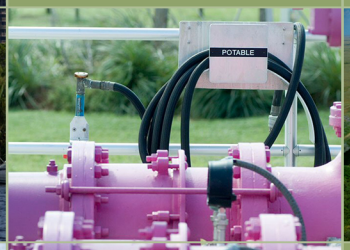
SOUTH FLORIDA WATER MANAGEMENT DISTRICT








LOWER EAST COAST
Water Supply Plan
APPENDICES

2005-2006 UPDATE

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Water Supply Development Projects

Table 1. Broward County Water Supply Development Projects Summary.

County	Utility	Projects	Water Source	Total Capital Costs	Total Design Yield (MGD)				Project Code
					2010	2015	2020	2025	
Broward	Broward County District 1 (BCWWS)	Two Floridan Wells and Treatment Systems	Brackish	$30,000,000	0.00	2.50	5.00	5.00	U
Broward	Broward County 2A/ North Regional (BCWWS)	Use of ASR Well at Broward County 2A WTP	Other	$1,375,000	1.00	1.00	1.00	1.00	U
Broward	Broward County 2A/ North Regional (BCWWS)	West Reclaimed Water Landscape Irrigation for City of Coconut Creek	Reclaimed	$55,640,000	0.60	1.70	2.85	2.85	U
Broward	Broward County 2A/ North Regional (BCWWS)	East Reclaimed Water Landscape Irrigation for City of Pompano Beach	Reclaimed	$40,258,000	0.00	2.00	2.00	2.00	U
Broward	Broward County 2A/ North Regional (BCWWS)	Highly Treated Reuse/Recharge Water for Canal Recharge	Reclaimed	$44,200,000	0.00	6.50	6.50	10.00	D
Broward	Broward County South Regional	Highly Treated Reuse/Recharge Water for Canal Recharge	Reclaimed	TBD	0.00	10.00	10.00	12.00	D
Broward	Cooper City	Conservation Program	Other	$1,500,000	0.50	0.50	0.75	0.75	D
Broward	Cooper City	Floridan RO Facility	Brackish	$11,000,000	1.50	1.50	2.00	2.00	U/D
Broward	Coral Springs	2.00 MGD Floridan RO Water Treatment Plant	Brackish	$10,000,000	2.00	2.00	2.00	2.00	U
Broward	Coral Springs Imp. District (CSID)	Highly Treated Reuse/Recharge Water for Canal Recharge with Coral Springs and North Springs Imp. District (NSID) (2.00 MGD) for Total of 5.00 MGD	Reclaimed	$3,000,000	1.00	1.50	1.50	2.00	D
Broward	Dania Beach	South Regional Wellfield Raw Water Purchase	Other		1.21	2.19	2.56	2.72	D

U/D = Utility Proposed/District Modified
U = Utility Proposed
D = District Proposed
P = Previously Funded Project

Table 1. Broward County Water Supply Development Projects Summary (Continued).

County	Utility	Projects	Water Source	Total Capital Costs	Total Design Yield (MGD)				Project Code
					2010	2015	2020	2025	
Broward	Davie	RO Addition to South WTP (6.00 MGD Capacity)	Brackish	$16,000,000	4.00	5.00	5.00	6.00	U
Broward	Davie	New RO Plant to Serve New 441 Corridor and Downtown Regional Activity Center (RAC) (6.00 MGD Capacity)	Brackish	$24,000,000	4.00	5.00	5.00	6.00	U
Broward	Deerfield Beach	West WTP Brackish Water RO Treatment Improvements - Phase I	Brackish	$5,000,000	1.50	1.50	1.50	1.50	U
Broward	Deerfield Beach	West WTP Brackish Water RO Treatment Improvements - Phase II	Brackish	$2,500,000	1.50	1.50	1.50	3.00	U/D
Broward	Ferncrest	Purchases from Town of Davie	Other	TBD	0.56	0.56	0.56	0.56	D
Broward	Fort Lauderdale	Dixie Floridan Water Supply/Treatment Facility	Brackish	$22,885,000	0.00	4.50	7.50	7.50	U/D
Broward	Fort Lauderdale	Prospect Floridan Water Supply/Treatment Facility	Brackish	$220,696,000	0.00	27.75	30.00	30.00	U/D
Broward	Hallandale Beach	South Regional Wellfield Raw Water Purchase	Other		7.67	8.53	9.19	9.66	U/D
Broward	Hillsboro Beach	New Floridan Aquifer Water Supply Well and Treatment Plant	Brackish	$6,000,000	2.00	2.00	2.00	2.00	U/D
Broward	Hollywood	Additional RO Trains (C, D, E, F & G) at the Water Treatment Plant (WTP)	Brackish	$16,500,000	6.50	6.50	10.70	10.70	U
Broward	Hollywood	Conservation Project	Other	$1,000,000	1.00	1.00	1.00	1.00	D
Broward	Hollywood	Reuse System Storage and Expansion (2)	Reclaimed	$29,000,000	0.00	0.00	4.00	4.00	U
Broward	Hollywood	South Regional Wellfield Raw Water Purchase	Other		7.80	7.93	7.93	7.93	U/D
Broward	Lauderhill	Floridan RO and Expansion	Brackish	$15,500,000	2.00	4.00	4.00	4.25	D
Broward	Margate	Floridan Well and RO Plant	Brackish	$17,000,000	2.50	2.50	2.50	2.50	D
Broward	Miramar	2.00 MGD Floridan RO Water System	Brackish	$4,250,000	1.00	1.00	1.00	1.00	U
Broward	Miramar	2.00 MGD Reclaimed Water Expansion	Reclaimed	$3,500,000	2.00	2.00	2.00	2.00	U/D
Broward	Miramar	4.00 MGD Highly Treated Stormwater or Reuse/Recharge System	Other	$3,500,000	1.00	3.00	4.00	4.00	U

U/D = Utility Proposed/District Modified
U = Utility Proposed
D = District Proposed
P = Previously Funded Project

Table 1. Broward County Water Supply Development Projects Summary (Continued).

County	Utility	Projects	Water Source	Total Capital Costs	Total Design Yield (MGD)				Project Code
					2010	2015	2020	2025	
Broward	North Lauderdale	Highly Treated Reuse/Recharge Water for Canal Recharge	Reclaimed	$1,500,000	0.50	0.50	0.50	0.50	D
Broward	North Springs Imp. District (NSID)	Floridan RO Water Treatment Plant	Brackish	$14,000,000	3.00	3.00	3.00	3.00	D
Broward	Parkland	Bulk Water Purchases (NSID)	Other	$500,000	0.25	0.25	0.25	0.25	D
Broward	Pembroke Pines	Highly Treated Reuse/Recharge Project for 6.00 MGD	Reclaimed	$36,000,000	6.00	6.00	6.00	6.00	U/D
Broward	Plantation	Highly Treated Reuse/Recharge Project for 2.00 MGD	Reclaimed	$14,000,000	2.00	TBD	TBD	TBD	U/D
Broward	Plantation	3.00 MGD Floridan RO Water Treatment Plant	Brackish	$18,000,000	3.00	3.00	3.00	3.00	U
Broward	Pompano Beach	2006 Reclaimed Water Expansion	Reclaimed	TBD	1.25	1.25	1.25	1.25	P
Broward	Pompano Beach	Reuse Distribution Expansion FY 2016 - FY 2025	Reclaimed	TBD	0.60	1.10	1.40	1.50	U
Broward	Pompano Beach	Highly Treated Reuse/Recharge Area Project	Reclaimed	TBD	0.33	0.33	0.33	0.33	U
Broward	Pompano Beach	Highly Treated Reuse/Recharge Water for Canal Recharge	Reclaimed	TBD	2.00	2.00	3.50	5.00	D
Broward	Royal Utility	Conservation and Water Loss Reduction	Other	$250,000	0.25	0.25	0.25	0.25	D
Broward	Sunrise	Springtree WTP Existing ASR Blending Well and Expansion	Brackish	$400,000	3.00	3.00	3.00	3.00	U
Broward	Sunrise	Sawgrass WWTP - Highly Treated Reuse/Recharge Project	Reclaimed	$108,000,000	0.00	4.00	7.00	9.00	U
Broward	Sunrise	Sawgrass WTP Floridan RO Water Treatment Plant	Brackish	$31,300,000	5.00	5.00	5.00	5.00	U
Broward	Sunrise	Southwest WWTP - Highly Treated/Indirect Potable	Reclaimed	$24,000,000	2.00	2.00	2.00	2.00	U
Broward	Tamarac	2.00 MGD Floridan RO Water Treatment Plant	Brackish	$10,000,000	0.00	2.00	2.00	2.00	U

U/D = Utility Proposed/District Modified
U = Utility Proposed
D = District Proposed
P = Previously Funded Project

Table 2. Miami-Dade County Water Supply Development Projects Summary.

County	Utility	Projects	Alternative Water Source	Total Capital Costs	Total Design Yield (MGD)				Project Code
					2010	2015	2020	2025	
Miami-Dade	Florida City	Friedland Manor Stormwater for Indirect Potable Use	Captured Storm Water	$8,000,000	0.65	0.65	0.65	0.65	U
Miami-Dade	Florida City	Floridan Wells	Brackish	$9,660,000	3.90	6.50	6.50	6.50	U
Miami-Dade	Florida City	RO Plant/Brine Treatment RO	Brackish	$18,840,000	2.00	4.50	4.50	4.50	U
Miami-Dade	Florida City	Satellite Treatment	Reclaimed	$4,900,000	0.50	0.50	0.50	0.50	U
Miami-Dade	Florida City	Stormwater Reuse	Captured Storm Water	$2,850,000	0.36	0.36	0.36	0.36	U
Miami-Dade	Homestead	Reclaimed Capacity Expansion	Reclaimed	$3,000,000	1.60	1.60	1.60	6.00	U/D
Miami-Dade	Homestead	Floridan RO Wells, Lines, Mains and Treatment Facility	Brackish	$20,000,000	5.00	5.00	9.00	9.00	D
Miami-Dade	Miami-Dade WASD	Expanding Floridan RO Hialeah Facility	Brackish	$118,000,000	0.00	10.00	15.00	15.00	U/D
Miami-Dade	Miami-Dade WASD	Floridan Blending Wells & ASR	Brackish	$10,200,000	7.40	7.40	7.40	7.40	U
Miami-Dade	Miami-Dade WASD	Floridan Blending Hialeah/Preston	Brackish	$5,200,000	4.80	4.80	4.80	4.8	U
Miami-Dade	Miami-Dade WASD	Reuse Projects North District	Reclaimed	$26,800,000	7.00	7.00	7.00	7.0	U
Miami-Dade	Miami-Dade WASD	Reuse Projects Central District	Reclaimed	$15,300,000	1.00	1.00	1.00	1.0	U
Miami-Dade	Miami-Dade WASD	South Dade Groundwater Recharge Phase I	Reclaimed	$357,500,000	0.00	18.00	18.00	18.0	U

U/D = Utility Proposed/District Modified
U = Utility Proposed
D = District Proposed
P = Previously Funded Project

Table 2. Miami-Dade County Water Supply Development Projects Summary (Continued).

County	Utility	Projects	Alternative Water Source	Total Capital Costs	Total Design Yield (MGD)				Project Code
					2010	2015	2020	2025	
Miami-Dade	Miami-Dade WASD	South Dade Groundwater Recharge Phase II	Reclaimed	$298,000,000	0.00	0.00	0.00	20.00	U
Miami-Dade	Miami-Dade WASD	Conservation	Other	TBD	5.00	7.00	9.00	11.00	U
Miami-Dade	North Miami	Winson Water Plant Expansion	Brackish	$37,000,000	8.00	10.00	12.00	16.00	U
Miami-Dade	North Miami Beach	Floridan RO Wells, Lines, Mains and Treatment Facility Phase I-III	Brackish	$8,210,000	12.50	12.50	12.50	12.50	U
Miami-Dade	North Miami Beach	Floridan RO Wells, Lines, Mains and Treatment Facility Phase IV	Brackish	$37,500,000	0.00	5.00	5.00	5.00	U
Miami-Dade	North Miami Beach	ASR Wells	Other	$4,500,000	2.00	2.00	2.00	2.00	U
Miami-Dade	North Miami Beach	Reclaimed Water Pipe and Storage for Truck Washing Facility	Reclaimed	$1,000,000	0.25	0.25	0.25	0.25	U
Miami-Dade	North Miami Beach	Reclaimed Water Infrastructure for Irrigation	Reclaimed	$3,000,000	1.00	1.00	1.00	1.00	U

U/D = Utility Proposed/District Modified
U = Utility Proposed
D = District Proposed
P = Previously Funded Project

Table 3. Monroe County Water Supply Development Projects Summary.

County	Utility	Projects	Alternative Water Source	Total Capital Costs	Total Design Yield (MGD)				Project Code
					2010	2015	2020	2025	
Monroe	Florida Keys Aqueduct Authority (FKAA)	Floridan RO Plant at the FKAA's J. Robert Dean Water Treatment Plant in Florida City	Brackish	$30,200,000	4.50	6.00	6.00	6.00	U
Monroe	Florida Keys Aqueduct Authority (FKAA)	North Key Largo (AKA Ocean Reef)	Brackish	$26,850,000	4.00	4.00	4.00	4.00	U
Monroe	Florida Keys Aqueduct Authority (FKAA)	Reuse/Reclaimed in Unincorporated Monroe County	Reclaimed	$9,600,000	0.15	0.25	0.30	0.35	U

U/D = Utility Proposed/District Modified
U = Utility Proposed
D = District Proposed
P = Previously Funded Project

Table 4. Palm Beach County Water Supply Development Projects Summary.

County	Utility	Projects	Alternative Water Source	Total Capital Costs	Total Design Yield (MGD)				Project Code
					2010	2015	2020	2025	
Palm Beach	Beeline Community Development Dist.	Water Conservation or Purchased Water	Other	TBD	0.00	0.00	0.25	0.25	D
Palm Beach	Beeline Utilities, L.L.C.	Floridan Wells and RO Facility	Brackish	TBD	1.00	1.00	1.00	1.00	D
Palm Beach	Boca Raton	Expansion of Reclaimed System Infrastructure FY 2010	Reclaimed	$2,000,000	5.00	5.00	5.00	5.00	U
Palm Beach	Boca Raton	Expansion of Reclaimed Water Misc. Projects FY 2010	Reclaimed	TBD	2.19	2.19	2.19	2.19	U
Palm Beach	Boca Raton	Expansion of Reclaimed Water Projects for Biscayne	Reclaimed	TBD	2.60	4.25	4.25	4.25	U
Palm Beach	Boca Raton	Recycling of Membrane Concentrate for Potable Water FY 2011-FY 2012	Other	$4,000,000	0.00	4.25	4.25	4.25	U
Palm Beach	Boynton Beach	West Water Plant RO for Floridan Option	Brackish	$30,000,000	0.00	7.50	7.50	7.50	U
Palm Beach	Boynton Beach	Groundwater Recharge Enhancement	Captured Storm Water	$2,000,000	4.00	4.00	4.00	4.00	U
Palm Beach	Boynton Beach	Reclaimed Water Distribution Phase I: Coastal Business Area	Reclaimed	$1,600,000	1.00	1.00	1.00	1.00	U
Palm Beach	Delray Beach	Reclaimed Water Plant Expansion	Reclaimed	$6,905,000	3.00	3.00	3.00	3.00	U

U/D = Utility Proposed/District Modified
U = Utility Proposed
D = District Proposed
P = Previously Funded Project

Table 4. Palm Beach County Water Supply Development Projects Summary (Continued).

County	Utility	Projects	Alternative Water Source	Total Capital Costs	Total Design Yield (MGD)				Project Code
					2010	2015	2020	2025	
Palm Beach	Delray Beach	Delray Beach Areas 1 Reclaimed Water System - 2005	Reclaimed	N/A	0.63	0.63	0.63	0.63	P
Palm Beach	Delray Beach	Delray Beach Areas 2 & 3 Reclaimed Water System - 2006	Reclaimed	$2,060,900	1.90	1.90	1.90	1.90	P
Palm Beach	Delray Beach	Delray Beach Areas 4, 6, 8, 11-13 Reclaimed Water System	Reclaimed	$8,560,000	4.65	4.65	4.65	4.65	P
Palm Beach	Delray Beach	Floridan RO Water Treatment Plant	Brackish	$14,000,000	0.00	1.00	2.50	3.50	D
Palm Beach	Golf	Delray Beach Expanded Areas Reclaimed Water System	Reclaimed	$100,000	0.00	0.25	0.25	0.25	D
Palm Beach	Highland Beach	Expansion and Improvement of Floridan RO Facility	Brackish	$4,833,809	2.25	2.25	2.25	2.25	U
Palm Beach	Jupiter	Jupiter Floridan Expansion (Add'l Capacity)	Brackish	$34,250,000	6.50	10.00	10.00	12.00	U/D
Palm Beach	Jupiter	Surface Water Improvements to Supplement Reclaimed Irrigation System	Captured Storm Water	$1,066,000	5.00	5.00	10.00	10.00	P
Palm Beach	Jupiter	Nanofiltration Concentrate Transfer to Loxahatchee River District	Reclaimed	$718,000	3.00	3.00	3.00	3.00	U
Palm Beach	Jupiter	Loxahatchee River District Reclaimed Water System	Reclaimed	$1,400,000	2.40	5.00	5.00	5.00	U
Palm Beach	Lake Worth	Floridan RO Water Treatment Plant, 4.00 MGD Expanding to 9.00 MGD by 2025	Brackish	$46,970,000	2.61	4.00	6.50	6.75	U

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Table 4. Palm Beach County Water Supply Development Projects Summary (Continued).

County	Utility	Projects	Alternative Water Source	Total Capital Costs	Total Design Yield (MGD)				Project Code
					2010	2015	2020	2025	
Palm Beach	Lantana	Purchase Water Agreement with Lake Worth	Other	$2,500,000	0.50	0.60	0.80	1.00	D
Palm Beach	Manalapan	Floridan RO Expansion	Brackish	$3,000,000	1.10	1.25	1.44	1.60	D
Palm Beach	Palm Beach County - Lake Region	Floridan RO Water Treatment Plant (WTP) Phase I	Brackish	$25,000,000	10.00	10.00	10.00	10.00	U
Palm Beach	Palm Beach County Utilities	Palm Beach County WTP No. 2 Floridan Expansion (15.00 MGD)	Brackish	$45,000,000	0.00	0.00	15.00	15.00	U
Palm Beach	Palm Beach County Utilities	New Northern Floridan Wellfield and Facility	Brackish	$35,000,000	0.00	10.00	10.00	10.00	U
Palm Beach	Palm Beach County Utilities	Reclaimed Pipeline Projects (3)	Reclaimed	$12,500,000	4.50	6.50	6.50	6.50	U
Palm Beach	Palm Beach County Utilities	Western Communities Reclaimed Water Constructed Wetlands	Reclaimed	$6,000,000	0.00	0.00	0.00	2.00	U
Palm Beach	Palm Beach County Utilities	Satellite Membrane Bioreactor Reclaimed Water Facilities (3)	Reclaimed	$9,000,000	2.00	4.00	4.00	6.00	U
Palm Beach	Palm Beach County Utilities	Palm Beach County Water Reclamation Facility Projects (3)	Reclaimed	$39,500,000	3.00	3.00	18.00	21.00	U
Palm Beach	Palm Beach County Utilities	Construct 0.50 MGD Reclaimed Water Facility in the Palm Beach County Agricultural Reserve Area	Reclaimed	$1,500,000	0.00	0.00	0.50	0.50	U
Palm Beach	Palm Springs	Purchase Water Agreement	Other	$2,500,000	0.50	0.75	1.00	1.25	D

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Table 4. Palm Beach County Water Supply Development Projects Summary (Continued).

County	Utility	Projects	Alternative Water Source	Total Capital Costs	Total Design Yield (MGD)				Project Code
					2010	2015	2020	2025	
Palm Beach	Riviera Beach	New Riviera Beach 20.00 MGD Floridan RO Water Treatment Plant	Brackish	$60,000,000	10.50	12.00	13.50	15.00	U/D
Palm Beach	Seacoast	Hood Road WTP RO System - Four Floridan Wells and Two RO Reject Wells	Brackish	$59,000,000	1.60	3.90	5.80	7.30	U/D
Palm Beach	Seacoast	Seacoast 4.00 MGD Reclaimed Water Treatment Expansion - 2006 Funded Project	Reclaimed	$10,250,600	4.00	4.00	4.00	4.00	P
Palm Beach	Seminole Improvement District	Water Conservation or Purchased Water	Other	TBD	0.00	0.50	0.50	0.50	D
Palm Beach	Tequesta	2006 Project Floridan Well #4 and Raw Water Main	Brackish	$1,210,000	0.88	0.88	0.88	0.88	P
Palm Beach	Tequesta	Floridan RO Expansion	Brackish	TBD	1.00	2.25	2.25	2.25	D
Palm Beach	Tropical Breeze Estates	Water Conservation	Other	TBD	0.00	0.50	0.50	0.50	D
Palm Beach	Wellington/Acme Improvement District	Floridan Wells and RO Facility	Brackish	TBD	4.00	4.00	5.00	5.00	D
Palm Beach	West Palm Beach	Wetlands-Based Water Reclamation Project - 20.00 MGD	Reclaimed	$15,000,000	10.00	10.00	10.00	10.00	U
Palm Beach	West Palm Beach	Wetlands-Based Water Reclamation Project - 30.00 MGD	Reclaimed	$25,000,000	0.00	10.00	10.00	10.00	U

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Table 4. Palm Beach County Water Supply Development Projects Summary (Continued).

County	Utility	Projects	Alternative Water Source	Total Capital Costs	Total Design Yield (MGD)				Project Code
					2010	2015	2020	2025	
Palm Beach	West Palm Beach	2006 Project Alternative Sites 1 & 2 Wetlands Rehydration	Reclaimed	$255,000	1.50	1.50	1.50	1.50	P
Palm Beach	West Palm Beach	2006 Project Wetlands-Based Water Reclamation Project - Phase III	Reclaimed	$950,000	0.50	0.50	0.50	0.50	P
Palm Beach	West Palm Beach	11.00 MGD Western Water Treatment Plant	Reclaimed	$20,000,000	0.00	11.50	11.50	11.50	U
Palm Beach	West Palm Beach	ASR Wells	Other	$10,000,000	0.00	10.00	10.00	10.00	U

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Table 5. Lower East Coast Water Supply Development Projects for Other Entities.

County	Entity	Projects	Alternative Water Source	Total Capital Costs	Total Design Yield (MGD)				Project Code
					2010	2015	2020	2025	
Broward	FP&L	FPL2015B	TBD		0.00	7.60	7.60	7.60	U
Miami-Dade	FP&L	FPL2021A	TBD		0.00	0.00	0.00	27.80	U
Miami-Dade	FP&L	FPL2023	TBD		0.00	0.00	0.00	27.80	U
Miami-Dade	FP&L	Turkey Point	Brackish		12.10	12.10	12.10	12.10	U
Miami-Dade	FP&L	Miami-Dade Baseline	TBD		2.10	2.10	2.10	2.10	U
Monroe	City of Marathon	Wastewater Collection Blending	Reclaimed	$70,539,313	0.40	1.00	1.00	1.00	U
Palm Beach	FP&L	WCEC Unit 1 (2009)	TBD		7.60	7.60	7.60	7.60	U
Palm Beach	FP&L	WCEC Unit 2 (2010A)	TBD		7.60	7.60	7.60	7.60	U
Palm Beach	FP&L	FPL2012B	TBD		0.00	0.00	7.60	7.60	U
Palm Beach	Loxahatchee River Environmental Control District	Nanofiltration/Reuse Blending	Other	$1,400,000	2.40	2.40	2.40	2.40	U
Palm Beach	Loxahatchee River Environmental Control District	Disinfection Facilities Expansion	Reclaimed	$800,000	1.00	1.00	1.00	1.00	U
Palm Beach	Loxahatchee River Environmental Control District	Reuse Distribution System Expansion	Reclaimed	$800,000	1.40	1.40	1.40	1.40	U
Palm Beach	Loxahatchee River Environmental Control District	Reclaimed Water Storage Maximization	Reclaimed	$750,000	1.00	1.00	1.00	1.00	U
Palm Beach	Loxahatchee River Environmental Control District	Reclaimed Water Supplement	Reclaimed	$2,700,000	1.50	1.50	1.50	1.50	U

U/D = Utility Proposed/District Modified
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P = Previously Funded Project

B

Information for Local Government Comprehensive Plans

The water supply plan updates contain a variety of water supply-related information useful to local governments in the preparation and amendment of their comprehensive plans. Much of that information is contained within other appendices or chapters of this *2005–2006 Lower East Coast Water Supply Plan Update* (2005–2006 LEC Plan Update) and can be found in the following locations:

Water Sources	Chapters 5 and 7 and Appendix A
Utility Areas Served (2005–2006 & 2025)	Appendices B and D
Population Projections (2005–2025)	Chapter 2 and Appendix D
Demand Projections (2005–2025)	Chapter 2 and Appendix D
Water Supply Projects (2005–2025)	Chapter 7 and Appendix A

Other information useful for comprehensive plans is provided in this appendix:

1. The South Florida Water Management District's (SFWMD or District) checklist of needed comprehensive plan data.
   a. Cited statutory provisions.
2. Tables showing which utilities serve which jurisdictions.
3. Maps of utility areas currently served (2005–2006) and to-be-served (2025).

1. CHECKLIST OF NEEDED COMPREHENSIVE PLAN DATA

This section provides a general checklist of the type of data and information that the SFWMD will be looking for to review water supply issues in local government comprehensive plans. This listing is not all-inclusive, but provides a broad, general framework that should be used in combination with the more

detailed, related guidelines developed by the Florida Department of Community Affairs (FDCA), and case-by-case comments made by the SFWMD on specific water supply issues.

Checklist guidance is given for three water supply aspects of comprehensive plans:

A. Plan Amendments (Future Land Use Change).

B. 10-Year Water Supply Facilities Work Plan and Other Potable Water Sub-Element Revisions.

C. Evaluation & Appraisal Report (EAR).

A. Plan Amendments (Future Land Use Change)

Water Supply Demand Projections

- Address both raw and finished (i.e., after any losses due to water treatment) water supply needs for both potable and nonpotable (i.e., irrigation) demands, using professionally acceptable methodologies.
- Address existing and future conservation and reuse commitments, and levels of service, for both the proposed future land use change and the comprehensive plan.
- Address both the build-out time frame for a proposed future land use change and the established planning time frame for the comprehensive plan.

Water Source Identification

- For existing demands, reflect water source(s) from supplier's consumptive use permit (CUP).
- For future demands covered by a supplier's commitment to provide service under remaining available capacity of an existing consumptive use permit, reflect the water source(s) from the supplier's CUP.
- For future demands not covered by an existing CUP, provide sufficient planning level data and analysis to demonstrate the availability of a sustainable water source as identified in the appropriate District regional water supply plan.

Availability of Water Supply and Public Facilities

- Demonstrate that there is an availability of raw water supply from the proposed source(s) of raw supply for the future land use change, given all other approved land use commitments within the local government's jurisdiction over both the proposed amendment's build-out, and the established planning period of the comprehensive plan. (See Section 163.3167(13), F.S., and Subsection 163.3177(6)(a), F.S.)
- Demonstrate that there is an availability of both treatment facility capacity and permitted, available finished water supply for the future land use change, given all other commitments for that capacity and supply over the proposed amendment's build-out time frame.

- If the availability of either water supply and/or public facilities is not currently demonstrable, this will require either phasing of the future land use (see Subsection 163.3177(10)(h), F.S.), and/or appropriate amendments to the Capital Improvements Element, or to the Potable Water Sub-Element, to ensure the necessary capital planning and timely availability of the needed infrastructure and water supply. (See Subsections 163.3177(3)(a) and (6)(c), F.S.)

Related Comprehensive Plan Amendments

- Addressing a future land use change may also require amendments to other specific elements within the comprehensive plan if it requires an adjustment to either the plan's future population or demand projections; the comprehensive plan's established planning period; or, the water supply sources required to be addressed in the comprehensive plan. (See Section 163.3167(13), F.S., and Subsections 163.3177(5)(a), 163.3177(6)(a), 163.3177(6)(c), and 163.3177(6)(d), F.S.)

B. 10-Year Water Supply Facilities Work Plan and Other Potable Water Sub-Element Revisions

(Within 18 months following this 2005–2006 LEC Water Supply Plan Update)

Water Supply Demand Projections

- Coordinate with the regional water supply plan's demand projections. Address both raw and finished (i.e., after any losses due to water treatment) water supply needs for both potable and nonpotable (i.e., irrigation) demands within the jurisdiction (regardless of supplier) for at least five-year intervals out to the established planning time frame of the comprehensive plan.
- Address existing and future conservation and reuse commitments and levels of service for the established planning time frame of the comprehensive plan.
- Identify existing and future utility service areas (i.e., areas to be actually served) for each provider within the jurisdiction.
- Identify areas and amounts of any self-supply (i.e., supply by single-family individual wells) separately.

Water Source Identification

- Address the water supply sources necessary to meet and achieve the existing and projected water use demand for the established planning period, considering the regional water supply plan.

Water Supply Project Identification and Selection

- Identify sufficient conservation, reuse, alternative water supply projects and traditional water supply projects necessary to meet projected demands.
- Select and incorporate into the comprehensive plan alternative water supply project(s) selected by the local government from those identified in the regional water supply plan, or propose alternatives.
- Based upon projected demands, include a water supply facilities work plan, covering at least a 10-year planning period, but preferably out to the

established planning period, for building all public, private and regional water supply facilities that will provide water supply service within the local government's jurisdiction (e.g., if it is a water provider to land uses within the jurisdiction, its facility planning must be addressed in the work plan).

- Appropriate amendments to the Capital Improvements Element may be required. (See Subsection 163.3177(3)(a), F.S.).

C. Evaluation & Appraisal Report (EAR) Subsection 163.3191(2)(L), F.S.

(Submitted after the adoption of a 10-Year Water Supply Facilities Work Plan)

Water Supply Project Identification and Selection

- Identify the extent to which the local government has been successful in identifying alternative water supply projects and traditional water supply projects, including conservation and reuse, necessary to meet projected demands.
- Evaluate the degree to which the 10-Year Water Supply Facilities Work Plan has been implemented for building all public, private and regional water supply facilities within the jurisdiction necessary to meet projected demands.

1a. CITED STATUTORY PROVISIONS (RELEVANT PORTIONS)

163.3167(13), F.S.: Each local government shall address in its comprehensive plan, as enumerated in this chapter, the water supply sources necessary to meet and achieve the existing and projected water use demand for the established planning period, considering the applicable plan developed pursuant to s. 373.0361.

163.3177(3)(a), F.S.: The comprehensive plan shall contain a capital improvements element designed to consider the need for and the location of public facilities in order to encourage the efficient utilization of such facilities and set forth:

1. A component which outlines principles for construction, extension or increase in capacity of public facilities, as well as a component which outlines principles for correcting existing public facility deficiencies, which are necessary to implement the comprehensive plan. The components shall cover at least a 5-year period.

2. Estimated public facility costs, including a delineation of when facilities will be needed, the general location of the facilities, and projected revenue sources to fund the facilities.

3. Standards to ensure the availability of public facilities and the adequacy of those facilities including acceptable levels of service.

4. Standards for the management of debt.

5. A schedule of capital improvements which includes publicly funded projects, and which may include privately funded projects for which the local government has no fiscal responsibility, necessary to ensure that adopted level-of-service standards are achieved and maintained. For capital improvements that will be funded by the developer, financial feasibility shall be demonstrated by being guaranteed in an enforceable development agreement or interlocal agreement pursuant to paragraph (10)(h), or other enforceable agreement. These development agreements and interlocal agreements shall be reflected in the schedule of capital improvements if the capital improvement is necessary to serve development within the 5-year schedule. If the local government uses planned revenue sources that require referenda or other actions to secure the revenue source, the plan must, in the event the referenda are not passed or actions do not secure the planned revenue source, identify other existing revenue sources that will be used to fund the capital projects or otherwise amend the plan to ensure financial feasibility.

6. The schedule must include transportation improvements included in the applicable metropolitan planning organization's transportation improvement program adopted pursuant to s. 339.175(7) to the extent that such improvements are relied upon to ensure concurrency and financial feasibility. The schedule must also be coordinated with the applicable metropolitan planning organization's long-range transportation plan adopted pursuant to s. 339.175(6).

163.3177(5)(a), F.S.: Each local government comprehensive plan must include at least two planning periods, one covering at least the first 5-year period occurring after the plan's adoption and one covering at least a 10-year period.

163.3177(6)(a), F.S.: A future land use plan element designating proposed future general distribution, location, and extent of the uses of land for residential uses, commercial uses, industry, agriculture, recreation, conservation, education, public buildings and grounds, other public facilities, and other categories of the public and private uses of land… . The future land use plan shall be based upon surveys, studies, and data regarding the area, including the amount of land required to accommodate anticipated growth; the projected population of the area; the character of undeveloped land; the availability of water supplies, public facilities, and services; … .

163.3177(6)(c), F.S.: A general sanitary sewer, solid waste, drainage, potable water, and natural groundwater aquifer recharge element correlated to principles and guidelines for future land use, indicating ways to provide for future potable water, drainage, sanitary sewer, solid waste, and aquifer recharge protection requirements for the area. The element may be a detailed engineering plan including a topographic map depicting areas of prime groundwater recharge. The element shall describe the problems and needs and the general facilities that will be required for solution of the problems and needs. The element shall also include a topographic map depicting any areas adopted by a regional water management district as prime groundwater recharge areas for the Floridan or Biscayne aquifers. These areas shall be given special consideration when the local

government is engaged in zoning or considering future land use for said designated areas. For areas served by septic tanks, soil surveys shall be provided, which indicate the suitability of soils for septic tanks. Within 18 months after the governing board approves an updated regional water supply plan, the element must incorporate the alternative water supply project or projects selected by the local government from those identified in the regional water supply plan pursuant to s. 373.0361(2)(a) or proposed by the local government under s. 373.0361(7)(b). If a local government is located within two water management districts, the local government shall adopt its comprehensive plan amendment within 18 months after the later updated regional water supply plan. The element must identify such alternative water supply projects and traditional water supply projects and conservation and reuse necessary to meet the water needs identified in s. 373.0361(2)(a) within the local government's jurisdiction and include a work plan, covering at least a 10-year planning period, for building public, private and regional water supply facilities, including development of alternative water supplies, which are identified in the element as necessary to serve existing and new development. The work plan shall be updated, at a minimum, every 5 years within 18 months after the governing board of a water management district approves an updated regional water supply plan. Amendments to incorporate the work plan do not count toward the limitation on the frequency of adoption of amendments to the comprehensive plan. Local governments, public and private utilities, regional water supply authorities, special districts and water management districts are encouraged to cooperatively plan for the development of multijurisdictional water supply facilities that are sufficient to meet projected demands for established planning periods, including the development of alternative water sources to supplement traditional sources of groundwater and surface water supplies.

163.3177(6)(d), F.S.: A conservation element for the conservation, use and protection of natural resources in the area, including air, water, water recharge areas, wetlands, waterwells, estuarine marshes, soils, beaches, shores, flood plains, rivers, bays, lakes, harbors, forests, fisheries and wildlife, marine habitat, minerals, and other natural and environmental resources. Local governments shall assess their current, as well as projected, water needs and sources for at least a 10-year period, considering the appropriate regional water supply plan approved pursuant to s. 373.0361, or, in the absence of an approved regional water supply plan, the district water management plan approved pursuant to s. 373.036(2). This information shall be submitted to the appropriate agencies… .

163.3177(10)(h), F.S.: It is the intent of the Legislature that public facilities and services needed to support development shall be available concurrent with the impacts of such development in accordance with s. 163.3180. In meeting this intent, public facility and service availability shall be deemed sufficient if the public facilities and services for a development are phased, or the development is phased, so that the public facilities and those related services which are deemed necessary by the local government to operate the facilities necessitated by that development are available concurrent with the impacts of the development. The public facilities and services, unless

already available, are to be consistent with the capital improvements element of the local comprehensive plan as required by paragraph (3)(a) or guaranteed in an enforceable development agreement. This shall include development agreements pursuant to this chapter or in an agreement or a development order issued pursuant to chapter 380. Nothing herein shall be construed to require a local government to address services in its capital improvements plan or to limit a local government's ability to address any service in its capital improvements plan that it deems necessary.

163.3191(2)(l), F.S.: The extent to which the local government has been successful in identifying alternative water supply projects and traditional water supply projects, including conservation and reuse, necessary to meet the water needs identified in s. 373.0361(2)(a) within the local government's jurisdiction. The report must evaluate the degree to which the local government has implemented the work plan for building public, private and regional water supply facilities, including development of alternative water supplies, identified in the element as necessary to serve existing and new development.

2. TABLES SHOWING WHICH UTILITIES SERVE WHICH JURISDICTIONS

This portion of Appendix B contains two tables showing local government jurisdictions and the utilities that provide raw or finished water to those local governments. **Table 1** is listed by local governments within the LEC Planning Area. **Table 2** is listed by utilities serving specific local government jurisdictions within the LEC Planning Area.

Table 1. The Local Governments in the LEC Planning Area and the Utilities Serving Them.

Local Government	County	Utility/Entity Serving Local Government
Broward County **(unincorporated)**	Broward	Broward County Water & Wastewater Services; City of Hollywood; Sunrise Utilities Dept.
City of Coconut Creek	Broward	Broward County Water & Wastewater Services; City of Margate; Parkland Utilities, Inc.
City of Cooper City	Broward	Cooper City Utilities Dept.
City of Coral Springs	Broward	City of Coral Springs; Coral Springs Improvement District; North Springs Improvement District; Royal Utility Co.; Broward County Water & Wastewater Services
City of Dania Beach	Broward	City of Dania Beach; City of Hollywood; Broward County Water & Wastewater Services
Town of Davie	Broward	Town of Davie; Sunrise Utilities Dept; Ferncrest Utilities
City of Deerfield Beach	Broward	City of Deerfield Beach; Broward County Water & Wastewater Services; Palm Beach County Water Utilities Dept.
City of Fort Lauderdale	Broward	City of Fort Lauderdale; City of Tamarac
City of Hallandale Beach	Broward	City of Hallandale Beach; Broward County Water & Wastewater Services
Town of Hillsboro Beach	Broward	Town of Hillsboro Beach
City of Hollywood	Broward	City of Hollywood; Broward County Water & Wastewater Services
Town of Lauderdale-by-the-Sea	Broward	City of Fort Lauderdale
City of Lauderdale Lakes	Broward	Broward County Water & Wastewater Services
City of Lauderhill	Broward	City of Lauderhill
Village of Lazy Lake	Broward	City of Fort Lauderdale
City of Lighthouse Point	Broward	City of Pompano Beach Utilities Dept.; Broward County Water & Wastewater Services
City of Margate	Broward	City of Margate
City of Miramar	Broward	City of Miramar
City of North Lauderdale	Broward	City of North Lauderdale; Broward County Water & Wastewater Services
City of Oakland Park	Broward	City of Fort Lauderdale; Broward County Water & Wastewater Services
City of Parkland	Broward	Parkland Utilities, Inc.; North Springs Improvement District; City of Coconut Creek (retail)

Table 1. The Local Governments in the LEC Planning Area and the Utilities Serving Them (Continued).

Local Government	County	Utility/Entity Serving Local Government
Town of Pembroke Park	Broward	City of Hollywood
City of Pembroke Pines	Broward	City of Pembroke Pines
City of Plantation	Broward	City of Plantation
City of Pompano Beach	Broward	City of Pompano Beach Utilities Dept.; Broward County Water & Wastewater Services
Village of Sea Ranch Lakes	Broward	City of Fort Lauderdale.
Seminole Tribe of Florida		Seminole Hollywood Reservation
Town of Southwest Ranches	Broward	City of Pembroke Pines; Sunrise Utilities Dept.
City of Sunrise	Broward	Sunrise Utilities Dept.
City of Tamarac	Broward	City of Tamarac; City of Fort Lauderdale
Weston	Broward	Sunrise Utilities Dept.
West Park	Broward	City of Hollywood
Wilton Manors	Broward	City of Fort Lauderdale
Miami-Dade County **(unincorporated)**	Miami-Dade	City of North Miami Beach; City of North Miami; Miami-Dade Water & Sewer Dept.
Aventura	Miami-Dade	City of North Miami Beach
City of Bal Harbour Village	Miami-Dade	Miami-Dade Water & Sewer Dept.
Town of Bay Harbor Islands	Miami-Dade	Miami-Dade Water & Sewer Dept.
Village of Biscayne Park	Miami-Dade	City of North Miami Beach; City of North Miami
City of Coral Gables	Miami-Dade	Miami-Dade Water & Sewer Dept.
Town of Cutler Bay	Miami-Dade	Miami-Dade Water & Sewer Dept.
City of Doral	Miami-Dade	Miami-Dade Water & Sewer Dept.
Village of El Portal	Miami-Dade	Miami-Dade Water & Sewer Dept.
City of Florida City	Miami-Dade	Florida City Water and Sewer Dept.
Town of Golden Beach	Miami-Dade	City of North Miami Beach
City of Hialeah	Miami-Dade	Miami-Dade Water & Sewer Dept.
City of Hialeah Gardens	Miami-Dade	Miami-Dade Water & Sewer Dept.
City of Homestead	Miami-Dade	City of Homestead
Village of Indian Creek	Miami-Dade	Miami-Dade Water & Sewer Dept.
Village of Key Biscayne	Miami-Dade	Miami-Dade Water & Sewer Dept.
Town of Medley	Miami-Dade	Miami-Dade Water & Sewer Dept.
City of Miami	Miami-Dade	Miami-Dade Water & Sewer Dept.
City of Miami Beach	Miami-Dade	Miami-Dade Water & Sewer Dept.
City of Miami Gardens	Miami-Dade	City of North Miami Beach
Town of Miami Lakes	Miami-Dade	Miami-Dade Water & Sewer Dept.

Table 1. The Local Governments in the LEC Planning Area and the Utilities Serving Them (Continued).

Local Government	County	Utility/Entity Serving Local Government
Village of Miami Shores	Miami-Dade	City of North Miami; Miami-Dade Water & Sewer Dept.
City of Miami Springs	Miami-Dade	Miami-Dade Water & Sewer Dept.
City of North Bay Village	Miami-Dade	Miami-Dade Water & Sewer Dept.
City of North Miami	Miami-Dade	City of North Miami ; City of North Miami Beach; Miami-Dade Water & Sewer Dept.
City of North Miami Beach	Miami-Dade	City of North Miami Beach; Miami-Dade Water & Sewer Dept.
City of Opa-Locka	Miami-Dade	Miami-Dade Water & Sewer Dept.
Village of Palmetto Bay	Miami-Dade	Miami-Dade Water & Sewer Dept.
Village of Pinecrest	Miami-Dade	Miami-Dade Water & Sewer Dept.
City of South Miami	Miami-Dade	Miami-Dade Water & Sewer Dept.
City of Sunny Isles Beach	Miami-Dade	City of North Miami Beach
Town of Surfside	Miami-Dade	Miami-Dade Water & Sewer Dept.
City of Sweetwater	Miami-Dade	Miami-Dade Water & Sewer Dept.
Village of Virginia Gardens	Miami-Dade	Miami-Dade Water & Sewer Dept.
City of West Miami	Miami-Dade	Miami-Dade Water & Sewer Dept.
Monroe County **(unincorporated)**	Monroe	Florida Keys Aqueduct Authority
Village of Islamorada	Monroe	Florida Keys Aqueduct Authority
City of Key Colony Beach	Monroe	Florida Keys Aqueduct Authority
City of Key West	Monroe	Florida Keys Aqueduct Authority
City of Layton	Monroe	Florida Keys Aqueduct Authority
City of Marathon	Monroe	Florida Keys Aqueduct Authority
Palm Beach County **(unincorporated)**	Palm Beach	Palm Beach County Water Utilities Dept.; City of Boynton Beach; Village of Golf; Town of Jupiter; Maralago Cay; Village of Palm Springs; Seacoast Utility Authority; Seminole Improvement District; Tropical Breeze Estates; Village of Wellington/Acme Improvement District
City of Atlantis	Palm Beach	Palm Beach County Water Utilities Dept.
City of Belle Glade	Palm Beach	City of Belle Glade; Palm Beach County Water Utilities Dept. (future)
City of Boca Raton	Palm Beach	City of Boca Raton; Palm Beach County Water Utilities Dept.
City of Boynton Beach	Palm Beach	City of Boynton Beach; Palm Beach County Water Utilities Dept.
Town of Briny Breezes	Palm Beach	City of Boynton Beach
Town of Cloud Lake	Palm Beach	Palm Beach County Water Utilities Dept.

Table 1. The Local Governments in the LEC Planning Area and the Utilities Serving Them (Continued).

Local Government	County	Utility/Entity Serving Local Government
City of Delray Beach	Palm Beach	City of Delray Beach; Palm Beach County Water Utilities Dept.
Town of Glen Ridge	Palm Beach	Palm Beach County Water Utilities Dept.
Village of Golf	Palm Beach	Village of Golf
City of Greenacres	Palm Beach	Palm Beach County Water Utilities Dept.
Town of Gulf Stream	Palm Beach	City of Delray Beach
Town of Haverhill	Palm Beach	Palm Beach County Water Utilities Dept.
Town of Highland Beach	Palm Beach	Town of Highland Beach; Palm Beach County Water Utilities Dept.
Town of Hypoluxo	Palm Beach	City of Boynton Beach; Town of Manalapan
Town of Juno Beach	Palm Beach	Town of Jupiter; Seacoast Utility Authority
Town of Jupiter	Palm Beach	Town of Jupiter
Town of Jupiter Inlet Colony	Palm Beach	Village of Tequesta
Town of Lake Clarke Shores	Palm Beach	Palm Beach County Water Utilities Dept.; Town of Lake Worth; Village of Palm Springs
Town of Lake Park	Palm Beach	Seacoast Utility Authority
City of Lake Worth	Palm Beach	City of Lake Worth ; Palm Beach County Water Utilities Dept.
Town of Lantana	Palm Beach	Town of Lantana
Town of Loxahatchee Groves	Palm Beach	Unincorporated Palm Beach County
Town of Manalapan	Palm Beach	Town of Manalapan
Town of Mangonia Park	Palm Beach	Town of Mangonia Park
Village of North Palm Beach	Palm Beach	Seacoast Utility Authority
Town of Ocean Ridge	Palm Beach	City of Boynton Beach
City of Pahokee	Palm Beach	City of Pahokee; Palm Beach County Water Utilities Dept. (future)
Town of Palm Beach	Palm Beach	City of West Palm Beach Public Utilities
City of Palm Beach Gardens	Palm Beach	Seacoast Utility Authority
Town of Palm Beach Shores	Palm Beach	City of Riviera Beach
Village of Palm Springs	Palm Beach	Village of Palm Springs; Palm Beach County Water Utilities Dept.
City of Riviera Beach	Palm Beach	City of Riviera Beach
Village of Royal Palm Beach	Palm Beach	Palm Beach County Water Utilities Dept.
City of South Bay	Palm Beach	City of South Bay; Palm Beach County Water Utilities Dept. (future)

Table 1. The Local Governments in the LEC Planning Area and the Utilities Serving Them (Continued).

Local Government	County	Utility/Entity Serving Local Government
Town of South Palm Beach	Palm Beach	City of West Palm Beach Public Utilities
Village of Tequesta	Palm Beach	Village of Tequesta
Village of Wellington	Palm Beach	Village of Wellington / Acme Improvement District; Palm Beach County Water Utilities Dept.
City of West Palm Beach	Palm Beach	City of West Palm Beach Public Utilities; Palm Beach County Water Utilities Dept.

Table 2. Utilities/Entities and the Local Governments They Serve in the LEC Planning Area.

Utility/Entity Name	County	Local Governments Served (raw & finished)
Broward County Water & Wastewater Services	Broward	Unincorporated Broward County; City of Coconut Creek (Coconut Creek distributes to the City of Parkland and Seminole Tribe Coconut Creek Reservation); City of Coral Springs; City of Dania Beach; City of Deerfield Beach; City of Hallandale Beach; City of Hollywood; City of Lauderdale Lakes; City of Lighthouse Point; City of North Lauderdale; City of Oakland Park; City of Pompano Beach
Cooper City Utilities Dept.	Broward	City of Cooper City
City of Coral Springs	Broward	City of Coral Springs
Coral Springs Improvement District	Broward	City of Coral Springs
City of Dania Beach	Broward	City of Dania Beach
Town of Davie	Broward	Town of Davie; Seminole Reservation (Hard Rock Casino)
City of Deerfield Beach	Broward	City of Deerfield Beach
Ferncrest Utilities	Broward	Town of Davie
City of Fort Lauderdale	Broward	City of Fort Lauderdale; Town of Lauderdale-by-the-Sea; Village of Lazy Lake; City of Oakland Park; Village of Sea Ranch Lakes; City of Tamarac; City of Wilton Manors
City of Hallandale Beach	Broward	City of Hallandale Beach
Town of Hillsboro Beach	Broward	Town of Hillsboro Beach
City of Hollywood	Broward	City of Hollywood; City of Dania Beach; Town of Pembroke Park; Seminole Hollywood Reservation; City of West Park; Unincorporated Broward County
City of Lauderhill	Broward	City of Lauderhill
City of Margate	Broward	City of Margate; City of Coconut Creek

Table 2. Utilities/Entities and the Local Governments They Serve the LEC Planning Area (Continued).

Utility/Entity Name	County	Local Governments Served (raw & finished)
City of Miramar	Broward	City of Miramar
City of North Lauderdale	Broward	City of North Lauderdale
North Springs Improvement District	Broward	City of Parkland; City of Coral Springs
Parkland Utilities, Inc.	Broward	City of Parkland; City of Coconut Creek
City of Pembroke Pines	Broward	City of Pembroke Pines; Town of Southwest Ranches
City of Plantation	Broward	City of Plantation
City of Pompano Beach Utilities Dept.	Broward	City of Pompano Beach; City of Lighthouse Point
Royal Utility Co.	Broward	City of Coral Springs
Seminole Tribe of Florida Utility	Broward	Seminole Hollywood Reservation
Sunrise Utilities Dept.	Broward	City of Sunrise, Town of Davie, Town of Southwest Ranches, City of Weston, Unincorporated Broward County
City of Tamarac	Broward	City of Tamarac, City of Fort Lauderdale
Miami-Dade Water & Sewer Department	Miami-Dade	Village of Bal Harbour; Town of Bay Harbour Islands; City of Coral Gables; Town of Cutler Bay, City of Doral; Village of El Portal; City of Hialeah Gardens; City of Hialeah; Village of Indian Creek; Village of Key Biscayne; Town of Medley; City of Miami Beach; Town of Miami Lakes; Village of Miami Shores; City of Miami; City of Miami Springs; Unincorporated Miami-Dade County; City of North Bay Village; City of North Miami Beach; City of North Miami; City of Opa-Locka; Village of Palmetto Bay; Village of Pinecrest; City of South Miami; Town of Surfside; City of Sweetwater; Village of Virginia Gardens; City of West Miami
Americana Village	Miami-Dade	Unincorporated Miami-Dade County
Florida City Water and Sewer Dept.	Miami-Dade	City of Florida City
City of Homestead	Miami-Dade	City of Homestead
City of North Miami	Miami-Dade	City of North Miami; Village of Biscayne Park; Village of Miami Shores; Unincorporated Miami-Dade County

Table 2. Utilities/Entities and the Local Governments They Serve the LEC Planning Area (Continued).

Utility/Entity Name	County	Local Governments Served (raw & finished)
City of North Miami Beach	Miami-Dade	City of North Miami Beach; City of Aventura; Village of Biscayne Park; Town of Golden Beach; City of Miami Gardens; City of North Miami; City of Sunny Isles Beach; Unincorporated Miami-Dade County
Florida Keys Aqueduct Authority	Monroe	Village of Islamorada; City of Key Colony Beach; City of Key West; City of Layton; City of Marathon; Unincorporated Monroe County
Palm Beach County Water Utilities Dept.	Palm Beach	City of Atlantis; City of Belle Glade (future); City of Boca Raton; City of Boynton Beach; Town of Cloud Lake; City of Deerfield Beach; City of Delray Beach; Town of Glen Ridge; City of Greenacres; Town of Haverhill; Town of Highland Beach; Town of Lake Clarke Shores; City of Lake Worth; Town of Loxahatchee Groves; Unincorporated Palm Beach County; Village of Palm Springs; City of Pahokee (future); Village of Royal Palm Beach; City of South Bay (future); Village of Wellington; City of West Palm Beach
City of Belle Glade	Palm Beach	City of Belle Glade
City of Boca Raton	Palm Beach	City of Boca Raton
City of Boynton Beach	Palm Beach	City of Boynton Beach; Town of Briny Breezes; Town of Hypoluxo; Town of Ocean Ridge; Unincorporated Palm Beach County
City of Delray Beach	Palm Beach	City of Delray Beach; Town of Gulf Stream
Village of Golf	Palm Beach	Village of Golf; Unincorporated Palm Beach County
Town of Highland Beach	Palm Beach	Town of Highland Beach
Town of Jupiter	Palm Beach	Town of Jupiter; Town of Juno Beach; Portions of Unincorporated Martin County; Unincorporated Palm Beach County
City of Lake Worth	Palm Beach	City of Lake Worth; Town of Lake Clarke Shores
Town of Lantana	Palm Beach	Town of Lantana
Town of Manalapan	Palm Beach	Town of Manalapan; Town of Hypoluxo
Town of Mangonia Park	Palm Beach	Town of Mangonia Park
Maralago Cay	Palm Beach	Unincorporated Palm Beach County
City of Pahokee	Palm Beach	City of Pahokee
Village of Palm Springs	Palm Beach	Village of Palm Springs; Town of Lake Clarke Shores; Unincorporated Palm Beach County
City of Riviera Beach	Palm Beach	City of Riviera Beach; Town of Palm Beach Shores

Table 2. Utilities/Entities and the Local Governments They Serve in the LEC Planning Area (Continued).

Utility/Entity Name	County	Local Governments Served (raw & finished)
Seacoast Utility Authority	Palm Beach	Town of Juno Beach; Town of Lake Park; Village of North Palm Beach; City of Palm Beach Gardens; Unincorporated Palm Beach County
Seminole Improvement District	Palm Beach	Unincorporated Palm Beach County
City of South Bay	Palm Beach	City of South Bay
Village of Tequesta	Palm Beach	Village of Tequesta; Town of Jupiter Inlet Colony
Tropical Breeze Estates	Palm Beach	Unincorporated Palm Beach County
Village of Wellington / Acme Improvement District	Palm Beach	Village of Wellington; Unincorporated Palm Beach County
City of West Palm Beach Public Utilities	Palm Beach	City of West Palm Beach; Town of Palm Beach; Town of South Palm Beach

Table 3. Utilities and the Non-Community Entities They Serve in the LEC Planning Area.

Utility/Entity Name	County	Non-Community Entity Served
AG Holley State Hospital	Palm Beach	State hospital facility in the Town of Lantana
Beeline Community Development District	Palm Beach	Beeline Community Development District in Unincorporated Palm Beach County
Beeline Utilities, L.L.C.	Palm Beach	Palm Beach Park of Commerce in Unincorporated Palm Beach County

3. MAPS OF UTILITY AREAS CURRENTLY SERVED (2005–2006) AND TO-BE-SERVED (2025)

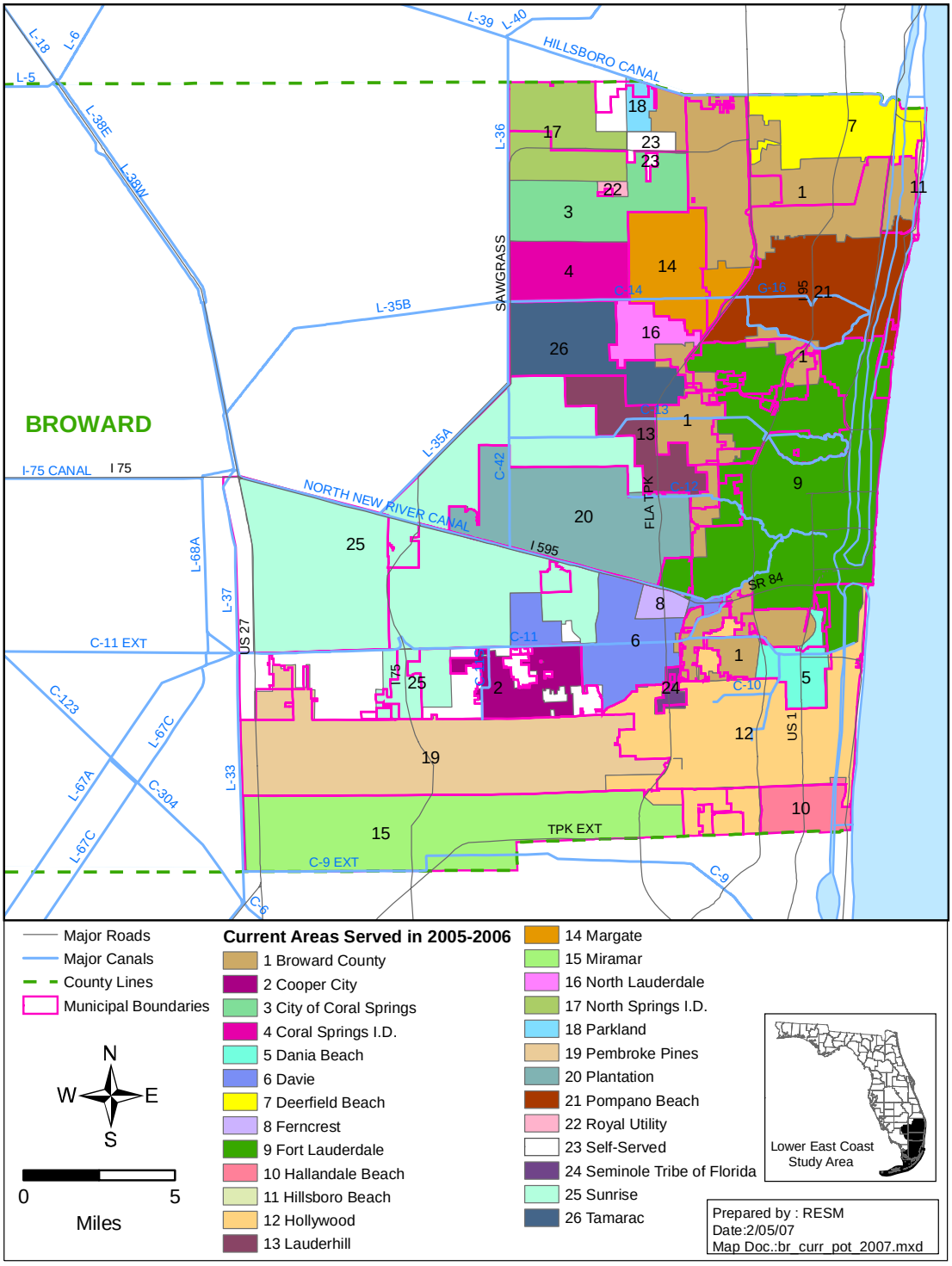

Figure 1. 2005–2006 Utility Service Areas in Broward County.

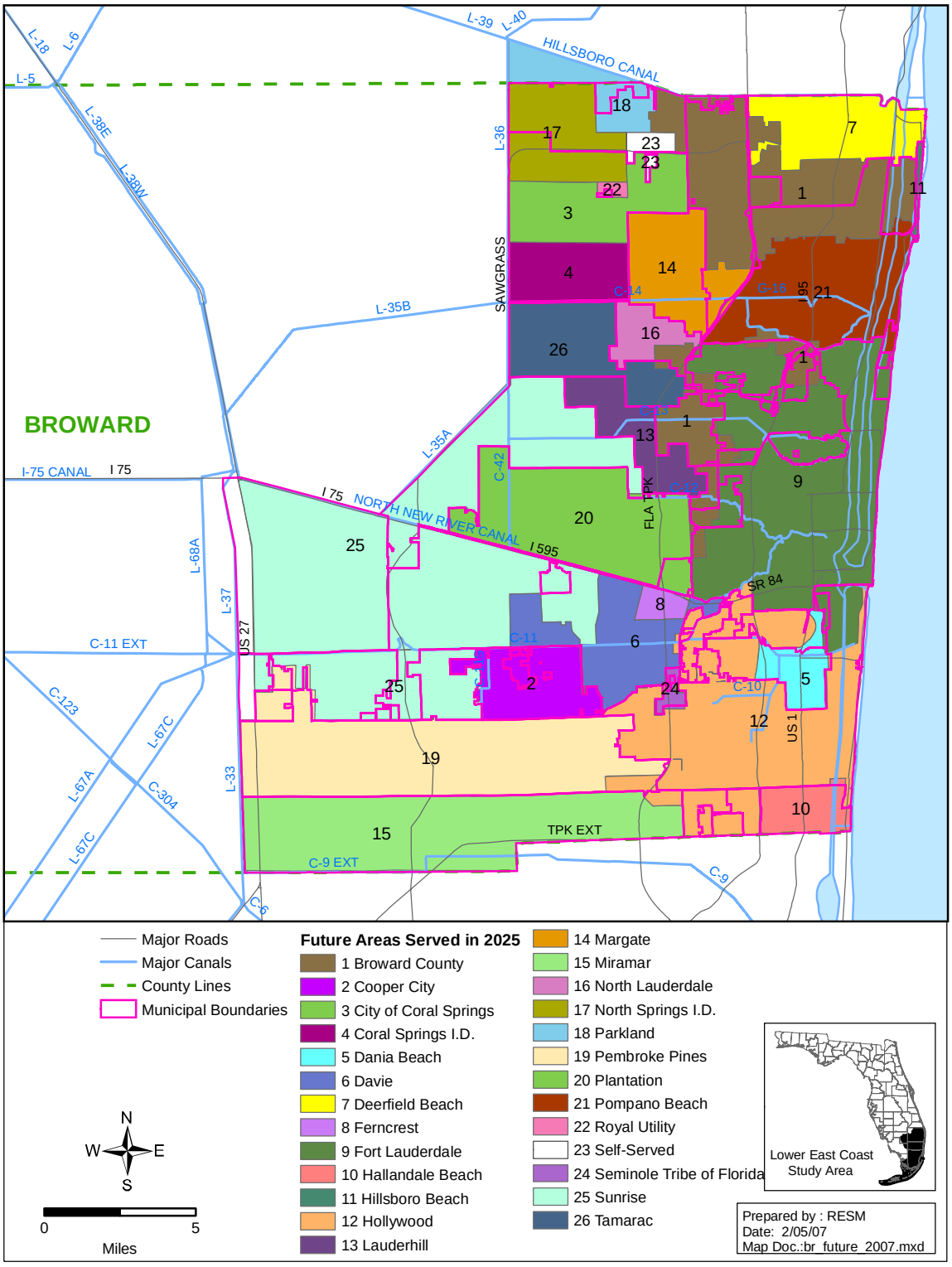

Figure 2. 2025 Utility Service Areas in Broward County.

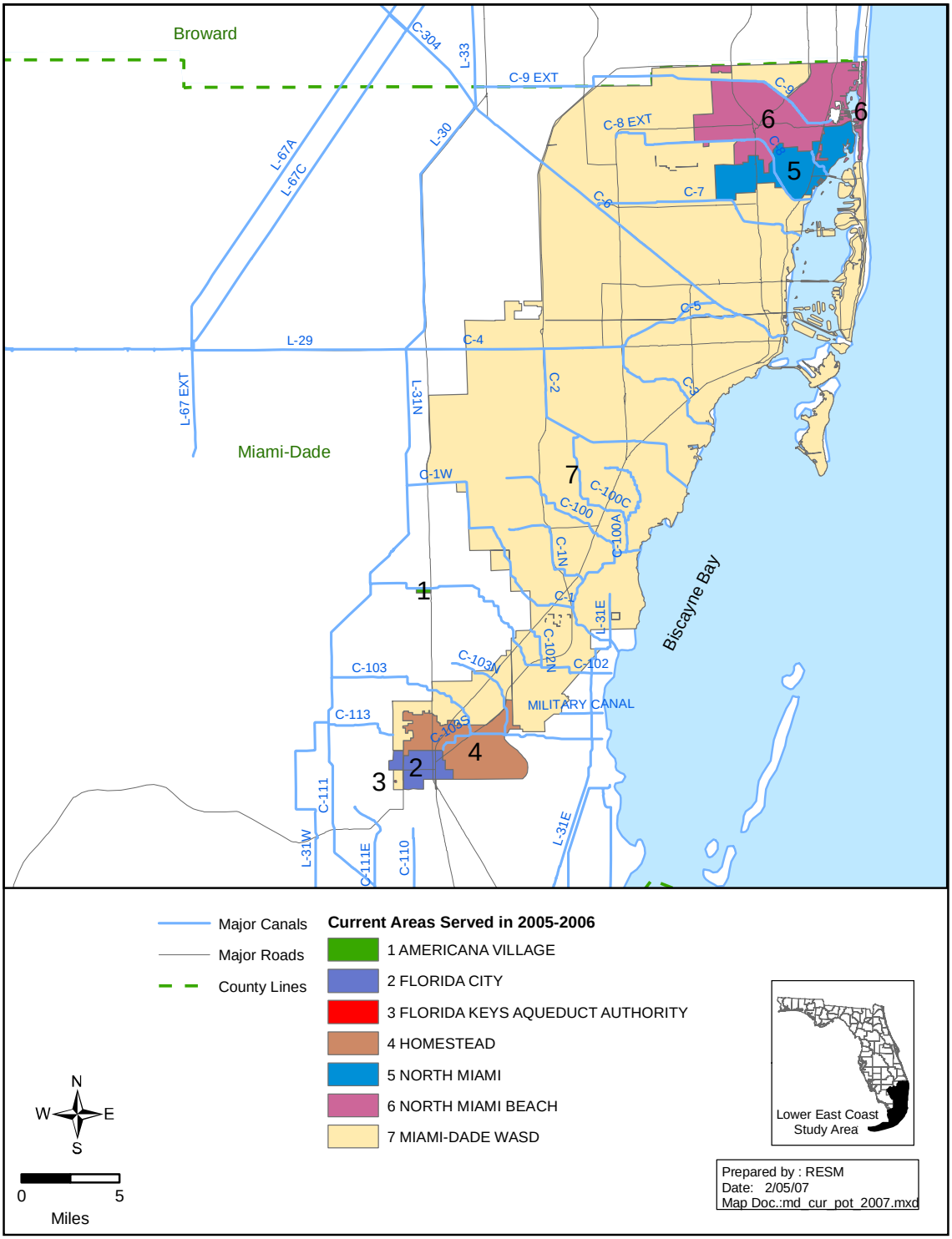

Figure 3. 2005–2006 Utility Service Areas in Miami-Dade County.

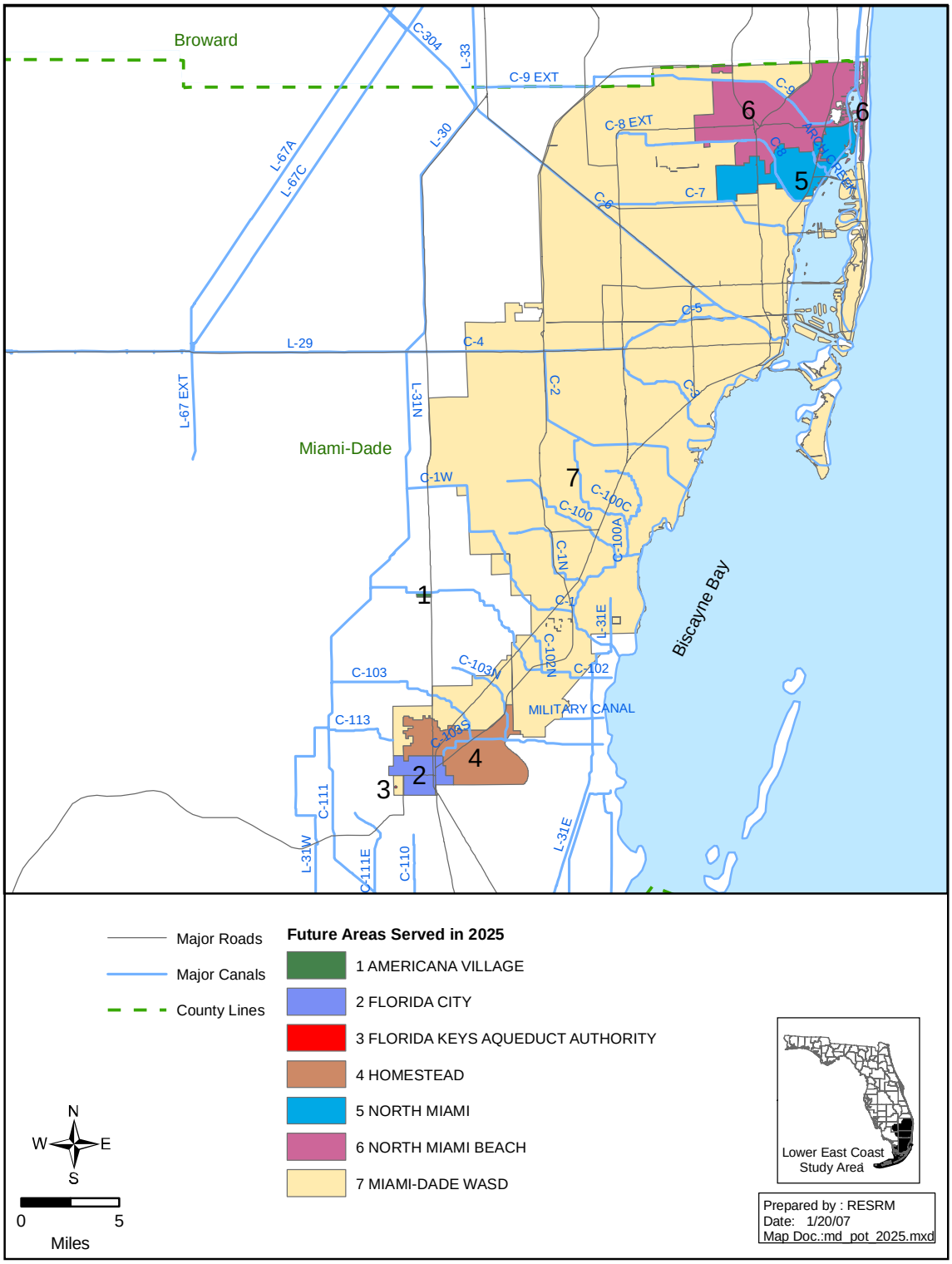

Figure 4. 2025 Utility Service Areas in Miami-Dade County.

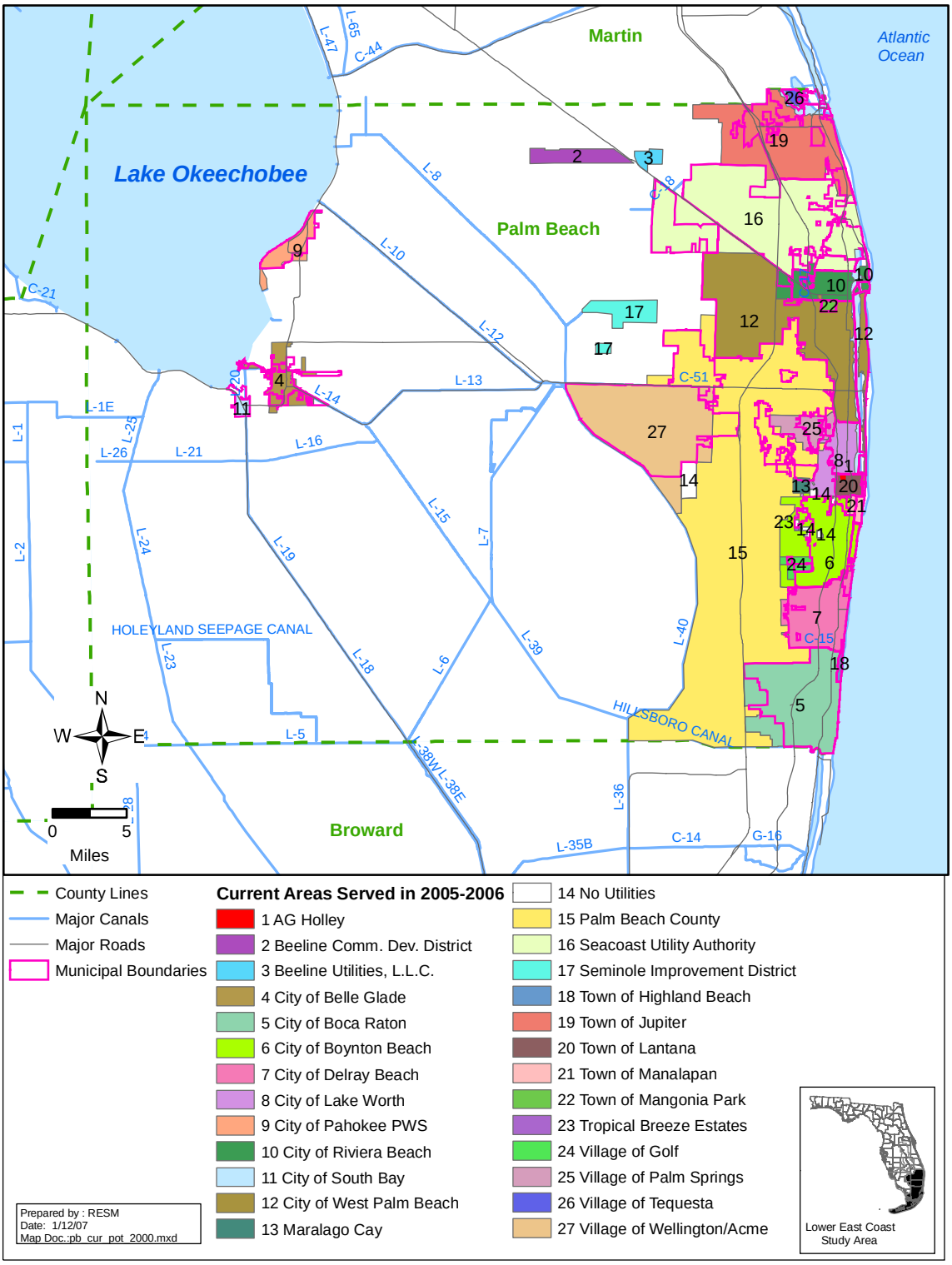

Figure 5. 2005–2006 Utility Service Areas in Palm Beach County.

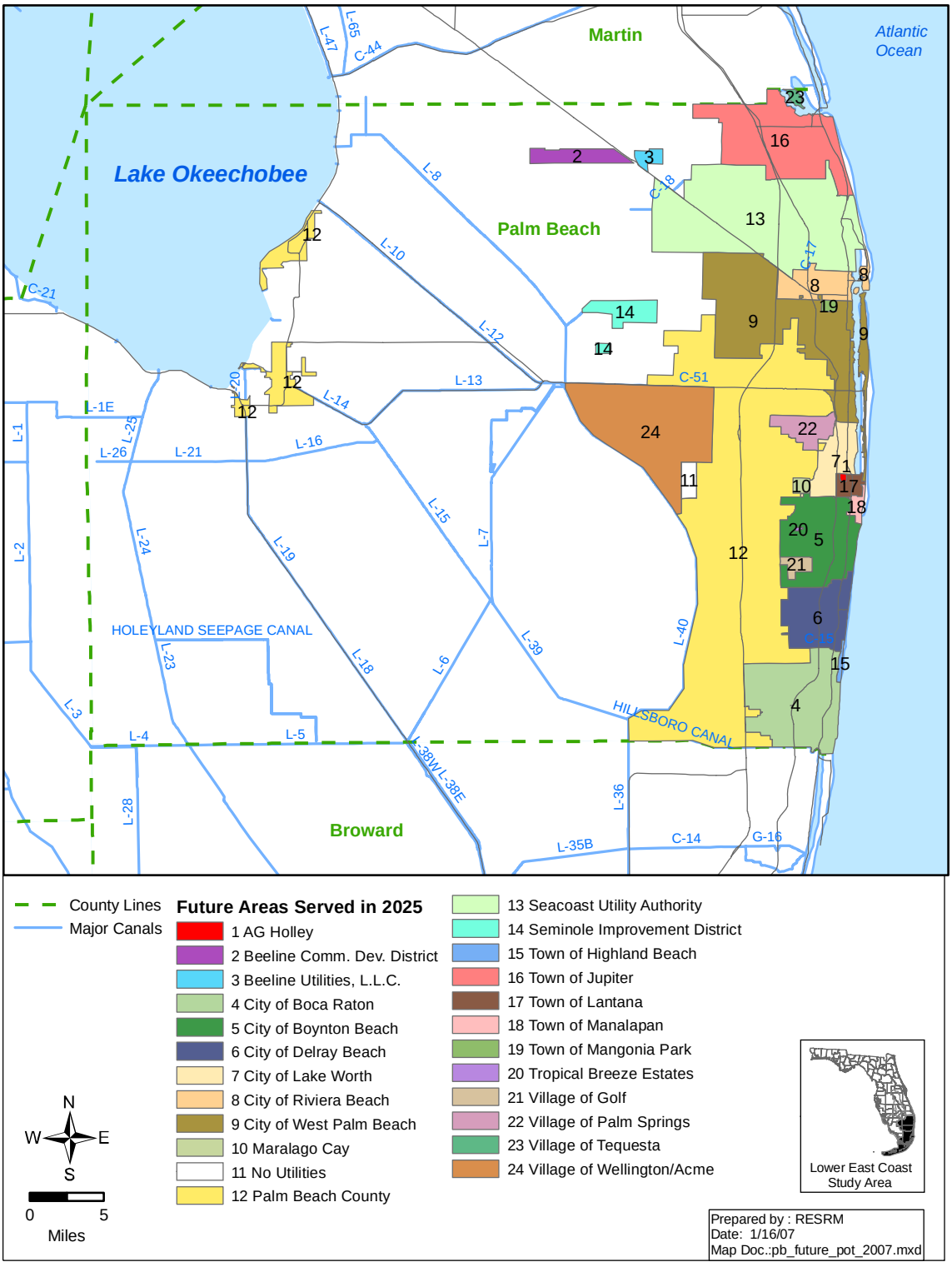

Figure 6. 2025 Utility Service Areas in Palm Beach County.

C
Accomplishments

OVERVIEW

To reduce the Lower East Coast (LEC) Planning Area's reliance on the Everglades regional system in meeting its future water supply needs, the *2000 Lower East Coast Regional Water Supply Plan* (2000 LEC Plan) included a substantial number of project recommendations. Of the plan's 46 recommendations, 45 were for projects supporting water resource development, and one recommendation addressed the need for projects supporting water supply development.

The 2000 LEC Plan organized the recommended projects into the following categories:

- Ongoing projects from the *1998 Interim Plan for Lower East Coast Regional Water Supply* (SFWMD 1998).
- Other federal, state and District projects.
- Comprehensive Everglades Restoration Plan (CERP) projects.
- Recommendations to the CERP resulting from analysis performed during the Lower East Coast regional water supply planning and development process.
- Recommendations to the CERP from the *Caloosahatchee Water Management Plan* (CWMP) (SFWMD 2000).
- Operational recommendations resulting from the LEC Planning Area's water supply planning process and analysis.
- Consumptive Use Permitting (CUP) and Resource Protection projects.
- Other Water Resource and Water Supply Development projects.

Development of projects in each of these categories had regional, as well as local responsibilities, which the 2000 LEC Plan discussed.

This appendix represents a historical summary of the accomplishments and progress related to each 2000 LEC Plan recommendation from 2000 through 2006. The Five-Year Water Resources Development Work Program, contained in the SFWMD's annual *South Florida Environmental Report, Volume II*, Chapter 5, summarizes the progress of these recommendations.

Implementation of 2000 Lower East Coast Plan Recommendations

Ongoing Projects from the Lower East Coast Interim Plan

1. Regional Saltwater Intrusion

Recommendation: The South Florida Water Management District (SFWMD or District) will re-evaluate the existing saltwater intrusion monitoring network to ensure its reliability in detecting the movement of the saltwater interface and propose a sampling plan and maintenance schedule.

Progress: The District uses a network of wells and data loggers in its continuing effort to monitor saltwater intrusion in Palm Beach, Broward and Miami-Dade counties. This information has been valuable in consumptive use permitting and during droughts. The report, *Movement of the Saltwater Interface in the Surficial Aquifer System in Response to Hydrologic Stresses Water Management Practices, Broward County, Florida* (Dausman and Langevin 2005) was prepared by the U.S. Geological Survey (USGS) in cooperation with the District.

2. Floridan Aquifer System Groundwater Model

Recommendation: The District will refine the existing Floridan Aquifer System (FAS) groundwater flow model using data collected from the construction of aquifer storage and recovery (ASR) projects associated with the CERP, and individual utilities with deep well injection facilities.

Progress: The District completed five technical publications summarizing the results of the Floridan Exploratory Drilling and Testing Program in the LEC Region. District staff installed data loggers at 16 Floridan Aquifer monitor well sites, which included some utility sites, for use in model calibration. The data loggers determined circulation patterns in the Floridan Aquifer geochemical analysis and isotope age dating techniques. Instead of refining the existing FAS groundwater flow model, the District completed Phase 1 development of a new groundwater flow and transport model of the FAS, and will begin the final phase of model development in 2007.

3. Northern Palm Beach County Comprehensive Water Management Plan

Recommendation: The District and the City of West Palm Beach cofunded a cooperative planning effort to develop a comprehensive water management plan for much of northern Palm Beach County.

Progress: This planning effort, the *Northern Palm Beach County Comprehensive Water Management Plan* (NPBCCWMP), *Volume I*, was completed in 2002 (SFWMD 2002).

4. Eastern Hillsboro Regional ASR Pilot

Recommendation: The LEC Interim Plan recommended a regional functional ASR System Pilot Project to be located west of U.S. 441 along the Hillsboro Canal in cooperation with Palm Beach County.

Progress: Construction of the Eastern Hillsboro ASR Project, with financial support from the SFWMD, was completed in 2003. The project began cycle testing the system in 2004. While cycle testing continued, the county applied to the Florida Department of Environmental Protection (FDEP) for an operating permit.

5. Hillsboro (Site 1) Impoundment Pilot Project

Recommendation: The LEC Interim Plan recommended a small-scale pilot project impoundment be constructed to assess its performance and to obtain information for a proposed full-scale storage reservoir to capture water lost to tide and return flow to the Hillsboro Canal.

Progress: The U.S. Army Corps of Engineers (USACE) and the SFWMD determined this project was not needed since data from the pilot impoundment would not be available in time to assist in the design of the full-scale impoundment. The Site 1 Impoundment has been incorporated into the District's ongoing Acceler8 projects as part of the Water Preserve Areas (WPAs) Project. In 2006, the Site 1 Impoundment was renamed the Fran Reich Preserve.

6. Lake Worth Lagoon Minimum/Maximum Flow Targets

Recommendation: The LEC Interim Plan recommended hydrologic and ecological studies be conducted to identify the appropriate freshwater flows to the Lake Worth Lagoon.

Progress: The District, in cooperation with Palm Beach County Environmental Resources Management, completed these studies. The final report, *"Lake Worth Lagoon Monitoring Project,"* which was published in 2003, is available at http://www.pbcgov.com/erm/enhancement/Images/PDF_Documents/LWL_Report.pdf.

7. Northern Broward County Secondary Canals Recharge Network

Recommendation: The LEC Interim Plan recommended the development of a master plan to complete the interconnection of surface water infrastructure to allow conveyance of water to maintain/enhance subregional groundwater levels, to benefit wellfields and selected wetlands, and to prevent saltwater intrusion.

Progress: The Palm Aire Golf Club Rehydration Project was completed in September 2005. The North Springs Improvement District/Pine Tree Interconnect was completed in January 2006. The design and permitting for the C-12/Old Plantation Water Control District (OPWCD) Interconnect is scheduled for completion in 2007.

8. Southeast Broward County Interconnected Water Supply System

Recommendation: An interagency agreement for the development of an integrated water supply system will be developed through a mediated process between the service areas of Hollywood, Hallandale Beach, Dania Beach, Broward County, and possibly the Seminole Tribe of Florida, as well as other communities. This agreement will result in a design study identifying the locations and costs of regional wellfield expansion and water treatment facilities.

Progress: Discussions and negotiations between county and city representatives resulted in the implementation of increased withdrawals from the Brian Piccolo Park Wellfield to an average of 5 million gallons per day (MGD) to supply the City of Hollywood. As a result, no further activity for this recommendation was needed.

9. Broward County Urban Environmental Enhancement

Recommendation: The available sources and methods for distributing surface water to benefit specific wetland restoration systems will be examined in the Broward County Integrated Water Resource Plan. Local environmental demands will need to be assessed in terms of quantities and timing of deliveries. Once identified, the county and District are prepared to assess the availability of regional and alternative sources of water to meet this demand. The District will address reservation of water, and the District will encourage development of alternative sources, such as the reuse of reclaimed water.

Progress: The Hillsboro Pinelands, Tradewinds South, Fern Forest Basin I and II, and Tall Cypress natural systems enhancement projects have been completed.

10. Miami-Dade Water and Sewer Department Utility ASR

Recommendation: The LEC Interim Plan recommended the development of local ASR in LEC Service Area 3, and provided funding to Miami-Dade County to begin construction of two 5.0-MGD wells.

Progress: Miami-Dade County completed 15 MGD of ASR capacity. Additional disinfection has been required by the FDEP before full-scale operation can begin.

11. Biscayne Bay Minimum and Maximum Flow Targets

Recommendation: A major recommendation of the LEC Plan is to identify the freshwater flows that support the maintenance of environmentally desirable flow and salinity targets for Biscayne Bay.

Progress: Establishment of minimum flow and level (MFL) criteria for Biscayne Bay – South Central has been postponed to 2008. The District gathered information for the purpose of assessing existing water resources, conducted a survey of literature, and interviewed knowledgeable scientists about the potential indicators and their linkages with freshwater flow. In 2006, the Governing Board directed staff to submit available science on Biscayne Bay for scientific peer

review. Recommendations resulting from the peer review will be helpful in guiding future direction for MFLs and water reservations.

Other Federal, State or District Projects

12. Critical Projects

Recommendation: The District is the local sponsor of critical projects in the LEC Planning Area. The Critical Project Program was authorized by the United States Congress under the *Water Resources Development Act of 1996* to expeditiously implement restoration projects that are deemed critical to the restoration of the south Florida ecosystem. These projects include the West Canal Structure (C-4), Western C-11 Water Quality Treatment and the Lake Okeechobee Water Retention/Phosphorus Removal projects.

Progress: The West Canal Structure (C-4) and Western C-11 Water Quality Treatment projects have been completed, as well as the Critical Project Pilot Stormwater Treatment Areas (STAs) at Nubbin Slough and Taylor Creek.

13. Well Abandonment Program (Recommendation from the Caloosahatchee Water Management Plan)

Recommendation: The District administered a voluntary well abandonment program that identified abandoned artesian wells, geophysically logged them, and plugged or rehabilitated the wells, as necessary, to prevent deterioration of the Surficial Aquifer System (SAS) through upland leakage or discharge to land surface. This program ended in 1991. The District should work with local and state officials to locate uncontrolled abandoned wells and identify plugging strategies and applicable funding sources for proper plugging of the wells.

Progress: The District continues to assist with state or local initiatives.

14. Saltwater Influence at S-79 (Recommendation from the CWMP)

Recommendation: Saline water has been a recurring problem for the potable water intakes in the Caloosahatchee River. The potable water intakes are located approximately 1 mile upstream of the S-79 Structure. During extended periods of low flow, the chloride content of the shallow water increases well beyond the recommended limit of 250 milligrams per liter (mg/L) for drinking water. The District will coordinate additional analysis of the saltwater influence problem at the S-79 Structure.

Progress: In 2005, the SFWMD began constructing the C-43 West Reservoir in Hendry County. The reservoir will have the potential to store up to 55 billion gallons of water captured during high-flow periods from the river for release back into the river during low-flow periods to meet environmental needs. These environmental needs are directly associated with maintaining reduced salinity in the river below the S-79 Structure. In addition, Lee County is currently working on Phase 2 of an ASR project at the Olga Water Treatment plant. This District-cofunded project involves installation of a second ASR well for high-volume

storage for treated supply from the Olga facility, which would enable the county to reduce or suspend withdrawals from the river when salinities increase above the potable range.

15. Permitting Issues Associated with ASR Systems and Reuse of Reclaimed Water

Recommendation: The District should continue working with the Florida Legislature, the U.S. Environmental Protection Agency (USEPA) and the FDEP to explore rule changes to the state and federal Underground Injection Control Program to allow for, and encourage, injection of groundwater or surface water for ASR.

Progress: In 2001, the District committed to conduct scientific studies prior to proceeding with any request for legislative and/or rule changes regarding storage of partially treated water via ASR systems. To date, no legislation or rulemaking has been initiated.

16. Mobile Irrigation Labs

Recommendation: The Florida Department of Agriculture and Consumer Services (FDACS) should administer and fund the two existing and one additional mobile irrigation labs (MILs) in the LEC Planning Area. To replace current District participation, additional funding sources need to be found. An additional urban MIL is recommended for Broward County.

Progress: There are four urban and three agricultural MILs in the LEC Planning Area. Of these, the District funds four MILs. In the past two years (Fiscal Years 2004 and 2005), recommendations for improvements to agricultural and urban irrigation systems in the LEC Planning Area would have yielded average potential water savings of 0.59 MGD if implemented. Districtwide, each urban MIL would save an average of 0.08 MGD if all recommendations were implemented, and each agricultural MIL would save an average of 0.41 MGD if all recommendations were implemented.

17. CERP Projects That Affect the LEC Planning Area and the Caloosahatchee Basin

Recommendation: The analysis completed as part of the LEC Plan confirms that the Restudy (the planning process that resulted in the CERP) projects scheduled for completion by 2020 are extremely beneficial for meeting MFLs and natural system restoration targets, including reducing high-water flows to estuaries and providing water to meet demands in the LEC Planning Area. Completion of the CERP projects by 2020 is crucial to meeting the objectives of the LEC Plan.

Progress: The *CERP Master Implementation Sequencing Plan* (MSIP), which is being developed by the USACE and the SFWMD, includes the sequencing and scheduling of all the CERP projects, including pilot projects and operational elements, based on the best scientific, technical, funding, contracting and other information available. The projects are grouped in five-year "bands" in order to focus the limited resources on the products that can be accomplished within the

specified time frame. The MSIP is available from the CERP Web site: http://www.evergladesplan.org/pm/pm_docs/misp/040105_prog_regs_misp_1_0.pdf. The MSIP's *Appendix B: Comparison of Construction Completion Dates by Band* provides additional information.

Designed as a 50-50 partnership between the state and federal governments, the CERP has not moved ahead as anticipated. Therefore, in 2004, the state chose to fund eight restoration projects, called Acceler8, to expedite the funding, design and construction of these components of the CERP.

Recommendations to the CERP from the LEC Plan

18. S-155A

Recommendation: The LEC Plan recommends that additional analysis in the planning phase of the CERP North Palm Beach County – Part 1 determine the most effective method to provide water to the C-51 Backpumping and Treatment component, while continuing to provide benefits to the Lake Worth Lagoon without affecting the location of S-155A as designed for the Everglades Construction Project.

Progress: At this stage in the planning process, it has been determined that due to the lack of available and/or suitable land for the stormwater treatment area (STA) and the potential abundance of water available from the L-8 Basin, this component will be substantially modified from the conceptual plan in order to provide equal or greater benefits that are more efficient, effective and acceptable.

19. Everglades Hydropatterns within WCA-2B

Recommendation: Results of regional modeling efforts performed as part of the LEC Plan identified Water Conservation Area (WCA)-2B as the only area of the northern Everglades that received an unacceptable score for the incremental (2005, 2010, and 2015) and LEC-1 Revised simulations, as well as for the LEC-1 simulations. These results indicate this area of the Everglades fails to meet LEC regional water supply planning targets, and ecosystem recovery is not likely to occur unless significant hydrologic improvements are made to the area.

Progress: Currently, no CERP project has been designed to restore the hydropatterns of WCA-2B. This issue will be addressed by the CERP Restoration, Coordination Verification (RECOVER) team.

20. Everglades Agricultural Area Storage Reservoirs

Recommendation: The LEC Plan recommends investigating four changes to this feature to be considered in the future CERP analyses as a means of optimizing EAA water supply without adversely impacting water deliveries to the natural system: 1) the sizes of the reservoirs would be modified; 2) runoff from the Hillsboro Canal Basin could be captured and routed to the enlarged Compartment 1; 3) Compartment 1 could be used to meet demands in the West Palm Beach Basin; and, 4) structural and conveyance changes may be necessary to implement these modifications.

Progress: The Acceler8 Everglades Agricultural Area (EAA) Reservoir A-1 real estate has been purchased. The final reservoir design has been initiated. Test cell investigations are complete. Seepage canal design is complete. Excavation groundbreaking occurred in August 2006. More information about the project is available from the District's Web site: http://www.evergladesplan.org and http://www.evergladesnow.org.

21. L-8 Project

Recommendation: This Restudy component was designed to include a combination of aboveground and in-ground reservoirs located immediately west of the L-8 Borrow Canal and north of the C-51 Canal in Palm Beach County. The LEC Plan recommended development of an operating schedule that can optimize the use of the stored ASR water to meet water supply availability and flood protection for northern Palm Beach County.

Progress: The C-51 and Southern L-8 Reservoir and L-8 Basin Modification components of the CERP North Palm Beach County – Part 1 are currently being evaluated during the planning phase to determine the most efficient and effective method to increase environmental water supply deliveries to the Grassy Waters Preserve, Loxahatchee Slough and Northwest Fork of the Loxahatchee River. The SFWMD has acquired at a cost of $218 million up to 47,000 acre-feet of storage for the L-8 Reservoir, which is scheduled to be completed in 2008–2009. Phase 1 of the M-Canal Widening effort has been completed by the City of West Palm Beach in partnership with the SFWMD. Phase 2 of the M-Canal Widening effort is scheduled to be completed by 2008. Construction of the G-160 Loxahatchee Slough Structure and the G-161 Northlake Boulevard Structure was completed. This was a major step to reconnect the historical watershed of the L-8 Reservoir and the Grassy Waters Preserve to the Loxahatchee Slough and Northwest Fork of the Loxahatchee River, which were separated for many years by Northlake Boulevard. Hydraulic reconnection of the watershed will be achieved when other interconnection facilities (M-Canal Widening, Control Pump 2, East Perimeter Canal) have been improved, and the G-161 operations protocol and agreements have been completed between the District, the City of West Palm Beach and others.

22. C-51 Regional Groundwater Projects ASR Facilities

Recommendation: The purpose of this feature is to capture and store excess flows from the C-51 Canal currently discharged to the Lake Worth Lagoon for later use during dry periods. The analysis performed during the LEC regional water supply planning process optimized the operation of the ASR features by using stored ASR water more often and redirecting where it is distributed.

Progress: The planning phase for the C-51 Regional ASR component of the CERP North Palm Beach County – Part 2 is scheduled to be initiated in 2009.

23. West Miami-Dade Reuse Feasibility Study

Recommendation: This feature was designed to produce superior, advanced treatment of wastewater from a future wastewater treatment plant in western Miami-Dade County. The plant will be located in the Bird Drive Basin in Miami-Dade County. The purpose for the feature is to meet the demands for the Bird Drive Recharge Area, the South Dade Conveyance System and Northeast Shark River Slough. As part of the West Miami-Dade Reuse Feasibility Study, the volume of reuse water needed to meet identified demands should be re-evaluated, that other beneficial uses of reclaimed water should also be considered, and that alternative sources of water should be analyzed.

Progress: Efforts on this reuse study have been suspended as a result of Miami-Dade Water and Sewer Department removing a western wastewater facility from its Long-Term Facilities Plan. The Bird Drive Recharge Area component of the CERP has been incorporated into the Everglades National Park Seepage Management Project. Together, the USACE and SFWMD initiated the planning process to implement this CERP project in June 2005. In December 2005, the Project Implementation Report (PIR) phase began. This phase, lasting approximately four years, includes analysis of problems and opportunities, existing and future conditions, an assessment of alternatives, and selection of a plan to meet project goals. Detailed design and construction of a selected plan are projected to occur between 2010 and 2016. If wastewater is not available for the Bird Drive component, the design may change from the plan described in the Restudy.

24. Lake Okeechobee Regulation Schedule

Recommendation: Modifications to the Lake Okeechobee regulation schedule, Run 25, were recommended in the Restudy. These modifications would take advantage of the additional storage facilities identified in the construction features. Two additional zones will be added to the schedule. As part of the analysis performed for the LEC Plan, a Water Supply and Environmental (WSE) Schedule with modifications to accommodate additional storage features showed superior performance in meeting environmental and water supply demands on the lake.

Progress: Subsequent to establishing the WSE schedule, the Lake Okeechobee & Estuary Recovery (LOER) Plan was developed to improve water quality, expand water storage, facilitate land acquisition, and enhance the ecological health of Lake Okeechobee and the St. Lucie and Caloosahatchee estuaries. State agencies charged with carrying out this plan include the SFWMD, the FDEP, the Department of Agriculture and Consumer Services (FDACS) and the Florida Department of Community Affairs (FDCA). Due to concerns with the current WSE Schedule and public safety issues related to the Herbert Hoover Dike, the USACE is expediting modifications to the Lake Okeechobee regulation schedule.

25. Lake Belt Storage Area Projects

Recommendation: The Lake Belt storage areas are expected to be completed in 2036. Modeling and analysis for the LEC Plan showed that completing 50 percent of the planned reservoir capacity was critical in meeting multiple water resource objectives in the region by 2020. The construction of seepage barriers are necessary for this design and will require careful coordination with the limestone mining industry in order to obtain a portion of reservoir capacity before mining is completed. Likewise, pilot studies to test the feasibility of some aspects of the concept are critical and will require ongoing coordination with the mining industry. The LEC Plan recommended the identification of seepage barrier locations early on and coordination with the mining industry on the timing so that blasting will not cause damage to seepage barriers.

Progress: The Lake Belt In-Ground Reservoir Technology Pilot Project and the North Lake Belt Storage Area Project are scheduled to occur between 2015 and 2020. Lands for the implementation of the full-scale Lake Belt In-Ground Reservoir will not be available until 2022. Related CERP Lake Belt projects are slated from 2025 to 2030, and from 2035 to 2040.

26. Everglades Rain-Driven Operations

Recommendation: The District should modify the regulation schedules for WCAs-2A, 2B, 3A, 3B and the current rainfall delivery formula for Everglades National Park, as recommended in the LEC Interim Plan and in the Restudy, in order to implement rain-driven operations for all of these areas. These new operational rules are intended to improve timing and range of water depths in the WCAs and Everglades National Park to restore more natural hydropatterns, as well as meet minimum flows and levels for these areas.

Progress: A rainfall-driven operation project management plan has been approved to meet the rainfall driven operation objectives for the EAA-A1 Acceler8 milestone of 2010. This plan covers WCA-3 and Everglades National Park.

27. Change Coastal Wellfield Operations

Recommendation: The District should encourage shifting demands from eastern facilities to western facilities, away from the saltwater interface, for some coastal public water supply utilities in the LEC Planning Area, which are expected to experience an increased threat of saltwater intrusion. The Restudy recommended that a portion of demand should be shifted inland for the following utilities: Riviera Beach, Lake Worth, Lantana, Manalapan, Boca Raton and Florida City. The individual utilities may consider other water supply options, and the District proposed a water resource development project in which the utilities in southeastern Broward County cooperatively develop additional wellfield and treatment capacity.

Progress: In Palm Beach County, the following utilities have developed western wellfields in order to shift demands from coastal wellfields: Riviera Beach, Boca Raton and Lantana. In addition, the Town of Manalapan is constructing a

treatment facility for withdrawals from the Floridan Aquifer, and Lake Worth is drilling a Floridan Aquifer wellfield. In Broward County, utilities have interconnections that allow shifting coastal withdrawals to western regional wellfields.

Recommendations to the CERP from the CWMP

28. Caloosahatchee River ASR Pilot Project

Recommendation: The District should work cooperatively with the USACE to site, design, construct, and operate a pilot regional Aquifer Storage and Recovery (ASR) project. Recovery performance and additional information obtained from the construction of and cycle testing at this facility will guide the design of the regional ASR wellfield.

Progress: The Caloosahatchee River (C-43) Basin ASR Pilot is a project being conducted to assist in the implementation of the CERP. This pilot project is designed to address technical and regulatory uncertainties associated with regional implementation of ASR projects. In the Caloosahatchee River (C-43) Basin ASR Pilot Project, ASR technology continues to be tested and evaluated.

29. C-43 Basin Storage Reservoir and ASR Project

Recommendation: The District should cooperate with the USACE in development of the PIR, design, construction, and operation of a regional reservoir and ASR project within the Caloosahatchee Basin. A comprehensive geologic and geotechnical investigation should be completed as a part of the PIR to provide the information needed to size and design the reservoir. Development of the PIR, land acquisition, design, and plans and specifications should be completed by 2005 and construction should be initiated in 2005.

Progress: The C-43 (Caloosahatchee River) West Reservoir Project is one of the District's Acceler8 projects, as well as a component of a larger restoration project for the Caloosahatchee River and Estuary that will capture water from the Caloosahatchee River (C-43) during high-flow times for storage and dry-season use. A location has been acquired in Hendry County to construct a reservoir for 170,000 acre-feet of storage. Construction activities are scheduled to begin in the summer of 2007 and slated to finish late in 2010.

30. Southwest Florida Study

Recommendation: The District should work in cooperation with the USACE to initiate and complete the Southwest Florida Study, now referred to as the Southwest Florida Feasibility Study (SWFFS), by 2005 as recommended in the CERP. The modeling work that has been completed as a part of the CWMP should be used as the basis for development of a preferred alternative to meet the demands within the Caloosahatchee Basin in 2020. The primary purpose of the SWFFS should be to provide a framework in which to address the health of aquatic ecosystems; water flows; water quality (including appropriate pollution

reduction targets); water supply; flood protection; wildlife and biological diversity; and, natural habitat.

Progress: The USACE and the SFWMD are conducting the SWFFS, which will develop a water resources plan for the entire southwest Florida area. The study will also provide for ecosystem and marine/estuary restoration and protection, environmental quality, flood protection, water supply and other water-related purposes. It is anticipated this study will be completed by 2008.

Operational Recommendations

31. Systemwide Operational Protocols

Recommendation: The District needs to develop a comprehensive set of revised operational protocols that cover all of the existing components of the South Florida Water Resource Management System (SFWRMS). The SFWRMS covers the entire District area and includes the original components of the Central & Southern Florida (C&SF) Project, as well as supplemental project structures constructed by the District and the Everglades Construction Project. These protocols will implement recent and proposed programs and policies, including: MFLs; rain-driven deliveries to the Everglades; Water Shortage Plan; Water Supply Plan Elements; Modified Water Deliveries Project; C-111 Project; Everglades Construction Project; the CERP; and, the Lake Okeechobee Construction Project.

Progress: The District adopted *Adaptive Protocols for Lake Okeechobee* (SFWMD *et al.* 2003) for the management of Lake Okeechobee, which allow for the delivery of fresh water to the Caloosahatchee and St. Lucie estuaries during dry conditions when the Lake Okeechobee Regulation Schedule would otherwise not provide such releases. The District has also moved forward to update the drought management plan for Lake Okeechobee, formerly known as the Supply-Side Management Plan. That effort is still under way and is titled the Lake Okeechobee Water Shortage Management Plan.

32. Periodic Operational Flexibility

Recommendation: The District needs to develop a process to identify and implement short-term deviations to existing operational protocols that consider all of the existing and proposed components of the SFWRMS. These periodic operational deviations in process and review will cover 14 geographic subregions. A process to develop and implement short-term operational deviations must be initiated to ensure that every effort is made to meet the regional water resource goals in the next 20 years as the major elements of the LEC Plan and the CERP are implemented.

Progress: The District adopted Adaptive Protocols for the management of Lake Okeechobee, which allow for the delivery of fresh water to the Caloosahatchee and St. Lucie estuaries during dry conditions when the Lake Okeechobee Regulation Schedule would otherwise not provide such releases. The District has also moved forward to update the drought management plan for Lake

Okeechobee, formerly known as the Supply-Side Management Plan. That effort is still under way and is titled the Lake Okeechobee Water Shortage Management Plan.

33. Lake Okeechobee Vegetation Management Plan

Recommendation: The 2000 LEC Plan recommended the formation of a Lake Okeechobee Vegetation and Fire Management Team that would work in cooperation with the existing South Florida Interagency Fire Management Council to develop a Lake Okeechobee Vegetation Management Plan. The plan should be designed to manage torpedo grass and melaleuca expansion within the lake by providing increased opportunity for control of the invasive species in anticipation of dry periods. The District, in cooperation with the FDEP and the USACE, will develop an approved work plan to deploy helicopters, spray boats and herbicide field teams, as necessary, to conduct a large-scale torpedo grass and melaleuca eradication program within the western littoral zone of the lake in the event the lake levels fall below 12 feet National Geodetic Vertical Datum (NGVD).

Progress: An active Lake Okeechobee vegetation management interagency team was established in 1982 and continues to meet on a bimonthly or monthly basis. Representatives from the FDEP, USACE, the University of Florida, and the Florida Fish and Wildlife Commission (FWC) regularly attend the meetings to provide guidance for the ongoing vegetation management of Lake Okeechobee. A District team has not been developed because of the interagency statutory authority of Lake Okeechobee and funding associated with management of the lake. The South Florida Interagency Fire Council manages control burns associated with Lake Okeechobee.

Consumptive Use Permitting and Resource Protection Projects

34. Water Reservations

Recommendation: The District should establish water reservations where necessary to assure the public of the availability of water specific to locations for the protection of fish and wildlife, or public health and safety.

Progress: Section 373.223(4), Florida Statutes (F.S.), provides the basis for establishing reservations as a means to protect fish and wildlife resources. Under Florida law, permitted uses and domestic water uses (which are exempt from requirements to obtain a permit) have the legal status of an "existing legal use." All presently existing legal uses of water shall be protected so long as such use is not contrary to the public interest.

There are two types of water reservations being developed by the SFWMD. The first is an initial water reservation. Development of initial reservations focuses on determining the volume, duration and timing of existing flows required to protect fish and wildlife resources. Under this program, all presently existing legal uses of water will be protected so long as their use is not contrary to the public interest (Section 373.233(4), F.S.). The first drafts of initial water reservation

criteria for the Northwest Fork of the Loxahatchee River, and Caloosahatchee and St. Lucie estuaries are expected by the end of 2007.

The second type of water reservation, known as a project reservation, will be used in the implementation of CERP-related projects. Project reservations determine the appropriate quantity, timing and distribution of water that is generated by individual CERP projects for the protection of fish and wildlife. Project reservations protect water anticipated to be available in the future through implementation of a project for the protection of fish and wildlife. The water is reserved in advance, ensuring that when a project is completed, those quantities remain available for the protection of fish and wildlife, or public health and safety (See *Guidance Memorandum Number 4*, USACE 2005).

35. Establish Minimum Flows and Levels

Recommendation: The SFMWD should establish MFLs by rule by December 2000 for Lake Okeechobee, Everglades National Park, the WCAs, the Biscayne Aquifer (north of the C-2 Canal), and the Caloosahatchee River and Estuary. The SFWMD should develop and establish MFLs for the Loxahatchee River and St. Lucie Estuary by 2001, and MFLs for the southern Biscayne aquifer by 2003, and for Biscayne Bay by 2004.

Progress: The SFWMD is statutorily required to develop a recovery strategy for those MFL water bodies that are expected to exceed the proposed criteria. To date, MFLs have been established for the following six priority water bodies in the LEC Planning Area: Lake Okeechobee; the Everglades (WCAs, Everglades National Park, and Rotenberger and Holeyland wildlife management areas); the northern Biscayne Aquifer; and, Florida Bay within the LEC Planning Area. In areas related to the LEC Planning Area, MFLs have been established for the Northwest Fork of the Loxahatchee River, Caloosahatchee River and Estuary, and St. Lucie River and Estuary.

36. Minimum Flow and Level Criteria for the Rockland Marl Marsh

Recommendation: Everglades National Park staff suggested the proposed interim MFLs criteria for the Rockland Marl Marsh within the park may not sufficiently protect these wetlands from significant harm. Additional wetland research was proposed to confirm or refine the MFL return frequency criteria that will not cause significant harm to marl-forming wetland plant and animal communities. As part of the LEC regional water supply planning process, the District, Everglades National Park and USGS staff will jointly develop a work plan to conduct the necessary research needed to confirm or refine the proposed MFL return frequency criteria for the Rockland Marl Marsh. This work will also help to determine appropriate levels for reservations of water.

Progress: To date, results of the literature review and analyses continue to suggest that existing criteria are adequate to protect the resource from significant harm.

37. Minimum Flows and Levels for Florida Bay

Recommendation: In response to recommendations made by Everglades National Park staff, Florida Bay was placed on the District's priority water body list for establishment in 2003. A sufficiency review of the necessary technical information needed to develop MFLs for Florida Bay has been completed and is under review. A number of research projects were also completed to provide data for developing initial MFLs for Florida Bay. In addition, conceptual models of Florida Bay are being developed by the CERP Restoration, Coordination Verification (RECOVER) team and may be used as a starting point for developing MFL criteria for Florida Bay. The District expects to develop initial MFL criteria for Florida Bay by 2003.

Progress: The MFL for Florida Bay was established in 2006.

38. Minimum Flow and Level Recovery Strategies

Recommendation: Pursuant to the requirements of the MFLs statute, analyses of current and future conditions should be conducted for each of the priority water bodies where MFLs were defined. When the evaluations showed MFLs are not or will not be met in the future, recovery or prevention strategies, as appropriate, should be developed.

Progress: Recovery or prevention strategies have been developed and approved for all of the MFLs that have been adopted: Lake Okeechobee, Biscayne Aquifer, the Everglades, the Loxahatchee River and Florida Bay. In related areas, a recovery strategy was also developed for the Caloosahatchee River and Estuary, and a prevention strategy has been identified for the St. Lucie River and Estuary.

39. Minimum Flow and Level Monitoring Systems

Recommendation: Monitoring systems must be established in order to implement MFL recovery and prevention strategies and conduct the research needed to further refine the ability to project when significant harm could occur. The monitoring systems will collect water flow, water level and water quality data. Monitoring data are necessary to develop interim operational strategies and to gauge the success of MFL long-term recovery and prevention strategies.

Progress: Monitoring efforts are under way in each of the areas where MFLs have been established.

40. Consumptive Use Permitting, Rulemaking and Resource Projections Projects

Recommendation: The District should continue conducting the rule development and rulemaking processes for the implementation of reservations, MFL recovery and prevention strategies, the Consumptive Use Permitting (CUP) Program, the Water Shortage Program and operational strategies.

Progress: The "B List" of water use rule revisions was adopted by the Governing Board on June 12, 2003. One key rule change designated the regional water management system as a source of limited availability.

Other Water Resource Projects

41. Comprehensive Water Conservation Program

Recommendation: The District will develop and implement a Comprehensive Water Conservation Program to cultivate a conservation ethic in cooperation with water users, utilities and local governments to promote water conservation and more efficient use of the water resources in the LEC Planning Area. The Conservation Program will incorporate continued development and compliance with water conservation ordinances; development and implementation of public education programs; use of alternative water sources; other conservation methods; and, document new and existing water conservation efforts. The creation of a water conservation coordinator position and provisions for fiscal incentives are envisioned as potential tools to establish the water conservation plan.

Progress: A statewide, comprehensive water conservation effort was initiated to implement the recommendations of the Water Conservation Initiative. A work plan developed for this statewide effort, known as "Conserve Florida," seeks to improve water conservation by developing a water conservation performance measurement system to integrate with strategic planning and consumptive use permitting. The District has made the following progress toward the main goals outlined by the Conserve Florida Program:

Rulemaking efforts are under way at the SFWMD to consider goal-based conservation as a permit condition. Workshops are being held concerning revisions to Chapter 40E-2, Florida Administrative Code (F.A.C.), and the *Basis of Review for Water Use Permit Applications* (SFWMD 2003) that would require individual water utilities to develop goal-based conservation programs. Goal-based conservation allows utilities to achieve a water management district agreed-upon conservation goal, such as a reduction in per capita or overall reduction in pumpage, using any method from a suite of methods the utility chooses, to satisfy CUP conservation requirements.

Through the Water Savings Incentive Program (WaterSIP), the SFWMD provides matching funds up to $50,000 to water providers for water-saving technologies, such as low-flow plumbing fixtures, rain sensors, fire hydrant flushing devices and other hardware.

The Mobile Irrigation Laboratory (MIL) Program is designed to conduct irrigation audits of agricultural and urban irrigation systems through specialized labs on wheels. Currently, there are 15 operational labs Districtwide. In the LEC Planning Area, there are four urban labs and three agriculture labs.

The SFWMD funds outreach and educational programs to encourage water users to make efficient use of water resources through conservation and reuse.

42. Seawater Reverse Osmosis Treatment Facilities

Recommendation: The District should conduct a study to determine the feasibility of co-locating seawater reverse osmosis treatment facilities with coastal electrical power plants located within the District.

Progress: A 2001 feasibility study for co-locating seawater or brackish RO treatment facilities with electric power plants recommended a more detailed evaluation and cost analysis for the LEC Planning Area. As part of the 2005–2006 water supply planning process, it was concluded that seawater desalination is a potential alternative source that merits future consideration. The SFWMD conducted a *Co-Located Desalination Feasibility Study* in 2006 (SFWMD 2006), which concluded that seawater desalination was both technically and economically feasible. The study recommended three sites, in Fort Myers, Fort Lauderdale and Port Everglades, for possible implementation of pilot projects.

43. Reclaimed Water System in Northern Palm Beach County

Recommendation: This project will examine the feasibility of meeting the unmet future demands for irrigation water in northern Palm Beach County and coastal Martin County by conveying reclaimed water from central Palm Beach County.

Progress: The North Palm Beach and Southern Martin County Reclaimed Water Master Plan was completed in December 2002. It concluded that the reclaimed water system for Northern Palm Beach County and Southern Martin County is not feasible at this time.

44. Indirect Aquifer Recharge

Recommendation: The District will explore the feasibility of recharging primary or secondary canals with wastewater treated to advanced wastewater treatment standards in conjunction with a cooperative utility. If economical feasibility is found, a pilot project will be recommended in the update of this plan. Success of the pilot project will ultimately lead to the development of full-scale projects throughout the region.

Progress: The District and FDEP are working together to promote the concept of using highly treated reclaimed water, called Advanced Wastewater Treatment (AWT), as a source for canal recharge. The District completed the *Canal Recharge Feasibility Study* (CDM 2006), which is also known as the *Groundwater Replenishment via Canal Recharge Augmentation Study*, to assess the availability of water for reclamation, treatment technologies and the potential impacts to the areas

targeted for recharge. The final report and data collected have been submitted to the FDEP for review and recommendation to the Florida Legislature.

45. High-Volume Surface Water ASR Testing in Taylor Creek

Recommendation: Currently, the District owns the only aquifer storage and recovery (ASR) well with a USEPA-authorized aquifer exemption covering primary water quality parameters. This ASR well, which is located by Taylor Creek in Okeechobee County, was permitted, constructed and tested at a capacity of 5 MGD during the late 1980s. Results of the testing suggest that the Mid-Floridan Aquifer may be capable of receiving and storing surface water at much larger injection rates than 5 MGD. It is recommended that the well be modified to support injection/recovery testing at rates of 20 MGD. The well is currently in disrepair and needs a FDEP underground injection operation permit, at a minimum, prior to additional testing.

Progress: This project is currently inactive.

Water Supply Development Projects

46. Water Supply Development

Recommendation: The recommendation of this plan is that individual water users evaluate alternative water supply sources and select the alternative, or combination of alternatives, which best suit local conditions. The District will continue to evaluate consumptive uses for their impacts on both the regional system and local resources on a case-by-case basis.

Progress: The Water Resource Protection and Sustainability Program provides annual state revenues and matching District funds to support alternative water supply development, such as construction of desalination, reclaimed water and new storage facilities. This combination of state and District funds are specifically for cost-sharing alternative water supply project construction costs. All local governments within the LEC Planning Area are now required to prepare 10-Year Water Supply Facilities Work Plans and adopt revisions to their comprehensive plans within 18 months following the approval of the LEC Plan Update.

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D

Urban and Agricultural Demand Projections

OVERVIEW

Water demands in this *2005–2006 Lower East Coast Water Supply Plan Update* (2005–2006 LEC Plan Update) are considered both in terms of the water needed to meet the demands of the users/customers and the withdrawal demands on the water resources. This appendix explains and presents projections for both the user/customer demands and the demands on the water resources.

In previous water supply plans, the user/customer demands and water withdrawal demands were identified together. This approach, however, had to be modified to address the situations in which customer demands and resource demands differ. For instance, in the Lower East Coast (LEC) Planning Area, a significant percentage of new utility demands are being met using brackish water sources, and withdrawals from these sources are about one-third higher than withdrawals from freshwater sources, which are used in conventional treatment processes. This is due to the water treatment process at reverse osmosis (RO) plants, which yields both potable water (about 75 percent to 80 percent of water entering the plant) and a concentrate containing the salts (about 20 percent to 25 percent of water entering the plant).

Demand assessments for 2000 and projections through 2025 in five-year time frames are presented in this appendix for the following water use categories:

- Public Water Supply.
- Domestic Self-Supply and Small Public Supply Systems.
- Commercial and Industrial Self-Supply.
- Recreational Self-Supply.
- Thermoelectric Power Generation Self-Supply.
- Agricultural Self-Supply.

The Public Water Supply category encompasses potable water supplied by water treatment facilities with projected average pumpages greater than 100,000 gallons per day (GPD), or 0.1 million gallons per day (MGD), in 2025 to all types of

customers, not just residential. Within this water use category, customer demands are referred to as "finished water demands" because they are measured by the treated water leaving the plants. The other five water use categories are self-supplied. The Domestic Self-Supply category includes households whose sources of domestic water are private wells, as well as small utilities. Commercial and Industrial Self-Supply refers to self-supplied business operations. Recreational Self-Supply includes irrigation demands for golf courses and other large landscaped areas, such as parks and cemeteries. Thermoelectric Power Generation Self-Supply water primarily represents replacement water for evaporative losses from cooling water and boiler make-up water at power plants. The Agricultural water use category includes demands for crop irrigation.

GENERAL DESCRIPTION OF METHODOLOGY AND DATA SOURCES

This section describes the data, information and procedures used to develop the water demand estimates for this 2005–2006 LEC Plan Update. The demands are those of the people in the LEC Planning Area and their activities, especially as reflected in land use. Therefore, estimates and projections of population and land use are basic to estimating water demands. These estimates and projections need to reflect appropriate breakdowns by location and type of use (e.g., crop type for agricultural use). Another key is to develop appropriate use factors that can be applied to the population and land use information as appropriately defined and broken down by location and use type.

The water demand projections include analyses during average rainfall conditions and 1-in-10 year drought demand conditions, as mandated by Subsection 373.0361(2)(a)l, Florida Statutes (F.S.).

Activity Factors

Population

Population is the chief independent variable for projection purposes for public water supplies and domestic self-supplies.

2000 Population

U.S. Census data were used as the basis for the 2000 population and the distribution of that population to sub-county areas. Census block level information from the census count was used as the basic unit of analysis. Total population, occupied housing units and persons per occupied housing unit were obtained from the census for blocks within each county.

Information from South Florida Water Management District (SFWMD or District) permit files and data from utilities were used to define the areas served by each utility. The utilities' data were especially important in identifying the areas actually served by each utility. The areas not served by utilities were the primary basis for the estimation of the self-supplied population. While data from the 1990 Census and earlier censuses had identified the source of water for households, data were no longer included in the 2000 Census. Populations in areas not served by utilities were included as self-supplied population.

The geographic areas represented by the census blocks and utility-served areas were input as polygon layers into the SFWMD Geographic Information System (GIS). The two layers were overlaid to determine if census blocks were inside or outside the area served by each utility. Imagery was used to review decisions when needed. The populations by census block for each public water supply utility and for domestic self-supplied users were then calculated. The populations for each utility-served area were then totaled.

A few utilities, most notably the cities of Jupiter and Tequesta in Palm Beach County, serve significant populations in Martin County, which is in the Upper East Coast (UEC) Planning Area. To provide the best population-served estimates for planning purposes, these populations are included in the populations served in the LEC Plan Update. In addition, some residents in far western Palm Beach County and the portion of Hendry County within the LEC Planning Area are served by Clewiston Public Utilities (formerly served by U.S. Sugar) and are included in the *2005–2006 Lower West Coast Water Supply Plan Update* (2005–2006 LWC Plan Update) (SFWMD 2006).

Population Projections

The goal of water supply planning is to use the best available data to estimate future populations. For estimating county populations, the latest medium county population projections published by the Bureau of Economic and Business Research (BEBR), University of Florida, are primarily used. In preparing this plan update, the BEBR's county level projections were used to guide the population projections for all counties. These projections are updated on an annual basis, and the latest projections used were issued in February 2006 (BEBR 2006). However, these projections were not significantly different than projections developed the previous year or from projections developed by Miami-Dade and Broward counties.

For Palm Beach, Broward and Miami-Dade counties, the projected share of total county population for each utility service area was based on the projected traffic analysis zone (TAZ) population growth in each county. Traffic analysis zones are useful in projecting the distribution of population because they analyze relatively small geographic areas and are integrated into each county's transportation planning process.

In addition, GIS information about the areas that each utility expects to serve in the future was obtained from the utilities. The two layers were overlaid to determine if TAZs were inside or outside the area served by each utility. Population estimates were then calculated for each utility by deciding which polygons were inside or outside of utility-served boundaries. The populations for each utility-served area were then totaled.

The projections used in this plan update are believed to represent a reasonable balance of long- and short-term factors affecting the development of the LEC Planning Area. However, the many recent development proposals throughout the LEC Planning Area, which could significantly change growth patterns within the area, emphasize the uncertainties of 20-year population projections.

Land Use Projections

Land use projections were developed jointly for the LEC Plan Update planning process and for use in the SFWMD's hydrologic models, especially the South Florida Water Management Model (SFWMM), which is the primary tool for regional analyses in the LEC Planning Area and Lake Okeechobee service areas. The data were essentially updates of previous efforts in support of the *2000 Lower East Coast Regional Water Supply Plan* (2000 LEC Plan) and the hydrologic modeling evaluations completed in support of that plan, as well as the *Central and Southern Florida Flood Control Project Comprehensive Review Study* (known as the Restudy) and the Comprehensive Everglades Restoration Plan (CERP).

The land use information used directly to develop the demand estimates includes irrigated agricultural acreage by crop type and by county or sub-county area, and irrigated recreational use acreage (golf course and other large landscaped areas).

However, some land currently in agricultural production in the Everglades Agricultural Area (EAA) will be incorporated into Acceler8 and CERP projects. The projections were specifically modified to reflect the currently anticipated use of this land for these water management purposes. This resulted in an explicit reduction of 48,300 acres of sugarcane in the EAA, of which 5,000 acres are in Hendry County and 43,500 acres are in Palm Beach County.

Estimates and Projections of Water Use Factors

Public Water Supply and Self-Supplied Demands

For public water suppliers and self-supplied demands, the finished water demands per capita for each utility are based on historical data and generally held constant into the future.

Per capita water use rates in 2000 for each utility were calculated by dividing finished water demands by the permanent resident population served by public water supply utilities. These per capita rates include: total use (incorporating use by seasonal residents and tourists); commercial and industrial utility supplied use; losses incurred in water delivery; and, use by permanent residents. Some utilities have achieved a planned level of service, which is different from the 2000 estimate. For those utilities, the planned level of service, finished water demand per capita estimates were used.

Domestic Self-Supply per capita rates were based on the average Public Water Supply per capita for the county. For Public Water Supply and Domestic Self-Supply use, 1-in-10 year demand conditions are represented by a use that is 6 percent higher than the average demands.

To determine the water withdrawal demands, information regarding the sources and efficiency factors are needed. Conventional treatment processes for freshwater sources generally show insignificant differences between raw water withdrawals and finished water demands. On the other hand, for the nanofiltration treatment process applied to fresh water, finished water production is generally 85 percent of raw water withdrawals. For reverse osmosis (RO) treatment of brackish water, freshwater production is generally about 75 percent of raw water withdrawals. Aquifer storage and recovery (ASR) systems generally recover about 75 percent of water placed into storage. Reuse of reclaimed water substitutes for water resource withdrawals that would otherwise be required by irrigators, some of whom may have alternatively used potable water. These factors are typical for applications in determining water withdrawal

demands; however, when specific information was available as to the expected factor for a particular utility or project, this information was used.

Irrigation Demands

The Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) Model, which is a measure of the water placed within the root zone of the crop or landscape, was used to estimate net irrigation demands for agricultural and recreational uses. Irrigation requirements were calculated for average and 1-in-10 year drought demands. To estimate agricultural and recreational irrigation demands, the 2000 and projected irrigated acreages were evaluated using 36 years of rainfall and potential evapotranspiration climatic data from appropriate meteorological stations. The analyses also considered growing seasons, soil types, irrigation methods and strategies.

Agricultural 1-in-10 year drought demands are higher than demands under average conditions, with the difference depending somewhat on soil and crop type. Recreational use has similar differences between average and drought demand estimates.

Irrigation application efficiencies reflect the ability of each type of irrigation system to place water into the root zone of the crop, where the irrigation system directly meets the needs of farmers or landscapers. The result of applying the efficiencies to the net irrigation demand estimates provides estimates of gross irrigation demands, which are typically the withdrawal demands (demands on the water resource). Efficiencies for irrigation systems are typically 85 percent for low-volume systems, 75 percent for overhead sprinkler systems, 50 percent for flood systems and 35 percent for sprinkler systems on containerized nurseries. A unique situation exists in the muck soils of the EAA in that nearly all the land is used for agriculture; the type of irrigation system is by water table maintenance; the downward seepage of water is negligible; and, the removal of surface water from the basin requires pumping. In this situation, irrigation system efficiencies can vary widely. A 50 percent efficiency factor was used in this plan update as the field scale efficiency within the EAA.

DEMAND ESTIMATES AND PROJECTIONS BY CATEGORY OF WATER USE

(1 & 2) Public Water Supply and Domestic Self-Supply Demands

Public Water Supply and Domestic Self-Supply demand estimates and projections were developed from 2000 through 2025 in five-year increments. The Domestic Self-Supply category includes small public supply systems with projected demands of less than 100,000 GPD (0.1 MGD), as well as residents

who supply their own indoor domestic water needs. Water demands were forecast by multiplying population projections by per capita finished water demand use rates.

The finished water demands are the demands of each utility's customers, which include: permanent residents, seasonal residents, tourists, commercial, government and industrial users. The concept of customer demands as applied to public water suppliers is essentially equivalent to finished water leaving the water treatment plants. While utility finished water production includes unaccounted for water, as well as water whose use is eventually metered, the finished water production is still a good measure of utility customer demands. This is because a significant portion of the unaccounted for water is used, but simply unmetered. The rest of the water, while not ultimately used by customers, is limited through the consumptive use permitting (CUP) process.

In many cases, the finished water demands met by each utility are not significantly different from the raw water withdrawals, but the differences are becoming more important and many of the differences arise from the decisions made regarding source and treatment methods. The finished water demands of any utility's customers do not include water used in treatment processes, the effects of ASR systems, or the effects of bulk sales and purchases. However, in order to produce the finished water provided to utility customers, there is a larger water withdrawal demand, reflecting what is withdrawn from the water resource, including all of the supply necessary to overcome process inefficiencies and account for bulk deliveries and purchases.

Projection Methodology

The basic finished water projection methodology for the Public Water Supply and Domestic Self-Supply users was to estimate populations served by each utility and apply a per capita consumption based on finished water demands per capita for each user. The raw water withdrawals are projected based on the finished water demand projections, and the source and treatment methods capacities are identified in the projects in **Chapter 7** and the expected efficiencies and use of those capacities.

Projection Results

Table 1 shows the projected Public Water Supply population by planning sub-area. **Table 2** provides finished water demands under average conditions by utility, while **Table 3** provides the finished water needs for 1-in-10 year drought demands. In the same manner, **Table 4** provides estimated raw water withdrawals under average conditions, while **Table 5** provides raw water withdrawals under 1-in-10 year drought conditions.

These projections reflect information available at the time the plan update was adopted, and appropriate projections will change as additional information becomes available. For instance, the population projections are tied to TAZ projections to distribute an acceptable total county population (typically medium projections developed by the BEBR to utility service areas. These projections are updated every several years, and the county total populations are updated by BEBR on an annual basis. At the time of the plan update adoption, specific issues had been identified, but not resolved, regarding projections for the City of Boynton Beach.

[A mapping error was discovered just prior to plan update approval concerning the City of Boynton Beach. As a result, it now appears that some of the population in the Boynton Beach service area, which was previously expected to be self-supplied, may be served by the utility. This change will increase the population served by about 9,500 and finished water demands by about 1.70 MGD by 2025 over those identified in the plan update. Projects identified in this plan update are sufficient to cover an increase in expected demands of this magnitude.]

Table 1. Public Water Supply and Domestic Self-Supply Projections of Population Served by Utility.

Utility	2000	2005	2010	2015	2020	2025
Palm Beach County						
AG Holley	0	0	0	0	0	0
Beeline Community Dev. Dist.	0	0	0	0	0	0
Beeline Utilities, L.L.C.	0	0	0	0	0	0
Boca Raton	103,442	107,336	111,230	116,301	122,584	128,167
Boynton Beach	84,545	91,474	98,403	106,258	115,393	125,226
Delray Beach	62,411	66,286	70,161	74,145	78,969	84,146
Golf	2,702	2,762	2,821	2,889	3,034	3,155
Highland Beach	3,752	3,970	4,188	4,482	5,132	5,662
Jupiter[a]	42,801	54,379	65,957	74,997	84,650	93,057
Lake Region - Palm Beach County Utilities (Belle Glade, Pahokee, South Bay)	32,544	33,416	34,394	36,755	39,539	42,115
Lake Worth	46,909	48,941	50,974	54,209	58,613	63,067
Lantana	9,146	9,558	9,970	10,531	11,524	12,359
Manalapan	2,095	2,377	2,658	2,862	3,152	3,401
Mangonia Park	1,173	2,527	2,543	2,546	2,549	2,552
Maralago Cay (Arrowhead)	1,300	1,300	1,300	1,300	1,300	1,300
Palm Beach County Utilities	322,353	372,238	422,123	476,024	521,219	566,284
Palm Beach County Utilities - Royal Palm Beach	21,245	25,416	29,587	31,522	33,845	35,830
Palm Springs	33,217	35,142	37,067	38,835	40,851	42,772
Riviera Beach	31,174	36,030	40,885	44,560	48,868	52,899
Seacoast	71,847	83,743	95,640	106,616	115,369	122,817
Seminole Improvement District	15	207	400	504	639	754
Tequesta[a]	11,816	12,199	12,581	12,936	13,422	13,834
Tropical Breeze Estates	373	432	490	523	577	623
Wellington/Acme	40,168	47,939	55,710	62,374	69,127	75,334
West Palm Beach	90,149	111,302	123,063	134,147	144,996	156,217
Palm Beach County Self-Supplied	118,288	131,064	143,664	154,319	163,974	172,617
Palm Beach County Total	1,133,465	1,280,038	1,415,809	1,549,635	1,679,326	1,804,188

a. Includes population served by Jupiter and Tequesta utilities.

Table 1. Public Water Supply and Domestic Self-Supply Projections of Population Served by Utility (Continued).

Utility	2000	2005	2010	2015	2020	2025
Broward County						
Broward District 1 (BCWWS)	63,904	73,137	79,289	87,644	96,201	100,941
Broward 2A/North Regional (BCWWS)	98,442	112,643	128,787	134,426	140,065	142,618
Broward South Regional (BCWWS)	0	0	0	0	0	0
Cooper City	27,784	29,437	33,807	38,176	38,476	38,776
Coral Springs	58,086	61,345	64,604	67,328	69,157	70,088
Coral Springs Imp. District	37,516	39,274	41,031	42,231	43,509	44,586
Dania Beach	13,435	16,060	18,685	20,818	23,030	23,990
Davie	25,212	29,635	34,057	36,631	39,664	41,949
Deerfield Beach	52,179	54,613	57,046	60,538	63,474	66,381
Ferncrest	4,485	4,854	5,223	5,472	5,594	5,675
Fort Lauderdale	223,188	237,492	248,797	285,507	329,847	361,178
Hallandale Beach	34,679	37,048	39,416	43,866	47,266	49,678
Hillsboro Beach	2,163	2,333	2,502	2,770	2,935	3,592
Hollywood	178,511	185,169	199,357	234,298	267,731	285,899
Lauderhill	57,240	61,573	65,906	70,355	73,831	76,937
Margate	58,648	60,402	62,662	66,105	69,091	73,208
Miramar	66,167	92,822	119,476	124,468	129,842	134,974
North Lauderdale	31,882	33,167	34,452	36,642	38,592	39,941
North Springs Imp. District	23,588	34,879	46,170	46,869	47,577	47,978
Parkland Utilities	2,274	2,491	2,829	3,482	3,918	4,110
Pembroke Pines	132,341	145,297	158,252	161,625	164,440	166,073
Plantation	82,934	85,157	90,987	96,463	101,477	105,944
Pompano Beach	79,890	89,192	94,219	104,056	111,651	116,381
Royal Utility	3,169	3,335	3,501	3,696	3,756	3,790
Seminole Tribe	1,875	2,007	2,138	2,266	2,326	2,390
Sunrise	186,794	215,143	243,491	251,969	257,441	260,631
Tamarac	52,521	55,108	57,694	60,937	64,249	66,935
Broward Self-Supplied	1,782	4,281	6,658	6,531	6,347	6,151
Broward County Total	1,600,689	1,767,894	1,941,036	2,095,169	2,241,487	2,340,794

Table 1. Public Water Supply and Domestic Self-Supply Projections of Population Served by Utility (Continued).

Utility	2000	2005	2010	2015	2020	2025
Miami-Dade County						
Alexander Orr (WASD)	924,074	1,001,562	1,078,365	1,127,193	1,185,201	1,243,208
Americana Village	2,000	2,000	2,000	2,000	2,000	2,000
Florida City	7,438	10,061	12,684	15,306	18,049	20,792
Hialeah Preston (WASD)	976,374	1,036,416	1,095,864	1,149,575	1,206,416	1,255,831
Homestead	35,626	47,890	60,155	72,419	80,953	89,486
North Miami	88,997	95,073	101,013	107,081	110,497	115,034
North Miami Beach	155,261	162,205	169,878	176,867	183,112	189,357
South Dade (WASD)	32,006	37,326	43,331	78,151	88,766	99,380
Miami-Dade Self-Supplied	26,957	31,966	36,975	41,131	46,396	51,661
Miami-Dade County Total	2,248,734	2,424,499	2,600,263	2,769,725	2,921,389	3,066,750
Monroe County						
Florida Keys Aqueduct Authority (FKAA)	78,855	82,413	84,100	85,800	87,200	88,600
Monroe County Total	78,855	82,413	84,100	85,800	87,200	88,600
Hendry County						
Hendry Self-Supplied	1,883	1,279	1,279	1,279	1,279	1,279
Hendry County Total	1,883	1,279	1,279	1,279	1,279	1,279
LEC Planning Area Total	5,063,626	5,556,123	6,042,487	6,501,608	6,930,681	7,301,611

Table 2. Public Water Supply and Domestic Self-Supply Average Finished Water Demand Projections by Utility (MGD).

Utility	2000	2005	2010	2015	2020	2025
Palm Beach County						
AG Holley	0.09	0.07	0.09	0.09	0.09	0.09
Beeline Community Dev. Dist.	0.44	0.26	0.47	0.47	0.47	0.47
Beeline Utilities, L.L.C.	0.02	0.02	0.55	0.55	0.55	0.55
Boca Raton	44.10	39.09	40.52	42.37	44.65	46.69
Boynton Beach	13.31	15.73	15.49	16.73	18.17	19.71
Delray Beach	17.45	17.10	18.59	19.65	20.93	22.30
Golf	0.47	0.51	0.49	0.50	0.53	0.55
Highland Beach	1.42	1.60	1.58	1.70	1.94	2.14
Jupiter	13.16	15.15	20.29	23.07	26.04	28.62
Lake Region - Palm Beach County Utilities (Belle Glade, Pahokee, South Bay)	5.40	6.40	5.78	6.17	6.65	7.07
Lake Worth	7.06	6.98	7.67	8.16	8.82	9.49
Lantana	2.20	2.09	2.29	2.42	2.65	2.84
Manalapan	1.34	1.28	1.70	1.83	2.02	2.18
Mangonia Park	0.63	0.49	0.49	0.49	0.49	0.49
Maralago Cay (Arrowhead)	0.30	0.25	0.25	0.25	0.25	0.25
Palm Beach County Utilities	45.44	52.24	59.51	67.10	73.47	79.83
Palm Beach County Utilities - Royal Palm Beach	2.78	2.44	3.87	4.12	4.43	4.69
Palm Springs	4.33	4.33	4.83	5.06	5.33	5.58
Riviera Beach	8.02	7.42	10.52	11.46	12.57	13.61
Seacoast	17.25	18.53	20.14	22.46	24.30	25.87
Seminole Improvement District	0.36	0.12	0.44	0.46	0.49	0.51
Tequesta	3.28	3.57	3.49	3.59	3.72	3.84
Tropical Breeze Estates	0.11	0.12	0.14	0.15	0.17	0.18
Wellington/Acme	5.30	5.98	7.35	8.23	9.12	9.94
West Palm Beach	28.55	29.93	31.81	33.96	36.00	38.14
Palm Beach County Self-Supplied	25.41	27.95	30.49	32.49	34.27	35.88
Palm Beach County Total	248.22	259.64	288.85	313.53	338.11	361.50

Table 2. Public Water Supply and Domestic Self-Supply Average Finished Water Demand Projections by Utility (MGD) (Continued).

Utility	2000	2005	2010	2015	2020	2025
Broward County						
Broward District 1 (BCWWS)	8.80	9.24	10.39	11.48	12.60	13.22
Broward 2A/North Regional (BCWWS)	15.46	15.07	18.42	19.22	20.03	20.39
Broward South Regional (BCWWS)	0.00	0.00	0.00	0.00	0.00	0.00
Cooper City	3.46	3.21	4.05	4.57	4.60	4.64
Coral Springs	7.98	7.86	8.88	9.25	9.50	9.63
Coral Springs Imp. District	5.17	4.38	5.65	5.82	6.00	6.14
Dania Beach	2.27	2.54	3.16	3.52	3.89	4.05
Davie	3.90	4.57	5.27	5.67	6.14	6.49
Deerfield Beach	11.88	11.30	12.99	13.78	14.45	15.11
Ferncrest	0.56	0.56	0.65	0.68	0.70	0.71
Fort Lauderdale	51.03	47.81	56.87	65.27	75.40	82.57
Hallandale Beach	5.73	5.66	6.51	7.25	7.81	8.21
Hillsboro Beach	0.94	0.84	1.09	1.20	1.28	1.56
Hollywood	23.73	24.53	26.41	31.04	35.47	37.88
Lauderhill	7.81	6.42	8.99	9.60	10.07	10.50
Margate	7.54	6.77	8.06	8.50	8.88	9.41
Miramar	6.51	9.80	11.75	12.25	12.77	13.28
North Lauderdale	2.68	2.72	2.90	3.08	3.25	3.36
North Springs Imp. District	3.21	3.91	6.28	6.38	6.47	6.53
Parkland Utilities	0.26	0.26	0.32	0.40	0.45	0.47
Pembroke Pines	12.71	13.25	15.20	15.52	15.79	15.95
Plantation	13.33	12.97	14.38	15.24	16.03	16.74
Pompano Beach	18.88	17.27	18.00	19.87	21.33	22.23
Royal Utility	0.48	0.41	0.53	0.56	0.57	0.57
Seminole Tribe	0.23	0.25	0.27	0.28	0.29	0.30
Sunrise	23.70	27.50	30.90	31.97	32.67	33.07
Tamarac	6.50	6.25	7.14	7.54	7.95	8.28
Broward Self-Supplied	0.36	0.86	1.33	1.31	1.27	1.23
Broward County Total	245.11	246.21	286.38	311.26	335.67	352.54

Table 2. Public Water Supply and Domestic Self-Supply Average Finished Water Demand Projections by Utility (MGD) (Continued).

Utility	2000	2005	2010	2015	2020	2025
Miami-Dade County						
Alexander Orr (WASD)	169.47	174.38	167.15	174.71	183.71	192.70
Americana Village	0.24	0.26	0.24	0.24	0.24	0.24
Florida City	2.53	2.44	2.52	3.05	3.59	4.14
Hialeah Preston (WASD)	149.52	145.54	169.86	178.18	186.99	194.65
Homestead	8.24	9.51	13.92	16.76	18.73	20.70
North Miami	13.07	12.86	14.83	15.72	16.22	16.89
North Miami Beach	23.00	22.49	25.16	26.20	27.12	28.05
South Dade (WASD)	6.66	7.04	6.72	12.11	13.76	15.40
Miami-Dade Self-Supplied	5.39	6.39	7.39	8.23	9.28	10.33
Miami-Dade County Total	378.12	380.92	407.79	435.20	459.64	483.10
Monroe County						
Florida Keys Aqueduct Authority (FKAA)	17.02	17.42	20.08	22.10	23.43	23.90
Monroe County Total	17.02	17.42	20.08	22.10	23.43	23.90
Hendry County						
Hendry Self-Supplied	1.40	1.40	1.40	1.40	1.40	1.40
Hendry County Total	1.40	1.40	1.40	1.40	1.40	1.40
LEC Planning Area Total	889.87	905.60	1,004.50	1,083.48	1,158.26	1,222.44

Table 3. Public Water Supply and Domestic Self-Supply 1-in-10 Year Finished Water Demand Projections by Utility (MGD).

Utility	2000	2005	2010	2015	2020	2025
Palm Beach County						
AG Holley	0.10	0.07	0.10	0.10	0.10	0.10
Beeline Community Dev. Dist.	0.47	0.28	0.49	0.49	0.49	0.49
Beeline Utilities, L.L.C.	0.02	0.02	0.58	0.58	0.58	0.58
Boca Raton	46.75	41.44	42.95	44.91	47.33	49.49
Boynton Beach	14.11	16.67	16.42	17.73	19.26	20.90
Delray Beach	18.50	18.13	19.71	20.83	22.18	23.64
Golf	0.50	0.54	0.52	0.53	0.56	0.58
Highland Beach	1.51	1.70	1.68	1.80	2.06	2.27
Jupiter	13.95	16.06	21.50	24.45	27.60	30.34
Lake Region - Palm Beach County Utilities (Belle Glade, Pahokee, South Bay)	5.72	6.78	6.12	6.54	7.04	7.50
Lake Worth	7.48	7.40	8.13	8.65	9.35	10.06
Lantana	2.33	2.21	2.43	2.57	2.81	3.01
Manalapan	1.42	1.36	1.80	1.94	2.14	2.31
Mangonia Park	0.67	0.52	0.52	0.52	0.52	0.52
Maralago Cay (Arrowhead)	0.32	0.27	0.27	0.27	0.27	0.27
Palm Beach County Utilities	48.17	55.37	63.08	71.13	77.88	84.62
Palm Beach County Utilities - Royal Palm Beach	2.95	2.59	4.10	4.37	4.69	4.97
Palm Springs	4.59	4.59	5.12	5.37	5.64	5.91
Riviera Beach	8.50	7.87	11.15	12.15	13.33	14.43
Seacoast	18.29	19.64	21.35	23.80	25.76	27.42
Seminole Improvement District	0.38	0.13	0.47	0.49	0.52	0.54
Tequesta	3.48	3.78	3.70	3.80	3.95	4.07
Tropical Breeze Estates	0.12	0.13	0.15	0.16	0.18	0.19
Wellington/Acme	5.62	6.34	7.79	8.72	9.67	10.54
West Palm Beach	30.26	31.73	33.72	36.00	38.16	40.43
Palm Beach County Self-Supplied	26.94	29.63	32.32	34.43	36.33	38.03
Palm Beach County Total	263.12	275.22	306.18	332.34	358.40	383.19

Table 3. Public Water Supply and Domestic Self-Supply 1-in-10 Year Finished Water Demand Projections by Utility (MGD) (Continued).

Utility	2000	2005	2010	2015	2020	2025
Broward County						
Broward District 1 (BCWWS)	9.33	9.80	11.01	12.17	13.36	14.02
Broward 2A/North Regional (BCWWS)	16.39	15.97	19.52	20.38	21.23	21.62
Broward South Regional (BCWWS)	0.00	0.00	0.00	0.00	0.00	0.00
Cooper City	3.67	3.40	4.29	4.84	4.88	4.92
Coral Springs	8.46	8.33	9.41	9.80	10.07	10.21
Coral Springs Imp. District	5.48	4.64	5.99	6.17	6.36	6.51
Dania Beach	2.41	2.69	3.35	3.73	4.12	4.30
Davie	4.13	4.84	5.58	6.01	6.50	6.88
Deerfield Beach	12.59	11.98	13.77	14.61	15.32	16.02
Ferncrest	0.59	0.59	0.69	0.72	0.74	0.75
Fort Lauderdale	54.09	50.68	60.29	69.18	79.93	87.52
Hallandale Beach	6.07	6.00	6.90	7.68	8.28	8.70
Hillsboro Beach	1.00	0.89	1.15	1.28	1.35	1.65
Hollywood	25.15	26.00	28.00	32.91	37.60	40.15
Lauderhill	8.28	6.81	9.53	10.18	10.68	11.13
Margate	7.99	7.18	8.54	9.01	9.42	9.98
Miramar	6.90	10.39	12.46	12.98	13.54	14.08
North Lauderdale	2.84	2.88	3.07	3.27	3.44	3.56
North Springs Imp. District	3.40	4.14	6.66	6.76	6.86	6.92
Parkland Utilities	0.28	0.28	0.34	0.42	0.47	0.50
Pembroke Pines	13.47	14.05	16.11	16.45	16.74	16.91
Plantation	14.13	13.75	15.24	16.16	17.00	17.74
Pompano Beach	20.01	18.31	19.08	21.07	22.60	23.56
Royal Utility	0.51	0.43	0.56	0.59	0.60	0.61
Seminole Tribe	0.25	0.27	0.28	0.30	0.31	0.32
Sunrise	25.12	29.15	32.75	33.89	34.63	35.06
Tamarac	6.89	6.63	7.57	7.99	8.43	8.78
Broward Self-Supplied	0.38	0.91	1.41	1.38	1.35	1.30
Broward County Total	259.82	260.98	303.56	329.94	355.81	373.69

Table 3. Public Water Supply and Domestic Self-Supply 1-in-10 Year Finished Water Demand Projections by Utility (MGD) (Continued).

Utility	2000	2005	2010	2015	2020	2025
Miami-Dade County						
Alexander Orr (WASD)	179.64	184.84	177.18	185.20	194.73	204.26
Americana Village	0.25	0.28	0.25	0.25	0.25	0.25
Florida City	2.68	2.59	2.68	3.23	3.81	4.39
Hialeah Preston (WASD)	158.50	154.27	180.05	188.88	198.21	206.33
Homestead	8.74	10.08	14.75	17.76	19.85	21.95
North Miami	13.85	13.63	15.72	16.66	17.20	17.90
North Miami Beach	24.38	23.84	26.67	27.77	28.75	29.73
South Dade (WASD)	7.06	7.46	7.12	12.84	14.58	16.33
Miami-Dade Self-Supplied	5.71	6.78	7.84	8.72	9.84	10.95
Miami-Dade County Total	400.81	403.78	432.26	461.31	487.22	512.09
Monroe County						
Florida Keys Aqueduct Authority (FKAA)	18.04	18.47	21.29	23.42	24.83	25.33
Monroe County Total	18.04	18.47	21.29	23.42	24.83	25.33
Hendry County						
Hendry Self-Supplied	1.48	1.48	1.49	1.49	1.49	1.49
Hendry County Total	1.48	1.48	1.49	1.49	1.49	1.49
LEC Planning Area Total	943.27	959.93	1,064.77	1,148.49	1,227.75	1,295.79

Table 4. Public Water Supply and Domestic Self-Supply Average Raw Water Withdrawals by Utility (MGD).

Utility	2000	2005	2010	2015	2020	2025
Palm Beach County						
AG Holley	0.09	0.08	0.10	0.10	0.10	0.10
Beeline Community Dev. Dist.	0.44	0.26	0.47	0.47	0.47	0.47
Beeline Utilities, L.L.C.	0.02	0.03	0.73	0.73	0.73	0.73
Boca Raton	44.10	42.69	45.02	47.07	49.62	51.88
Boynton Beach	15.50	14.55	14.55	18.55	20.47	22.53
Delray Beach	17.45	17.30	20.80	20.15	21.86	23.69
Golf	0.47	0.51	0.49	0.50	0.53	0.55
Highland Beach	1.42	2.13	2.11	2.26	2.59	2.86
Jupiter	14.35	17.70	24.39	28.10	32.06	35.50
Lake Region - Palm Beach County Utilities (Belle Glade, Pahokee, South Bay)	5.68	6.74	7.70	8.23	8.86	9.43
Lake Worth	7.35	7.27	8.89	9.84	11.11	11.93
Lantana	2.40	2.20	2.20	2.20	2.20	2.20
Manalapan	1.34	1.28	2.07	2.25	2.49	2.71
Mangonia Park	0.63	0.49	0.49	0.49	0.49	0.49
Maralago Cay (Arrowhead)	0.30	0.25	0.25	0.25	0.25	0.25
Palm Beach County Utilities	45.44	58.97	64.89	73.18	80.13	87.05
Palm Beach County Utilities - Royal Palm Beach	2.78	2.64	4.35	4.69	5.09	5.44
Palm Springs	4.33	4.50	4.33	4.33	4.33	4.33
Riviera Beach	8.02	7.42	14.02	15.29	16.76	18.15
Seacoast	17.25	19.12	20.68	23.76	26.22	28.31
Seminole Improvement District	0.36	0.17	0.55	0.57	0.61	0.64
Tequesta	3.28	2.34	3.49	3.59	3.72	3.91
Tropical Breeze Estates	0.11	0.12	0.15	0.17	0.19	0.20
Wellington/Acme	5.30	6.75	7.81	8.98	10.17	11.26
West Palm Beach	28.55	31.51	32.42	34.61	36.69	38.87
Palm Beach County Self-Supplied	25.41	27.95	30.49	32.49	34.27	35.88
Palm Beach County Total	252.38	274.97	313.44	342.83	372.00	399.35

Table 4. Public Water Supply and Domestic Self-Supply Average Raw Water Withdrawals by Utility (MGD) (Continued).

Utility	2000	2005	2010	2015	2020	2025
Broward County						
Broward District 1 (BCWWS)	8.80	9.12	10.60	12.24	13.74	14.56
Broward 2A/North Regional (BCWWS)	15.46	16.04	19.14	19.94	20.75	21.11
Broward South Regional (BCWWS)	8.92	10.52	18.71	20.07	21.10	21.73
Cooper City	3.46	4.12	4.76	5.37	5.42	5.46
Coral Springs	7.98	7.86	9.21	9.71	10.05	10.22
Coral Springs Imp. District	5.17	4.70	6.04	6.22	6.40	6.56
Dania Beach	2.27	0.12	1.33	1.33	1.33	1.33
Davie	3.90	4.70	5.81	6.39	7.03	7.52
Deerfield Beach	11.88	11.11	13.36	14.42	15.31	16.19
Ferncrest	0.56	0.75	0.56	0.56	0.56	0.56
Fort Lauderdale	51.03	47.81	59.90	71.09	84.60	94.15
Hallandale Beach	5.73	3.25	0.00	0.00	0.00	0.00
Hillsboro Beach	1.06	0.95	1.27	1.43	1.52	1.91
Hollywood	23.73	23.36	22.91	27.47	33.38	36.59
Lauderhill	7.81	6.66	9.85	10.66	11.29	11.86
Margate	7.54	8.35	10.05	10.64	11.15	11.86
Miramar	6.51	11.09	13.68	14.33	15.04	15.71
North Lauderdale	2.68	2.89	2.96	3.08	3.25	3.36
North Springs Imp. District	3.21	3.99	7.16	7.39	7.58	7.68
Parkland Utilities	0.26	0.26	0.26	0.26	0.26	0.26
Pembroke Pines	12.71	13.65	15.20	15.52	15.79	15.95
Plantation	13.33	16.97	16.91	18.02	19.08	20.02
Pompano Beach	18.88	17.57	19.10	21.60	23.54	24.74
Royal Utility	0.48	0.41	0.53	0.56	0.57	0.57
Seminole Tribe	0.23	0.25	0.27	0.29	0.30	0.31
Sunrise	23.70	30.39	32.03	33.46	34.39	34.93
Tamarac	6.50	6.40	8.33	7.66	8.21	8.65
Broward Self-Supplied	0.36	0.86	1.33	1.31	1.27	1.23
Broward County Total	254.15	264.15	311.26	341.03	372.91	395.04

Table 4. Public Water Supply and Domestic Self-Supply Average Raw Water Withdrawals by Utility (MGD) (Continued).

Utility	2000	2005	2010	2015	2020	2025
Miami-Dade County						
Alexander Orr (WASD)	172.75	177.76	171.80	180.99	190.90	200.07
Americana Village	0.26	0.28	0.26	0.26	0.26	0.26
Florida City	2.55	2.50	2.72	3.41	4.14	4.87
Hialeah Preston (WASD)	166.98	163.00	174.58	184.59	194.32	202.10
Homestead	8.24	10.70	16.06	19.84	22.47	25.10
North Miami	7.43	8.60	16.67	17.86	18.53	19.42
North Miami Beach	14.07	13.70	30.64	32.53	33.77	35.01
South Dade (WASD)	6.79	7.18	6.90	12.55	14.30	15.99
Miami-Dade Self-Supplied	5.39	6.39	7.39	8.23	9.28	10.33
Miami-Dade County Total	384.47	390.11	427.03	460.26	487.97	513.16
Monroe County						
Florida Keys Aqueduct Authority (FKAA)	18.50	17.78	21.33	24.01	25.79	26.41
Monroe County Total	18.50	17.78	21.33	24.01	25.79	26.41
Hendry County						
Hendry Self-Supplied	1.40	1.40	1.40	1.40	1.40	1.40
Hendry County Total	1.40	1.40	1.40	1.40	1.40	1.40
LEC Planning Area Total	910.89	948.40	1,074.47	1,169.54	1,260.07	1,335.37

Table 5. Public Water Supply and Domestic Self-Supply 1-in-10 Year Raw Water Withdrawals by Utility (MGD).

Utility	2000	2005	2010	2015	2020	2025
Palm Beach County						
AG Holley	0.10	0.08	0.10	0.10	0.10	0.10
Beeline Community Dev. Dist.	0.47	0.28	0.49	0.49	0.49	0.49
Beeline Utilities, L.L.C.	0.02	0.03	0.77	0.77	0.77	0.77
Boca Raton	46.75	45.25	47.72	49.90	52.59	54.99
Boynton Beach	16.43	15.42	15.42	19.66	21.69	23.88
Delray Beach	18.50	18.34	22.05	21.36	23.17	25.11
Golf	0.50	0.54	0.52	0.53	0.56	0.58
Highland Beach	1.51	2.26	2.24	2.40	2.75	3.03
Jupiter	15.21	18.76	25.85	29.78	33.98	37.63
Lake Region - Palm Beach County Utilities (Belle Glade, Pahokee, South Bay)	6.02	7.14	8.16	8.72	9.39	10.00
Lake Worth	7.79	7.71	9.42	10.43	11.78	12.64
Lantana	2.54	2.33	2.33	2.33	2.33	2.33
Manalapan	1.42	1.36	2.20	2.38	2.64	2.87
Mangonia Park	0.67	0.52	0.52	0.52	0.52	0.52
Maralago Cay (Arrowhead)	0.32	0.27	0.27	0.27	0.27	0.27
Palm Beach County Utilities	48.17	62.51	68.78	77.57	84.93	92.28
Palm Beach County Utilities - Royal Palm Beach	2.95	2.80	4.61	4.97	5.40	5.76
Palm Springs	4.59	4.77	4.59	4.59	4.59	4.59
Riviera Beach	8.50	7.87	14.87	16.20	17.77	19.23
Seacoast	18.29	20.27	21.92	25.19	27.80	30.01
Seminole Improvement District	0.38	0.18	0.58	0.61	0.65	0.68
Tequesta	3.48	2.48	3.70	3.80	3.95	4.15
Tropical Breeze Estates	0.12	0.13	0.16	0.18	0.20	0.22
Wellington/Acme	5.62	7.16	8.28	9.52	10.78	11.94
West Palm Beach	30.26	33.40	34.36	36.68	38.89	41.20
Palm Beach County Self-Supplied	26.94	29.63	32.32	34.43	36.33	38.03
Palm Beach County Total	267.52	291.46	332.25	363.40	394.32	423.31

Table 5. Public Water Supply and Domestic Self-Supply 1-in-10 Year Raw Water Withdrawals by Utility (MGD) (Continued).

Utility	2000	2005	2010	2015	2020	2025
Broward County						
Broward District 1 (BCWWS)	9.33	9.67	11.23	12.98	14.56	15.44
Broward 2A/North Regional (BCWWS)	16.39	17.00	20.28	21.14	21.99	22.38
Broward South Regional (BCWWS)	9.46	11.15	19.83	21.27	22.36	23.03
Cooper City	3.67	4.36	5.05	5.70	5.74	5.79
Coral Springs	8.46	8.33	9.77	10.30	10.65	10.83
Coral Springs Imp. District	5.48	4.98	6.40	6.59	6.79	6.96
Dania Beach	2.41	0.13	1.41	1.41	1.41	1.41
Davie	4.13	4.98	6.16	6.77	7.45	7.97
Deerfield Beach	12.59	11.78	14.16	15.28	16.23	17.16
Ferncrest	0.59	0.80	0.59	0.59	0.59	0.59
Fort Lauderdale	54.09	50.68	63.49	75.35	89.68	99.80
Hallandale	6.07	3.45	0.00	0.00	0.00	0.00
Hillsboro Beach	1.12	1.01	1.35	1.51	1.62	2.02
Hollywood	25.15	24.77	24.29	29.12	35.38	38.79
Lauderhill	8.28	7.06	10.44	11.30	11.97	12.57
Margate	7.99	8.85	10.66	11.28	11.82	12.57
Miramar	6.90	11.76	14.50	15.19	15.94	16.66
North Lauderdale	2.84	3.06	3.14	3.27	3.44	3.56
North Springs Imp. District	3.40	4.23	7.59	7.83	8.03	8.14
Parkland Utilities	0.28	0.28	0.28	0.28	0.28	0.28
Pembroke Pines	13.47	14.47	16.11	16.45	16.74	16.91
Plantation	14.13	17.99	17.93	19.10	20.22	21.22
Pompano Beach	20.01	18.62	20.24	22.90	24.95	26.23
Royal Utility	0.51	0.43	0.56	0.59	0.60	0.61
Seminole Tribe	0.25	0.27	0.29	0.31	0.32	0.33
Sunrise	25.12	32.21	33.95	35.47	36.45	37.02
Tamarac	6.89	6.78	8.83	8.12	8.70	9.17
Broward Self-Supplied	0.38	0.91	1.41	1.38	1.35	1.30
Broward County Total	269.40	279.99	329.94	361.49	395.28	418.74

Table 5. Public Water Supply and Domestic Self-Supply 1-in-10 Year Raw Water Withdrawals by Utility (MGD) (Continued).

Utility	2000	2005	2010	2015	2020	2025
Miami-Dade County						
Alexander Orr (WASD)	183.12	188.42	182.10	191.85	202.36	212.08
Americana Village	0.28	0.30	0.28	0.28	0.28	0.28
Florida City	2.71	2.65	2.89	3.62	4.39	5.17
Hialeah Preston (WASD)	177.00	172.78	185.06	195.66	205.98	214.23
Homestead	8.74	11.34	17.02	21.03	23.82	26.61
North Miami	7.88	9.12	17.67	18.93	19.64	20.58
North Miami Beach	14.92	14.52	32.48	34.49	35.79	37.11
South Dade (WASD)	7.20	7.61	7.32	13.30	15.16	16.95
Miami-Dade Self-Supplied	5.71	6.78	7.84	8.72	9.84	10.95
Miami-Dade County Total	407.54	413.52	452.65	487.88	517.25	543.95
Monroe County						
Florida Keys Aqueduct Authority (FKAA)	19.61	18.84	22.61	25.45	27.33	27.99
Monroe County Total	19.61	18.84	22.61	25.45	27.33	27.99
Hendry County						
Hendry Self-Supplied	1.48	1.48	1.49	1.49	1.49	1.49
Hendry County Total	1.48	1.48	1.49	1.49	1.49	1.49
LEC Planning Area Total	965.55	1,005.30	1,138.94	1,239.71	1,335.67	1,415.49

(3) Commercial and Industrial Self-Supply

This category includes Commercial and Industrial demands not supported by a public utility. Water used for commercial and industrial purposes supplied by utilities is included with other utility demands.

Projection Methodology

These water uses were estimated for 2000 by the U.S. Geological Survey (USGS) (USGS 2004), which directly contacted the users. In the LEC Planning Area, the largest uses are associated with mining and food processing. Inspection of data for earlier years assembled by the USGS indicates that the levels of use and changes in use have not been related to population and general economic development, but they have remained small and changed erratically. For these reasons, the 2000 Commercial and Industrial demands were held constant through 2025. Commercial and Industrial demands are not estimated to change between average and 1-in-10 year drought demand conditions, and the withdrawal demands are considered to be the same as the user demands.

Projection Results

Table 6 summarizes the Commercial and Industrial Self-Supply demand estimates and projections in the LEC Planning Area.

Table 6. Commercial and Industrial Self-Supply Demand (MGD).

County Area	2000	2005	2010	2015	2020	2025
Palm Beach	19.0	19.0	19.0	19.0	19.0	19.0
Broward	0.5	0.5	0.5	0.5	0.5	0.5
Miami-Dade	41.7	41.7	41.7	41.7	41.7	41.7
Monroe	0.1	0.1	0.1	0.1	0.1	0.1
Eastern Hendry	0.0	0.0	0.0	0.0	0.0	0.0
LEC Planning Area Total	61.3	61.3	61.3	61.3	61.3	61.3

(4) Recreational Self-Supply

The Recreational Self-Supply water use category includes self-supplied irrigation demands for golf courses and other large landscaped areas, such as parks and cemeteries.

Projection Methodology

Acreage used for recreational and landscaped purposes was identified using the SFWMM land use data described earlier. The Recreational and Landscape category represents a significant share of urban water use and is a major user of reclaimed water. The best estimate at this time is that irrigated acreage for recreational use will grow from 35,600 acres to 46,300 acres between 2005 and 2025.

Recreational irrigation demand estimates during average and 1-in-10 year drought conditions were made using the AFSIRS Model. These irrigation demands were calculated in the same way as other irrigation requirements, using representative irrigation system/rainfall station/soil type combinations for each major subbasin within each county.

Projection Results

Recreational Self-Supply acreage projections are shown in **Table 7**. The projected net irrigation (user) demands are shown in **Table 8** for both average conditions and for 1-in-10 year drought conditions. Gross irrigation demands (withdrawal demands) for average and for 1-in-10 year drought conditions are shown in **Table 9**. During this 20-year planning period, Recreational Self-Supply demands will increasingly be met by the reuse of reclaimed water. This will not only reduce withdrawal demands on the water resources, but also provide additional recharge of the Surficial Aquifer.

Table 7. Recreational Self-Supply Acreage in the LEC Planning Area.

Sub-County Area	2000	2005	2010	2015	2020	2025
Palm Beach - Coastal	19,077	20,364	21,650	22,937	24,223	25,510
Palm Beach - EAA	56	79	102	126	149	172
Broward	9,112	9,454	9,796	10,138	10,480	10,822
Miami-Dade	4,693	5,720	6,748	7,775	8,803	9,830
Monroe	0	0	0	0	0	0
Hendry - EAA	0	0	0	0	0	0
Hendry - Western Basins	0	0	0	0	0	0
LEC Planning Area Total	32,938	35,617	38,296	40,976	43,655	46,334

Table 8. Net Irrigation Demands for Recreational Self-Supply Use Category in the LEC Planning Area.

Sub-County Area	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	25.1	26.8	28.5	30.2	31.9	33.6
Palm Beach - EAA	0.0	0.1	0.1	0.1	0.1	0.1
Broward	12.4	12.9	13.3	13.8	14.3	14.7
Miami-Dade	7.2	8.8	10.4	12.0	13.6	15.1
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	0.0	0.0	0.0	0.0	0.0	0.0
LEC Planning Area Total	44.8	48.6	52.3	56.1	59.8	63.6
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Palm Beach - Coastal	31.1	33.2	35.3	37.4	39.5	41.6
Palm Beach - EAA	0.1	0.1	0.1	0.2	0.2	0.2
Broward	15.5	16.1	16.7	17.3	17.9	18.4
Miami-Dade	8.6	10.5	12.4	14.3	16.2	18.1
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	0.0	0.0	0.0	0.0	0.0	0.0
LEC Planning Area Total	55.3	59.9	64.5	69.1	73.7	78.3

Table 9. Gross Irrigation Demands for Recreational Self-Supply Use Category in the LEC Planning Area.

Sub-County Area	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	33.5	35.7	38.0	40.3	42.5	44.8
Palm Beach - EAA	0.1	0.1	0.1	0.1	0.2	0.2
Broward	16.5	17.2	17.8	18.4	19.0	19.6
Miami-Dade	9.6	11.7	13.9	16.0	18.1	20.2
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	0.0	0.0	0.0	0.0	0.0	0.0
LEC Planning Area Total	59.7	64.7	69.8	74.8	79.8	84.8
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Palm Beach - Coastal	41.4	44.2	47.0	49.8	52.6	55.4
Palm Beach - EAA	0.1	0.1	0.2	0.2	0.3	0.3
Broward	20.7	21.5	22.2	23.0	23.8	24.6
Miami-Dade	11.5	14.0	16.5	19.0	21.6	24.1
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	0.0	0.0	0.0	0.0	0.0	0.0
LEC Planning Area Total	73.7	79.9	86.0	92.1	98.2	104.4

(5) Thermoelectric Power Generation Self-Supply

The major use of water at thermoelectric power plants is for cooling purposes. In the LEC Planning Area, and in most of south Florida, this use has until recently been met by flow-through cooling using tidal water—not fresh water or brackish groundwater. This is the case for Florida Power & Light's (FPL) Turkey Point Plant in Miami-Dade County, which uses water that is recirculated through a canal system for cooling. Water from Biscayne Bay is used to provide make-up water for the canal system. Florida Power & Light's other power plant uses include boiler make-up water and ancillary uses, such as domestic type use by employees. For instance, FPL purchases water from Broward County Water and Wastewater Services to meet these various needs at its Port Everglades facilities. In the 2000 LEC Plan, the estimated Thermoelectric Self-Supply freshwater demands for 1995 were only 2.0 MGD, and these demands were not projected to grow through 2020. The USGS estimates of these demands are 2.1 MGD for both 1995 and 2000, which is fully consistent with the estimates and projection pattern in the 2000 LEC Plan.

However, this pattern is changing as a significant number of new power plants are being planned. These plants are expected to use evaporative cooling towers and fresh water and brackish groundwater for cooling. This changing pattern of water use is exemplified by FPL's West County Energy Facility in Palm Beach County, which is undergoing site certification for two, natural gas-fired combined cycle generating units that will use an expected 15.2 MGD from fresh and brackish water sources.

Projection Methodology

Projections were made in conjunction with FPL, the major electric supplier in south Florida, and reflect growth expectations in power demands; strategies for obtaining the electricity to meet those demands (which leads to estimation of power plant construction); types and locations of power plants; types of cooling facilities; and, ability to achieve efficiencies in water use. Most of these factors are subject to considerable uncertainty, and the efficacy of meeting demands from freshwater sources vs. saltwater sources needs further consideration, as does the cost-effectiveness of design and operational strategies that could significantly reduce water use below the amounts estimated.

The estimates presented in **Table 10** include only the generating capacity expected to be located in the LEC Planning Area. Significant additional capacity has been proposed for areas within the Lake Okeechobee Service Area, which are outside the LEC Planning Area. Those demands are included in the 2005–2006 Kissimmee Basin (KB), Lower West Coast (LWC) and Upper East Coast (UEC) plan updates. Thermoelectric power generation demands are estimated to be the same for average and 1-in-10 year drought conditions.

Projection Results

Projected thermoelectric power water demands are presented in **Table 10**. These projections are the same for average and 1-in-10 year demands and for user/customer demands and water withdrawal demands.

The projections account for seven planned plants, which will use cooling towers as the heat rejection method. The efficacy and availability of water sources will be a consideration in the site selection, and the primary source of water for the plants will be alternative water supplies, including captured excess storm water, Floridan Aquifer water and reuse water.

Table 10. Projected LEC Thermoelectric Power Demands (MGD).

Sub-County	2000	2005	2010	2015	2020	2025
Palm Beach	0.0	2.4	17.6	17.6	25.2	25.2
Broward	0.0	0.0	0.0	7.6	7.6	7.6
Miami-Dade	2.1	2.1	14.2	14.2	14.2	69.8
Total	2.1	4.5	31.8	39.4	47.0	102.6

(6) Agricultural Self-Supply

Agricultural water use includes irrigated commercially grown crop categories as developed by the Water Demand Projection Subcommittee, composed of representatives from Florida's five water management districts. These categories are: 1) citrus; 2) other fruits and nuts; 3) vegetables, melons and berries; 4) field crops; 5) sod; 6) greenhouse/nursery; 7) pasture; and, 8) miscellaneous.

Projection Methodology

The Agricultural demand assessment uses acreage estimates developed as part of the overall GIS land use analysis, which was incorporated into the SFWMM. To estimate the demands associated with the acreage for each crop, information from District Water Supply Assessments and previous hydrologic modeling efforts was used to identify soil types, growing seasons, irrigation system types and irrigation system efficiencies.

The actual Agricultural Self-Supply demand calculations for this LEC Plan Update were made using the AFSIRS Model. This is a change from the 2000 LEC Plan, which used a modified Blaney-Criddle Model to estimate supplemental requirements for irrigation.

The AFSIRS Model calculates both net and gross irrigation requirements. A crop's net irrigation requirement is the amount of water delivered to the root zone of the crop, while gross irrigation requirement includes both the net irrigation requirement and the losses incurred in the process of delivering irrigation to the crop's root zone. Irrigation efficiency refers to the average percent of total water applied and delivered to the plant's root zone. This relationship is expressed as follows:

Gross Irrigation Requirement = Net Irrigation Requirement / Irrigation Efficiency

Agricultural alternative water supply projects are likely to target changes in the sources and efficiencies of water delivery in order to meet the crop net irrigation demands. For instance, tailwater recovery could capture some of the water not

effectively delivered to the root zone, and by recapturing and reusing this water, withdrawals from the water resource could ultimately be reduced.

Average and 1-in-10 year drought irrigation requirements were calculated using the District's AFSIRS Model. Historical weather data from the rainfall station considered to best represent the crop/county/subbasin combination were used to calculate irrigation requirements.

Projections of irrigation system type and the effect of the corresponding irrigation efficiencies (shown in parentheses) were based on the interpretation of current ratios and trends. There are three basic types of irrigation systems currently used in south Florida crop production. These are seepage (50 percent), sprinkler (75 percent) and low-volume (85 percent) systems.

Available water capacity and soil depth have a direct effect on effective rainfall. Another factor the AFSIRS Model considered explicitly is on-farm irrigation management strategy, which was combined with soil properties. The AFSIRS Model defines eight "generic" soil types representing the major kinds of soils found in Florida. Runs for each crop for each basin were made using the most appropriate generic soil, as defined by the AFSIRS Model.

Improved pasture is defined by the SFWMD as pasture that has the facilities in place to carry out irrigation. Irrigation of pastureland is believed to be limited and based more on sales opportunities and extreme drought maintenance, and not as part of regular crop management. The assumption used for the LEC Plan Update was that improved pasture will not be irrigated. The water supply planning assumption that improved pasture is not irrigated does not preclude ranchers from acquiring SFWMD consumptive use permits or carrying out pasture irrigation.

Projection Results

Citrus

In the LEC Planning Area, most of the citrus is located in the Palm Beach County–Coastal Basin and the Hendry County–Western Basins subbasins. Acreage in the Palm Beach County–Coastal Basin is expected to decline significantly, primarily due to competition from urban land uses. No significant increase or decrease in acreage is projected for the other subbasins. Water use in the planning area will decline along with the change in acreage. **Table 11** presents the acreage projections, while **Table 12** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 13** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 11. Citrus Acreage in the LEC Planning Area.

County	2000	2005	2010	2015	2020	2025
Palm Beach - Coastal	17,664	15,335	13,005	10,676	8,346	6,017
Palm Beach - EAA	296	330	364	397	431	465
Broward	0	0	0	0	0	0
Miami-Dade	347	339	331	322	314	306
Monroe	0	0	0	0	0	0
Hendry - EAA	488	488	488	488	488	488
Hendry - Western Basins	32,790	32,869	32,947	33,026	33,104	33,183
LEC Planning Area Total	51,585	49,360	47,135	44,909	42,684	40,459

Table 12. Net Irrigation Demands for Citrus in the LEC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	17.2	13.9	10.9	8.2	5.8	3.8
Palm Beach - EAA	0.2	0.2	0.2	0.3	0.3	0.3
Broward	0.0	0.0	0.0	0.0	0.0	0.0
Miami-Dade	0.3	0.3	0.3	0.3	0.3	0.3
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.3	0.3	0.3	0.3	0.3	0.3
Hendry - Western Basins	37.8	37.9	38.0	38.1	38.2	38.3
LEC Planning Area Total	55.9	52.7	49.8	47.2	44.9	43.0
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Palm Beach - Coastal	24.7	20.3	16.3	12.6	9.2	6.2
Palm Beach - EAA	0.4	0.4	0.4	0.5	0.5	0.6
Broward	0.0	0.0	0.0	0.0	0.0	0.0
Miami-Dade	0.5	0.5	0.4	0.4	0.4	0.4
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.6	0.6	0.6	0.6	0.6	0.6
Hendry - Western Basins	50.7	50.8	50.9	51.0	51.1	51.3
LEC Planning Area Total	76.8	72.6	68.7	65.1	61.9	59.0

Table 13. Gross Irrigation Demands for Citrus in the LEC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	29.7	21.9	15.8	11.1	7.3	4.5
Palm Beach - EAA	0.4	0.4	0.5	0.5	0.6	0.6
Broward	0.0	0.0	0.0	0.0	0.0	0.0
Miami-Dade	0.4	0.4	0.4	0.3	0.3	0.3
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.6	0.6	0.6	0.6	0.6	0.6
Hendry - Western Basins	55.8	53.3	50.9	48.8	46.8	45.0
LEC Planning Area Total	87.0	76.6	68.2	61.4	55.7	51.1
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Palm Beach - Coastal	42.6	32.0	23.7	17.0	11.6	7.3
Palm Beach - EAA	0.7	0.8	0.9	1.0	1.0	1.1
Broward	0.0	0.0	0.0	0.0	0.0	0.0
Miami-Dade	0.6	0.6	0.6	0.5	0.5	0.5
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	1.2	1.2	1.2	1.2	1.2	1.2
Hendry - Western Basins	74.8	71.3	68.2	65.3	62.7	60.3
LEC Planning Area Total	119.8	105.9	94.5	85.0	77.0	70.4

Other Fruits and Nuts

The major crops in this category are avocados and mangos. Total acreage of Other Fruits and Nuts in the LEC Planning Area is concentrated in Miami-Dade County. Overall, only a slight decline in acreage is expected, and this will be mostly due to urbanization pressures. Water use is also expected to decline slightly. **Table 14** presents the acreage projections, while **Table 15** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 16** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 14. Acres of Other Fruits and Nuts in the LEC Planning Area.

County	2000	2005	2010	2015	2020	2025
Palm Beach - Coastal	46	55	64	73	82	91
Palm Beach - EAA	94	76	57	39	20	2
Broward	985	788	592	395	199	2
Miami-Dade	16,627	16,585	16,543	16,501	16,459	16,417
Monroe	0	0	0	0	0	0
Hendry - EAA	0	0	0	0	0	0
Hendry - Western Basins	23	23	23	23	23	23
Total LEC Planning Area	17,775	17,527	17,279	17,031	16,783	16,535

Table 15. Net Irrigation Demands for Other Fruits and Nuts in the LEC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	0.0	0.0	0.0	0.1	0.1	0.1
Palm Beach - EAA	0.1	0.1	0.0	0.0	0.0	0.0
Broward	0.7	0.6	0.4	0.3	0.1	0.0
Miami-Dade	15.1	15.1	15.0	15.0	14.9	14.9
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	0.0	0.0	0.0	0.0	0.0	0.0
LEC Planning Area Total	15.9	15.7	15.6	15.4	15.2	15.0
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Palm Beach - Coastal	0.1	0.1	0.1	0.1	0.1	0.1
Palm Beach - EAA	0.1	0.1	0.1	0.0	0.0	0.0
Broward	1.2	1.0	0.7	0.5	0.2	0.0
Miami-Dade	22.6	22.6	22.5	22.5	22.4	22.3
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	0.0	0.0	0.0	0.0	0.0	0.0
LEC Planning Area Total	24.1	23.7	23.4	23.1	22.8	22.5

Table 16. Gross Irrigation Demands for Other Fruits and Nuts in the LEC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	0.0	0.1	0.1	0.1	0.1	0.1
Palm Beach - EAA	0.1	0.1	0.1	0.1	0.0	0.0
Broward	0.7	0.6	0.4	0.3	0.1	0.0
Miami-Dade	20.1	20.1	20.0	20.0	19.9	19.9
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	0.0	0.0	0.0	0.0	0.0	0.0
LEC Planning Area Total	21.0	20.8	20.6	20.4	20.2	20.0
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Palm Beach - Coastal	0.1	0.1	0.1	0.1	0.1	0.1
Palm Beach - EAA	0.2	0.2	0.1	0.1	0.0	0.0
Broward	1.2	1.0	0.7	0.5	0.2	0.0
Miami-Dade	30.2	30.1	30.0	29.9	29.9	29.8
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	0.1	0.0	0.0	0.0	0.0	0.0
LEC Planning Area Total	31.7	31.4	31.0	30.7	30.3	30.0

Vegetables, Melons and Berries

The chief crops in this category include snap beans, tomatoes, peppers, squash, radishes, sweet corn and tropical vegetables. Vegetable acreage in the LEC Planning Area is concentrated in Miami-Dade County and the Hendry County–Western Basins area. Vegetable acreage through the projection period is expected to increase in Hendry County, hold constant in Miami-Dade County, and show a decline in coastal Broward and Palm Beach counties. Changes in water use parallel the changes in acreage.

Table 17 presents the acreage projections, while **Table 18** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 19** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 17. Vegetables, Melons and Berries Acreage in the LEC Planning Area.

County	2000	2005	2010	2015	2020	2025
Palm Beach - Coastal	17,539	15,962	14,385	12,808	11,231	9,654
Palm Beach - EAA	4	177	350	523	696	869
Broward	1,481	1,186	890	595	299	4
Miami-Dade	45,142	44,833	44,525	44,216	43,908	43,599
Monroe	0	0	0	0	0	0
Hendry - EAA	0	0	0	0	0	0
Hendry - Western Basins	22,658	23,449	24,241	25,032	25,824	26,615
Total LEC Planning Area	86,824	85,607	84,391	83,174	81,958	80,741

Table 18. Net Irrigation Demands for Vegetables, Melons and Berries in the LEC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	11.6	10.6	9.5	8.5	7.4	6.4
Palm Beach - EAA	0.0	0.2	0.3	0.5	0.6	0.8
Broward	1.0	0.8	0.6	0.4	0.2	0.0
Miami-Dade	37.9	37.7	37.4	37.2	36.9	36.6
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	27.1	28.1	29.0	30.0	30.9	31.9
LEC Planning Area Total	77.7	77.3	76.9	76.5	76.1	75.7
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Palm Beach - Coastal	17.1	15.6	14.0	12.5	10.9	9.4
Palm Beach - EAA	0.0	0.2	0.4	0.7	0.9	1.1
Broward	1.5	1.2	0.9	0.6	0.3	0.0
Miami-Dade	51.0	50.7	50.3	50.0	49.6	49.3
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	34.2	35.4	36.6	37.8	39.0	40.2
LEC Planning Area Total	103.8	103.1	102.3	101.5	100.8	100.0

Table 19. Gross Irrigation Demands for Vegetables, Melons and Berries in the LEC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	15.5	14.1	12.7	11.3	9.9	8.5
Palm Beach - EAA	0.0	0.3	0.6	0.9	1.2	1.6
Broward	1.4	1.1	0.8	0.5	0.3	0.0
Miami-Dade	52.0	51.6	51.3	50.9	50.6	50.2
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	54.3	56.2	58.1	60.0	61.9	63.7
LEC Planning Area Total	123.1	123.3	123.5	123.7	123.8	124.0
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Palm Beach - Coastal	22.8	20.7	18.7	16.6	14.6	12.5
Palm Beach - EAA	0.0	0.4	0.9	1.3	1.7	2.2
Broward	2.0	1.6	1.2	0.8	0.4	0.0
Miami-Dade	69.9	69.4	69.0	68.5	68.0	67.5
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	68.4	70.8	73.2	75.6	78.0	80.4
LEC Planning Area Total	163.1	163.0	162.9	162.8	162.7	162.6

Field Crops - Sugarcane

Sugarcane is the principal field crop grown within the LEC Planning Area. Other field crops grown include rice, potatoes and tropical field crops. Because of its dominance in terms of acreage, sugarcane is discussed separately from "other field crops."

Sugarcane is initially propagated by planting stalk cuttings. The first harvest takes place approximately 13 months after planting. Sugar production per unit of land surface declines gradually with each additional rotation, and in approximately four years (one planting and three ratoons), the increased yields associated with replanting outweigh the costs. Because land may lay fallow for several months between crop rotation cycles, approximately 20 percent of the land associated with sugarcane production will not be harvested in any given year.

The largest percentage of sugarcane acreage in south Florida is grown in the muck soils of the EAA (Palm Beach and Hendry counties). In addition, significant acreage occurs on the "sand lands" in Hendry and Glades counties, primarily in the LEC Planning Area. Some of the sand land acreage occurs in the

Western Basins portion of the LEC Planning Area. Water use per acre within each basin also remains the same through the planning period, and therefore, water use parallels the changes in acreage.

Table 20 presents the acreage projections, while **Table 21** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 22** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 20. Sugarcane Acreage in the LEC Planning Area.

County	2000	2005	2010	2015	2020	2025
Palm Beach - Coastal	4,877	4,069	3,262	2,454	1,647	839
Palm Beach - EAA	431,756	423,799	391,971	391,971	391,971	391,971
Broward	0	0	0	0	0	0
Miami-Dade	0	0	0	0	0	0
Monroe	0	0	0	0	0	0
Hendry - EAA	42,989	41,989	37,989	37,989	37,989	37,989
Hendry - Western Basins	7,814	7,877	7,939	8,002	8,064	8,127
Total LEC Planning Area	487,436	477,734	441,161	440,416	439,671	438,926

Table 21. Net Irrigation Demands for Sugarcane in the LEC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	2.2	1.8	1.5	1.1	0.7	0.4
Palm Beach - EAA	192.7	189.1	174.9	174.9	174.9	174.9
Broward	0.0	0.0	0.0	0.0	0.0	0.0
Miami-Dade	0.0	0.0	0.0	0.0	0.0	0.0
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	19.2	18.7	17.0	17.0	17.0	17.0
Hendry - Western Basins	9.4	9.5	9.6	9.6	9.7	9.8
LEC Planning Area Total	223.5	219.2	202.9	202.6	202.3	202.1
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Palm Beach - Coastal	5.6	4.7	3.7	2.8	1.9	1.0
Palm Beach - EAA	494.6	485.5	449.0	449.0	449.0	449.0
Broward	0.0	0.0	0.0	0.0	0.0	0.0
Miami-Dade	0.0	0.0	0.0	0.0	0.0	0.0
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	49.2	48.1	43.5	43.5	43.5	43.5
Hendry - Western Basins	12.7	12.8	12.9	13.0	13.1	13.2
LEC Planning Area Total	562.1	551.1	509.2	508.4	507.5	506.7

Table 22. Gross Irrigation Demands for Sugarcane in the LEC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	2.2	1.8	1.5	1.1	0.7	0.4
Palm Beach - EAA	385.4	378.3	349.9	349.9	349.9	349.9
Broward	0.0	0.0	0.0	0.0	0.0	0.0
Miami-Dade	0.0	0.0	0.0	0.0	0.0	0.0
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	38.4	37.5	33.9	33.9	33.9	33.9
Hendry - Western Basins	18.8	19.0	19.1	19.3	19.4	19.6
LEC Planning Area Total	444.8	436.6	404.4	404.2	404.0	403.7
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Palm Beach - Coastal	5.6	4.7	3.7	2.8	1.9	1.0
Palm Beach - EAA	989.2	970.9	898.0	898.0	898.0	898.0
Broward	0.0	0.0	0.0	0.0	0.0	0.0
Miami-Dade	0.0	0.0	0.0	0.0	0.0	0.0
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	98.5	96.2	87.0	87.0	87.0	87.0
Hendry - Western Basins	25.5	25.7	25.9	26.1	26.3	26.5
LEC Planning Area Total	1,118.7	1,097.5	1,014.6	1,013.9	1,013.2	1,012.5

Field Crops – Other Field Crops

Other field crops in the LEC Planning Area include primarily rice, potatoes and tropical field crops. Acreage and water use are projected to remain fairly steady through 2025. **Table 23** presents the acreage projections, while **Table 24** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 25** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 23. Other Field Crops Acreage in the LEC Planning Area.

County	2000	2005	2010	2015	2020	2025
Palm Beach - Coastal	877	806	734	663	591	520
Palm Beach - EAA	10,946	11,072	11,197	11,323	11,448	11,574
Broward	1,596	1,290	985	679	374	68
Miami-Dade	25,482	25,228	24,973	24,719	24,464	24,210
Monroe	0	0	0	0	0	0
Hendry - EAA	0	0	0	0	0	0
Hendry - Western Basins	1,409	1,342	1,275	1,209	1,142	1,075
LEC Planning Area Total	40,310	39,737	39,165	38,592	38,020	37,447

Table 24. Net Irrigation Demands for Other Field Crops in the LEC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	1.2	1.1	1.0	0.9	0.8	0.7
Palm Beach - EAA	11.1	11.2	11.3	11.5	11.6	11.7
Broward	0.8	0.7	0.5	0.4	0.2	0.0
Miami-Dade	16.7	16.5	16.3	16.2	16.0	15.8
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	1.9	1.8	1.7	1.7	1.6	1.5
LEC Planning Area Total	31.7	31.3	30.9	30.5	30.1	29.8
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Palm Beach - Coastal	1.5	1.4	1.3	1.2	1.0	0.9
Palm Beach - EAA	15.9	16.1	16.2	16.4	16.6	16.8
Broward	1.4	1.2	0.9	0.6	0.3	0.1
Miami-Dade	26.5	26.3	26.0	25.7	25.5	25.2
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	2.4	2.3	2.2	2.1	2.0	1.9
LEC Planning Area Total	47.8	47.2	46.6	46.0	45.4	44.8

Table 25. Gross Irrigation Demands for Other Field Crops in the LEC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	2.4	2.2	2.0	1.8	1.6	1.4
Palm Beach - EAA	22.1	22.4	22.7	22.9	23.2	23.4
Broward	1.1	0.9	0.7	0.5	0.3	0.0
Miami-Dade	22.2	22.0	21.8	21.6	21.4	21.1
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	3.9	3.7	3.5	3.3	3.1	2.9
LEC Planning Area Total	51.7	51.2	50.6	50.0	49.5	48.9
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Palm Beach - Coastal	3.1	2.8	2.6	2.3	2.1	1.8
Palm Beach - EAA	31.8	32.1	32.5	32.8	33.2	33.6
Broward	1.9	1.6	1.2	0.8	0.5	0.1
Miami-Dade	35.4	35.0	34.7	34.3	34.0	33.6
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	4.9	4.7	4.4	4.2	4.0	3.7
LEC Planning Area Total	77.0	76.2	75.4	74.5	73.7	72.8

Sod Production

Sod projections presented in this appendix refer to irrigated sod. Some sod may be harvested from pastureland, which is not irrigated. Pasture supporting cow-calf operations is typically not irrigated because it is not economical. Some pasture in the coastal areas may include horse farms, ranchettes, etc., which may be irrigated and may have been included with sod production.

Significant growth in sod production and associated water use is expected to decline in coastal Broward County and remain fairly constant in the EAA and Hendry County–Western Basins, which are the other basins with significant production. Irrigation requirements are similar to those for recreational uses and on a per acre basis do not change over the projection period.

Table 26 presents the acreage projections, while **Table 27** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 28** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 26. Sod Acreage in the LEC Planning Area.

County	2000	2005	2010	2015	2020	2025
Palm Beach - Coastal	0	0	0	0	0	0
Palm Beach - EAA	398	397	396	395	394	393
Broward	853	682	512	341	171	0
Miami-Dade	0	0	0	0	0	0
Monroe	0	0	0	0	0	0
Hendry - EAA	0	0	0	0	0	0
Hendry - Western Basins	789	789	789	789	789	789
LEC Planning Area Total	2,040	1,868	1,697	1,525	1,354	1,182

Table 27. Net Irrigation Demands for Sod in the LEC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	0.0	0.0	0.0	0.0	0.0	0.0
Palm Beach - EAA	0.3	0.3	0.3	0.3	0.3	0.3
Broward	1.1	0.9	0.7	0.4	0.2	0.0
Miami-Dade	0.0	0.0	0.0	0.0	0.0	0.0
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	1.2	1.2	1.2	1.2	1.2	1.2
LEC Planning Area Total	2.6	2.4	2.2	2.0	1.7	1.5
Net Irrigation Demands for 1-in-10 Year Conditions (MGD)						
Palm Beach - Coastal	0.0	0.0	0.0	0.0	0.0	0.0
Palm Beach - EAA	0.5	0.5	0.5	0.5	0.5	0.5
Broward	1.5	1.2	0.9	0.6	0.3	0.0
Miami-Dade	0.0	0.0	0.0	0.0	0.0	0.0
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	1.5	1.5	1.5	1.5	1.5	1.5
LEC Planning Area Total	3.6	3.3	3.0	2.7	2.4	2.1

Table 28. Gross Irrigation Demands for Sod in the LEC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	0.0	0.0	0.0	0.0	0.0	0.0
Palm Beach - EAA	0.6	0.6	0.6	0.6	0.6	0.6
Broward	1.5	1.2	0.9	0.6	0.3	0.0
Miami-Dade	0.0	0.0	0.0	0.0	0.0	0.0
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	2.4	2.4	2.4	2.4	2.4	2.4
LEC Planning Area Total	4.5	4.2	3.9	3.6	3.3	3.0
Gross Irrigation Demands for 1-in-10 Year Conditions (MGD)						
Palm Beach - Coastal	0.0	0.0	0.0	0.0	0.0	0.0
Palm Beach - EAA	1.1	1.1	1.1	1.1	1.1	1.1
Broward	2.0	1.6	1.2	0.8	0.4	0.0
Miami-Dade	0.0	0.0	0.0	0.0	0.0	0.0
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	3.1	3.1	3.1	3.1	3.1	3.1
LEC Planning Area Total	6.1	5.7	5.3	4.9	4.6	4.2

Greenhouse/Nursery

Estimated greenhouse/nursery acreage and irrigation requirements in the LEC Planning Area are expected to decline over the projection period, especially in Palm Beach and Broward counties and remain fairly constant in Miami-Dade County.

Table 29 presents the acreage projections, while **Table 30** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 31** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 29. Greenhouse/Nursery Acreage in the LEC Planning Area.

County	2000	2005	2010	2015	2020	2025
Palm Beach - Coastal	4,171	3,721	3,271	2,822	2,372	1,922
Palm Beach - EAA	349	312	275	238	201	164
Broward	1,309	1,070	831	591	352	113
Miami-Dade	13,455	13,376	13,297	13,218	13,139	13,060
Monroe	0	0	0	0	0	0
Hendry - EAA	0	0	0	0	0	0
Hendry - Western Basins	21	21	21	21	21	21
LEC Planning Area Total	19,305	18,500	17,695	16,890	16,085	15,280

Table 30. Net Irrigation Demands for Greenhouse/Nursery in the LEC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	6.6	5.9	5.2	4.5	3.7	3.0
Palm Beach - EAA	0.3	0.2	0.2	0.2	0.2	0.1
Broward	2.2	1.8	1.4	1.0	0.6	0.2
Miami-Dade	23.3	23.1	23.0	22.9	22.7	22.6
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	0.0	0.0	0.0	0.0	0.0	0.0
LEC Planning Area Total	32.4	31.1	29.8	28.5	27.3	26.0
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Palm Beach - Coastal	7.8	7.0	6.1	5.3	4.4	3.6
Palm Beach - EAA	0.5	0.4	0.4	0.3	0.3	0.2
Broward	2.6	2.1	1.6	1.2	0.7	0.2
Miami-Dade	26.4	26.2	26.1	25.9	25.8	25.6
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	0.0	0.0	0.0	0.0	0.0	0.0
LEC Planning Area Total	37.3	35.8	34.2	32.7	31.2	29.7

Table 31. Gross Irrigation Demands for Greenhouse/Nursery in the LEC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	13.2	11.7	10.3	8.9	7.5	6.1
Palm Beach - EAA	0.5	0.5	0.4	0.4	0.3	0.3
Broward	5.5	4.5	3.5	2.5	1.5	0.5
Miami-Dade	32.3	32.1	31.9	31.7	31.6	31.4
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	0.1	0.1	0.1	0.1	0.1	0.1
LEC Planning Area Total	51.7	49.0	46.3	43.6	40.9	38.3
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Palm Beach - Coastal	15.6	13.9	12.2	10.6	8.9	7.2
Palm Beach - EAA	0.9	0.8	0.7	0.6	0.5	0.4
Broward	6.4	5.2	4.1	2.9	1.7	0.6
Miami-Dade	36.7	36.4	36.2	36.0	35.8	35.6
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Basins	0.1	0.1	0.1	0.1	0.1	0.1
LEC Planning Area Total	59.7	56.6	53.4	50.2	47.1	43.9

Improved Pasture

Improved pasture is generally not irrigated and no irrigation demands are estimated since they would only relate to some of the acres some of the time.

Other Agricultural Uses

This plan update does not present estimates for cattle watering or aquaculture, the former because of its small size and the latter because most of the use represents localized flow through, in which the water returns to the source from which it was taken.

Summary of Agricultural Results

Although estimates and projections for the agricultural subsections have been discussed in terms of crop/use categories, it is also important to summarize the results in terms of total acreage and use by subbasin. Overall, modest declines in agricultural acreage and water use are expected in the LEC Planning Area. Declines in Broward and Palm Beach–Coastal counties are expected primarily due to urbanization, while declines in the EAA are due to changes in land use for

water management purposes. Little change in agricultural acreage and water use is expected in Miami-Dade County and Hendry County–Western Basins.

The acreages presented in the tables for this LEC Plan Update do not include acreages that are historically part of the Lake Okeechobee Service Area (LOSA) that lie in the LWC, UEC and KB planning areas. In the LWC Planning Area, and particularly in the East and West Caloosahatchee subbasins, growth is expected in the irrigated acreage in the sub-areas that historically have accessed and used surface water, including water from Lake Okeechobee. In those sub-areas, irrigated crop acreage is projected to increase from 131,900 acres in 2000 to 145,100 in 2025, an increase of slightly over 13,000 acres.

Acreage by subbasin is presented in **Table 32**, while total agricultural net irrigation demands are presented **Table 33**. Gross irrigation demands (water withdrawal demands) are presented in **Table 34**.

Table 32. Total Irrigated Agricultural Acreage in the LEC Planning Area.

County	2000	2005	2010	2015	2020	2025
Palm Beach - Coastal	45,174	39,948	34,722	29,495	24,269	19,043
Palm Beach - EAA	443,843	436,162	404,610	404,886	405,162	405,438
Broward	6,224	5,017	3,809	2,602	1,394	187
Miami-Dade	101,053	100,361	99,669	98,976	98,284	97,592
Monroe	0	0	0	0	0	0
Hendry - EAA	43,477	42,477	38,477	38,477	38,477	38,477
Hendry - Western Basins	65,504	66,370	67,236	68,101	68,967	69,833
LEC Planning Area Total	705,275	690,334	648,522	642,538	636,554	630,570

Table 33. Net Irrigation Demands for Total Irrigated Agricultural Acreage in the LEC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	38.8	33.3	28.1	23.2	18.6	14.4
Palm Beach - EAA	204.6	201.3	187.4	187.6	187.9	188.2
Broward	5.9	4.8	3.6	2.5	1.4	0.2
Miami-Dade	93.3	92.7	92.1	91.5	90.8	90.2
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	19.5	19.1	17.3	17.3	17.3	17.3
Hendry - Western Basins	77.6	78.6	79.6	80.6	81.7	82.7
LEC Planning Area Total	439.7	429.7	408.1	402.7	397.7	393.0
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Palm Beach - Coastal	56.8	49.0	41.5	34.4	27.6	21.2
Palm Beach - EAA	511.9	503.2	467.1	467.5	467.8	468.2
Broward	8.2	6.6	5.0	3.5	1.9	0.3
Miami-Dade	127.1	126.2	125.4	124.6	123.7	122.9
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	49.8	48.7	44.1	44.1	44.1	44.1
Hendry - Western Basins	101.7	103.0	104.3	105.6	106.9	108.2
LEC Planning Area Total	855.5	836.7	787.4	779.6	772.0	764.9

Table 34. Gross Irrigation Demands for Total Irrigated Agricultural Acreage in the LEC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Palm Beach - Coastal	62.9	51.8	42.3	34.2	27.1	20.9
Palm Beach - EAA	409.2	402.6	374.8	375.3	375.8	376.3
Broward	10.2	8.3	6.3	4.4	2.5	0.5
Miami-Dade	127.1	126.2	125.4	124.5	123.7	122.9
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	39.0	38.1	34.6	34.6	34.6	34.6
Hendry - Western Basins	135.3	134.6	134.1	133.9	133.8	133.9
LEC Planning Area Total	783.8	761.7	717.5	706.9	697.5	689.1
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Palm Beach - Coastal	89.7	74.3	61.0	49.4	39.1	30.0
Palm Beach - EAA	1,023.9	1,006.4	934.2	934.9	935.7	936.4
Broward	13.5	11.0	8.4	5.8	3.2	0.6
Miami-Dade	172.8	171.6	170.4	169.3	168.1	167.0
Monroe	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - EAA	99.7	97.4	88.2	88.2	88.2	88.2
Hendry - Western Basins	176.8	175.7	174.9	174.5	174.2	174.2
LEC Planning Area Total	1,576.3	1,536.3	1,437.2	1,422.1	1,408.6	1,396.4

TOTAL PLANNING AREA DEMAND AND PLAN COMPARISONS

Total Planning Area Demands

This section summarizes both the total user/customer demands and the water withdrawal demands in the LEC Planning Area. The projects identified in **Chapter 7** of the 2005–2006 LEC Plan Update are designed to meet the user/customer demands. Water withdrawal demands reflect the water withdrawn from water resources to meet user/customer demands. Both user/customer and water withdrawal demands are presented for average and 1-in-10 year drought conditions. **Table 35** shows the user/customer demands and **Table 36** shows the estimated water withdrawal demands from 2000 to 2025 for the LEC Planning Area for average and 1-in-10 year drought demands, respectively.

Table 35. User/Customer Water Demands 2000 through 2025 by Water Use Category in the LEC Planning Area (MGD).

Water Use Category	2000	2005	2010	2015	2020	2025
User/Customer Demands for Average Conditions (MGD)						
Public Water Supply	857.31	868.99	963.88	1,040.06	1,112.03	1,173.60
Domestic Self-Supply	32.56	36.60	40.62	43.42	46.23	48.85
Commercial & Industrial Self-Supply	61.30	61.30	61.30	61.30	61.30	61.30
Recreational Self-Supply	44.80	48.60	52.30	56.10	59.80	63.60
Thermoelectric Power Generation Self-Supply	2.10	4.50	31.80	39.40	47.00	102.60
Agricultural Self-Supply	439.70	429.70	408.10	402.70	397.70	393.00
Total Water Demands	1,437.77	1,449.70	1,558.00	1,642.98	1,724.06	1,842.94
User/Customer Demands for 1-in-10 Year Drought Conditions (MGD)						
Public Water Supply	908.75	921.13	1,021.72	1,102.47	1,178.75	1,244.01
Domestic Self-Supply	34.52	38.80	43.05	46.03	49.00	51.78
Commercial & Industrial Self-Supply	61.30	61.30	61.30	61.30	61.30	61.30
Recreational Self-Supply	55.30	59.90	64.50	69.10	73.70	78.30
Thermoelectric Power Generation Self-Supply	2.10	4.50	31.80	39.40	47.00	102.60
Agricultural Self-Supply	855.50	836.70	787.40	779.60	772.00	764.90
Total Water Demands	1,917.47	1,922.33	2,009.77	2,097.89	2,181.75	2,302.89

Table 36. Water Withdrawal Demands 2000 through 2025 by Water Use Category in the LEC Planning Area (MGD).

Water Use Category	2000	2005	2010	2015	2020	2025
Water Withdrawal Demands for Average Conditions (MGD)						
Public Water Supply	878.33	911.79	1,033.85	1,126.12	1,213.84	1,286.52
Domestic Self-Supply	32.56	36.60	40.62	43.42	46.23	48.85
Commercial & Industrial Self-Supply	61.30	61.30	61.30	61.30	61.30	61.30
Recreational Self-Supply	59.70	64.70	69.80	74.80	79.80	84.80
Thermoelectric Power Generation Self-Supply	2.10	4.50	31.80	39.40	47.00	102.60
Agricultural Self-Supply	783.80	761.70	717.50	706.90	697.50	689.10
Total Water Demands	1,817.79	1,840.60	1,954.87	2,051.94	2,145.67	2,273.17
Water Withdrawal Demands for 1-in-10 Year Drought Conditions (MGD)						
Public Water Supply	931.03	966.50	1,095.88	1,193.68	1,286.67	1,363.71
Domestic Self-Supply	34.52	38.80	43.05	46.03	49.00	51.78
Commercial & Industrial Self-Supply	61.30	61.30	61.30	61.30	61.30	61.30
Recreational Self-Supply	73.70	79.90	86.00	92.10	98.20	104.40
Thermoelectric Power Generation Self-Supply	2.10	4.50	31.80	39.40	47.00	102.60
Agricultural Self-Supply	1,576.30	1,536.30	1,437.20	1,422.10	1,408.60	1,396.40
Total Water Demands	2,678.95	2,687.30	2,755.24	2,854.61	2,950.77	3,080.19

Changes Compared to the 2000 LEC Plan

Several changes were made to the demand assessment and projection methodology from the 2000 LEC Plan to the 2005–2006 LEC Plan Update. These are summarized as follows:

Census blocks vs. Census block groups: The population analysis conducted in this 2005–2006 LEC Plan Update used census blocks, whereas block groups were used for the 2000 LEC Plan. A Census block is the smallest Census geographic area, normally bounded by streets and other prominent physical features. A Census block has a higher resolution than a group of blocks (Census block group); therefore, use of blocks rather than block groups provide a higher level of precision.

A lower water use threshold for public water supply utilities from 500,000 to 100,000 gallons per day: This had the effect of increasing the number of Public Water Supply utilities analyzed in the 2005–2006 LEC Plan Update.

Supplemental irrigation needs determined use of the AFSIRS Model vs. a modified Blaney-Criddle Model: Both of these models estimate evapotranspiration (ET) in order to derive supplemental irrigation requirements for agricultural crops and outdoor irrigation. However, in south Florida, the Blaney-Criddle Model tends to overestimate ET, which is the driving component of supplemental irrigation. As a result, the Blaney-Criddle Model has the potential to overestimate supplemental irrigation requirements. To address this, District staff began using the AFSIRS Model as the regional water supply plans were updated. The AFSIRS Model yields supplemental irrigation requirements that better reflect historic use patterns, and are generally lower than the modified Blaney-Criddle Model on an annual basis.

Comparison of 2005-2006 LEC Plan and 2000 LEC Plan

Projected Water Demands

Table 37 compares the projected average water withdrawal demands estimated in the 2000 LEC Water Supply Plan with those estimated for the 2005–2006 LEC Plan Update. **Table 38** does the same for the 1-in-10 year drought projected demands.

Table 37. End Point Projections of Average Water Withdrawal Demands in the 2000 LEC Plan and the 2005–2006 LEC Plan Update.

Water Use Category	2000 LEC Plan Average Demands for 2020 (MGD)	2005-2006 LEC Plan Average Demands for 2025 (MGD)	% Change 2000 LEC Plan (2020) vs. 2005-2006 LEC Update (2025)
Public Water Supply	1,214.80	1,286.52	0.06
Domestic Self-Supply and Small Public Supply Systems	57.80	48.85	-0.15
Commercial & Industrial Self-Supply	74.90	61.30	-0.18
Recreational Self-Supply (Golf Course)	194.90	84.80	-0.56
Thermoelectric Power Generation Self-Supply	2.02	102.60	49.54
Agricultural Self-Supply	976.50	689.10	-0.29
Total Water Use	2,520.92	2,273.17	-0.10

Table 38. End Point Projections of 1-in-10 Year Water Withdrawal Demands in the 2000 LEC Plan and the 2005–2006 LEC Plan Update.

Water Use Category	2000 LEC Plan 1-in-10 Year Demands for 2020 (MGD)	2005-2006 LEC Plan 1-in-10 Year Demands for 2025 (MGD)	% Change 2000 LEC Plan (2020) vs. 2005-2006 LEC Plan Update (2025)
Public Water Supply	1,352.90	1,363.71	0.01
Domestic Self-Supply and Small Public Supply Systems	63.40	51.78	-0.18
Commercial & Industrial Self-Supply	74.90	61.30	-0.18
Recreational Self-Supply	238.40	104.40	-0.56
Thermoelectric Power Generation Self-Supply	2.03	102.60	49.54
Agricultural Self-Supply	1,388.50	1,396.40	0.01
Total Water Use	3,120.13	3,080.19	-0.01

The most significant differences between the demand estimates in the 2000 LEC Plan and the demand estimates in this plan update occur for the following reasons:

- The slightly higher Public Water Supply demands in this plan update can be accounted for by the expected increased use of membrane processes, especially reverse osmosis, of Floridan Aquifer water.
- In the Thermoelectric Power Generation category, the 2000 LEC Plan did not project any additional power generation needs for the planning area. This plan update projects seven new power generation facilities to be located in the LEC Planning Area, which will have significant fresh and/or brackish water demands to meet the cooling needs.
- Agricultural demands under average conditions are significantly lower because of the use of the AFSIRS Model, as discussed previously. This difference disappears under 1-in-10 year drought conditions.

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E

Potable and Wastewater Treatment Facilities

POTABLE WATER TREATMENT FACILITIES

Potable water used in the Lower East Coast (LEC) Planning Area is produced by large water treatment facilities, with some smaller "package" water treatment plants and predominately self-supply (i.e., private wells supplying individual users). This section focuses on large facilities with average pumpages equal to or greater than 100,000 gallons per day (GPD)—or 0.10 million gallons per day (MGD).

Descriptions of Existing Water Facilities

Raw water withdrawal sources in the LEC Planning Area include water from the Surficial Aquifer System (SAS) and Floridan Aquifer System (FAS), surface water, and aquifer storage and recovery (ASR). **Table 1** presents summary descriptions for each of the potable water treatment facilities located in the LEC Planning Area. The table contains: the name of the supply entity; the South Florida Water Management District's (SFWMD or District) permit number; the facility's 2005 Daily Average Annual Use; the raw water withdrawal source; and, the Florida Department of Environmental Protection's (FDEP) permit number and rated capacity. The 2005 Daily Average Annual Use reflects the information in the Basic Facilities Reports, as reported to the FDEP by the utilities.

WASTEWATER TREATMENT FACILITIES

Wastewater treatment in the Lower East Coast (LEC) Planning Area is provided primarily by regional wastewater treatment facilities, with some smaller "package plants," and on-site treatment and disposal systems (primarily septic tanks). This *2005–2006 Lower East Coast Water Supply Plan Update* (2005–2006 LEC Plan Update) focuses on the regional facilities because they could have a positive impact on the water resources through reuse due to the volume of their flows, and could support a regional reuse program. Many are also located in areas close to potential reclaimed users.

This section includes wastewater treatment facilities (WWTFs) in the LEC Planning Area based on information provided in the FDEP's *2005 Reuse Inventory Report* and appendices (FDEP 2006). Rule 62-601.300(4), Florida Administrative Code (F.A.C.), requires domestic wastewater facilities with a permitted capacity of 100,000 gallons per day or greater (0.10 MGD) that discharge to ground waters via reuse and land application systems to monitor reclaimed water or effluent for the primary and secondary drinking water standards contained in Chapter 62-550, F.A.C. These discharge monitoring reports form the basis of the *2005 Reuse Inventory Report*.

In addition to the discharge monitoring reports, certain flow data and information related to water resource caution areas were obtained from the water management districts and the FDEP's wastewater databases. Data from the 2004 reuse inventory was used for facilities that did not submit a 2005 annual reuse report form.

Table 2, which captures this information, includes each facility's name, permit number, FDEP rated capacity, annual average daily flow and wastewater management methods.

The FDEP rated capacity, or permitted capacity, means the treatment capacity a plant is approved for by the FDEP permit, which is expressed in units of million gallons per day (MGD). The permit specifies the time frame associated with the permitted capacity (e.g., annual average daily flow, maximum monthly average daily flow, three-month average daily flow).

Annual average daily flow means the total volume of wastewater flowing into a wastewater facility during any consecutive 365 days, divided by 365 and expressed in units of MGD.

Wastewater Management Methods

Treated wastewater is disposed of through a variety of methods in the LEC Planning Area, including surface water discharge, deep well injection, ocean outfall and reuse.

Surface Water Discharge

This method of wastewater management involves disposing of the effluent through a pipeline to a receiving surface water. Prior to disposal, effluent is required to receive at least secondary treatment (20 milligrams per liter (mg/L) carbonaceous biochemical oxygen demand, 20 mg/L total suspended solids or 90 percent removal, whichever is more stringent) and basic level disinfection. Additional levels of treatment may be required and are based on the characteristics of the effluent and the receiving water, as well as other regulatory

requirements and standards. Effluent standards from this method are known as water quality based effluent limitations (WQBELs). The WQBELs are a means of determining the available assimilative capacity of a water body and setting effluent limits using appropriate procedures for simulation and prediction of water quality impacts.

As regulatory requirements become more stringent, utilities may choose to find alternative means for effluent disposal. In addition, any new discharge or expansion of an existing discharge must justify compliance with the state's antidegradation requirements prior to issuance of a permit for such a discharge. The antidegradation rule requires a utility proposing to construct a new discharge or expanding an existing discharge to demonstrate that an alternate disposal method, such as reuse, is not feasible in lieu of a discharge to surface water, and that such a discharge is clearly in the public interest.

Deep Well Injection Class I Wells

This method of wastewater management consists of injecting secondary treated effluent (no disinfection required) through a cased well to the boulder zone, a fractured carbonate sequence formation found at depths ranging from 1,900 feet to 3,600 feet below the ground surface. Deep wells also serve as an alternative means of disposal for a reuse system.

Ocean Outfall

Currently, six municipal facilities in Palm Beach, Broward and Miami-Dade counties discharge secondarily treated wastewater through ocean outfalls. A recent report, *Ocean Outfall Study* (Koopman, Heaney *et al.* 2006), prepared by the University of Florida for the FDEP, evaluated alternative use of this wastewater discharge option. Additional information about this report is available from: http://www.dep.state.fl.us/water/reuse/docs/OceanOutfallStudy.pdf.

Reuse

Reuse consists of using treated wastewater (reclaimed water) for a beneficial purpose. Reclaimed water is used for the irrigation of golf courses, residential lawns, parks and other green spaces, and for groundwater recharge via rapid infiltration basins (RIBs). Some of the facilities use reclaimed water for plant process water, and some for irrigation of the utility site, which could also be considered reuse. The FDEP classifies reuse into the following categories: Part II and Part IV: Land Applications; Part III: Reclaimed; Part V: Indirect Potable; Part VI: Overland Flow; and, Part VII: Industrial Uses. Information regarding the type of reuse each WWTF employs was obtained from the FDEP's December 2005 discharge monitoring reports. In the LEC Planning Area, only 11 percent of wastewater was reused in 2005.

Additional information about the *2005 Reuse Inventory Report and Appendices* is available from: http://www.dep.state.fl.us/water/reuse/inventory.htm.

Table 1. Potable Water Treatment Facilities in the Lower East Coast Planning Area – 2005.

Supply Entity	SFWMD		Withdrawal Source				FDEP	
	Permit Number	2005 Daily Average Annual Use	Surficial Aquifer System (MGD)	Surface Water (MGD)	Floridan Aquifer System (MGD)	ASR Net (MGD)	Permit Number	Rated Capacity (MGD)
Broward County								
Broward County Water & Wastewater Services District 1	06-00146	8.53	8.53				4060167	16.00
Broward County Water & Wastewater Services District 2A/North Regional	06-00142	15.07	15.07				4060163	40.00
Broward County Water & Wastewater Services South Regional Wellfield	06-01474	10.52	10.52				4060165	6.70
Cooper City Utilities Dept.	06-00365	3.21	3.21				4060282	6.00
City of Coral Springs	06-00102	7.86	7.86				4060290	16.00
Coral Springs Improvement District	06-00100	4.38	4.38				4060291	7.20
City of Dania Beach	06-00187	2.54	1.33				4060253	3.02
Town of Davie	06-00134	4.57	4.57				4060344	7.40
City of Deerfield Beach	06-00082	11.30	11.30				4060254	34.80
Ferncrest Utilities, Inc.	06-00170	0.56	0.56				4060419	1.33
City of Fort Lauderdale	06-00123	47.81	47.81				4060486	90.00
City of Hallandale Beach	06-00138	5.66	3.00				4060573	10.00
Town of Hillsboro Beach Public Water Supply	06-00101	0.84	0.84				4060615	2.02
City of Hollywood	06-00038	24.53	24.53		0.58		4060642	55.50
City of Lauderhill	06-00129	6.42	7.78				4060787	16.00
City of Margate	06-00121	6.77	6.77				4060845	18.00
City of Miramar	06-00054	9.80	9.80				4060925	5.70
City of North Lauderdale	06-00004	2.72	2.72				4060976	7.50
North Springs Improvement District	06-00274	3.91	3.91				4064390	4.80
Parkland Utilities, Inc.	06-00242	0.26	0.26				4061957	0.58
City of Pembroke Pines	06-00135	13.25	13.25				4061083	18.00
City of Plantation Public Water Supply	06-00103	12.97	12.97				4061121	12.00
City of Pompano Beach Utilities Dept.	06-00070	17.27	17.27				4061129	40.00
Royal Utility Company	06-00003	0.41	0.41				4061517	1.00
Seminole Tribe of Florida Utility	N/A		0.77					
Sunrise Utilities Dept.	06-00120	27.50	27.50				4061408	36.00

Table 1. Potable Water Treatment Facilities in the Lower East Coast Planning Area – 2005 (Continued).

Supply Entity	SFWMD		Withdrawal Source				FDEP	
	Permit Number	2005 Daily Average Annual Use	Surficial Aquifer System (MGD)	Surface Water (MGD)	Floridan Aquifer System (MGD)	ASR Net (MGD)	Permit Number	Rated Capacity (MGD)
City of Tamarac	06-00071	6.25	6.25				4061429	20.00
Miami-Dade County								
Americana Village	13-02004	0.26	0.26				4131403	0.50
Florida City Water and Sewer Department	13-00029	2.44	2.44				4130255	4.00
City of Homestead	13-00046	7.77	13.39				4130645	16.90
Miami-Dade County Water and Sewer Department	13-00017	346.50	346.50				4130871	217.74
City of North Miami	13-00059	12.86	12.86				4130977	9.30
City of North Miami Beach	13-00060	22.49	22.49				4131618	17.67
Monroe County								
Florida Keys Aqueduct Authority	13-00005	17.42	17.00				4134357	22.00
Palm Beach County								
AG Holley State Hospital	50-01092	0.07	0.07				4500006	0.36
Beeline Community Development District	50-01663	0.26	0.26				4501137	1.50
Beeline Utilities, L.L.C.	50-01528	0.02	0.02				4504516	0.18
City of Belle Glade	50-00454	4.62		4.62			4500105	
City of Boca Raton	50-00367	39.09	39.09				4500130	70.00
City of Boynton Beach	50-00499	13.73	13.73				4500773	29.64
City of Delray Beach	50-00177	17.10	17.10				4500351	26.00
Village of Golf	50-00612	0.51	0.51				4501528	0.86
Town of Highland Beach	50-00346	1.60			1.60		4500609	2.25
Town of Jupiter	50-00010	16.36	9.71		5.42		4501491	27.30
City of Lake Worth	50-00234	6.98	6.98				4500773	12.90
Town of Lantana	50-00575	1.90	1.90				4500784	3.84
Town of Manalapan	50-00506	1.28	1.28				4500840	1.94
Town of Mangonia Park	50-00030	0.49	0.49				4500841	1.08
Maralago Cay	50-011283	0.25		0.25			4500062	0.42
City of Pahokee	50-00473	0.99		0.99			4501023	1.80
Palm Beach County Water Utilities Department	50-00135	54.24	54.24				4504393	91.38
Village of Palm Springs	50-00036	4.33	4.33				4501058	10.00
City of Riviera Beach	50-00460	7.42	7.42				4501229	17.50

Table 1. Potable Water Treatment Facilities in the Lower East Coast Planning Area – 2005 (Continued).

Supply Entity	SFWMD		Withdrawal Source				FDEP	
	Permit Number	2005 Daily Average Annual Use	Surficial Aquifer System (MGD)	Surface Water (MGD)	Floridan Aquifer System (MGD)	ASR Net (MGD)	Permit Number	Rated Capacity (MGD)
Palm Beach County (Continued)								
Seacoast Utility Authority	50-00365	18.53	18.53				4501124	30.50
Seminole Improvement District	50-03711	0.12	0.12				4504903	0.54
City of South Bay	50-00131	0.78		0.78			4501911	2.20
Village of Tequesta	50-00046	1.63	1.98		0.88		4501438	3.93
Tropical Breeze Estates	50-00137	0.12	0.12				4500981	0.16
Village of Wellington / Acme Development District	50-00464	5.98	5.98				4500014	11.00
City of West Palm Beach	50-00615	29.93	29.93				4501559	47.00

Table 2. 2005 Reuse Inventory Report – Wastewater Treatment Facilities in the Lower East Coast Planning Area.

Wastewater Treatment Facility	Permit Number	FDEP Rated Capacity	Average Annual Daily Flow	Disposal Method Capacity (MGD)							2005 Rated Reuse Capacity (MGD)	2005 Part III Reuse Capacity (MGD)
				Deep Well & Other	Surface Water Discharge (Ocean Outfall)	Reuse						
						Part II, IV (Land Application)	Part III (Reclaimed)	Part V (Indirect Potable)	Part VI (Overland Flow)	Part VII (Industrial Use)		
Broward County												
Broward County North Regional	FL0031771	84.00	73.84	30.95	38.39					4.50	7.46	1.73
Cooper City	FL0040398	3.10	1.27	1.27		Not Listed in FDEP Reuse Report						
Coral Springs Improvement District	FLA041301	6.00	5.20	5.20		Not Listed in FDEP Reuse Report						
Town of Davie	FL0040541	4.85	3.40			Not Listed in FDEP Reuse Report						
Ferncrest	FLA013583	0.60	0.36			Not Listed in FDEP Reuse Report						
Fort Lauderdale - G.T. Lohmeyer	FLA041378	43.00	37.00			Not Listed in FDEP Reuse Report						
Hollywood	FL0026255	42.00	42.04		39.20		2.84				5.00	5.00
Margate	FL0041289	10.20	5.90			Not Listed in FDEP Reuse Report						
City of Miramar	FLA017025	8.90	4.58	1.84			1.85			0.89	2.74	1.85
City of Pembroke Pines	FLA013575	9.50	6.26			Not Listed in FDEP Reuse Report						
Plantation Regional	FL0040401	15.00	13.59	12.90						0.69	2.16	
Pompano Beach	FLA013581	2.50	1.62	0.23			1.39				2.50	2.50
Sunrise No. 1 (Springtree)	FLA041947	10.00	8.20			Not Listed in FDEP Reuse Report						
Sunrise No. 3 (Sawgrass)	FLA042641	20.00	13.00			Not Listed in FDEP Reuse Report						
Sunrise Southwest	FLA013580	0.99	0.42			0.42					0.99	
Totals		260.64	216.68	52.39	77.59	0.42	6.08	0.00	0.00	6.08	20.85	11.08

Table 2. 2005 Reuse Inventory Report – Wastewater Treatment Facilities in the Lower East Coast Planning Area (Continued).

Wastewater Treatment Facility	Permit Number	FDEP Rated Capacity	Average Annual Daily Flow	Disposal Method Capacity (MGD)							2005 Rated Reuse Capacity (MGD)	2005 Part III Reuse Capacity (MGD)
				Deep Well & Other	Surface Water Discharge (Ocean Outfall)	Reuse						
						Part II, IV (Land Application)	Part III (Reclaimed)	Part V (Indirect Potable)	Part VI (Overland Flow)	Part VII (Industrial Use)		
Miami-Dade County												
Americana Village Condo. Assoc.	FLA013641	0.20	0.12	Not Listed in FDEP Reuse Report								
Homestead	FLA013609	6.00	4.39			4.39					6.00	
Miami-Dade WASD North District	FL0032182	112.50	87.96	12.97	72.76		0.10			2.13	4.44	1.50
Miami-Dade WASD Central District	FLA024805	143.00	122.59		112.86					9.73	8.50	
Miami-Dade WASD South District	FL0042137	97.00	92.01	87.76			0.72			3.53	4.73	1.00
Totals		358.70	307.07	100.73	185.62	4.39	0.82	0.00	0.00	15.39	23.67	2.50

Table 2. 2005 Reuse Inventory Report – Wastewater Treatment Facilities in the Lower East Coast Planning Area (Continued).

Wastewater Treatment Facility	Permit Number	FDEP Rated Capacity	Average Annual Daily Flow	Disposal Method Capacity (MGD)							2005 Rated Reuse Capacity (MGD)	2005 Part III Reuse Capacity (MGD)
				Deep Well & Other	Surface Water Discharge (Ocean Outfall)	Reuse						
						Part II, IV (Land Application)	Part III (Reclaimed)	Part V (Indirect Potable)	Part VI (Overland Flow)	Part VII (Industrial Use)		
Monroe County												
U.S. Naval Air Station - Boca Chita	FLA147117	0.44	0.15	0.15		Not listed in FDEP Reuse Report						
Hawk's Cay - Duck Key	FLA014772	0.10	0.06				0.04				0.10	0.10
City of Key Colony Beach	FLA014720	0.34	0.25	0.20			0.05				0.06	0.06
Key Haven Utility	FLA014867	0.20	0.11			Not listed in FDEP Reuse Report						
Key West Resort Utility	FLA014951	0.50	0.34	0.10			0.22				1.05	1.00
Ocean Key Club - North Key Largo	FLA015009	0.55	0.32	0.32								
Richard A. Heyman - Key West	FL0025976	10.00	4.54	4.54		Not listed in FDEP Reuse Report						
Totals		12.13	5.77	5.31	0.00	0.00	0.31	0.00	0.00	0.00	1.21	1.16

Note: Monroe County does not have a countywide treatment system. The residents rely on a variety of different systems. Without a countywide system in place, each developer or homeowner has constructed private on-site or small package treatment facilities to serve the development or home. Therefore, there are about 23,000 on-site wastewater systems and 246 small wastewater treatment plants throughout the area. Only two cities, Key West and Key Colony Beach, have large wastewater treatment facilities. The five largest treatment plants (above) in the area, not including the City of Key West and the City of Key Colony Beach, have a combined capacity of 1.75 MGD and comprise 35 percent of the total permitted treatment capacity. The predominant method of wastewater treatment is On-site Wastewater Treatment Systems (OWTS). There are about 23,000 of these in current operation. Approximately 2,800 cesspools are still in operation, as well as 640 permitted aerobic treatment units (ATUs).

Islamorada, Village of Islands: Treatment and disposal of wastewater in the village is performed by residential and business owners through privately owned, operated and maintained wastewater systems. There are no public wastewater treatment facilities in the village. The wastewater facilities in the village consist of On-site Sewage Treatment and Disposal Systems (OSTDS). There are also cesspools and other undocumented systems scattered throughout the village.

City of Marathon: Treatment and disposal of wastewater is performed by residential and business owners through privately owned, operated and maintained wastewater systems. The wastewater facilities in the city consist of On-site Sewage Treatment and Disposal Systems (OSTDS), including substandard septic systems, and package or pre-engineered wastewater treatment plants. There is also property that has been determined to have cesspools or undocumented systems.

Source: 2005 Reuse Inventory Report.

Table 2. 2005 Reuse Inventory Report – Wastewater Treatment Facilities in the Lower East Coast Planning Area (Continued).

Wastewater Treatment Facility	Permit Number	FDEP Rated Capacity	Average Annual Daily Flow	Disposal Method Capacity (MGD)							2005 Rated Reuse Capacity (MGD)	2005 Part III Reuse Capacity (MGD)
				Deep Well & Other	Surface Water Discharge (Ocean Outfall)	Reuse						
						Part II, IV (Land Application)	Part III (Reclaimed)	Part V (Indirect Potable)	Part VI (Overland Flow)	Part VII (Industrial Use)		
Palm Beach County												
Beeline Community Dev. District (United Technologies)	FLA013693	0.22	0.06									
Belle Glade	FLA027740	4.50	3.12	2.99		0.13					0.07	
Boca Raton	FL0026344	17.50	20.91		14.01		5.69			1.21	7.00	7.00
Loxahatachee Environmental River Control District (ENCON)	FL0034649	9.00	7.39	2.67			4.47			0.25	10.62	8.87
Okeelanta Corporation	FLA013706	0.23	0.02			0.02					0.23	
Pahokee	FL0028355	1.20	0.81	0.80		0.01					0.08	
Palm Beach Southern Regional	FLA041424	30.00	23.90	13.20		1.00	7.90			1.80	18.40	10.40
Royal Palm Beach	FLA013749	2.20	2.34	1.86		0.48					1.24	
Seacoast Utilities PGA	FL0038768	12.00	7.93	0.38		0.50	5.58			1.47	17.46	14.91
South Bay	FLA021300	1.42	0.90			0.90					0.17	
South Central Regional	FL0035980	24.00	17.21		13.03		3.25			0.93	10.00	8.00
US Sugar Corp. / Bryant Village	FLA013704	0.17	0.08			0.08					0.17	
Wellington/Acme	FLA042595	4.75	3.14	3.08		0.06					1.00	
West Palm Beach / East Central	FL0041360	55.00	40.00			Not Listed in FDEP Reuse Report						
Totals		162.19	127.81	24.98	27.04	3.18	26.89	0.00	0.00	5.66	66.44	49.18

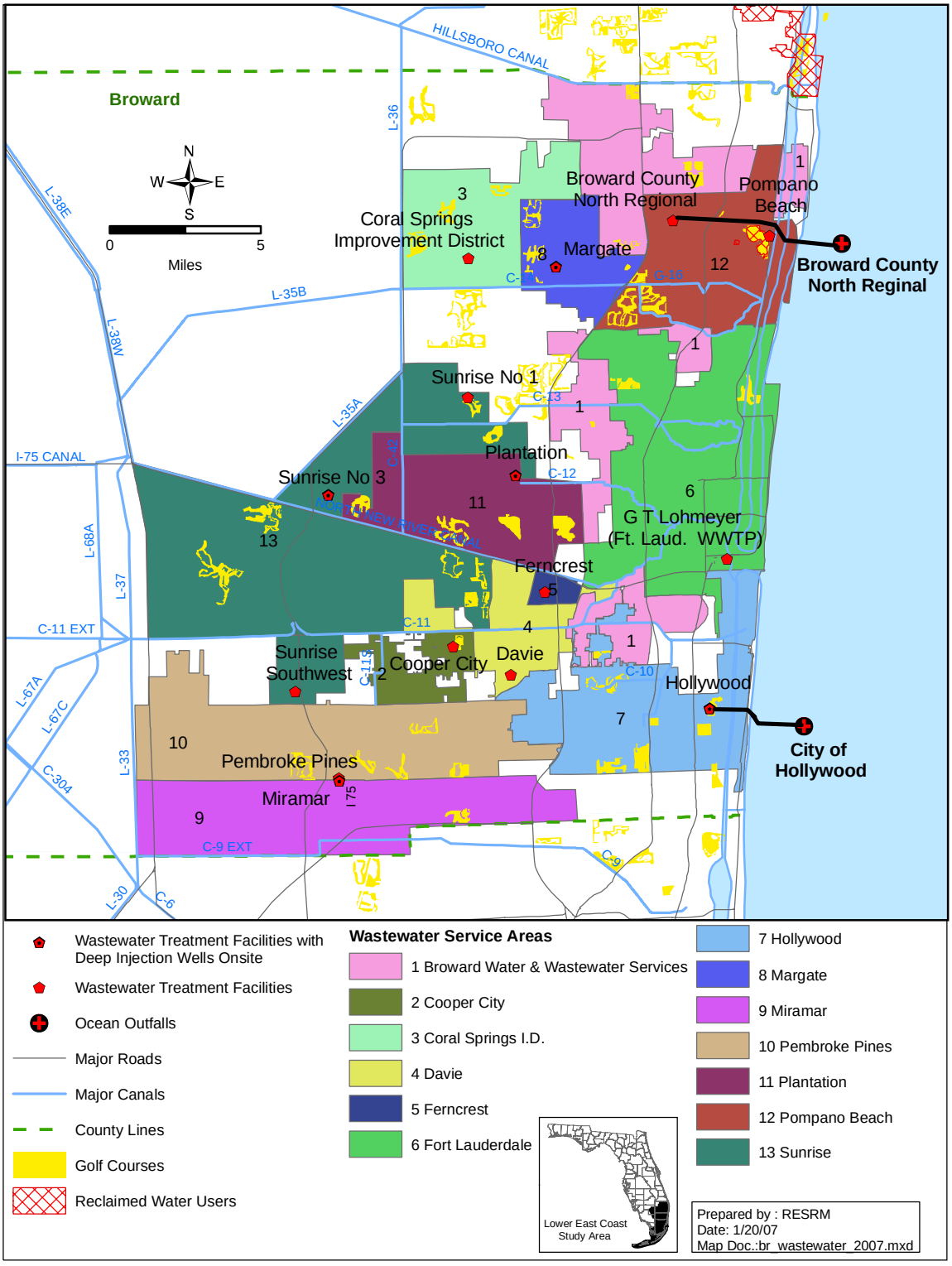

Figure 1. Wastewater Treatment Facilities in Broward County.

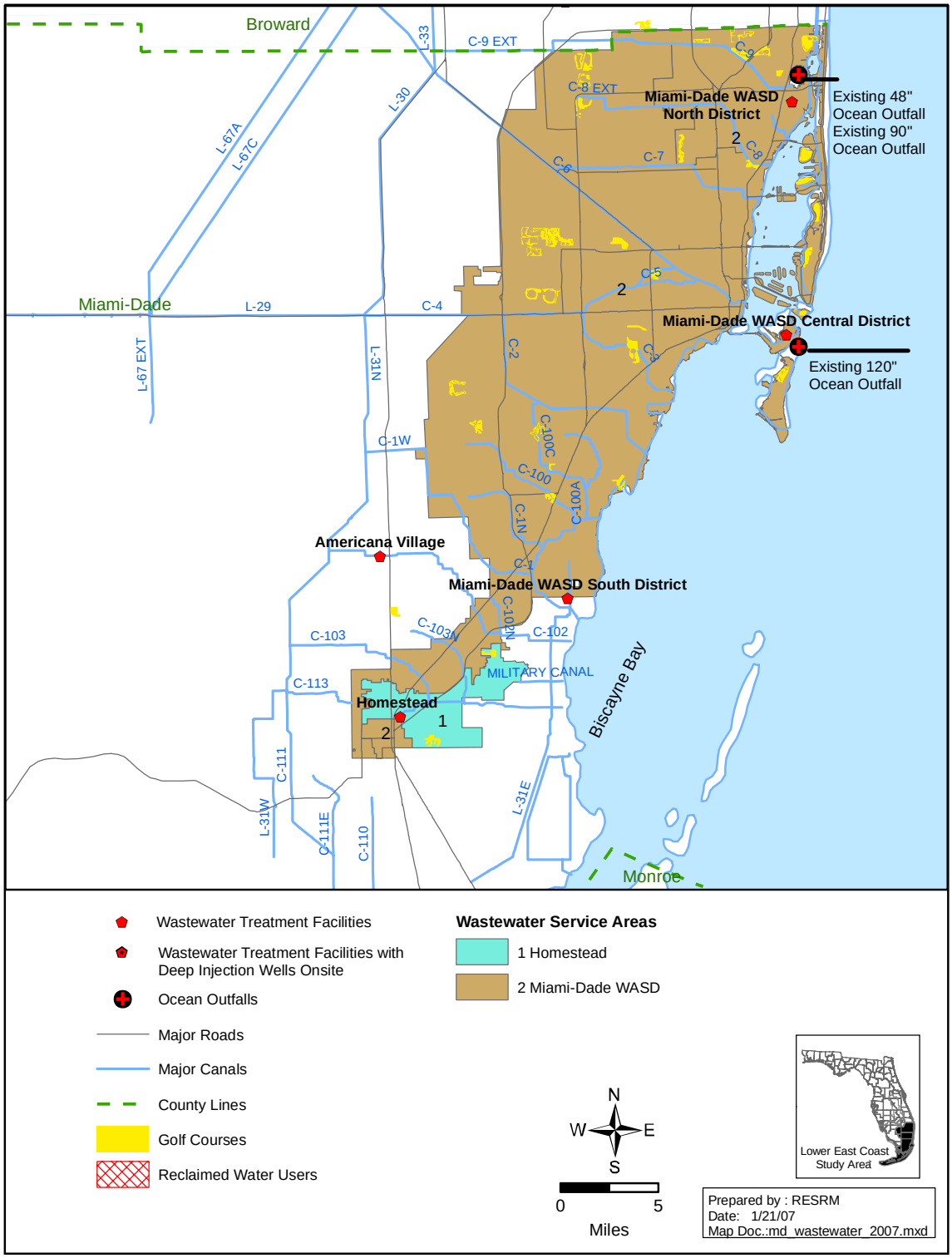

Figure 2. Wastewater Treatment Facilities in Miami-Dade County.

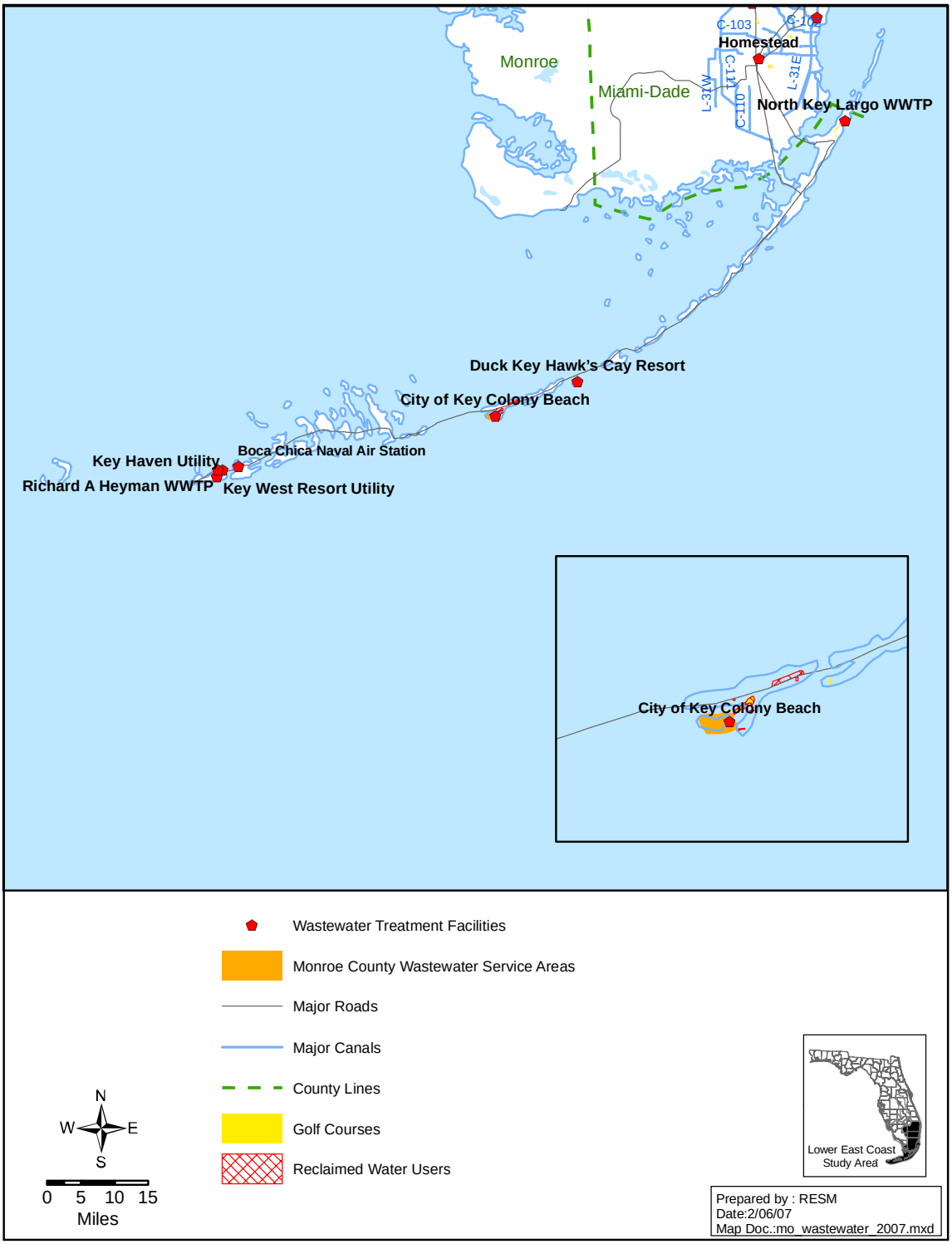

Figure 3. Wastewater Treatment Facilities in Monroe County.

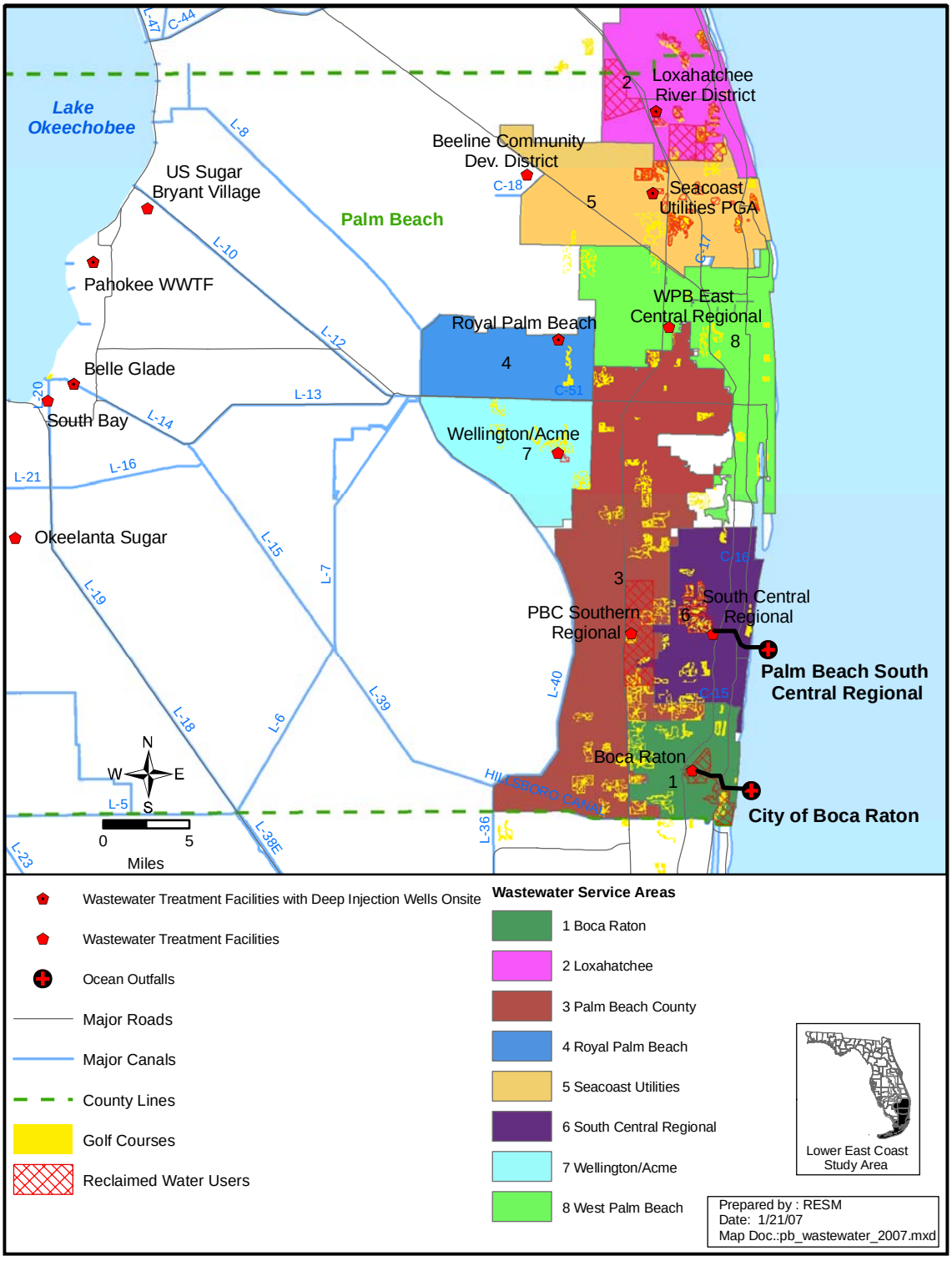

Figure 4. Wastewater Treatment Facilities in Palm Beach County.

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Florida Department of Environmental Protection. 2006. *2005 Reuse Inventory Report*. FDEP, Tallahassee, FL.

Koopman, B., et al. 2006. *Ocean Outfall Study*. University of Florida, Gainesville, FL, prepared for the Florida Department of Environmental Protection, Tallahassee, FL.

F
Conservation

OVERVIEW

The *2000 Lower East Coast Regional Water Supply Plan* (2000 LEC Plan) recommended plumbing retrofits for both interior plumbing fixtures and rain sensors for automatic landscape irrigation systems; continuation/expansion of the Mobile Irrigation Laboratory (MIL) Program; and, voluntary conversion of agricultural seepage irrigation systems to microirrigation in the Lower East Coast (LEC) Planning Area. Based on consensus from stakeholders and the analysis associated with this plan, it was concluded that the 2000 LEC Plan recommendations remain valid.

Water conservation options were selected from the *Florida Water Conservation Initiative's* (FDEP 2002) list of potential conservation measures. These are the methods best suited to the scope of the regional water supply plan. Options with the greatest potential water savings were identified; relevant information was assembled, such as laws, ordinances and South Florida Water Management District (SFWMD or District) rules; and, age of housing stock in the LEC Planning Area was considered and analyzed. An analysis of potential conservation water savings was performed. Funding mechanisms for the recommended alternatives are also discussed in this appendix.

AGRICULTURAL IRRIGATION CONSERVATION

Agriculture in the LEC Planning Area is quite diverse, with sugarcane having the largest acreage. Cultural practices for sugarcane do not allow for water conservation potential. The following four crops, ranked by acreage, present challenges for conservation programs: row crops, citrus, field crops other than sugarcane, and nurseries.

In 2001, the Florida Legislature enacted Section 570.085, Florida Statutes (F.S.), requiring the Florida Department of Agriculture and Consumer Services (FDACS) to establish an agricultural water conservation program that includes the following:

A cost-share program, coordinated where appropriate with the United States Department of Agriculture and other federal, state, regional, and local agencies, for irrigation system retrofit and application of mobile irrigation laboratory evaluations for water conservation as provided in this section and, where applicable, for water quality improvement pursuant to s. 403.067(7)(c).

The development and implementation of voluntary interim measures or best management practices, adopted by rule, which provide for increased efficiencies in the use and management of water for agricultural production. In the process of developing and adopting rules for interim measures or best management practices, the department shall consult with the Department of Environmental Protection and the water management districts. Such rules may also include a system to assure the implementation of the practices, including recordkeeping requirements. As new information regarding efficient agricultural water use and management becomes available, the department shall reevaluate and revise as needed, the interim measures or best management practices. The interim measures or best management practices may include irrigation retrofit, implementation of mobile irrigation laboratory evaluations and recommendations, water resource augmentation, and integrated water management systems for drought management and flood control and should, to the maximum extent practicable, be designed to qualify for regulatory incentives and other incentives, as determined by the agency having applicable statutory authority.

Provision of assistance to the water management districts in the development and implementation of a consistent, to the extent practicable, methodology for the efficient allocation of water for agricultural irrigation.

In 2004, the District responded to a request from the Institute of Food and Agricultural Sciences (IFAS), University of Florida, to become a funding participant in the Florida Automated Weather Network (FAWN). This network of weather stations provides real-time and historical data to water users (agricultural, as well as urban landscape) for making informed irrigation decisions.

Agricultural Best Management Practices

The Best Management Practices (BMPs) Program, authorized by Section 403.067, F.S., was developed to help farmers improve water quality. In 2004, the FDACS assembled an Agricultural Water Conservation Steering Committee to provide editorial guidance and to help formulate the more technical parts of the *Florida's Agricultural Water Conservation Best Management Practices* manual (FDACS 2006). The purpose of the manual is to:

- Carry out and implement the statutory mandates outlined in Section 570.085, F.S.
- Identify methods for growers to use nontraditional on-site alternative water resources.
- Provide a basis for FDACS to supplement existing BMP manuals, emphasizing more water conservation strategies (e.g., water quantity) and demonstrating the water quality benefits.
- Develop a template for future agricultural water conservation cost-share programs and to describe the current programs that are available to agriculture.

The BMPs programs are voluntary and developed in cooperation with specific agricultural commodity groups. Statewide, the commodity groups that currently have BMPs in place or under development are Cattle, Citrus, Green Industries (landscape, nurseries and golf courses), Horses, Silviculture (forestry), and Vegetables.

Section 403.021, F.S., mandates the involvement of the SFWMD in the BMPs Program, as well as several other federal, state and local agencies. The Florida Department of Environmental Protection (FDEP) sets allowable pollution limits called Total Maximum Daily Loads (TMDLs) for nutrients. Resource Conservation and Development corporations and soil and water conservation districts provide local support for BMPs programs. The IFAS, University of Florida, evaluates individual grove owners' compliance with BMPs. The U.S. Department of Agriculture – Natural Resources Conservation Service (USDA–NRCS) provides technical assistance and some additional cost-sharing for the program.

One of the major incentives to join the BMPs Program is a cost-sharing arrangement with the FDACS on implementation costs. The SFWMD provides financial and technical assistance for the program startup.

Agricultural Mobile Irrigation Labs

The mission of the Mobile Irrigation Lab (MIL) Program, which began in south Florida in 1989, is to educate and demonstrate to agricultural and urban water users how to irrigate efficiently. Funding for the MIL Program is a multiagency partnership, involving the SFWMD, the SFWMD's Big Cypress Basin Board, the USDA–NRCS, the FDACS, various soil and water conservation districts, and county and local governments.

In the LEC Planning Area, three MILs provide agricultural evaluations, two of which are funded by the District. In Fiscal Years 2004 and 2005, potential water

savings from the agricultural MILs in the LEC Planning Area totaled 0.23 MGD if all recommendations were implemented.

The MIL teams provide free irrigation system evaluations to identify and solve problems with existing irrigation systems, provide guidance regarding the selection and installation of new systems, and provide guidance with irrigation management planning. Accordingly, the MIL will calculate the potential water savings that would result if all the recommendations were implemented, yet is based on specific rainfall conditions that vary annually. Follow-up evaluations determine the actual volume of water saved, and the results of this evaluation are used to estimate the actual water savings in order to document and quantify the conservation gains. More information about agricultural MILs is provided in the *2005–2006 Consolidated Water Supply Plan Support Document* (SFWMD 2007) available from the District's Water Supply Plan Web site at: http://www.sfwmd.gov/org/wsd/wsp.

URBAN WATER CONSERVATION

Utilities in the LEC Planning Area have promoted water conservation through traditional methods, such as public outreach and customer information. The utilities in this region have implemented the Consumptive Use Permit (CUP) Program water conservation requirements, resulting in the implementation of water conservation programs and the adoption of conservation ordinances.

The approach to evaluating the best conservation measures for the LEC Planning Area was a repetitive one. The evaluation process entailed identifying characteristics of the planning area, such as age of housing stock, that would likely determine the type or respective age of technology of indoor plumbing devices, and characterizing use patterns by service area and per capita trends (**Table 1**).

Table 1. Examples of How Alternatives Are Evaluated.

Planning Area Housing Characteristic	Best Opportunity	Conservation Measure
Indoor - older housing with inefficient indoor plumbing fixtures	Retrofits	Plumbing (e.g., toilets, showerheads, etc.)
Outdoor – irrigation systems that do not respond to rainfall	Retrofits	Rain shut-off switches
New development	Local ordinances/ codes/regulatory measures	Varies from code enforcement to landscape technology, such as Xeriscape™

Indoor Water Use

Two significant changes occurred in plumbing standards in 1983 and 1994, which affected residential water use. In 1983, Chapter 553, F.S., was modified, lowering the maximum allowable flow rates for water fixtures in new construction to a maximum use of 3.5 gallons per flush for toilets and a flow rate of 3.0 gallons per minute (GPM) for showerheads. Prior to this state legislation, the typical volume of water for toilet flushing was 6.0 gallons and showerhead flow was 6.0 GPM.

In 1994, new plumbing standards for water use were implemented under the Federal Energy Policy Act of 1992, setting national plumbing code standards of 1.6 gallons per flush for toilets, 2.5 GPM for showerheads and 2.0 GPM for faucets.

Methodology

To determine the urban areas having the greatest potential for retrofits in the LEC Planning Area, a housing stock analysis was performed using age of housing as a determinate of the age and water use characteristics of plumbing fixtures. County property assessors' parcel data for Broward, Hendry, Miami-Dade, Monroe and Palm Beach counties provided the number and age of residential units. The age of the residential units was compared to the years when the plumbing code changed as described previously (pre-1984, 1984–1994, 1994–2000). **Table 2** shows the number of units and percentages of housing in each group for Broward, Hendry, Miami-Dade, Monroe and Palm Beach counties.

Table 2. Age of Housing Stock in Lower East Coast Counties (Indoor Retrofit).

County	Housing Stock			
	Pre-1984	1985-1994	Post 1994	Total
Broward	294,181	69,564	30,194	393,939
	75%	18%	8%	
Hendry[a]	393	362	208	963
	41%	38%	22%	
Miami-Dade	662,566	70,023	29,311	761,900
	87%	9%	4%	
Monroe[a]	107,671	39,121	24,018	170,810
	63%	23%	14%	
Palm Beach	250,026	107,901	55,816	413,743
	60%	26%	13%	
Grand Total	1,314,837	286,971	139,547	1,741,355
	76%	16%	8%	

a. Portion of county in the LEC Planning Area. Source: Tax assessors.

Costs and Savings

Utilities that would benefit most from plumbing fixture retrofits are those with significant housing in the pre-1984 age category, and therefore, have the most potential for indoor water savings.

Water savings derived from retrofitting pre-1984 housing to current standards is 4.4 gallons per flush for toilets, and 3.5 GPM for showerheads. Toilets are estimated to be flushed five times a day, while 10 minutes per shower is a standard estimate. According to the 2000 U.S. Census, the number of persons-per-household was 2.45 in Broward County; 3.09 in Hendry; 2.84 in Miami-Dade County; 2.23 in Monroe County; and, 2.34 in Palm Beach County.

Annual potential savings from retrofitting one unit from the pre-1984 technology to current standards would be 32,000 gallons for each retrofitted showerhead and 20,075 gallons for each retrofitted toilet.

For the purposes of this approach, it is assumed that a retrofit program would include 75 percent of the pre-1984 housing stock. This percentage is typically used as an estimate of expected coverage in an urban retrofit program, as some retrofits have already been done, some units are vacant or on the market, or for other reasons will not be part of the program. Using the county housing age data in **Table 2**, and assuming the 75 percent retrofit, the total potential annual savings of a showerhead retrofit is 19.00 MGD in Broward County; 0.03 MGD

in Hendry County; 49.00 MGD in Miami-Dade County; 6.30 MGD in Monroe County; and, 15.00 MGD in Palm Beach County—for a total of 90.00 MGD in the LEC Planning Area.

Similarly, using the housing age data in **Table 2**, and assuming the 75 percent retrofit, the total estimated annual savings of a toilet retrofit is 12.00 MGD in Broward County; 0.02 MGD in Hendry County; 31.00 MGD in Miami-Dade County; 4.00 MGD in Monroe County; and, 10.00 MGD in Palm Beach County—for a total potential savings of 57.00 MGD in the planning area.

Total potential annual savings for both toilet and showerhead retrofits are 31.00 MGD in Broward County; 0.50 MGD in Hendry County; 80.00 MGD in Miami-Dade County; 10.00 MGD in Monroe County; and, 25.00 MGD in Palm Beach County, for a total potential savings of 147.00 MGD. This estimate assumes one retrofit of each device per housing unit.

Whenever indoor water use is reduced, there is also a reduction in wastewater. Wastewater flows have been estimated to be as much as 50 percent of residential water use. Impacts to wastewater treatment facilities and the need for expansion and disposal can be reduced if water use is reduced.

Table 3 shows the estimated savings that could be accrued in the LEC Planning Area if the three retrofit measures are implemented, as well as the costs and assumptions used in the calculations. Costs for retrofits are $200 per toilet retrofit and $20 per showerhead, as described in the *2005–2006 Consolidated Water Supply Plan Support Document* (SFWMD 2007). Water conservation cost-efficiency is expressed in 1,000 gallons of water saved annually. Toilet retrofits cost $.25 per 1,000 gallons of water saved, and showerhead retrofits cost $.06 per 1,000 gallons of water saved.

Table 3. Estimated Savings Achieved by Implementing the Recommended Measures for Conservation in the LEC Planning Area.

Housing Stock Characteristic	Conservation Measure	Estimated Water Savings per Retrofit Device	Cost per Device	Cost per 1,000 Gallons	Planning Area Savings Based on Retrofit of 75% of Characteristic Housing Stock	Estimated Total Cost in Millions
Housing Built before 1984	Showerhead Retrofit	3.5 gallons/min.	$20	$.06/1,000	90.00 MGD	$19.72
Pre-1992 Outdoor Irrigation Systems Without Rain Sensors	Rain Sensor Installation	35 gallons/day	$68	$1.07/1,000	22.00 MGD	$43.28
Housing Built Before 1984	Toilet Retrofit	4.4 gallons/flush	$200	$.25/1,000	57.00 MGD	$197.23
				Planning Area Savings	169.00 MGD	$260.23

Note: Based on Housing Counts from Tax Assessors data.

Urban Landscape Irrigation

Methodology

For this evaluation, water savings derived from installing rain sensors for housing stock built prior to 1992 is estimated. Based on the county housing age data **Table 3**, and assuming 75 percent of the housing units are retrofitted, a total potential savings of 22.00 MGD was estimated for the LEC Planning Area (5.60 MGD in Broward County; 0.02 MGD in Hendry County; 9.60 MGD in Miami-Dade County; 0.90 MGD in Monroe County; and, 6.20 in Palm Beach County.

Table 4 shows that installing rain sensors in irrigation systems of housing units constructed prior to the 1991 Xeriscape™ landscaping law would result in the greatest savings. For those systems using reclaimed water, additional efficiencies can be realized using metering. Data for **Table 4** were obtained from county property assessors' parcel data as previously described.

Table 4. Age of Housing Stock in Lower East Coast Counties (Rain Sensor).

County	Housing Stock		
	Pre 1992	Post 1992	Total
Broward	211,940	38,048	249,988
	85%	15%	
Hendry[a]	660	303	963
	69%	31%	
Miami-Dade	365,282	31,672	396,954
	92%	8%	
Monroe[a]	34,258	5,698	39,956
	86%	14%	
Palm Beach	236,490	55,892	292,382
	81%	19%	
Grand Total	848,630	131,613	980,243
	87%	13%	

a. Portion of county in the LEC Planning Area. Source: Tax assessors.

To determine housing with the greatest potential for outdoor retrofits, age of the housing unit was compared to the law related to rain sensor changes (pre-1992 and 1992–2000). The percentages of units constructed in the two time periods are described for each county. A 1987 SFWMD Survey of Water Use indicated that 70 percent of all residential irrigation in the District is done by in-ground automatic irrigation systems, which are required to have a rain sensor as reflected in the law.

Costs and Savings

Rain sensors can provide a significant reduction in water use for nominal cost. The cost is estimated to average $68 per rain sensor, including installation, and can potentially save 12,700 gallons per year. This equates to a cost of $1.07 per 1,000 gallons. The useful life of a rain sensor is estimated to be five years. Areas benefiting the most from a rain sensor retrofit program would be pre-1992 housing units with in-ground irrigation systems.

Urban Mobile Irrigation Labs

Urban MIL personnel evaluate the effectiveness of irrigation systems and make recommendations to enhance the efficiency of the systems. In Fiscal Years 2004 and 2005, the five most common problems were:

- Mixed sprinkler/emitter sizes and unmatched precipitation in the same zone.
- Turf and landscape area irrigated in the same zone.
- Stream of water blocked by vegetation.
- Operating time too frequent.
- Operating time too long.

In the LEC Planning Area, there are four urban labs, two of which are funded by the District. In Fiscal Years 2004 and 2005, the potential water savings from the District-funded urban MILs in the LEC Planning Area totaled 0.36 MGD if all recommendations were implemented.

More information about urban MILs is provided in the *2005–2006 Consolidated Water Supply Support Document* (SFWMD 2007) available from the District's Water Supply Plan Web site: http://www.sfwmd.gov/org/wsd/wsp.

CONSERVATION MEASURES

Table 5 provides a general list of recommended conservation measures that would be effective in different types of utility service areas based on the population growth rate, housing stock and potential for growth.

The SFWMD actively engages in devising programs for retrofits, and has dedicated outreach specialists and intergovernmental representatives to assist utilities, local governments and water users to achieve the goals of this plan update. The District's Water Savings Incentive Program (WaterSIP) is tailored to assist the community to partially fund projects, such as large-scale retrofits, as recommended by this plan update. Through the WaterSIP, the SFWMD will continue to provide matching funds up to $50,000 to water providers for water-saving technologies.

Table 5. Utility Characteristics and Conservation Methods.

Type of Utility	Characteristics of Utilities	Utility-Specific Recommendations
Large Growth Potential	Considerable existing housing stock of intermediate to old age, significant land available for new development	Indoor retrofits, Xeriscape™ ordinance, irrigation hours ordinance, outreach and education
Moderate Growth Potential	Existing housing stock intermediate in age, moderate potential for development – limited by boundaries of other utility service areas and natural areas	Indoor retrofits, Xeriscape™ ordinance, irrigation hours ordinance, promote Mobile Irrigation Lab, outreach and education
Limited Growth Potential	Housing stock is older, service area is near build-out, very limited potential for growth	Indoor retrofits, rain sensor installation, promote Mobile Irrigation Lab, outreach and education

The SFWMD will also provide increased technical assistance, as well as outreach and education efforts in the LEC Planning Area. These efforts include annual conservation workshops held at the service center to showcase the District's funding programs for conservation and alternative water supplies; funding support for annual WaterFest events; support of Florida Yards and Neighborhoods; and, MIL educational efforts. Savings may vary from year to year as programs are implemented.

CONSERVATION – IMPLEMENTATION STRATEGIES

Potential strategies for water conservation developed in cooperation with the public include the following:

- Landscape irrigation water conservation has the potential for significant water savings, and has the potential to reduce Surficial Aquifer System resource issues. This may be accomplished by expanding MIL activity in the planning area, and may involve local government funding partnerships to increase lab services, especially in newer urban communities.
- Local governments should consider developing ordinances to address water-conserving landscape installation for new construction to maximize water savings in initial design and operation of both residential and commercial sites.
- Implement cost-effective indoor and outdoor retrofits in the LEC Planning Area based on the preceding analyses.

- Complete water conservation rulemaking for Chapter 40E-2, Florida Administrative Code (F.A.C.), and the *Basis of Review for Water Use Permit Applications*, emphasizing goal-based conservation programs for public water suppliers and major water users.
- Fund projects through the WaterSIP, including public/private partnerships, which further the preceding recommendations.
- Expand outreach and education through funding, public/private partnerships, the media, professional organizations and users.

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G

Cost Estimating and Economic Criteria

This appendix contains information on the origination of several of the cost estimations for the water source options and treatment technologies presented in this plan update.

A memo (**Exhibit 1**) summarizes the approach on the origination and updated cost information presented in the 2005–2006 Lower East Coast Water Supply Plan Update (2005–2006 LEC Plan Update). The approach discussed in this memo is supported by the Florida Department of Environmental Protection (FDEP) and the water management districts. The cost information provides a consistent set of definitions and criteria for the development of comparable planning level, life cycle, cost estimates for water supply and wastewater treatment alternatives.

Exhibit 1. Cost Estimating and Economic Criteria for 2005–2006 District Water Supply Plan Update.

TECHNICAL MEMORANDUM CH2MHILL

Cost Estimating and Economic Criteria for 2005 District Water Supply Plan

PREPARED FOR: Beth Wilder/SJRWMD

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Jerry Salsano/TAURANT

DATE: June 16, 2004

Purpose

This technical memorandum (TM) provides cost definitions and cost estimating and economic criteria to be used in the development of water supply facilities costing for the 2005 District Water Supply Plan (DWSP). These criteria will be applied to all cost estimates and economic comparisons developed as part of the 2005 DWSP to ensure that all costs are directly comparable.

This TM provides a consistent set of definitions and criteria for the development of comparable planning level life cycle cost estimates for all water supply alternatives.

Definitions

The following definitions will be used in the 2005 DWSP project and should be adhered to when applicable. For the most part, these definitions are the same as used by SJRWMD, as well as by Southwest Florida Water Management District (SWFWMD), in the development of the initial DWSPs.

Construction Cost

The construction cost is the total amount expected to be paid to a qualified contractor to build the required facilities at peak design capacity.

Non-construction Capital Cost

Non-construction capital cost is an allowance for construction contingency, engineering design, permitting and administration associated with the constructed facilities.

Land Cost

The market value of the land required to implement the water supply option.

DWSP 2005 COST ESTIMATING CRITERIA TM 062404 FINAL.DOC 1

Exhibit 1. Cost Estimating and Economic Criteria for 2005–2006 District Water Supply Plan Update (Continued).

Land Acquisition Cost

The estimated cost of acquiring the required land, exclusive of the land cost.

Total Capital Cost

Total capital cost is the sum of construction cost, non-construction capital cost, land cost, and land acquisition cost.

Operation and Maintenance Cost

The estimated annual cost of operating and maintaining the water supply option when operated at average day capacity.

Equivalent Annual Cost

Total annual life cycle cost of the water supply option based on service life and time value of money criteria established for this project. Equivalent Annual Cost accounts for Total Capital Cost and O&M costs with facility operating at average day design capacity.

Present Worth

The equivalent present value of current and future expenditures for a specified planning period.

Unit Production Cost

Equivalent Annual Cost divided by annual water production. The Unit Production Cost will be expressed in terms of dollars per 1,000 gallons.

Criteria

Cost estimating and economic criteria are guidelines for estimating costs associated with water supply options.

Peak Flow Ratio

Capital cost of water supply facilities will be based on maximum installed capacity designed to accommodate peak or maximum daily flow (MDF) requirements. O&M costs and annual water production are based on the average daily flow (ADF) produced. The peak flow ratio (MDF/ADF) for an individual water supply system depends on the demand characteristics of the service area. For public supply systems the peak ratio is generally at least 1.25 for large systems and can be greater than 2.0 for small systems.

For water supply options where the service area peak flow ratio is known, the known value can and should be used in the cost estimating and economic calculations. For regional planning applications, a peak ratio of 1.5 will be used. This MDF/ADF ratio was applied in the 2000 DWSP.

Exhibit 1. Cost Estimating and Economic Criteria for 2005–2006 District Water Supply Plan Update (Continued).

Cost Index

Engineering News Record (ENR) publishes a Construction Cost Index (CCI) that can be used to adjust the cost basis of a given construction project for past and future times. The ENRCCI is based on the following construction items: 200 hours of common labor at the 20-city average of common labor rates, plus 2,500 pounds of standard structural steel shapes at the mill price prior to 1996 and the fabricated 20-city price from 1996, plus 1.128 tons of Portland cement at the 20-city price, plus 1,088 board-ft of 2 x 4 lumber at the 20-city price.

Cost estimates, for the 2005 DWSP, will be expressed in estimated year 2005 dollars. Because much of 2005 DWSP cost estimating work will be completed prior to 2005, projection of the current ENRCCI (June 2004 ENRCCI = 7,109) to mid-year 2005 ENRCCI is required.

Basic construction materials costs have increased significantly in the first 6 months of 2004 and this recent history is included in the mid-year 2005 ENRCCI projection. Exhibit 1 shows the recent monthly historic ENRCCI trend, as well as monthly projections through June 2005. The projected ENRCCI for June 2005 is approximately 7,420. This projection is based on the observed mean monthly growth rate (0.357%) for the 30-month period from January 2003 through June 2004.

EXHIBIT 1
ENRCCI Projection to 2005
Cost Estimating & Economic Evaluation Criteria

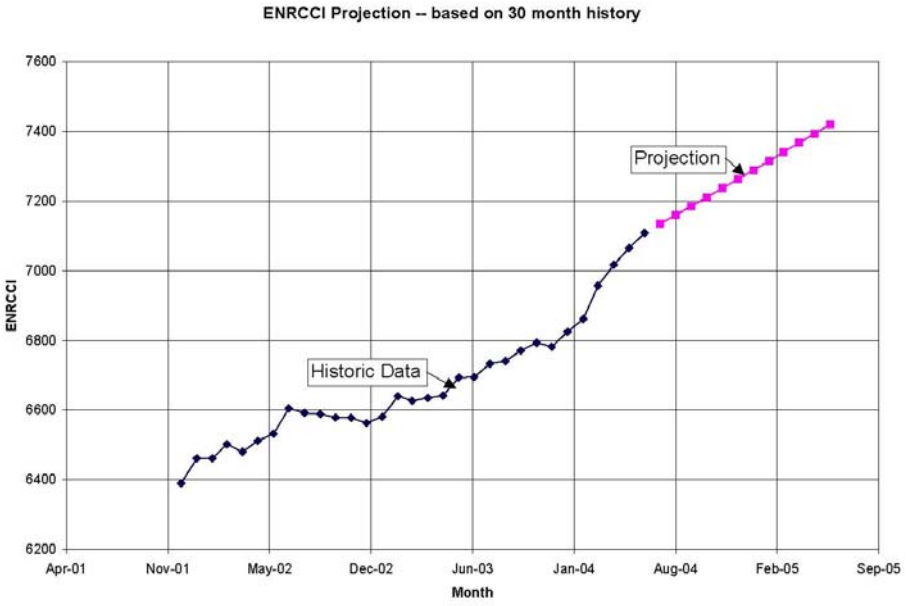

Exhibit 1. Cost Estimating and Economic Criteria for 2005–2006 District Water Supply Plan Update (Continued).

The cost basis for the 2000 DWSP was March 1996 with a corresponding ENRCCI value of 5,537. Using the projected mid-year 2005 ENRCCI value of 7,420 represents an increase in the cost basis of about 34 percent.

The conceptual planning level cost estimates prepared for the 2004 Interim Update DWSP projects are expressed on an April 2003 cost basis with a corresponding ENRCCI value of 6,635. Therefore, the cost basis for the 2005 DWSP will be approximately 11.8 percent greater than the cost basis for the 2004 Interim Update.

Non-construction Capital Cost

Non-construction capital cost will equal 45% of the planning level estimated construction cost. This includes a 20% allowance for construction contingency and a 25% allowance for engineering design, permitting, and administration. This value is unchanged from the 2000 DWSP.

Land Cost

Unit land cost ($/acre) for each parcel are based upon land use classification and size as supplied by SJRWMD land acquisition staff for the 2000 DWSP. An evaluation of current land values, as per recent SJRWMD land purchases, did not provide an adequate basis for revising the 2000 DWSP values. If actual site-specific land values are available for a given parcel and water supply option the site-specific value should be used in lieu of these typical regional values.

General land use classifications include urban, suburban, and rural. Size is based on acreage, where *small* refers to parcels 50 acres or less in size and *large* refers to parcels greater than 50 acres in size. Exhibit 2 provides the unit land cost matrix for parcels located within SJRWMD.

EXHIBIT 2
Unit Land Cost for Parcels
Cost Estimating & Economic Evaluation Criteria

Land Use Classification	Parcel Size	
	Small (< or = 50 acres) ($/acre)	Large (> 50 acres) ($/acre)
Urban	$ 100,000	N/A
Suburban	$ 20,000	$ 10,000
Rural	$ 5,000	$ 3,000

Unit land costs ($/ft²) for pipeline corridors vary based on the land use classification and whether or not the parcel is adjacent to public right of way (ROW) or in an undeveloped (new) area, and whether an easement or full ROW is required. Exhibit 3 provides the unit

Exhibit 1. Cost Estimating and Economic Criteria for 2005–2006 District Water Supply Plan Update (Continued).

cost matrix for pipeline corridors located within SJRWMD. These values are the same as used in the 2000 DWSP.

EXHIBIT 3
Unit Land Cost for Pipeline Corridors
Cost Estimating & Economic Evaluation Criteria

Land Use Classification	Adjacent to Public ROW		New Area	
	Easement ($/ft^2)	ROW ($/ft^2)	Easement ($/ft^2)	ROW ($/ft^2)
Urban	$ 4.00	$ 6.00	$ 3.00	$ 5.00
Suburban	$ 1.50	$ 3.00	$ 1.00	$ 2.00
Rural	$ 0.75	$ 1.00	$ 0.50	$ 0.75

Land Acquisition Cost

Land acquisition cost estimates will vary as a function of condemnation requirements, as follows:

- 12% of land value for known non-condemnation parcels
- 25% of land value for know condemnation parcels
- 18% of land value where condemnation status is unknown

In most case, at the conceptual regional planning level of analysis, it is anticipated that condemnation status will be unknown and therefore the 18% value will apply. A single value of 25% was used in the 2000 DWSP.

Interest Rate

For the 2005 DWSP, the interest rate to be used in all economic analysis calculations will be the current (FY04) federal water resources planning rate. This rate, set annually by the US Bureau of Reclamation for use by all federal agencies, is based on US Treasury bond rates. Although it is adjusted annually, it cannot be changed by more than ¼ percent in any single year. The current (FY04) federal planning rate, as published in the Federal Register (April 26, 2004), is 5.625 % per annum. This value will be used in all economic calculations for the 2005 DWSP.

The interest rate used in the 2000 DWSP was 7 % per annum. A value of 6 % was used in the 2004 Interim Update DWSP. Since that time the Federal water resources planning discount rate has been chosen as the interest rate criterion for water supply planning.

Economic Life of Facilities

The economic service life of facilities is based on the criteria used in the 2000 DWSP. Exhibit 4 provides the economic service life, in years based on component type. These values will be used in all annual cost and present worth calculations.

Exhibit 1. Cost Estimating and Economic Criteria for 2005–2006 District Water Supply Plan Update (Continued).

In all cases, land is considered a permanent resource and therefore has an infinite service life.

EXHIBIT 4
Economic Service Life
Cost Estimating & Economic Evaluation Criteria

Component Type	Service Life (years)
Water Conveyance Structures (pipelines, collection and distribution systems)	40
Other Structures (buildings, tankage, site improvements, etc.)	35
Wells	30
Process and Auxiliary Equipment (treatment equipment, pumps motors, mechanical equipment, etc.)	20
Reverse Osmosis Membranes	5

The non-construction capital costs associated with a given project, or major project component, will also be distributed in proportion to expected service life of the project. For example, if a given project, or major project component, has an economic service life of 20 years then the non-construction capital cost for that project, or major project component, also has an economic service life of 20 years.

Present Worth

A 20-year planning period will be used in present worth calculations. This present worth planning period was also used in the 2000 DWSP.

Summary

Generally, definitions and cost estimating and economic criteria applied to the 2005 DWSP will be the same as those applied to the 2000 DWSP. The main exceptions are the cost basis, the land acquisition cost factor and the interest rate.

All 2005 DWSP costs will be estimated year 2005 costs; whereas, the 2000 DWSP was developed using March 1996 costs. The cost basis for the 2004 Interim Update DWSP was April 2003.

The second change is the land acquisition factor. Land acquisition costs were estimated as 25% of land value for the 2000 DWSP. For the 2005 DWSP, this factor will vary depending upon condemnation status.

The final change is the interest rate used in the economic calculations. An interest rate of 7% was used for the 2000 DWSP and an interest rate of 6% was used for the 2004 Interim

Exhibit 1. Cost Estimating and Economic Criteria for 2005–2006 District Water Supply Plan Update (Continued).

Update DWSP. An interest rate of 5.625% will be used for the 2005 DWSP. The 2005 DWSP interest rate is equal to the current (FY04) Federal water resources planning rate.

All other definitions and criteria remain unchanged.

REFERENCES CITED

St. Johns River Water Management District. 2004. *Cost Estimating and Economic Criteria for 2005 District Water Supply – Technical Memorandum*. CH2M Hill. Palatka, FL.

H

Minimum Flows and Levels Criteria and Recovery and Prevention Strategies

OVERVIEW

Section 373.0361, Florida Statutes (F.S.), requires that each regional water supply plan be based on at least a 20-year planning period and include: a) water supply and water resource development components; b) a funding strategy for water resource development projects; c) minimum flows and levels (MFLs) established within the planning region; d) a MFL recovery and prevention strategy; and, e) technical data and information supporting the plan. In addition, Section 373.036(2) mandates that each regional water supply plan be updated at least every five years.

This appendix provides additional information and updated information since the *2000 Lower East Coast Regional Water Supply Plan* (2000 LEC Plan) (SFWMD 2000b) for the *2005–2006 Lower East Cost Water Supply Plan Update* (2005–2006 LEC Plan Update) regarding the establishment of MFLs and recovery and prevention strategies. This document was prepared to be read within the context of the entire plan update.

During the 2005 legislative session, Florida lawmakers revised state water law, strengthening the link between land use and water supply planning and creating the Water Protection and Sustainability Program. The alternative water supply portion of this program is intended to reduce competition between users and natural systems for available water by encouraging the development of alternative water supplies. Pursuant to Section 373.0361, F.S., the 2005–2006 LEC Plan Update includes MFLs for specified water bodies, and recovery and prevention strategies for those water bodies that are exceeding, or are expected to exceed, the proposed criteria.

As one of the tools for plan implementation, rulemaking to implement the regulatory recommendations of the 2000 LEC Plan constituted a significant

effort during the past several years. Rulemaking included changes to consumptive use permitting (CUP) criteria to cumulatively define the availability of water for consumptive uses and water resource protection. As recommended in the 2000 LEC Plan, certain rulemaking efforts were grouped in phases to allow for the cumulative analysis of the water resource and consumptive use implications of the regulatory program. The South Florida Water Management District (SFWMD or District) may also impose water shortage declarations to curb consumptive use withdrawals pursuant to Section 373.246, F.S. Water shortage declarations are designed to prevent MFL violations.

Another goal of the rulemaking schedule was to adopt rules as the technical information became available. As a result, the 2000 LEC Plan recommended that rulemaking should proceed for concepts that were sufficiently identified and evaluated in the planning process. Since the 2000 LEC Plan, MFLs have been established for the Everglades, Lake Okeechobee, the Biscayne Aquifer (SFWMD 2000c); the Northwest Fork of the Loxahatchee River (SFWMD 2002b); the Caloosahatchee River and Estuary (SFWMD 2000d); the St. Lucie River and Estuary (SFWMD 2002c); and, Florida Bay (SFWMD 2006b).

In addition, uncertainties in the rulemaking process, such as delays for development of supporting technical data or rules, created challenges with the proposed schedule for MFL rule development. The proposed schedule is, therefore, adapted each year to account for delays, while considering the need to develop associated rules through a coordinated rulemaking process. The schedule for development of MFLs is presented in **Chapter 6**.

In developing MFL recovery and prevention strategies, it is essential that the role of MFLs under Chapter 373, F.S., be identified. The SFWMD developed the 2000 LEC Plan based on a resource protection framework that helps identify the role of MFLs in relation to the other tools implemented under the statute. These concepts provide the basis for the proposed recovery and prevention strategies.

The overall goal of Chapter 373, F.S., is to ensure the sustainability of water resources of the state (Section 373.016, F.S.). Chapter 373, F.S., provides the District with several tools to carry out this responsibility. These tools have various levels of resource protection standards. Water resource protection standards in Chapter 373, F.S., must be applied together as a whole to meet this goal. Pursuant to Parts II and IV of Chapter 373, F.S., surface water management and CUP regulatory programs must prevent harm to the water resource. Minimum flows and levels must be set at the point at which further withdrawals could cause significant harm to the water resources or ecology of the area. Water shortage statutes, on the other hand, dictate that permitted water supplies must be restricted in a manner that prevents serious harm from occurring to the water resources. Other protection tools include reservations of water for fish and wildlife, or health and safety (Section 373.223(3), F.S.), and aquifer zoning to prevent undesirable uses of the groundwater (Section 373.036, F.S.).

The levels of impacts—harm, significant harm and serious harm—are relative resource protection terms. Each plays a role to help achieve the ultimate goal—to achieve a sustainable water resource. The role of MFLs is shown conceptually in **Figure 1**.

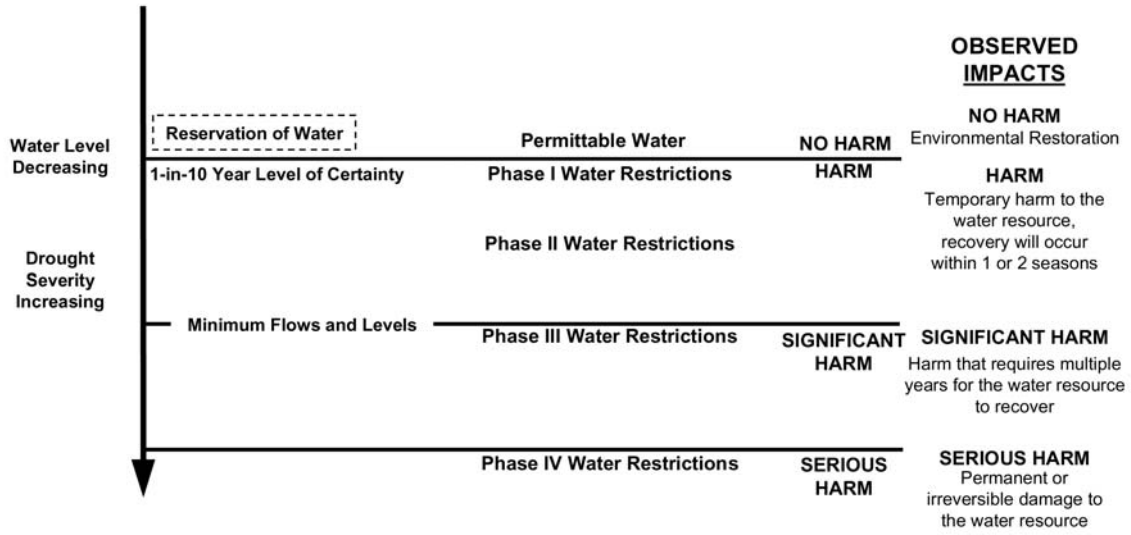

Figure 1. Conceptual Relationship among the Harm, Serious Harm and Significant Harm Standards.

Section 373.0421, F.S., requires that once the MFL technical criteria have been established, the water management districts must develop and expeditiously implement a recovery and prevention strategy for those water bodies that are currently exceeding, or are expected to exceed, the MFL criteria. Section 373.0421(2), F.S., provides the following in relevant part:

> The recovery or prevention strategy shall include phasing or a timetable which will allow for the provision of sufficient water supplies for all existing and projected reasonable-beneficial uses, including development of additional water supplies and implementation of conservation and other efficiency measures concurrent with, to the extent practical, and to offset, reductions in permitted withdrawals, consistent with the provisions of this chapter.

It is possible that the proposed MFL criteria cannot be achieved immediately, because of the lack of adequate regional storage and/or ineffective water distribution infrastructure. These storage and infrastructure shortfalls will be resolved through water resource development and water supply development projects, construction of facilities, and improved operational strategies that will increase the region's storage capacity and improve the existing delivery system. Planning and regulatory efforts, therefore, will include a programmed recovery process that will be implemented over time to improve water supply and

distribution to protect water resources and functions. The recovery process includes the following:

- A list of projects will be provided, which includes the structural solutions for the recovery plan and prevention strategy, as well as the timing and funding requirements for each project. **Table 1** provides a list of the various water resource development projects identified in this plan update that will provide water to meet the proposed MFL targets and water reservations. These projects include projects associated with the Comprehensive Everglades Restoration Plan (CERP), as well as the District's Acceler8 initiative and programs. **Table 1** also includes anticipated completion dates of these projects and the estimated amounts of water to be delivered to each area by components to meet the proposed MFLs and other water needs.
- If necessary to prevent the MFL criteria from being exceeded, demand management cutbacks for recovery during drought conditions will also be identified (e.g., phased water shortage restrictions to prevent significant or serious harm). This LEC Plan Update does not propose the use of the Water Shortage Plan [Chapter 40E-21, Florida Administrative Code (F.A.C.)] as a MFL recovery strategy. However, when a drought occurs, the District will rely on the Water Shortage Plan, as needed, to address regional system water availability.
- To the extent practicable, the District attempts to implement water deliveries to reduce or prevent the MFL criteria from being exceeded. For example, operational guidelines needed for implementation of water supply deliveries to avoid MFL exceedances, in concert with meeting other required water demands, are identified in the document, entitled *Adaptive Protocols for Lake Okeechobee Operations* (SFWMD *et al.* 2003).
- Before considering reduction in permitted withdrawals in a recovery and prevention strategy, all practical means to prevent reductions in available water supplies for consumptive use will be explored and implemented. When determining whether reductions in existing legal uses are required, the following factors shall be considered:
  - The extent of MFL shortfall directly caused by existing legal uses.
  - The practicality of avoiding the need for reductions in permitted supplies, including structural and operational measures, by maximizing the beneficial uses of the existing water source.
  - The risk of significant harm resulting from the existing legal use in the interim period before the recovery strategy is fully implemented.

Table 1. Water Resource Development Projects in the CERP, Acceler8 and District Programs That Provide Water Supplies Associated with MFL Recovery Plans and Prevention Strategies [d].

MFL Water Body	Water Resource Development Projects	Program	Finish date [a]	Est. cost ($ mil.)
Everglades (including WCAs and ENP) – projects needed for MFL Recovery	Modified Water Deliveries to Everglades National Park	SFWMD/ USACE	2010	398.0
	C-111 Spreader Canal/Operational Modifications [b] (diverts 360,000 acre-ft per year [ac-ft/yr])	Acceler8	2010	46.8
	WCA-3A/3B Seep. Management (70,000 ac-ft/yr)	Acceler8	2009	30.3
	EAA Storage Reservoir - Phase 1 (190,000 ac-ft)	Acceler8	2010	536.6
	Acme Basin B (1,028 ac-ft; diverts 32,000 ac-ft/yr)	Acceler8	2008	36.9
	Fran Reich Preserve (42,000 ac-ft/yr)	Acceler8	2009	41.3
	C-11 Impoundment (4,800 ac-ft)	Acceler8	2009	85.5
	C-9 Impoundment (6,600 ac-ft)	Acceler8	2009	58.2
	Decompartmentalize WCA-3A	CERP	2015-2020	290.1
	EAA Storage Reservoir (120,000 ac-ft)	CERP	2015-2020	184.5
Lake Okeechobee – projects needed for MFL Prevention	Lake Okeechobee Storage (250,000 ac-ft)	CERP	2010-2015	338.4
	Taylor Creek/Nubbin Slough Reservoir (50,000 ac-ft)	CERP	2010-2015	94.1
St. Lucie Estuary – projects needed for MFL Prevention	Ten Mile Creek Reservoir (6,100 ac-ft)	SFWMD	2008	32.0
	C-44 Reservoir/STA (50,600 ac-ft)	Acceler8	2009	339.8
Caloosahatchee Estuary – projects needed for MFL Recovery	C-43 West Reservoir (170,000 ac-ft)	Acceler8	2010	334.0
	C-43 Basin ASR (220 MGD)	CERP	2015-2020	213.0
Loxahatchee River – projects needed for MFL Recovery	C-51 and Southern L-8 Reservoir (47,000 ac-ft)	CERP	2015-2020	306.5
	G-160, 161 Structures	CERP	2006	2.3
	West Palm Beach Water Catchment Area ASR[c]	CERP	2015-2020	49.9
Florida Bay – projects needed for MFL Prevention	Florida Bay/Florida Keys Feasibility Study	CERP	2010	6.0
	WCA-3A/3B Seep. Management (70,000 ac-ft/yr)	Acceler8	2009	30.3

a. Dates to complete projects are taken from CERP 2005 MISP Status report and the Acceler8 October 2006 Project Status report. Finish dates are for completed construction. Specific years are not provided for CERP projects scheduled for completion beyond 2010; ranges are identified in five-year increments.
b. C-111 Operational Modifications are part of the Modification to South Dade Conveyance System in Southern Portion of L-31N and C-111 canals component.
c. The West Palm Beach Water Catchment Area ASR is part of the L-8 Project.
d. MFL rules identify the general programs that will be used to develop and implement prevention or recovery, rather than specific projects. The potential role of specific projects to address MFL water needs is generally considered in the respective MFL technical supporting documentation.

MFL PREVENTION STRATEGY THROUGH WATER SHORTAGE PLAN IMPLEMENTATION

Minimum flows and levels are the point at which further withdrawals would cause significant harm to water resources. Significant harm is defined as the level of harm that requires multiple years for the water resource to recover. This is considered to be more severe than the harm standard imposed in the CUP process, which relates to impacts that would occur during a 1-in-10 year drought. Therefore, MFLs in a recovered natural system would not be exceeded until conditions had already exceeded the 1-in-10 year drought level of certainty criteria. Serious harm, the ultimate harm to the water resources contemplated under Chapter 373, F.S., can be interpreted as long-term, irreversible or permanent impacts to the water resource. Minimum flows and levels are associated with significant harm, which is considered to be less severe than serious harm, and therefore, may act as triggers to impose water shortages.

The District has implemented its water shortage authority by restricting consumptive uses based on the concept of shared adversity between users and the water resources (Chapter 40E-21, F.A.C., Amended August 14, 2003). Under this program, different levels or phases of water shortage restrictions with varying levels of severity are imposed relative to the severity of drought conditions. The four phases of current water shortage restrictions are based on progressively increasing resource impacts leading up to serious harm. Under the District's program, Phase I and II water shortages primarily reduce water use through conservation techniques and minor use restrictions, such as restrictions on car washing and lawn watering. Phases III and IV, however, require use cutbacks that are associated with some level of economic impact to the users, such as the potential for crop damage due to agricultural irrigation restrictions. Established MFLs are considered in the evaluation of current water conditions (Rule 40E-21.221(3)(d), F.A.C.), and as a basis for establishing water use restrictions (Rule 40E-21-271(3)(d), F.A.C.).

MFLS FOR SPECIFIC WATER BODIES

MFL Criteria for Lake Okeechobee

The MFL criteria for Lake Okeechobee were established in 2001. Significant harm criteria (SFWMD 2000c) were based on the relationship between water levels in the lake and the ability to: a) protect the coastal aquifer against saltwater intrusion; b) supply water to Everglades National Park; c) provide littoral zone habitat for fish and wildlife; and, d) ensure navigational and recreational access. Consideration was also given to the lake's function as a storage area for

supplying water to adjacent areas, such as the Everglades Agricultural Area (EAA), the Seminole Indian Tribe, the Caloosahatchee and St. Lucie basins, and the Lake Okeechobee Service Area. The MFL criteria for Lake Okeechobee were defined as follows: "Water levels should not fall below 11 ft NGVD for more than 80 days duration, more often than once every six years, on average (SFWMD 2000c)."

Effects of Lake Okeechobee Regulation Schedule Proposed Changes

Subsequent to adoption of the Lake Okeechobee MFL criteria, the SFWMD amended the regional water shortage rule, Chapter 40E-22, F.A.C., to allow for a lowering of trigger stages by 0.5 feet National Geodetic Vertical Datum (NGVD). In addition, the U.S. Army Corps of Engineers (USACE) is currently conducting a Lake Okeechobee regulation schedule study to determine how best to manage water levels in the lake by releasing water through water management structures to the Caloosahatchee Estuary to the west, the St. Lucie Estuary to the east, and to major canals south of the lake. The USACE's Jacksonville District has initiated a schedule for revising the current Lake Okeechobee regulation schedule, based on operational changes only, without the benefit of any new construction. The document to revise the regulation schedule, a draft Supplemental Environmental Impact Statement, is under way. In 2007, when a new Lake Okeechobee regulation schedule is slated for implementation, water managers will immediately begin a process of developing further revisions to the regulation schedule that will take into account construction of early CERP projects, including Acceler8 project components. The proposed changes to the regulation schedule may affect the occurrences of low lake levels that will exceed the MFL criteria.

MFL Criteria for the Everglades

Technical relationships considered for developing MFL criteria for the Everglades included the effects of water levels on hydric soils and plant and wildlife communities, and frequency and severity of fires (SFWMD 2000c). Impacts associated with significant harm include increased peat oxidation, frequency of severe fires, soil subsidence, loss of aquatic refugia, loss of tree islands, and long-term changes in vegetation or wildlife habitat. The proposed minimum water level criteria for the Everglades were based on protecting the two dominant soil types found within the ecosystem—peat-forming wetlands and marl-forming wetlands

Water levels within wetlands overlying organic peat soils within the Water Conservation Areas (WCAs), Rotenberger and Holey Land wildlife management areas, and Shark River Slough (Everglades National Park) shall not fall below ground surface for more than 30 days and shall not fall below 1.0 foot below ground for one day or more of that 30-day period, at specific return frequencies

for different areas. Rule 40E-8.221(3), F.A.C., identifies these water levels as shown in **Table 2**.

Table 2. Minimum Water Level, Duration and Return Frequency Performance Measures for Selected Water Management Gauges Located within the Everglades (SFWMD 2000c and Rule 40E-8.221(3), F.A.C.).

Area	Key Gauge	Soil Type	Minimum Depth (ft) and Duration (days)	Return Frequency (years)
Loxahatchee National Wildlife Refuge (WCA-1)	1-7	Peat	-1.0 ft > 30 days	1-in-4
WCA-2A	2A-17	Peat	-1.0 ft > 30 days	1-in-4
WCA-2B	2B-21	Peat	-1.0 ft > 30 days	1-in-3
Holey Land WMA	HoleyG	Peat	-1.0 ft > 30 days	1-in-3
Rotenberger WMA	Rotts	Peat	-1.0 ft > 30 days	1-in-2
Northwest corner of WCA-3A	3A-NW	Peat	-1.0 ft > 30 days	1-in-4
Northwest WCA-3A	3A-2	Peat	-1.0 ft > 30 days	1-in-4
Northeast corner of WCA-3A	3A-3	Peat	-1.0 ft > 30 days	1-in-3
Northeast WCA-3A	3A-NE	Peat	-1.0 ft > 30 days	1-in-2
Central WCA-3A	3A-4	Peat	-1.0 ft > 30 days	1-in-4
Southern WCA-3A	3A-28	Peat	-1.0 ft > 30 days	1-in-4
WCA-3B	3B-SE	Peat	-1.0 ft > 30 days	1-in-7
Northeast Shark River Slough	NESRS-2	Peat	-1.0 ft > 30 days	1-in-10
Central Shark River Slough	NP-33	Peat	-1.0 ft > 30 days	1-in-10
Southwest Shark River Slough	NP 36	Peat	-1.0 ft > 30 days	1-in-7
Marl wetlands east of Shark River Slough	NP-38	Marl	-1.5 ft > 90 days	1-in-3
Marl wetlands west of Shark River Slough	NP-201 G-620	Marl	-1.5 ft > 90 days	1-in-5
Rockland Marl Marsh	G-1502	Marl	-1.5 ft > 90 days	1-in-2
Taylor Slough	NP-67	Marl	-1.5 ft > 90 days	1-in-2

Water levels within marl-forming wetlands, which are located east and west of Shark River Slough, the Rocky Glades and Taylor Slough within Everglades National Park, shall not fall below ground surface for more than 90 days and shall not fall below 1.5 feet belowground for one day or more of that 90-day period at specific return frequencies for different areas, as identified in **Table 2.**

Two general types of impacts (direct and indirect) can occur within the Everglades that can be attributed to consumptive use withdrawals (SFWMD 2000c). Indirect impacts occur as a result of making regional water deliveries to

areas other than the Everglades. Direct impacts result from pumping of adjacent wellfields that lower the water table along the eastern edge of the Everglades, affecting wetlands located directly west of the north-south perimeter levee. The District's current CUP criteria prohibit the issuance of permits that would cause harm to water resources. As a result, in areas where the MFL criteria are being exceeded (significant harm occurring), no consumptive use permits could be issued that would cause an additional drawdown under the 1-in-10 year level of certainty.

MFL Criteria for the Biscayne Aquifer

Criteria for the Biscayne Aquifer were developed based on analysis of technical relationships among groundwater levels and canal water levels, and the potential for saltwater intrusion (SFWMD 2000c). Harm occurs when the saltwater interface moves farther inland than has occurred historically due to seasonal water level fluctuations, up to and including a 1-in-10 year drought. Significant harm occurs when saline groundwater moves inland to an extent that it limits the ability of users to obtain fresh groundwater in the amounts specified in their permits and will require several years for the freshwater source to recover. The proposed criteria do not address the groundwater base flows to Biscayne Bay. Data are currently being collected to define MFLs for this water body and a MFL for Biscayne Bay – South is slated for completion in 2008.

The term minimum level for the Biscayne Aquifer refers to water levels associated with movement of the saltwater interface landward to the extent that groundwater quality at the withdrawal point is insufficient to serve as a water supply source for a period of several years before recovering. For evaluation of model simulations, operational criteria are applied to the coastal canals that receive regional water. **Table 3** provides the minimum canal operational levels for 11 primary water management structures. To meet the operational criteria, the canal stage cannot fall below the levels for more than 180 days, and the average annual stage must be sufficient to allow levels and chloride concentrations in the aquifer to recover to levels that existed before a drought or discharge event occurred.

Table 3. Minimum Canal Operation Levels of Coastal Canals (SFWMD 2000c).

Canal/Structure	Minimum Canal Operation Levels to Protect Against MFL Violations (ft NGVD)
C-51/S-155	7.80
C-16/S-41	7.80
C-15/S-40	7.80
Hillsboro/G-56	6.75
C-14/S-37B	6.50
C-13/S-36	4.00
North New River/G-54	3.50
C-9/S-29	2.00
C-6/S-26	2.50
C-4/S-25B	2.50
C-2/S-22	2.50

MFL Criteria for the Caloosahatchee River and Estuary

The Caloosahatchee Estuary MFL criteria are based on maintaining freshwater base flows to the upper reaches of the Caloosahatchee Estuary, which will prevent excessive salinity levels in the estuary from causing significant harm to submerged aquatic vegetation and fish and invertebrate communities (SFWMD 2000d). Research data were used to relate freshwater flow rates to salinity distributions along the Caloosahatchee River and to correlate biological community responses to varying salinity conditions. These relationships were established for submerged aquatic vegetation, fish and invertebrates, with major emphasis on the salinity requirements of the freshwater grass *Vallisneria* (commonly known as tape grass or eel grass). It was determined that the distribution and abundance of *Vallisneria* at a location 30 kilometers upstream of Shell Point is the best biological indicator for addressing freshwater flow needs for the restoration of the Caloosahatchee Estuary. The magnitude of die-off, combined with the frequencies of die-off events, and the resulting impact to fisheries resulting from the loss of *Vallisneria* habitat formed the basis of the proposed MFL criteria.

Low freshwater flows, when sustained, cause an increase in salinity, which result in die-off of *Vallisneria* to less than 20 shoots per square meter, as measured at a monitoring station located 30 kilometers upstream of Shell Point during the months of February through April. Significant harm to the Caloosahatchee

Estuary is considered to occur when these freshwater grasses die back due to high salinity from low freshwater inflows for three years in succession. Harm to the Caloosahatchee Estuary is considered to occur when freshwater grasses die back due to high salinity from low freshwater inflows, for two consecutive years. The freshwater inflow needed to prevent harm or significant harm is an average of 300 cubic feet per second (cfs) per day at the S-79 Structure during the months of February through April.

The MFL Rule 40E-8.011(3), F.A.C., stated that the minimum flow criteria for the Caloosahatchee River and Estuary should be reviewed and amended as needed within one year of the effective date of the rule. The purpose of this review is to re-examine the technical and scientific basis of the Caloosahatchee MFLs based on review comments and results from field observations, laboratory experiments and model development. The status update document (SFWMD 2003) specifically evaluated the ability of the 300 cfs discharge at the S-79 Structure to protect the submerged aquatic vegetation.

MFL Criteria for the St. Lucie River and Estuary

The MFL Rule 40E-8.341, F.A.C., for the St. Lucie River and Estuary states that mean monthly flows to the St. Lucie Estuary should not fall below 28 cfs from the Gordy Road Structure to the St. Lucie River North Fork for two consecutive months during a 365-day period, for two consecutive years. The proposed MFLs criteria for the St. Lucie River and Estuary were based on the determination that significant harm occurs to the oligohaline zone when net freshwater flows (sum of surface and groundwater inflows minus evaporation) to the estuary are at or below zero for a period of two consecutive months for two or more years in succession (SFWMD 2002c).

MFL Criteria for Florida Bay

The MFL criteria for Florida Bay were formally adopted by the District's Governing Board in November 2006. Pursuant to the MFL Rule 40E-8.221(5), F.A.C., a MFL violation occurs in northeastern Florida Bay when a MFL exceedance occurs during two successive years, more than once in a 10-year period. An exceedance of the minimum flow criteria will be deemed to occur when the average salinity over 30 or more consecutive days exceeds 30 parts per thousand (ppt) at the Taylor River salinity monitoring station, located at 25° 13' 29" north and 80° 39' 10" west (SFWMD 2006b). Multiple events of 30 or more day periods with salinity greater than 30 ppt, occurring within a single calendar year, are considered as a single exceedance.

MFL Criteria for the Northwest Fork of the Loxahatchee River

Pursuant to the MFL Rule 40E-8.221(1), F.A.C., a MFL violation occurs in the Northwest Fork of the Loxahatchee River when a MFL exceedance occurs more than once in a six-year period. A MFL exceedance occurs in the Northwest Fork of the Loxahatchee River when flows over the Lainhart Dam, located in the Northwest Fork of the Loxahatchee River, decline below 35 cfs for more than 20 consecutive days, or the average daily salinity concentration expressed as a 20-day rolling average exceeds two parts per thousand. The average daily salinity will be representative of mid-depth in the water column at River Mile 9.2 (SFWMD 2002b).

MFL RECOVERY AND PREVENTION STRATEGIES FOR SPECIFIC WATER BODIES

Pursuant to the requirements of the MFL statute, analyses of current and future conditions were conducted for each of the priority water bodies for which MFLs had been defined. When the evaluation showed that MFLs were not being achieved or will not be met in the future, recovery or prevention strategies, as appropriate, were developed. Following are the MFL recovery/prevention strategies for Lake Okeechobee and the Everglades. The evaluations showed that MFLs for the Biscayne Aquifer are expected to be met; therefore, a recovery/prevention strategy was not required.

Lake Okeechobee

The original analysis of modeling runs conducted for the 2000 LEC Plan (SFWMD 2000b), including the Water Supply and Environment (WSE) Regulation Schedule, indicated that MFL criteria for Lake Okeechobee were met. As a result, the MFL criteria were not likely to be exceeded even with the implementation of the 2000 LEC Plan, and thus, a recovery plan was not needed for Lake Okeechobee. The prevention strategy consisted of implementing the Water Shortage Plan (Chapter 40E-21, F.A.C.), including supply-side management and operation of lake structures under the WSE Regulation Schedule, as analyzed in the 2000 LEC Plan. In recent years, changes have been made to the Water Shortage Plan, and the USACE is in the process of revising the Lake Okeechobee regulation schedule. Exceedances of the MFL criteria may be more likely in the future, depending on changes that may occur to the Lake Okeechobee regulation schedule.

The USACE's proposed Lake Okeechobee regulation schedule modification may result in lake levels that will potentially exceed the District's Lake Okeechobee Minimum Flow and Level, as described in Chapter 40E-8, F.A.C. It is not possible to determine how the current MFL criteria will be affected until the USACE finalizes the operations plans. However, in the course of public review and comment pertaining to USACE proposals, questions have been raised as to whether the current MFL criteria accurately represent significant harm to water resources and ecology of the lake. Data collected since the original lake MFL was established suggest the low lake stage may be beneficial to several functions of the lake. As a result, it is recommended that the lake MFL be re-evaluated based on the current information to determine if changes are warranted.

In the meantime, staff identified several lake management options that can be implemented to improve the lake as a result of extreme lake levels associated with droughts. The proposed activities provide a means to partially offset conditions caused by periods of extremely low lake levels. Because these lower lake levels can provide opportunities to conduct lake remediation and restoration efforts that otherwise would not be possible, such periods of low water conditions will allow the District to conduct native aquatic and tree plantings, as well as sediment scraping and other habitat enhancements, and possibly efforts to supplement natural apple snail populations. **Table 4** identifies some of the stage-dependent initiatives that can be undertaken by the District and other agencies to offset the significant harm, which would otherwise be caused by low Lake Okeechobee water levels that exceed MFL criteria.

Table 4. Components of the Lake Okeechobee Recovery Plan.

Lake Level	Recovery Component	Benefits
At 11' NGVD and the stage is falling	Sediment scraping and other habitat enhancements, including removal of tussocks and other aggregations of organic material, such as the western berm.	Promote natural compaction, removal and/or oxidation of accumulated organic muck sediments. Removes barriers to fish migration in and out of the western littoral zone.
At or below 11' NGVD	Conduct controlled burns if fuel load and weather conditions permit.	Facilitate the removal of exotic species, such as torpedograss.
Below 11' NGVD	Allow maintenance and repair work on public boat ramps, and docking and marina facilities.	Restore original design depth of the waterways and provide navigable access.
At 10.5' NGVD and the stage is falling	Plant native terrestrial and emergent vegetation, such as bulrush (if a method for re-establishment proves to be feasible), native pond apples (*Anona galbra*), and cypress trees on the southern shore islands and on rim canal spoil islands.	Re-establish native trees on the islands to help prevent expansion of exotic and invasive vegetation and provide essential habitat for wading birds, raptors and endangered species, such as the snail kite and Okeechobee gourd.
Between 10' and 11' NGVD and the stage is rising	Plant native vegetation species, such as submerged aquatic vegetation (SAV) and emergent vegetation, such as bulrush.	Re-establish native plant species, which can prevent the expansion of exotic and invasive vegetation; assist in restoring fish and wildlife habitats; prevent uprooting of emergent and submerged plants; and, reduce turbidity, which in turn promotes and maintains SAV growth
At 11' NGVD and the stage is rising	Assess the feasibility of introducing apple snail populations via an apple snail hatchery or other techniques.	Supplement native apple snail populations for the endangered snail kite.
Non-lake stage dependent components	Investigate sediment management strategies in the tributaries and the pelagic zone of the lake.	Remove phosphorus-laden sediment that has the potential to re-suspend, and thus, reduce light transparency, which discourages growth of SAV and encourages phytoplankton bloom activity.

Everglades National Park and the Water Conservation Areas

This section discusses the water supply issues related to the Water Conservation Areas (WCAs) and Everglades National Park; the urban areas in Palm Beach, Broward and Miami-Dade counties and the Florida Keys portion of Monroe County; and, three adjacent regional ecosystems—the Northwest Fork of the Loxahatchee River, Biscayne Bay and Florida Bay. Although it is located in the Upper East Coast (UEC) Planning Area, Martin County is considered to the degree that future water supply may be affected by rulemaking related to the Northwest Fork of the Loxahatchee River.

As described in **Chapter 3**, the Everglades and the three adjacent ecosystems were naturally interconnected by sloughs and rivers prior to man's creation of drainage and other features, and the ecosystem components are still connected by water management facilities. Extensive efforts are under way to restore more natural water movement to and between the areas, while addressing the needs of a growing population.

In the 2000 LEC Plan, the Governing Board recommended development of a rule to identify the water available from the Everglades ecosystem (WCAs, Everglades National Park, and Holey Land and Rotenberger wildlife management areas) for allocation to consumptive uses. The 2000 LEC Plan recognized there were several tools to do this, including reservations, MFLs and consumptive use permit (CUP) rules. Prior to 2000, the District did not have any rules in place to analyze the cumulative regional effect of consumptive uses on the Everglades systems. The modeling conducted in the 2000 LEC Plan to estimate the additional water available from the Everglades assumed that the Comprehensive Everglades Restoration Plan (CERP) would be implemented as scheduled, growth would increase as projected and that operations of major regional sources, such as Lake Okeechobee, would not change.

A MFL for the Everglades was adopted in 2001, which found that significant harm was occurring to the ecosystem, and a recovery strategy for achieving the MFL was adopted. This recovery plan did not propose to place strict limits on projected increases from the regional system; however, it assumed that if growth occurred in the projected time frames and the CERP was implemented as scheduled, increases in allocations depending on the Everglades source for recharge could continue at a measured pace. This approach was implemented for the next several years. Also in 2003, along with the B-List rules, a permit duration rule was adopted that identified the Central and Southern Florida Flood Control Project (C&SF Project) and dependent groundwater sources as a "source of limited availability." This meant that only historically used demands would receive a 20-year duration at permit renewal, and increases over that amount

would only be authorized for a five-year period. In 2004, as a next step to respond to requests for additional water from sources dependent on Everglades recharge greater than the volume contemplated in the 2000 LEC Plan, the District developed the Consumptive Use Permit/CERP (CUP/CERP) Guiding Principles. Under these principles, the District continued to authorize measured increases in allocations even over those projected in the 2000 LEC Plan, as long as no impact from such allocations were projected to occur on water availability from the Everglades.

During the next two years, however, these assumptions relied on implementing the MFL recovery plan, and the consumptive use permitting process did not bear out as planned. As a result, in the consumptive use permitting process (even as early as 2002), the Governing Board continued to develop policies to address the increasing requests for water from the Everglades ecosystem. In these permits, increased demands over historic use were authorized only for a temporary time period, during which alternative sources or offsets to replace the increased reliance on the Everglades were required to be developed. These policies continued to be developed on a permit-by-permit basis until April 2006 when the Governing Board authorized staff to initiate rule development on a Regional System Water Availability Rule to limit increased dependence on the Everglades system. This rulemaking effort is also addressing withdrawals that require increased water from the Loxahatchee River Watershed water bodies.

In February 2007, the SFWMD Governing Board authorized the adoption of the Regional System Water Availability Rule. This rule limits allocations on permit renewal or modification to conditions or pumpage, depending on the specific use class, that existed prior to April 1, 2006, known as the "base condition water use." The rule only allows allocations over the "base condition water use" if additional impacts to the Everglades are avoided through alternative source development, or eliminated through the implementation of offsets (recharge barriers, recharge trenches), or terminated or reduced water uses that existed as of April 1, 2006. Wet-season water can also be allocated if the permit applicant demonstrates that such flows are not needed for restoration of the Everglades pursuant to the CERP, Acceler8 or the *Northern Palm Beach County Water Management Plan* (for the Loxahatchee River Watershed water bodies) (SFWMD 2002a). This rule also becomes a part of the MFL recovery plan for both the Everglades and the Northwest Fork of the Loxahatchee River.

Biscayne Aquifer

Measures to prevent the MFL criteria from being exceeded for the Biscayne Aquifer are as follows: 1) maintain coastal canal stages at the minimum operation levels specified in the MFL rule; 2) implement CUP conditions for issuance to prevent harmful movement of saltwater intrusion up to a 1-in-10 year level of certainty; 3) maintain a groundwater monitoring network and use data to initiate water shortage cutbacks should the threat of saline water movement become imminent; and, 4) conduct research in high risk areas to identify where the position of the saltwater front is adjacent to existing and future potable water sources (SFWMD 2000c). In addition, the District is conducting studies and providing incentives to local governments to use highly treated reclaimed water to provide aquifer recharge, combat saltwater intrusion, reduce the potential for MFL exceedances in the Biscayne Aquifer, and reduce conflicts between urban water uses and water needed for protection of natural systems.

Caloosahatchee River and Estuary

The MFL update study (SFWMD 2003) concluded that the 300 cubic feet per second (cfs) target for flows across the S-79 Structure, by itself, does not provide sufficient flow to fully protect water resources from significant harm. Additional or improved storage facilities may need to be provided in the watershed, including downstream of the S-79 Structure. The MFL should incorporate local basin runoff west of the S-79 Structure. Flows higher and lower than the average of 300 cfs should be considered based on the downstream impact. However, before any decisions are made to modify the CERP projects or the MFL criteria, estuarine and biological models need to be completed and fully calibrated, and improved flow measurements need to be obtained, especially for downstream tidal basin inflows.

Since establishing the MFL criteria for the Caloosahatchee River, the criteria have been exceeded during three of four years, resulting in one MFL violation (two consecutive years). The expectation is that periodic to frequent exceedances and violations of these criteria will continue to occur until the recovery plan is implemented. The recovery plan includes such projects as the Acceler8 C-43 West Reservoir Project (see **Table 1**), which, when completed and operational, will provide additional flow to the estuary during dry periods. Despite difficulties in meeting the MFL, high-volume flows during 2004, 2005 and 2006 were a much greater concern.

The SFWMD adopted revisions to the manner in which water is released from Lake Okeechobee, as described in the document, entitled *Adaptive Protocols for Lake Okeechobee Operation*s (SFWMD *et al.* 2003). These protocols, among other features, establish criteria for releasing water from the lake to alleviate problems

that arise from low-flow conditions in the Caloosahatchee River, including the upstream migration of salt water. Water managers are allowed to release water to the estuary as needed when the lake is within Zone D, without obtaining prior permission from the Governing Board. When the lake is in lower zones, releases can be made to the estuary to alleviate salinity problems and prevent exceedances of the MFL criteria, with Governing Board concurrence. Such releases have been made several times during recent years and have proven to be helpful in reducing the magnitude and frequency of MFL exceedances.

Analyses of both the 1995 and 2020 base cases, as presented in the 2000 LEC Plan (SFWMD 2000b), showed that the proposed MFL criteria for the Caloosahatchee Estuary would be exceeded. Therefore, a recovery plan was needed. Quantities of water in Lake Okeechobee seem to be insufficient to avoid significant harm to the Caloosahatchee Estuary until the proposed long-term regional storage facilities that comprise the recovery plan are built. These regional storage facilities, including aquifer storage and recovery (ASR) and regional surface water reservoirs, were recommended in the 2000 LEC Plan and the *Caloosahatchee Water Management Plan* (CWMP) (SFWMD 2000a).

Long-term evaluations conducted for both the *Central and Southern Florida Project Comprehensive Review Study* (Restudy) (USACE and SFWMD 1999) and the CWMP (SFWMD 2000a) indicated that both MFLs and minimum restoration flows (300 cfs during the spring) can be met through a combination of constructed reservoirs and limited deliveries from Lake Okeechobee and ASR systems located within the basin. Over the next five years, activities for construction of regional facilities include: a) implementation of the Caloosahatchee River (C-43) ASR Pilot Project; b) development of the Project Implementation Report (PIR) for the C-43 West Reservoir; and, c) completion of the Southwest Florida Feasibility Study. The reservoir and ASR projects are scheduled for completion in 2010 and 2015, respectively (**Table 1**).

St. Lucie River and Estuary

Although the St. Lucie River and Estuary currently receive an adequate supply of fresh water, and are expected to continue to do so as the CERP is implemented, a prevention strategy may be required to protect this resource (SFWMD 2002c). The ability to better manage water in the watershed may also make it possible to capture and retain water from the watershed for allocation to other users (e.g., urban and agricultural water supply).

The primary prevention strategy component is to manage discharges into the North Fork within the operational protocols of the Ten Mile Creek Project, construction of which was completed in 2006, with the exception of storm damage repairs and improvements. These projects are expected to be completed in 2008. In addition, research and monitoring efforts for the North and South

Forks of the St. Lucie River are being developed and implemented by the SFWMD Watershed Management Department to determine long-term water needs in the river and estuary

Northwest Fork of the Loxahatchee River

The MFL study indicated that the proposed criteria for the Loxahatchee River will be exceeded on a regular and continuing basis, and therefore, recovery and prevention strategies are needed to protect water resources in the river from significant harm. Analysis of historical information shows that over the past 10 years, the proposed minimum flow level of 35 cfs is exceeded approximately 25 percent of the time under current conditions (SFWMD 2002b). These low-flow conditions occurred frequently, such that an exceedance of the MFL criteria (flow less than 35 cfs for 20 consecutive days duration) occurred 34 times in 31 years or approximately once each year. The proposed criteria cannot be met because of a lack of sufficient water conveyance infrastructure and regional storage facilities. To address these issues, the MFL document identified specific projects that will be built in coming years to provide additional water to supplement the river and continue monitoring efforts to track the effects of these changes on water resources.

The structural and operational features of the recovery plan will be implemented through ongoing SFWMD water supply development efforts, including projects identified in the 2000 LEC Plan (SFWMD 2000b), many features of the *Northern Palm Beach County Comprehensive Water Management Plan* (SFWMD 2002a), and the Restudy (USACE and SFWMD 1999). The CERP projects will also provide the additional water needed to achieve restoration for the river (USACE and SFWMD 2005).

While the various projects are being built, a key component for the river's management is to continuously monitor salinity at River Mile 9.2, flow across Lainhart Dam and periodically assess vegetation communities in the floodplain. This information will be used as a basis to operate water control facilities to deliver a flow of 50 cfs to the river whenever sufficient water is available from the regional system as a means to reduce the upstream migration of salt water in the Northwest Fork.

Although sufficient water needed to meet the MFL recovery plan was provided by projects within the 2000 LEC Plan (SFWMD 2000b), the additional water needed to meet the restoration goals will need to be provided by the CERP North Palm Beach County Project – Part 1. The CERP includes features that will increase storage in the L-8 Basin through the construction of a reservoir and ASR wells (USACE and SFWMD 1999). Modeling studies using discharge scenarios, which included the CERP and 2000 LEC Plan projects, indicate that the MFLs and the restoration plan targets will be met when these facilities are

completed and fully operational. As noted previously, the Regional System Water Availability Rule addresses the Loxahatchee River Watershed and will become part of the MFL Recovery Plan.

Florida Bay

Data analysis and modeling studies provided in the report, entitled *Technical Documentation to Support Development of Minimum Flows and Levels for Florida Bay* (Florida Bay MFL Technical Support Document) (SFWMD 2006b), indicated that the MFL criteria were not likely to be exceeded under recent historic climatic conditions (represented by 36 years of historical rainfall records from 1965 to 2000) and current operational policies and procedures. Therefore, a recovery strategy was not required for the northeastern Florida Bay MFL. However, a prevention strategy is provided to minimize the likelihood that a violation of the MFL criteria will occur.

Technical studies conducted by the District and described in the *Technical Documentation to Support Development of Minimum Flows and Levels for Florida Bay* indicate that prevention of future significant harm to water resources and functions in northeastern Florida Bay can be achieved by continuing to provide sufficient freshwater flow to maintain monthly average salinities of less than 30 practical salinity units (psu) at the Taylor River monitoring site. Modeling studies indicated that high salinities (greater than 30 psu) generally occurred in the salinity transition zone (saline wetland adjacent to Florida Bay) during periods when salinities at the Taylor River site were elevated (19 psu or higher) at the beginning of the calendar year, local rainfall was below normal, and total freshwater flows to northeastern Florida Bay were below normal.

As part of a continuing adaptive management program for this region, upstream and downstream flows, water levels and salinity at the Taylor River site, and submerged aquatic vegetation (SAV) resources along the transect should be continually monitored. Within the framework of the Combined Structural and Operational Plan (CSOP) for the Modified Water Deliveries to Everglades National Park and C-111 Project, freshwater flows through the transition zone can potentially be managed prior to dry periods to prevent high salinity conditions by providing water from the regional system. Analyses for the MFL did not determine whether regional water would be available under such dry conditions, if the quality would be acceptable, or if any other portions of the Everglades ecosystem would be impacted. As noted previously, the Everglades ecosystem is a MFL water body in recovery. Any proposal for increased withdrawals, whether for consumptive use or environmental enhancement of another ecosystem, must be considered in that light.

Analyses needed to guide any potential operational modifications for improved management of freshwater discharges to the headwaters of Taylor Slough and

the southeast Everglades will be done with full consideration of the Everglades MFL and in coordination with the CSOP and other ongoing projects and planning efforts, most notably the C-111 Spreader Canal Acceler8 and CERP projects; the CERP Florida Bay and Florida Keys Feasibility Study; and, any associated operational and construction plans pursuant to these projects.

Results presented in the Florida Bay MFL technical report did indicate that total annual freshwater flows into northeastern Florida Bay above 105,000 acre-feet and/or three-month total flows in the early dry season above 7,000 acre-feet are generally sufficient to avoid exceedances of the MFL salinity criterion and severe ecological impacts, such as loss of SAV habitat and associated organisms within the transition zone and northeastern Florida Bay. These estimates provide an initial guide toward successful MFL adaptive management. Such an adaptive approach was also recommended by the independent peer review panel that reviewed the Florida Bay MFL Technical Support Document (SFWMD 2006b).

If water demands on the regional system increase in the future, or water is diverted away from Taylor River to meet demands elsewhere within the Everglades, then future planning efforts and field tests may be required at that time to evaluate the feasibility of providing additional regional storage, which may be needed to meet MFL requirements for the protection of the Florida Bay ecosystem.

Florida Bay Monitoring and Research Needs

The adopted MFL rule calls for the District to "continue field monitoring and research to assess salinity, water level and flow conditions and biological resource response in the region… ." Monitoring and research are necessary to: 1) assess the state of the Florida Bay ecosystem relevant to the documentation and prevention of MFL exceedances, and 2) to assess the validity of adopted MFL criteria to prevent significant harm and improve the scientific basis for any future revision of the Florida Bay MFL criteria. The adopted Florida Bay MFL rule specifies that a review and potential revision of the rule will be done within five years of adoption of the original rule. The scientific peer review of the Florida Bay MFL technical documentation generally supported the approach, concept and conclusions used to define the MFL criteria, but also identified a number of areas where additional information or research is needed to further support the results and conclusions. Actions recommended by the peer review panel are summarized in Section 2, which follows.

1) Monitoring for MFL Rule Documentation and Prevention of Exceedances.

The Florida Bay MFL Rule specifies that the salinity criterion be based on measurements at a single indicator site, the Taylor River site. Salinity is currently measured at this site by Everglades National Park (ENP) with support from the District. It is essential that this monitoring continue. Furthermore, the MFL rule

specifies the minimum flow estimated to be needed to prevent an exceedance and specifies a set of five stations where this flow is measured. These flow meter stations are at the mouths of major creeks flowing into Florida Bay and are operated by the U.S. Geological Survey (USGS). It is also essential that monitoring of freshwater discharge at these sites continue. The MFL technical report also noted that stages at the Craighead Pond site in lower Taylor Slough are a promising indicator of MFL exceedances. Continued stage monitoring at this site (by ENP) is strongly recommended. Information from this monitoring is essential for the success of any adaptive operational efforts to prevent exceedances.

2) Monitoring and Research to Assess the Validity of MFL Criteria to Prevent Significant Harm and Improve Future Florida Bay MFL Criteria.

An independent scientific peer review panel reviewed the Florida Bay MFL Technical Support Document (SFWMD 2006b) and found it to be a sound initial effort to quantify the relationship between hydrologic and biological resources, provide a basis for the definition of significant harm, and provide a basis for MFL criteria. However, the peer review report (*Overall Review and Responses to Technical Questions "Technical Documentation to Support Development of Minimum Flows and Levels (MFL) for Florida Bay"*) did identify many shortcomings of the technical analysis, and the panel's recommendations helped guide the development of these important monitoring and research plans for MFL technical improvement within the next five years (SFWMD 2006a). Key recommendations include:

- Broaden the geographic domain of the MFL.
- Improve hydrologic modeling.
- Continue monitoring *Ruppia maritima* and initiate *Ruppia* research.
- Initiate *Ruppia* modeling.
- Consider other submerged aquatic vegetation in the salinity transition zone as MFL indicators.
- Increase information and analysis of the relationship of salinity, habitat (e.g., with *Ruppia*), and animal species.

Continuation of existing hydrologic monitoring (see previous Section 1) should provide sufficient information for assessment and improvement of the Florida Bay MFL. However, improved modeling over a broader scale, as recommended by the peer review panel, should soon be possible, because of model development within the CERP's Florida Bay and Florida Keys Feasibility Study (FBFKFS). On an independent, but parallel path, this project is exploring relationships between structural operations, water levels, flows and salinity in Florida Bay. The development and application of TIME (watershed) and EFDC (hydrodynamic) models will provide tools that can better characterize the hydrologic-salinity relationships in the northeastern Florida Bay subregion and the bay as a whole. The FBFKFS presents an opportunity to evaluate these

hydrologic-salinity relationships and provides either additional support for, or a basis to, modify the current MFL Rule. These models may need to be further modified or refined in order to provide sufficient spatial or temporal resolution to determine the influence of managed flows or operational effects on salinity. Within the span of two years, a decision point is expected to be reached to determine whether an independent project is needed to support the MFL effort through supplemental data collection or model modification.

Based on the peer review report, it is clear that improved information is needed on the status and trends, and cause and effect relationships of several submerged aquatic vegetation species that comprise critical habitat of Florida Bay and its salinity transition zone. Foremost is the need to better document the distribution and seasonality of *Ruppia* in relationship to salinity change and test the adequacy of the species as the MFL indicator. Expanding the geographic extent of monitoring along the northern edge of Florida Bay, including waters from Long Sound to near Garfield Bight (and, if possible, Whitewater Bay), will provide a wider range of salinity and conditions than were considered in the initial MFL technical report. This will also provide the ability to test the variability of *Ruppia* response patterns and assumptions associated with the MFL criteria. Other associated submerged aquatic vegetation species (including more salinity sensitive species, such as *Najas, Chara, Utricularia*) should also be monitored. Research of *Ruppia* should, as recommended by the review panel, include experiments on salinity and other interacting factors that affect the growth, survivorship and reproductive success of the species. Finally, the Florida Bay Seagrass Community Model should be expanded to include *Ruppia*.

While the initial Florida Bay MFL did include the analysis of forage fish and other animals within Florida Bay proper, it did not include the analysis of information about the animal community of the salinity transition zone. Furthermore, analyses that were included were relatively crude and indicated high uncertainty regarding the effects of salinity and water management on these resources. Thus, the peer review panel strongly recommended new monitoring and research to assess the status of fish and macroinvertebrates, their sensitivity to salinity levels, and dependence of habitat quantity and quality. The greatest need is within the salinity transition zone, and initiating monitoring and research to assess relationships with salinity and habitat in coastal ponds will greatly advance the ability to improve the scientific basis of the MFL. Complex modeling is not practical within the next five years, and numerical analyses will likely be done using statistical approaches.

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MEETING SOUTH FLORIDA'S RAPIDLY GROWING WATER SUPPLY NEEDS WHILE SAFEGUARDING ITS NATURAL SYSTEMS REQUIRES INNOVATIVE SOLUTIONS, COHESIVE PLANNING AND A SHARED VISION FOR THE FUTURE.

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