costs of Developing EPX**

Anticipated costs associated with the EPX Program are substantial. However, they represent the future of the City's water supply. Improvements proposed in the EPX Program will ultimately provide more than 50 percent of the City's water and will provide a regulatory acceptable, drought-resistant, and sustainable water supply. Following the Phase I, Stage 1 (Planning) activities, estimates have been made associated with Phase 1 and Phase 2 expansions to the East WTP as shown in Exhibit 8.



City of Boynton Beach  
**East Water Plant Expansion (EPX)**  
 Proposed Site Plan  
 April 2005

Future Green Area

EXHIBIT 6

## EXHIBIT 7

### Project Schedule

	2004				2005				2006				2007				2008				2009				2010				2011			
Task	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Phase I - Initial EWTP Expansion to 10 MGD																																
Stage 1 - Planning																																
EWTP Site Layout																																
Well Siting																																
Raw Water Main Routing																																
Disposal Alternatives Analysis																																
Test Well Program																																
Stage 2 - Site Acquisition																																
Stage 3 - Detailed Design																																
Stage 4 - Permitting																																
Stage 5 - Construction																																
Phase II - EWTP Expansion 10-20 MGD																																
																															(Complete by 2014)	

A future Phase II represents an expansion of the new LPRO treatment facility to meet the City's ultimate or "build-out" water demand. By constructing the plant in two phases, the City can avoid over-building and financing unused capacity.

Following the completion of Phase II (the expansion of the LPRO process facility), raw water supplying the East WTP will originate almost entirely from the Upper Floridan Aquifer. At that time, the remaining facilities that currently make up the Lime Softening treatment process will have exceeded their design life and will be decommissioned. The resulting removal

of the surface facilities (filters and sludge management processes) will open much of the East WTP to alternative uses by the Utilities Department. Despite the fact that the City is shifting to the Upper Floridan Aquifer, the City will continue to maintain several of the existing shallow wells (installed into the Surficial Aquifer) and raw water mains. These wells will be used during the wet season to recharge the City's ASR wells and to stabilize and improve water generated from the new LPRO treatment process.

## EXHIBIT 8

### Budget

	Phase I (0-10 mgd)	Phase II (10-20 mgd)	Total
Production Wells	\$15,000,000	\$0	\$15,000,000
Raw Water Piping	\$20,000,000	\$0	\$20,000,000
Site Improvements	\$2,000,000	\$0	\$2,000,000
Treatment Process	\$36,000,000	\$10,000,000	\$46,000,000
Concentrate Disposal	\$13,000,000	\$0	\$13,000,000
<b>Total</b>	<b>\$86,000,000</b>	<b>\$10,000,000</b>	<b>\$96,000,000<sup>a</sup></b>

Note:

<sup>a</sup>Cost estimates are in 2005 dollars and do not reflect price escalation at the time of proposed construction due to inflation or changes in the commodity market