
Analysis of Water Supply Potential for Area B, the Everglades Buffer Strip, and the Hillsboro Basin: Phase 3b East Coast Buffer Implementation (C-4123-A3) Executive Summary

Prepared For



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

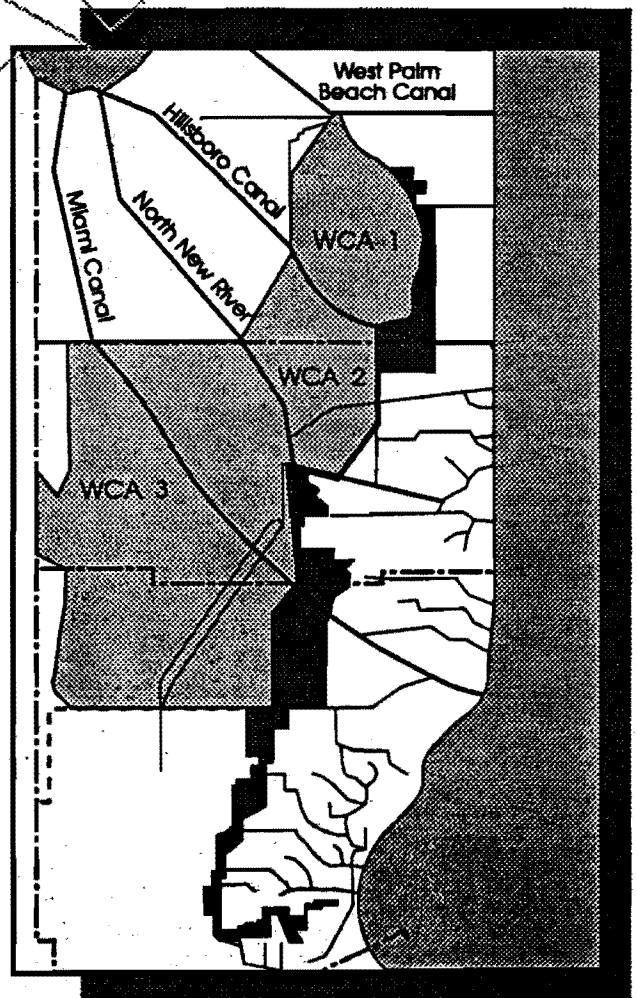
Prepared By

CH₂M HILL

In Association With

Mock, Roos & Associates, Inc.
Milian, Swain & Associates, Inc.

September 1994



**Analysis of Water Supply Potential for Area B, the
Everglades Buffer Strip, and the Hillsboro Basin:
Phase 3b East Coast Buffer Implementation
September 30, 1994**

Executive Summary

The South Florida Water Management District (District) is developing a regional water supply plan for the Lower East Coast (LEC) planning area. The overall objective of the LEC Regional Water Supply Plan is to identify water management strategies that will ensure that future water supply demands from all water users within the planning area will be met. One potential approach for enhancing regional capabilities for meeting water supply demands is capture and storage of excess surface waters normally discharged from the LEC to tide via the District's primary canal system. This report summarizes the Phase 3b analyses of the feasibility of surface water backpumping to intermediate surface water management systems, perhaps linked with Aquifer Storage and Recovery (ASR) wells, as a mechanism to enhance long-term water storage capacity. These studies were conducted by the CH2M HILL team in cooperation with the District.

East Coast Buffer Concept

Early during 1994, the National Audubon Society (Audubon) issued its "Report on Water Supply Preserves" (Audubon, 1994). Audubon generally endorsed the concept of storage of excess waters currently discharged to tide, but proposed that the storage facilities be a larger, interconnected system of regional marshlands. The Audubon preserves concept was very similar to prior District considerations of some form of continuous environmental buffer between the Everglades and the LEC as depicted in the District's "2050 Vision", the "Strategic Plan for the 1990s", and in the draft "District Water Management Plan."

As proposed by Audubon, the objectives of these water supply preserves would include the following:

- Raise water levels to prevent drainage of the Everglades and to reestablish natural hydroperiod patterns
- Return to the Everglades system waters that once drained westward from areas west of the coastal ridge
- Ensure appropriate quality of water that might be delivered to the Everglades from the LEC planning area
- Return more natural timing of water deliveries to the Everglades by recreating natural storage systems lost because of historical LEC development
- Increase aquifer recharge, and surface and subsurface storage of water, to enhance regional water supplies that will subsequently be available for urban consumption
- Protect urban drinking water wellfields
- Provide recreational opportunities
- Provide habitat for plants and animals that live in wetland communities
- Eliminate exotic plants

The conceptual preserves would serve as a buffer between the Everglades to the west and the increasingly urbanized areas of the LEC planning area to the east. As conceptualized by the District, this "East Coast Buffer" concept was considered to be compatible with ongoing evaluations of conceptual surface reservoir/ASR facilities. During the spring of 1994, the CH2M HILL team and the District conducted Phase 3a studies directed at identifying lands suitable for inclusion in the conceptual Buffer (see Figure ES-1). On the basis of those studies, it was concluded that the apparent ¹⁰⁰⁰⁻¹⁵⁰⁰water supply yields achievable with the Buffer were limited because of the shallow working depths of the aggregated system. However, significant and multiple environmental benefits were predicted, and the District directed that an additional phase of evaluation be performed.

Phase 3b Scope and Objectives

Under Phase 3b, a series of technical analyses were performed as cooperative work efforts between the District and the CH2M HILL team. Analyses conducted and the relative roles filled by the team members are summarized below:

- **Surface Water Management Facilities Siting:** District staff led a team review of East Coast Buffer siting, and defined the recommended Buffer footprint within different portions of the study area.
- **Water Quality Considerations:** CH2M HILL analyzed water quality data provided by Broward and Dade counties for 12 LEC primary canals to characterize the relative quality of alternative candidate source canals, evaluate compliance with potentially-applicable criteria, and assess probable treatment needs.
- **Conceptual Designs and Cost Estimates:** The District and the CH2M HILL team developed alternative conceptual designs for each of the Buffer management units. Preliminary planning-level cost estimates for system construction and operation were developed with the objective of allowing feasibility study-level comparisons of potential Buffer System alternatives.
- **Water Supply and Wetland Hydroperiod Analyses:** CH2M HILL analyzed water supply and environmental (hydroperiod management) benefits that should be achievable with development of the Buffer.
- **Conceptual Buffer System and ASR Linkage:** CH2M HILL analyzed the potential water supply benefits of linking four example Buffer management units with a range of ASR system capacities.
- **Cost Optimization Analyses:** CH2M HILL compared the costs of several alternative scenarios for development of the East Coast Buffer Management Units.

- **Permitting and Environmental Considerations:** CH2M HILL and Milian, Swain & Associates, Inc. compiled supplemental information regarding permitting requirements and other environmental considerations associated with the Buffer Concept.
- **Implementation Strategies:** District staff led development of conceptual implementation strategies for the East Coast Buffer.

In the aggregate, the Phase 3b feasibility studies were conducted with the overall objective of providing technical information needed to support the District's evaluations of regional management alternatives being analyzed under the LEC regional water supply planning process. Should the District elect to pursue implementation strategies in the future, substantially more detailed analyses will be required, including detailed engineering designs, environmental and economic impact evaluations, and unavoidable impact mitigation plans. As for the studies conducted to date, those detailed analyses would be conducted in cooperation with the counties, other resource management agencies, the private sector, and other interested parties.

Key Points Summary

The analyses conducted and the results and conclusions generated by this phase of study are detailed in the following document. On the basis of these studies, the following key points are highlighted:

1. Surface Water Management Facilities Siting (See Report Section 2)

A total of 32 "cells" were identified, which were subsequently re-combined to form eight Buffer management units analyzed further in subsequent study elements (see Table ES-1 and Figure ES-2). Buffer units were developed with specific water management objectives in mind. Thus, the eight Buffer units were grouped as follows:

Wetland Management Units (Units 1, 3, 4, and 7): To be managed primarily for wetland hydroperiod enhancement and for surface water supplies directed toward meeting natural systems demands.

Surface Water Reservoir (Unit 2): To be managed to meet urban surface water demands.

Aquifer Recharge Basins (Units 5, 6, and 8): To be managed to promote recharge of the Biscayne Aquifer.

2. Water Quality Considerations (See Report Section 3)

Ambient water quality data provided by the Dade County Department of Environmental Resources Management and the Broward County Department of Natural Resource Protection were compiled for the 1989-1993 period and selected key parameters were analyzed to compare the relative water quality of the candidate source canals. These analyses indicated that in general, water quality in this portion of the LEC is relatively good. While some of the average values for selected parameters within the study period exceeded potentially-applicable surface and groundwater quality criteria, the number of parameters of potential concern is low and the extent of the exceedances was small. On the basis of the information available to date, it is expected that passive treatment during water detention within marshes, reservoirs, and recharge basins will result in generally acceptable water quality prior to subsequent water movement to either surface or groundwater systems.

3. Conceptual Designs and Cost Estimates (See Report Section 4)

Conceptual designs were developed for each of the eight Buffer management units. Designs accounted for diversion facilities, levees, seepage recovery systems and/or seepage barriers, internal levees and spillways (if needed), and return flow spillways or pump stations, as applicable. Planning-level cost estimates were generated for each of the eight Buffer units individually, as well as for selected combinations of units that were analyzed together in other study elements. As in the past, land costs/value dominate the cost estimates. Tables ES-2 and ES-3 provide summaries of the estimated costs for the Buffer as a whole with and without the land costs defrayed by conceptual partnerships between government and the private sector.

4. Water Supply and Wetland Hydroperiod Analysis (See Report Section 5)

Environmental considerations, in the form of wetland hydroperiod targets, were imposed on the water supply yield model developed by CH2M HILL during prior project phases. The District and CH2M HILL ecologists worked together in defining a reasonable set of wetland stage criteria to use during the modeling analyses. On the basis of the flow availability analyses previously conducted, approximately 940,000 acre-feet/year (ac-ft/yr) (over 300 billion gallons/year) were identified as potentially divertable to storage (see Table ES-4 and Figure ES-3). The analyses summarized in Table ES-5 resulted in the estimated surface and groundwater yields listed in Table ES-6. Maximum estimated yield was 724,900 ac-ft/yr (about 240 billion gallons/yr), or about 80 percent of the estimated total potentially divertable volumes. About 64 percent of this total would be groundwater recharge; the remainder would be available to meet some form of surface water demand.

The relationships between total discharge to tide, water considered divertable to storage, and the total diverted to either surface or groundwater storage are depicted in Figures ES-4 through ES-6 for the reservoir, wetlands, and recharge basin groups, respectively. Figure ES-7 provides a summary of the estimated composite yields achievable through development of all eight Buffer management units.

Stage frequency information was tracked during the simulations of water supply yield from the wetland management units. As shown by the top line in Figure ES-8, the maximum allowable stage varied seasonally to mimic a hydroperiod pattern considered conducive to maintenance of a short-hydroperiod marsh system comparable to what currently exists in the southeastern portion of Water Conservation Area 3B. Mean monthly stages achieved during the 26-year simulation for each of the wetland management units indicated that the overall stage patterns achieved for Units 1, 3, and 7 closely approximated the desired pattern. Apparently because of less water availability and higher seepage rates, the targeted stages were not regularly achieved for wetland Management Unit 4 (southern part of the Everglades Buffer Strip).

5. Conceptual East Coast Buffer System and ASR Linkage (See Report Section 6)

Analyses of the potential surface and groundwater yields achievable by linking Aquifer Storage and Recovery wells with example Buffer management units was conducted to evaluate the potential hydrologic benefits of combination of these alternative storage technologies. The key results are summarized in Figure ES-9. Analysis of adding varying ASR capacities to Buffer Unit 2a on the Hillsboro Canal (water supply option 2) showed that for this type of reservoir system, the surface water supply yield could be nearly tripled by addition of 45 million gallons per day of ASR capacity. Linking ASR to a wetland management unit (Unit 4, water supply option 5) showed a similar pattern but less of an increase in surface yield, perhaps due to the limited water availability associated with this source canal. In both cases, the total water yield (surface + groundwater yield) was increased by addition of ASR to the surface facilities.

Linkage of ASR with the examples of recharge basins (Units 5 and 6, water supply options 6 and 7), showed a gradual increase in surface water supply yields because of the manageability of waters stored in the Floridan Aquifer as opposed to in the unconfined Biscayne Aquifer. These examples document the improved manageability of waters stored in ASR facilities when compared with the simple recharge of the shallow water table through the recharge basins.

6. Regional Cost Optimization Analysis (See Report Section 7)

Cost estimates and other data generated in Section 4 were used to compare the relative costs of developing different combinations of Buffer management units directed at specific water supply objectives. Separate cost optimization analyses, therefore, were conducted for the units comprised of shallow aquifer recharge basins, above-ground reservoirs, and wetland areas. Solely on the basis of unit costs of total water supply yield, the following "expansion paths" were defined for each category:

Recharge Basin Options:

1. Buffer Unit 8	\$76.35/ac-ft
2. Buffer Unit 5	\$81.76/ac-ft
3. Buffer Unit 6	\$237.09/ac-ft

Reservoir Options:

1. Buffer Unit 2a	\$98.99/ac-ft
2. Buffer Units 2a+2b	\$115.62/ac-ft
3. Buffer Units 1, 2a, and 2b	\$131.81/ac-ft

Wetland Options:

1. Buffer Unit 4	\$43.49/ac-ft
2. Buffer Unit 3	\$48.60/ac-ft
3. Buffer Unit 7	\$105.70/ac-ft

7. Permitting and Environmental Considerations (See Report Section 8)

On the basis of a District inventory of land areas falling into the various land use/land cover classes, nearly 65 percent of the 58,517 acres of land included within the analyzed Buffer management units were classified as existing wetlands of some form (see Table ES-7). Thus, if the entire Buffer footprint were included in the system, nearly 21,000 acres would be converted to wetlands and/or open waters. With adequate attention to Buffer unit management objectives, the opportunity exists for the creation of significant acreages of new wetland systems having improved value as wildlife habitat. In addition, the existing wetlands (about 38,000 acres) should be enhanced by water supply augmentation; the net acreage of lands that should experience improved environmental conditions should approach the 58,517-acre total.

Other aspects of the environmental review included a preliminary assessment of protected plant and animal species that might be present within each of the eight Buffer management units, and an estimate of the pollutant loads diverted away from tide through the

development of the conceptual Buffer units. On the basis of this analysis, the historical load to tide could potentially be reduced by about 63 percent.

On the basis of permitting reviews conducted during prior phases of this study, substantial difficulty is likely in terms of addressing all potential concerns regarding unavoidable environmental effects, and impact mitigation requirements. Most of these types of issues will need to be addressed in future phases of program implementation.

8. Implementation Strategies (See Report Section 9)

District staff led identification of conceptual implementation strategies for elements of the East Coast Buffer. These strategies focus on mechanisms for potential partnerships between government agencies and representatives of the private sector for implementation of Buffer elements, as well as on limited acquisitions of land and inclusion of publicly owned tracts into Buffer components. Implementation strategy concepts remain preliminary; more detailed plans may become available during the course of review of this draft report.

Recommendations

A number of recommendations are included within each of the report sections. Key recommendations include the following:

- Elements of the East Coast Buffer offer substantial water supply benefits to the region; evaluation of the Buffer concept should be included in the alternatives analyses conducted during development of the Lower East Coast Regional Water Supply Plan.
- Detailed designs of the Buffer unit facilities are needed; the District should consider moving on to the next phase of project design.
- Additional environmental permitting discussions with agencies having regulatory jurisdiction over regional facilities development is needed now that the conceptual designs have been developed. Similarly, additional

discussions with the counties and federal, state, regional, and local planning and environmental concerns are needed. The District should work closely with the U.S. Army Corps of Engineers during the Corps' C&SF Restudy to ensure elements of the Buffer concept are appropriately included in the federal analysis. In addition, the District should remain an active participant in the review of the limerock mining industry's proposed Northwest Dade Lakebelt system. Environmental studies being conducted as part of the EIS for this proposed system should be closely monitored for applicability to the East Coast Buffer implementation program.

- Consideration should be given to additional concept development in terms of Buffer unit operations. Alternatives to the flow routes selected may need to be considered on the basis of relative water availability from the different source canals.
- To truly address water quality concerns, more detailed evaluations should be considered. The District may wish to consider augmenting monitoring programs being conducted by the counties to allow expansion of parameter analysis and frequency of monitoring and build a more robust water quality database. To the extent possible, the District and the counties should seek out opportunities for collaborative studies taking advantage of pooled resources, capabilities, and areas of expertise.
- Where possible, the District should work with both the public and private sector in establishing partnerships which might expedite implementation of the Buffer concept. Innovative forging of partnerships should be encouraged so long as the overall result is a net benefit to the environmental systems of the LEC as well as the enhancement of regional water supply capacities.
- The East Coast Buffer studies to date have focused on areas not currently under study by the Corps as elements of the C111 General Reevaluation Report (GRR). The timing appears appropriate for the integration of the Buffer concepts developed for areas north of the C111 study area with the proposed elements of the GRR.

- Opportunities exist for environmental enhancement of wetlands in the southern-most portions of Dade County by applying concepts developed during the various phases of this project. Such studies would be consistent with the objectives of the Emergency Interim Plan for Florida Bay, and would also potentially integrate with C111 GRR implementation efforts.

These analyses of the potential water supply and environmental benefits of implementation of the conceptual East Coast Buffer have identified significant reasons for proceeding with concept development. It is likely that as new information becomes available, the footprint of the overall Buffer may be further constrained, and some elements of the system may ultimately prove to be too costly to develop for either financial or ecological reasons. Despite this possibility, the fact that the system has such great potential for realizing multiple benefits should help support the initiative needed to carry project implementation efforts through to completion. By maintaining focus on the net benefits to both the urban and natural systems of South Florida that could be realized with the Buffer, it should be possible to garner the momentum and support required to cooperatively implement elements of the Buffer system during the course of implementing the Lower East Coast Regional Water Supply Plan.

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**Table ES-1
Buffer Management Units**

Buffer Management Unit	Source Canal	Cell(s)	Area (acres)	Storage Type	Total Area by Storage Type (acres)		
					Reservoir	Recharge Basin	Wetland
1	Hillsboro	5	1,023	wetland			1,023
2a	Hillsboro	7	1,639	reservoir	1,639		
2b	Hillsboro	8	408	reservoir	408		
3	North New River	9 10 11	1,871 1,196 1,027	wetland wetland wetland			4,094
4	C11	12 13 14 15 16 17 18	437 395 1,200 249 83 268 704	reservoir wetland wetland wetland wetland wetland wetland	437		2,899
5	C9	19 20	3,555 4,371	recharge recharge		7,926	
6	C6	21 22 23 24 25	10,130 5,987 512 2,031 805	recharge recharge recharge recharge recharge		19,465	
7	C2 + C4	26 27 28 29 30 31	12,635 1,694 2,878 736 546 533	wetland wetland wetland wetland wetland wetland			19,022
8	C1	32	1,606	recharge		1,606	

Storage Type Characteristics:

Reservoir = 4 foot working depth

Recharge Basin = 4 foot working depth, if possible - includes rock mine lakes

Wetland = variable working depth defined by month (see Figure 5-2)

Table ES-2 Cost Summary Conceptual Cost Estimate			
Unit	Land Acquisition	Capital Cost	Total Cost
0	\$16,845,000	\$2,484,005	\$19,329,005
1	\$3,105,000	\$4,547,822	\$7,652,822
2	\$43,700,000	\$7,111,054	\$50,811,054
3	\$45,555,000	\$6,773,114	\$52,328,114
4	\$31,815,000	\$9,298,580	\$41,113,580
5	\$152,816,000	\$9,807,391	\$162,623,391
6	\$291,960,000	\$28,214,268	\$320,174,268
7	\$285,315,000	\$16,220,594	\$301,535,594
8	\$24,090,000	\$13,500,184	\$37,590,184
Total	\$895,201,000	\$95,473,007	\$993,158,012
Notes: Unit 0 consists of Buffer Cells 1, 2 and 4.			

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Table ES-3
Potential Land Cost Defrayals
Conceptual Cost Estimate

Unit	Total Capital and Land Acquisition Cost	Private Wetlands Proposed for SOR	Total Excluding Prop. SOR	Other Government Wetlands	Total Excluding Prop. SOR, Other Gov. Wetlands	Existing or Potential Mining	Total Excluding Prop. SOR Other Gov. Wetlands, Mining
0	\$19,329,005	\$7,860,000	\$11,469,005	\$8,985,000	\$2,484,005	\$0	\$2,484,005
1	\$7,652,822	\$0	\$7,652,822	\$3,105,000	\$4,547,822	\$0	\$4,547,822
2	\$50,811,054	\$0	\$50,811,054	\$0	\$50,811,054	\$0	\$50,811,054
3	\$52,328,114	\$165,000	\$52,163,114	\$11,985,000	\$40,178,114	\$0	\$40,178,114
4	\$41,113,580	\$900,000	\$40,213,580	\$11,685,000	\$28,528,580	\$0	\$28,528,580
5	\$162,623,391	\$0	\$162,623,391	\$0	\$162,623,391	\$54,000,000	\$108,623,391
6	\$320,174,268	\$0	\$320,174,268	\$10,035,000	\$310,139,268	\$256,560,000	\$53,579,268
7	\$301,535,594	\$180,000,000	\$121,535,594	\$24,630,000	\$96,905,594	\$0	\$96,905,594
8	\$37,590,184	\$0	\$37,590,184	\$1,065,000	\$36,525,184	\$21,765,000	\$14,760,184
Total		\$188,925,000		\$71,490,000		\$332,325,000	
Total	\$993,158,012		\$804,233,012		\$732,743,012		\$400,418,012
Notes: Unit 0 consists of Buffer Cells 1, 2 and 4.							

**Table ES-4
Canal Flow Available for Diversion**

Source Canal	Gaging Station	Total Area (acres)	Average Annual Flow to Tide (ac-ft/yr)	Western Basin Portion (%)	Average Annual Flow Available for Diversion (ac-ft/yr)
Hillsboro	G-56	65,920	156,456	61	95,656
North New River	G-54	19,200	129,405	94	121,939
C11	S-13	66,560	103,149	76	78,616
C9	S-29	62,720	250,677	77	194,143
C6	S-26	44,160	147,592	79	116,659
C2+C4	S-22 & S-25B	72,896	292,148	89	260,914
C1	S-21	36,480	78,487	88	69,120
Totals		367,936	1,157,914	81	937,047

Note: Table is based on 26-year period of record

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Table ES-5
Summary of Water Supply Options Evaluated

Water Supply Option	Buffer Management Unit	Source Canal	Storage Type	Storage Volume (ac-ft)	Demand Type	Analysis Method
1	1+2a+2b	Hillsboro	reservoir/ wetland	8,188 TO 9,825	urban	simulation
2	2a	Hillsboro	reservoir	6,556	urban	simulation
3	2b	Hillsboro	reservoir	1,932	urban	simulation
4	3	North New River	wetland	0 to 6,550	natural systems	simulation
5	4	C11	reservoir/ wetland	1,748 to 6,386	natural systems	simulation
6	5	C9	recharge basin	N.A.	N.A.	potential yield curves
7	6	C6	recharge basin	N.A.	N.A.	potential yield curves
8	7	C2+C4	wetland	0 to 25,273	natural systems	simulation
9	8	C1	recharge basin	N.A.	N.A.	potential yield curves

**Table ES-6
Water Supply Yield Summary**

Water Supply Option	Buffer Management Unit	Demand Type	System Reliability	Average Annual Surface Water Yield (ac-ft/yr)	Average Annual Groundwater Recharge (ac-ft/yr)	Total (ac-ft/yr)
1	1+2a+2b	urban	95%	20,300	16,800	37,100
2	2a	urban	95%	22,400	7,400	29,800
3	2a+2b	urban	95%	23,200	10,100	33,300
4	3	natural systems	70%	42,000	33,100	75,100
5	4	natural systems	70%	47,500	29,300	76,800
6	5	N.A.	N.A.	none	165,000	165,000
7	6	N.A.	N.A.	none	103,000	103,000
8	7	natural systems	70%	145,000	70,900	215,900
9	8	N.A.	N.A.	none	52,000	52,000

Totals:

Maximum urban demand met = 22,400 ac-ft/yr with Option 2

Maximum natural systems demands met = 234,500 ac-ft/yr with Options 4, 5, and 8

Maximum direct recharge = 320,000 ac-ft/yr with Options 6, 7, and 9

Total groundwater recharge (direct + seepage) = 460,700 ac-ft/yr with Options 2, 4, 5, 6, 7, 8, and 9

Maximum yield from all sources (surface water + groundwater) = 724,900 ac-ft/yr with Options 1, 4, 5, 6, 7, 8, and 9

Table ES-7
Land Use Inventory for the East Coast Buffer Management Units

Land Use Categories (Level II/III)	Wetland Units				Aquifer Recharge Units			Reservoir Units		Totals
	Unit 1	Unit 3	Unit 4	Unit 7	Unit 5	Unit 6	Unit 8	Unit 2a	Unit 2b	
ACTC (Truck Crops)	0.44	3.25		176.2	7.91		280.32		0.92	469.04
AFHT (Horse Training/Stables)									12.88	12.88
AMOR (Ornamentals)					49.19			198.79		247.98
APIM (Improved Pasture)					2614.93			1302.46		3917.39
BL (Barren Levees)	10.14							1.24		11.38
BP (Extractive)		12.41			69.95					82.36
BS (Spoil Areas)		18.91	12.76	101.43	1258.99	2840.43	44.29	18.85		4295.66
H (Water)		42.55	9.44	82.07	1239.95	3521.11	315.12	44.13	25.64	5280.01
WFCM (Wet - Cypress/Melaleuca)	838.44									838.44
WFCY (Wet - Cypress)	57.2									57.2
WNSG (Wet - Sawgrass)	115.8									115.8
WFME (Wet - Melaleuca)			480.68	1151.78	2353.56	6553.32				10539.34
WN (Wet - Nonforested)		1527.02	1577.31	16728.51		5782.71	778.33			26393.88
RS (Scrub and Brushland)		2164.32								2164.32
RG (Grassland)			1040.54	735.7	318.34	243.31				2337.89
FOAP (Australian Pines)								73.95		73.95
FOBP (Brazilian Pepper)						97.03			295.73	392.76
UORC (Recreational Facilities)			2.54							2.54
UTTL (Major Transmission Lines)		296.62	204.18			353.55				854.35
UTEP (Electrical Power Facilities)			2.04			0.21				2.25
U (Urban)						1.07				1.07
UI (Industrial)				29.16	0.17	2.92	187.67			219.92
URMH (Mobile Homes)			0.27							0.27
UOPK (Parks)						0.43				0.43
UTWS (Water supply Plants)						61.05				61.05
UOUD (Open Under Development)				2.19					72.99	75.18
USGF (Governmental)				14.41						14.41
URSL (Single Family, Low Dens.)		1.37			5.13					6.5
URSM (Single Family, Med. Dens.)	0.66									0.66
URSH (Single Family, High Dens.)						0.35				0.35
URMF (Multi-Family Bldg)						6.42				6.42

Table ES-7
Land Use Inventory for the East Coast Buffer Management Units

Land Use Categories (Level II/III)	Wetland Units				Aquifer Recharge Units			Reservoir Units		Totals
	Unit 1	Unit 3	Unit 4	Unit 7	Unit 5	Unit 6	Unit 8	Unit 2a	Unit 2b	
UTHW (Major Highways, ROWs)		27.82	4.67							32.49
UTRS (Antenna Arrays)					7.51					7.51
USCF (Correctional)						0.91				0.91
Total Acreages	1022.68	4094.27	3334.43	19021.45	7925.63	19464.82	1605.73	1639.42	408.16	58516.59
Percent Wetlands	98.9	37.3	61.7	94.0	29.7	63.4	48.5	0.0	0.0	64.8
Percent Nonwetlands	1.1	62.7	38.3	6.0	70.3	36.6	51.5	100.0	100.0	35.2
Acres of Wetlands	1011.44	1527.02	2057.99	17880.29	2353.56	12336.03	778.33	0.00	0.00	37944.66
Acres Converted to Wetlands/Open Water	11.24	2567.25	1276.44	1141.16	5572.07	7128.79	827.40	1639.42	408.16	20571.93

FIGURE ES-1.
Results of Phase 3a East Coast
Buffer Suitability Analysis.

East Coast Buffer Suitability Analysis

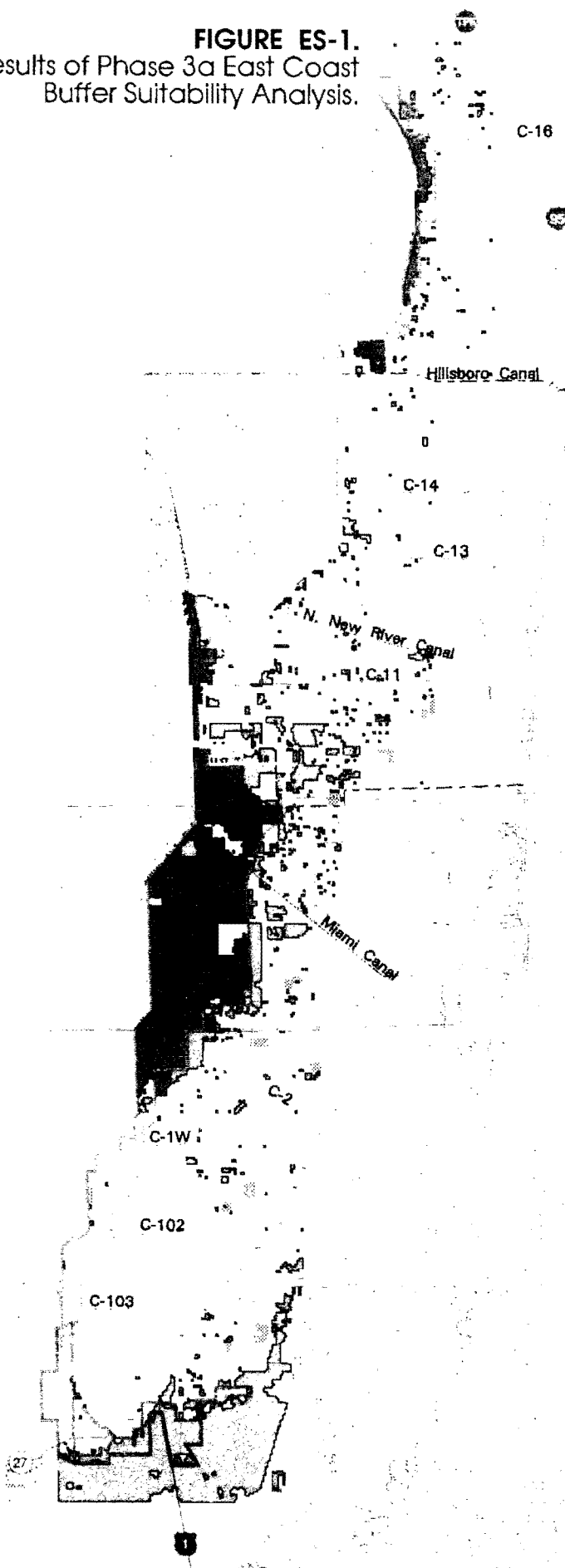
Suitability for Marshes and Reservoirs

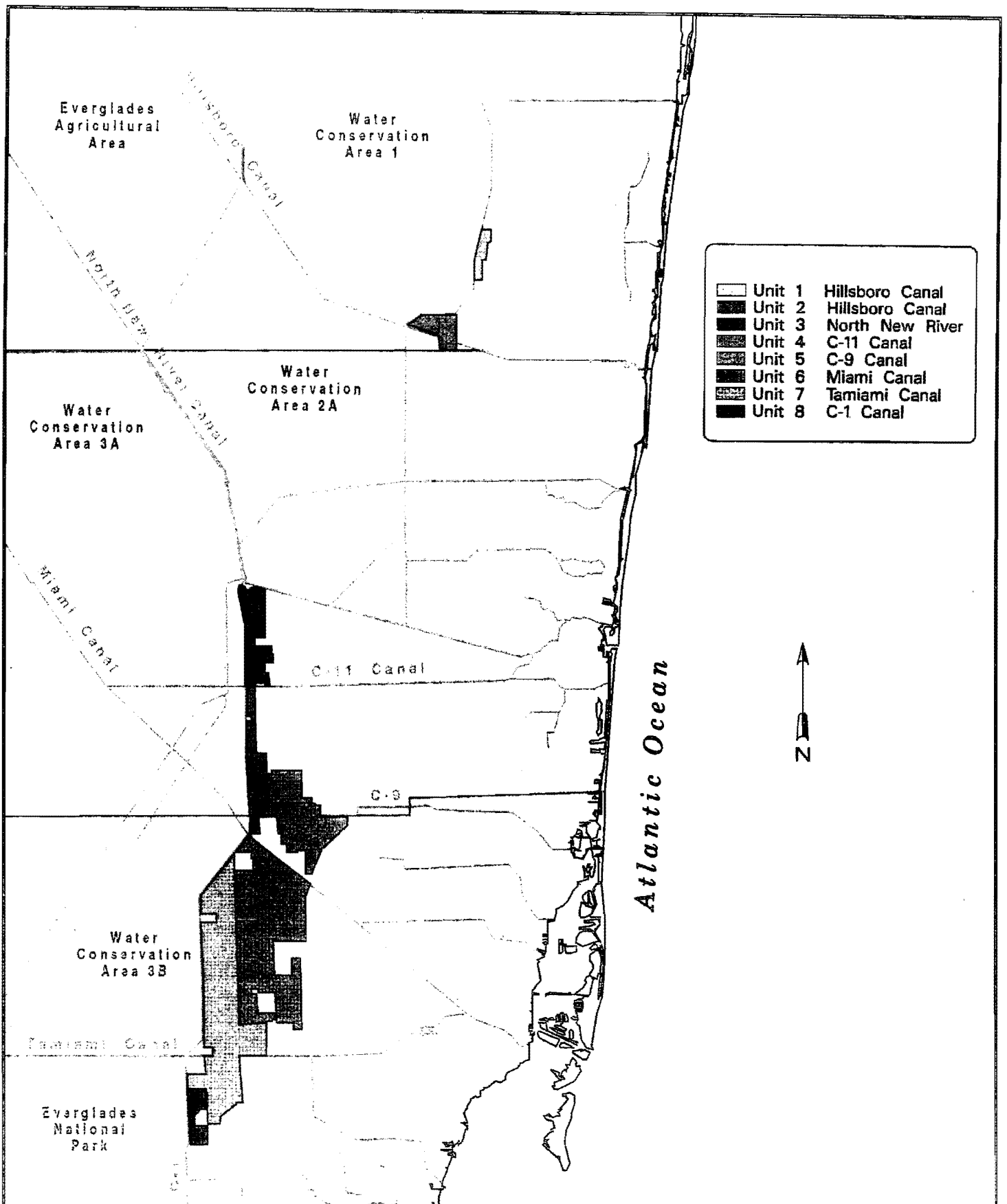
-  Most Suitable Reservoirs
-  Most Suitable Marsh
-  Other Suitable Marsh



South Florida Water
Management District

04-07-10





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Management Units LEC Buffer Concept FIGURE ES-2

SCALE:	Not to Scale
DATE:	Sept. 1994
P.A.	92192.35
DR.	Gxx-xx-xx-1
DRAWN	JGH
APPROVED:	

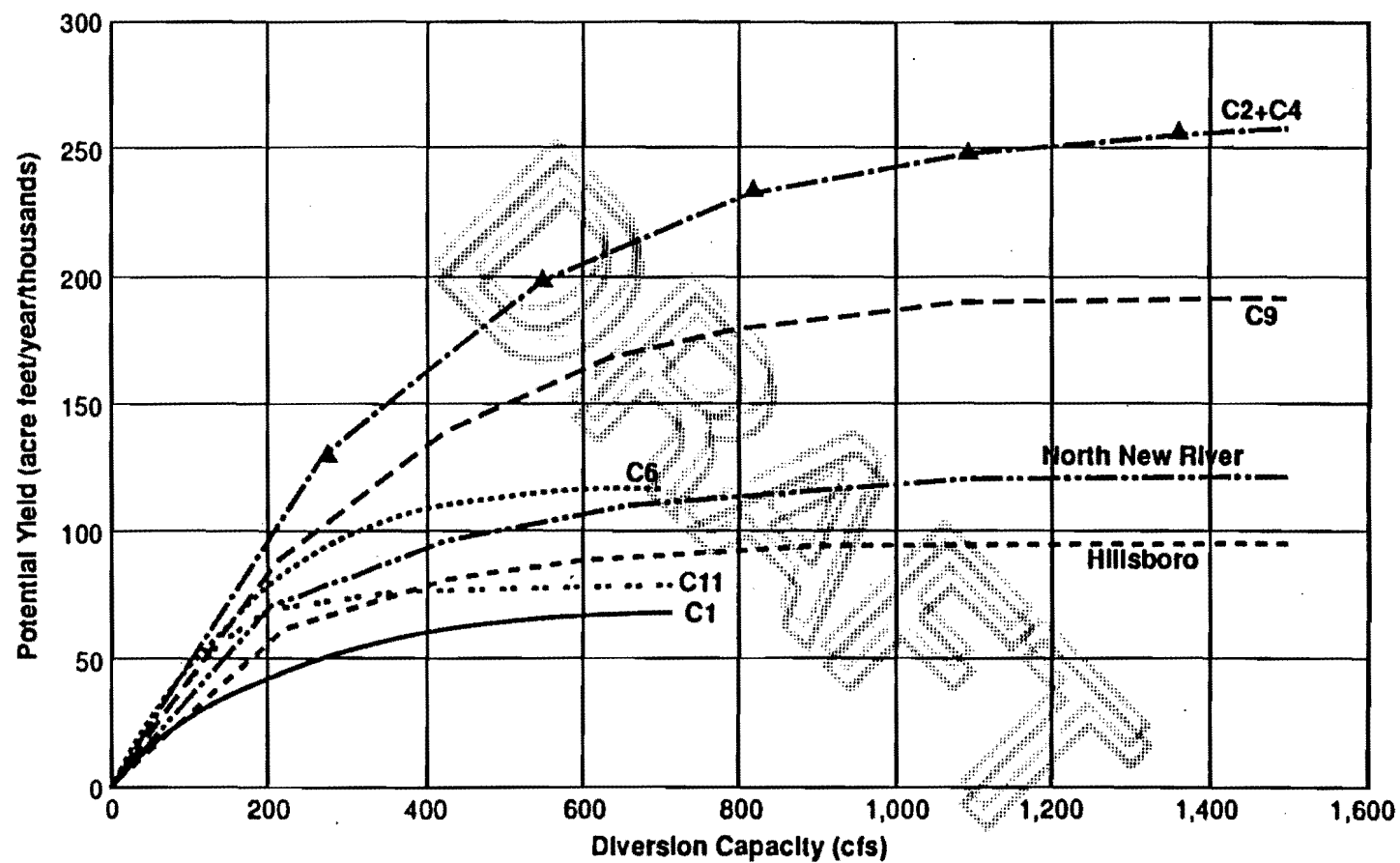
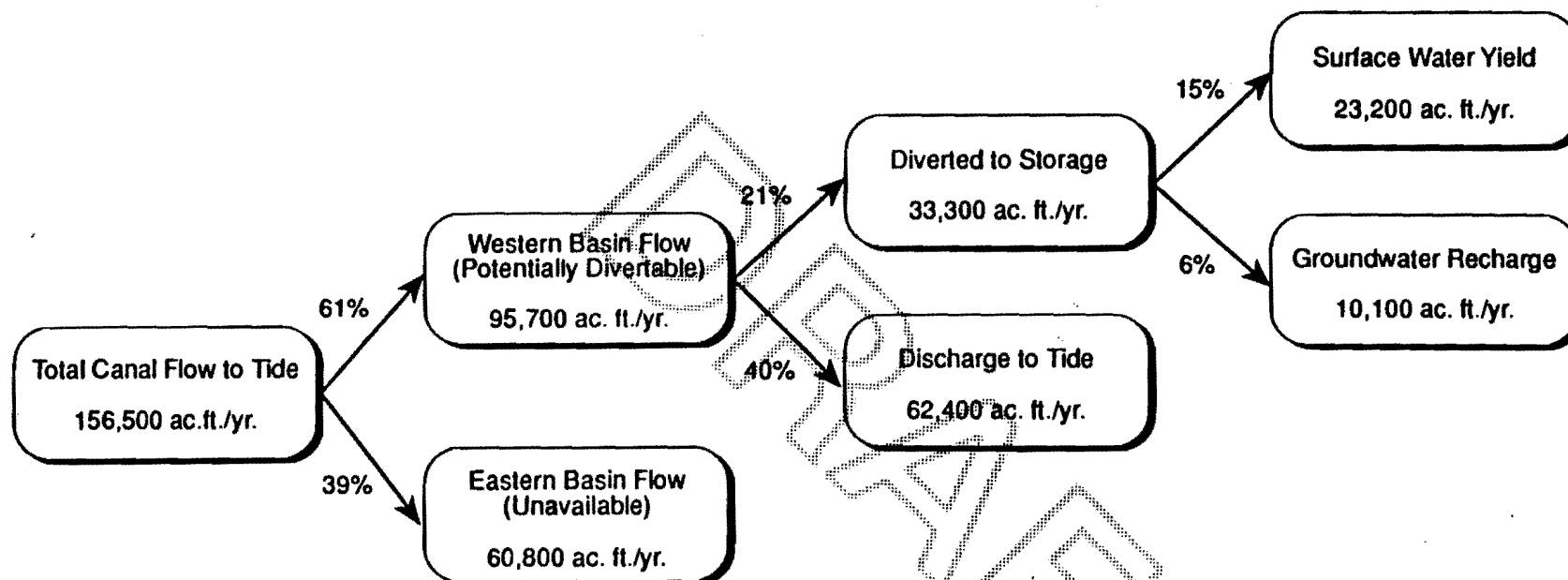


FIGURE ES-3.
Potential Yield for Selected Source Canals.

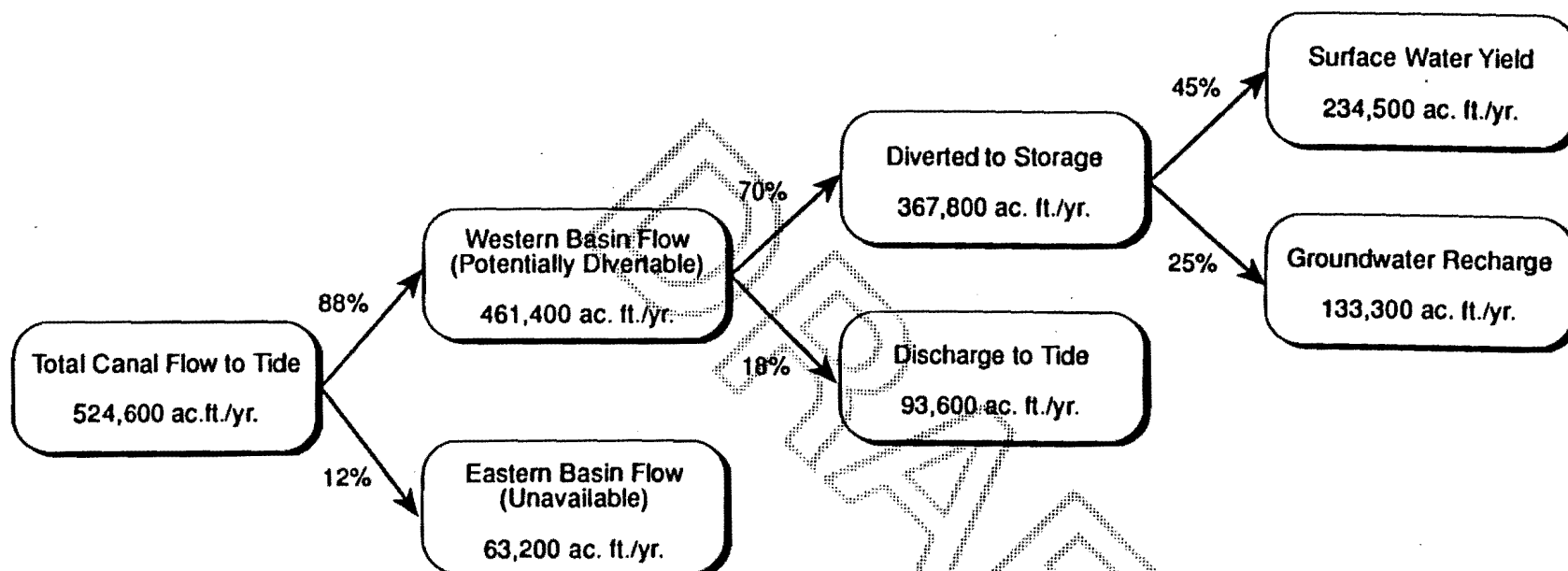




Option	Source Canal
3	Hillsboro

FIGURE ES-4.
Annual Flow Volumes for Urban Demand Distribution.

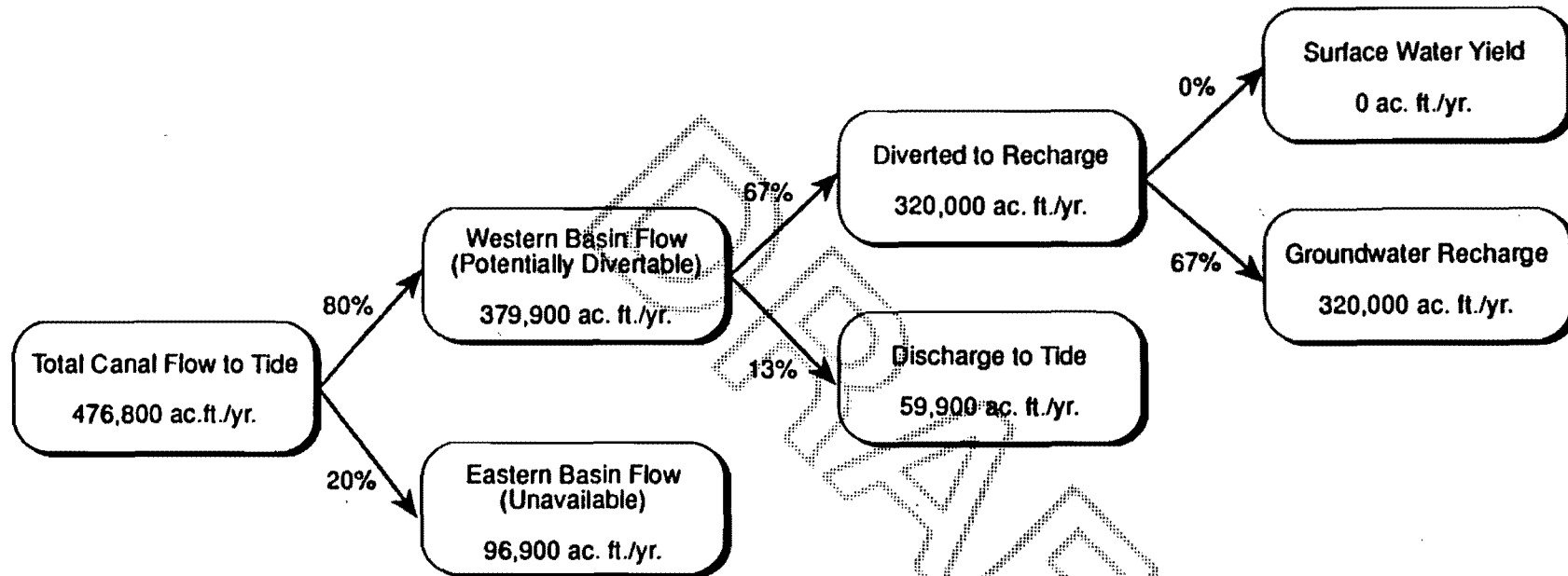




Option	Source Canal
4	New North River
5	C11
8	C2 and C4

FIGURE ES-5.
Annual Flow Volumes for Natural Systems Demand Distribution.

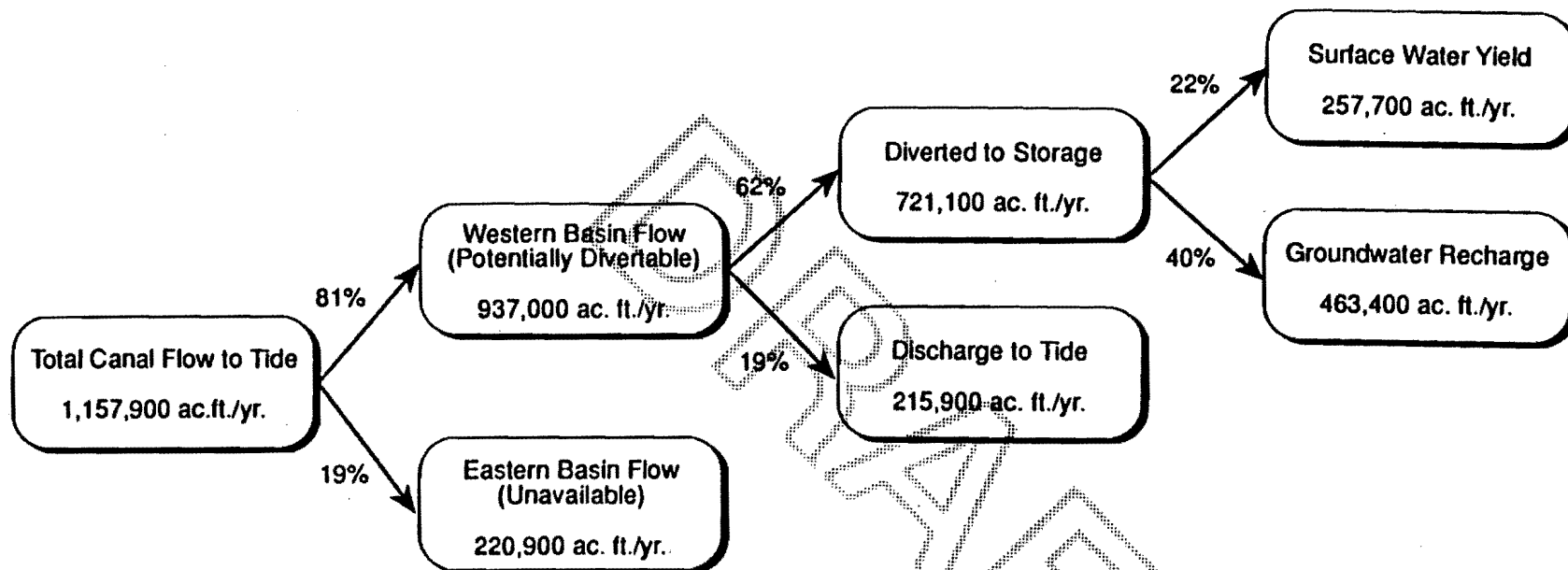




Option	Source Canal
6	C9
7	C6
9	C1

FIGURE ES-6.
Annual Flow Volumes for Direct Groundwater Recharge.





Option	Source Canal(s)
3 thru 9	All

Note: Surface water yield = urban + natural systems

Groundwater recharge = direct groundwater recharge + seepage.

FIGURE ES-7.
Total Annual Flow Volumes.



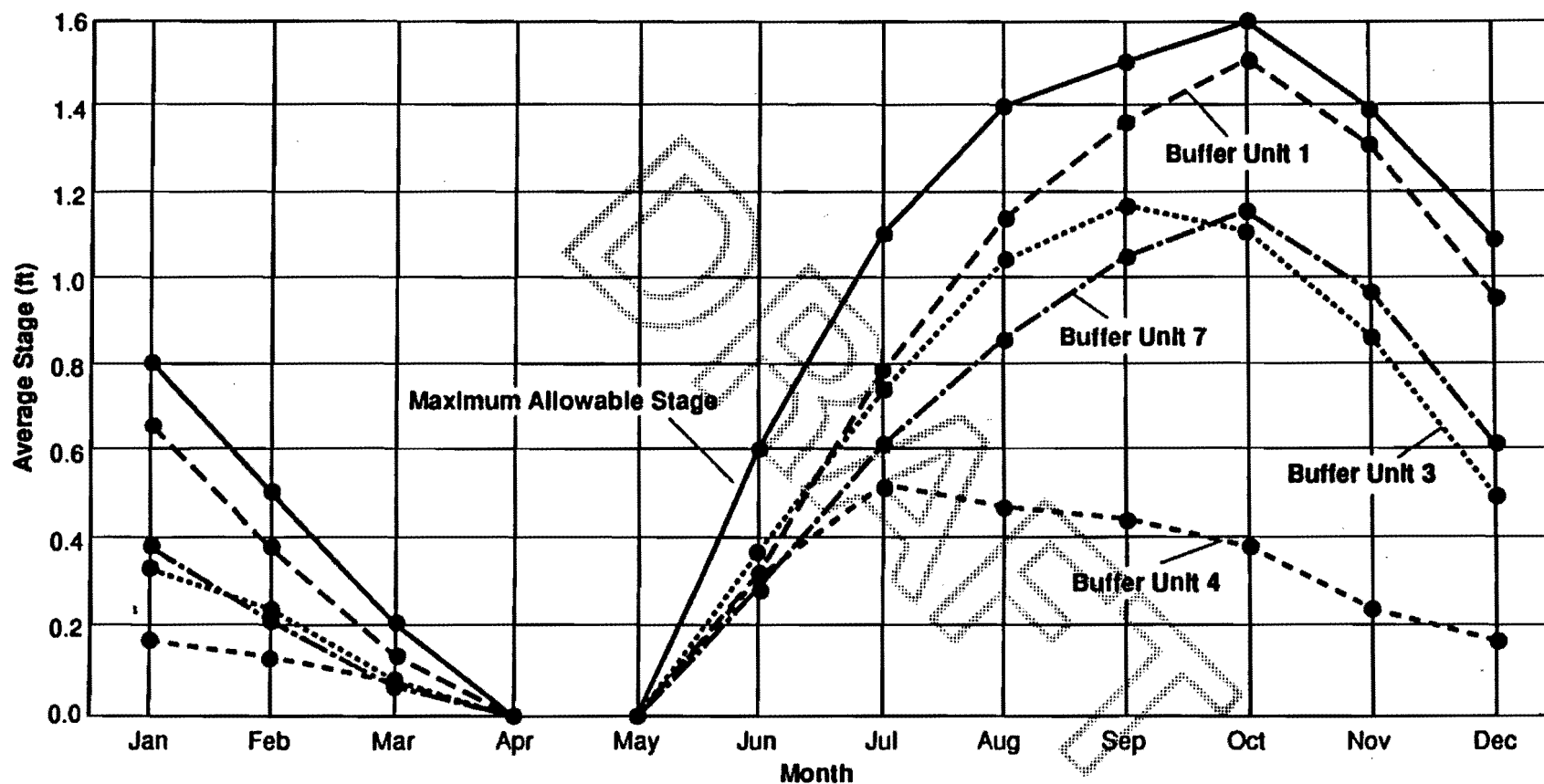


FIGURE ES-8.
Mean Monthly Wetlands Stage for LEC Buffer Units 1, 3, 4, and 7.

ASR Water Supply Summary

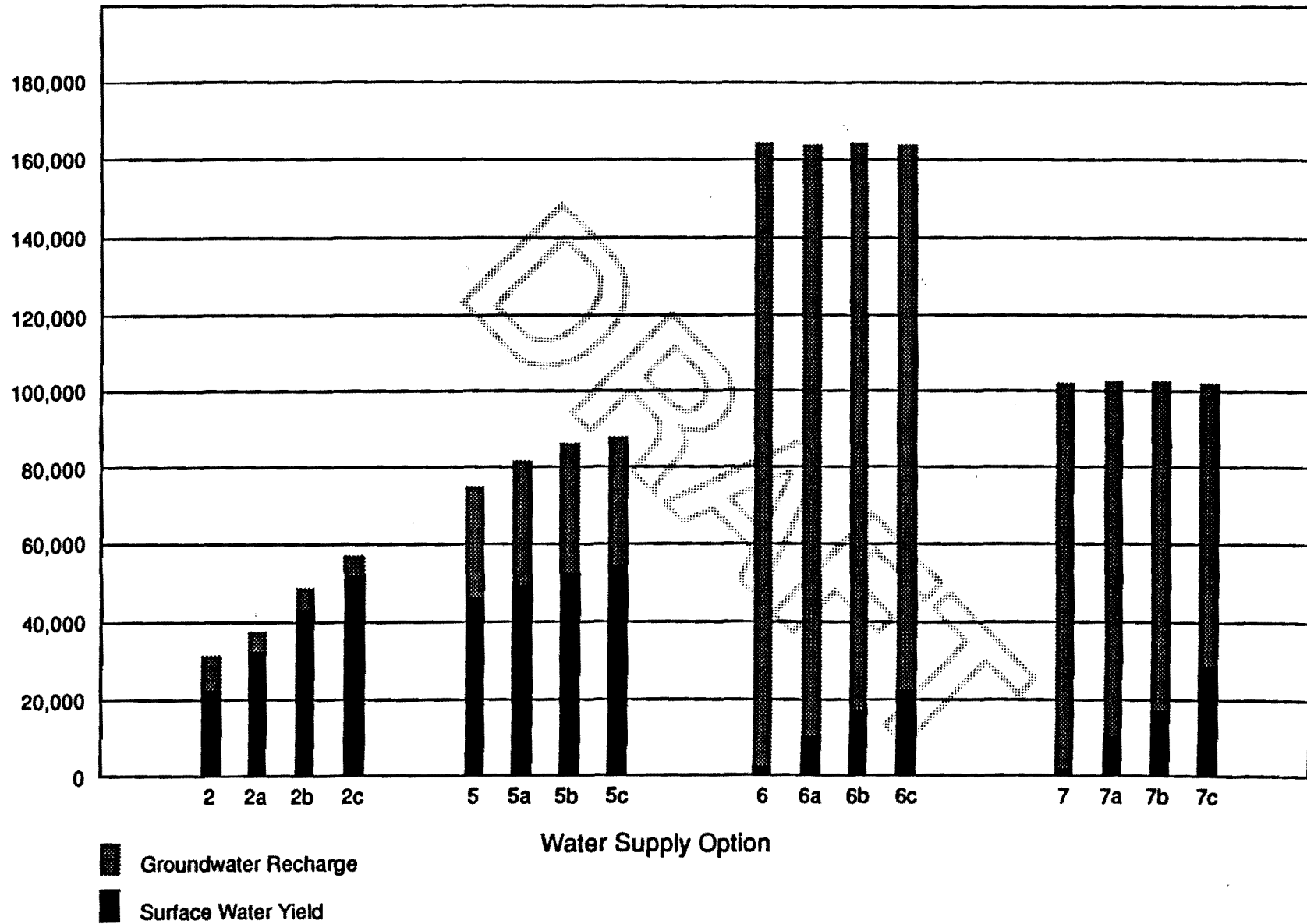


FIGURE ES-9

