Hydrologic Response In Residential Areas

HYDROLOLOGIC RESPONSE IN RESIDENTIAL AREAS

INTRODUCTION

Reference is made to *Test Iteration 7, Year One, Hydrologic Monitoring Report, Draft*, August 1997. The referenced draft report has a section on hydrologic response in residential areas that was prepared by South Florida Water Management District, Ecosystem Restoration Department, Southern Everglades Florida Bay Restoration Division. Parts of the referenced section are lifted out and used in this section.

TIME SCALES AND PERIODS OF COMPARISON (from referenced report)

A seasonal time scale is used for this evaluation. Where needed, monthly and daily time scales are used. The geographical extent of the data analyzed is regional, extending beyond the residential areas being evaluated. Where necessary, local analysis is performed.

The wet and dry seasons are defined as follows:

Wet season = June through October (5 months)
Dry season = November through May (7 months)

It is recognized that reduction of data to seasonal rain and water levels dampen the variability present in the monthly, daily and breakpoint time scales. However, analysis of the seasonal trends provides insight in to regional, long-term patterns that are not easily discernable at fine time scales.

For ease of computation, seasonal averages are obtained through reduction of daily values into monthly averages, and from monthly averages into seasonal averages. For purposes of this report, the result is the same as computing seasonal averages directly from daily values. It should be noted that not all groundwater daily values are computed to same way. Some daily records, mostly from SFWMD, are daily averages while others, usually from USGS, are daily maxima. The seasonal rain is the sum of the entire daily rain recorded for the season.

A convention was adopted for handling gaps in the data. For canal water levels, up to five missing days were accepted to compute a monthly average, and no more than one missing month was accepted to compute a seasonal average. For groundwater levels, up to 10 days and up to two months were accepted, respectively. For rainfall, up to five missing days were accepted to compute a rainfall total, and no more than one missing month was accepted to compute a seasonal total.

Four historical periods were identified for comparison with Year One Test 7. The periods used represent important hydrologic breaks marked by major construction or operational milestones, and are made to coincide with the seasons. The periods chosen for comparison with Year One are:

1) Pre-SDCS: January 1949 – October 1968, from the earliest start date of the data sets analyzed up to the completion of the South Dade Conveyance System (SDCS).

2) SDCS: November 1968 – October 1982, from the completion of the SDCS up to the completion of S-331.

3) S-331: November 1982 – October 1991, from the completion of S-331 up to the completion of G-211.

4) G-211: November 1991 – October 1995, from the completion of G-211 up to the end of Test 6.

8.5 SQUARE MILE AREA (from referenced report)

Figure 92 (page 149) (in body of report) shows the location of the monitoring stations used in this evaluation. Rain gages at Forth Mile Bend, Miami Field Station, and Homestead Field Station were chosen based on availability of a long period of record in the region. S-331 and S-336 rain gages were chosen based on their proximity to the 8.5 square mile area (SMA). Water levels upstream of S-331 represent water levels in the L-31N canal adjacent to the 8.5 SMA. Water levels upstream of S-336 represent water levels at the north end of L-31N. Water levels at G3273 represent water levels in the Rocky Glades adjacent to and west of the 8.5 SMA. Water levels at NESRS-2 represent water levels in NESRS north of the 8.5 SMA. Water levels at Angel represent levels in the low-lying areas in the southwestern portion or the 8.5 SMA. Water levels at G-596 well represent water levels in the high-ground areas in the eastern portion of the 8.5 SMA.

Figures 93 and 94 (pages 150-151) are graphs of period of record seasonal rainfall at Hialeah, Forty-Mile Bend, Miami Field Station, Homestead Field Station, S-336, and S-331 are included to show the variation of rainfall over the long period. This is important if one attempts to identify permanent changes in annual stage levels at various structures. What might appear to be increases or decreases in stage levels could highly relate to more or less rainfall and not changes in the physical conveyance system or operational changes. Additional comments will be made later when stage levels are presented.

Tables 25 and 26 (pages 152-153) from the referenced report are reproduced here. Table 25 shows comparisons of Year One Test 7 dry season to previous dry season rain totals and water level averages for 8.5 SMA. Two of the stations shown in the two tables that were analyzed in the body of this report are S-331 HW and Angel. For Table 25, which is the dry season table, the value for S-331 HW is 4.55 ft. This value is for Test 7, Year One. For Test 7, Years Two, Three, and Four the values are 4.89, 4.58, and 4.86 ft. These values for hydrologic years 1995, 1996, 1997, and 1998 are very close, even through the dry season average for hydrologic year 1997 would be considered "wet" while the other dry seasons would classify as "dry." Angel well for Test 7, Year One from the table is 5.87 ft. The values for Test 7, Years Two, Three, and Four are 5.17, 6.04, and 5.68 ft. Table 26 is the companion table presenting the wet season comparisons. For S-331 HW, the value from the table is 5.20 ft. The values for Test 7, Years Two, Three, and Four are 4.62, 5.02, and 4.67, respectively. For Angel, the value from the table is 6.42 ft. Values for Years Two, Three, and Four are 6.55, 6.09, and 6.77 ft, respectively. The evaluation form the tables in the reference report was that it appeared that levels for the 1996 year (Year One Test 7) were higher than POR values but there was insufficient data to be confident. The values for the three additional years are very close to values presented for the 1996 year, however there is still insufficient data to be fully confident that levels are trending up.

Figure 95 (page 155) is reproduced and included in this report to show the Angels graph. Table 9 (page 72) presents the average monthly stage and the dry and wet season averages for the four years of Test 7 which includes Year One, which is shown in Figure 28 (page 52). The pattern shown in this graph is similar in the other years. It should also be noted that the graphs for Angels and G-596 are similar in pattern.

Figure 96 (page 156) is also reproduced and included because it is good to see as much of the period of record (POR) as possible. Unfortunately, the record for Angels is short and can be misleading if looked at by itself. It would seem that a definite increase in stage level has occurred but if one reviews the long-term record of rainfall shown in Figure 70 (page 96), the appearance of an upward trend is directly related to a low and high period of rainfall. Also, the graph of G-596 gage actually implies a lowering of stage levels over the long run and the one-year or even four-year test is not sufficient to be confident that stage levels are affected by the operational modifications at every location.

Figures 97 and 98 (pages 157-158) are also graphical period of records for two additional gages, G-3273 and NESRS-2. In both graphs it appears that stage levels have increased but again whether this is due to operational modifications or simply functions of rainfall is not totally clear. There is a definite effort to place more flow into Northeast Shark Slough and if successful should increase stage levels which is the intention. Again, four years (Test 7) is too short to take a positive position. The graphs of S-336 HW and S-331 HW in Figure 98 do not show any indication of stage level increase. Stage levels between G-211 and S-331 are highly influenced by stages at Angels. A planned increase in this area is not the primary objective in stage level increase. The northern reach between G-211 and S-334/S-336 is desired.

BIRD DRIVE BASIN

Figure 92 (page 149) shows the location of the monitoring stations used in this evaluation. Antecedent and Year One rainfall conditions are represented by rain gages located at Forty Mile Bend, Miami Field Station, Homestead Field Station, S-331, and S-336. Water levels upstream (headwater) of S-336 represent water levels in the north end of L-31N, west of the Bird Drive Basin. Water levels downstream (tailwater) of S-336 depict stages in a short reach along the C-4 canal directly north of the Basin. Water levels at NESRS-2 represent water levels in ENP west of the L-31N canal and the Basin. Water levels at CA3B-SE represent water levels in the Water Conservation Are 3B, northwest of S-335 and the Basin. Well G-3439, located in the western portion of the Basin, will be used as representative of the groundwater/surface water conditions of the Basin. Well G-855, although southwest of the Basin, has a longer POR than G-3439 and may be used as an indicator of past groundwater/surface water trends in the Basin.

Table 27 (page 154) shows a comparison of Year One, Test 7 water levels to POR for Bird Drive Basin. The evaluation of Test 7, Years Two, Three, and Four did not include evaluation of individual gages used in the table, therefore, no additional support is provided. One comment from the table and that is that 1996 versus POR is positive for all gages meaning the average values for 1966 in both the dry and wet seasons were higher than the POR average stages. This would seem to be significant but the POR stages are averages and there would be greater and lesser values per year. Figure 99 (page 159) show POR stages for the individual gages. There seems to be a definite

increase in stage in the 1970s for gage G-855 but the record from 1980 forward is inconclusive. The record for G-3439 is too short. The period of record for NESRS-2 is fairly long and implies an increase around 1995. This may be a fact because of modified operations criteria. A similar implication is present for Water Conservation Area 3B (CA3B-SE). The increase is probably rainfall related. The period of record is not adequate and even three more years of data will not make it conclusive.

SUMMARY

The summary for this section includes the Summary from the referenced draft report.

Rainfall amounts during the 1995 wet season, prior to the start of Year One Test 7, were the highest of the last 26 years at most monitoring stations. Rainfall totals for Year One dry and wet season were normal.

Higher water levels were observed during Year One at Angel well in the western 8.5 SMA. Water levels remained above ground elevation the first two-and-a-half months of the dry season and for most of the wet season. A smaller increase in water levels was observed at G-596 well in eastern 8.5 SMA. The increase at G-596 is within historical variability and water levels remained below ground elevation.

Higher water levels were observed at G-3439 well in the Western Bird Drive Basin. Water levels were above ground elevation for a few days at the beginning of the dry season and for most of October 1996, late in the wet season.

A major contributor to the increase in water levels was rainfall, both regional and local, during the 1995 wet season. Because of the lasting effects of the unusual antecedent conditions, the analysis of the hydrologic response of the residential areas to Test 7 operational criteria is inconclusive at this time.

The above four paragraphs are the summary for the referenced report and is reproduced to be sure the conclusion reached in that study effort are presented here.

The effort in the overall report was to present the conclusions of the evaluation of three additional years of data of Test Iteration 7. For this particular section the few gages that appear in this section that were evaluated follow closely the 1996 year (Year One Test 7) and would seem to support the finding that 1996 average stage levels were higher than the period of record. It is pointed out, however that three additional years of data (four years total) is not sufficient to reach positive conclusions.

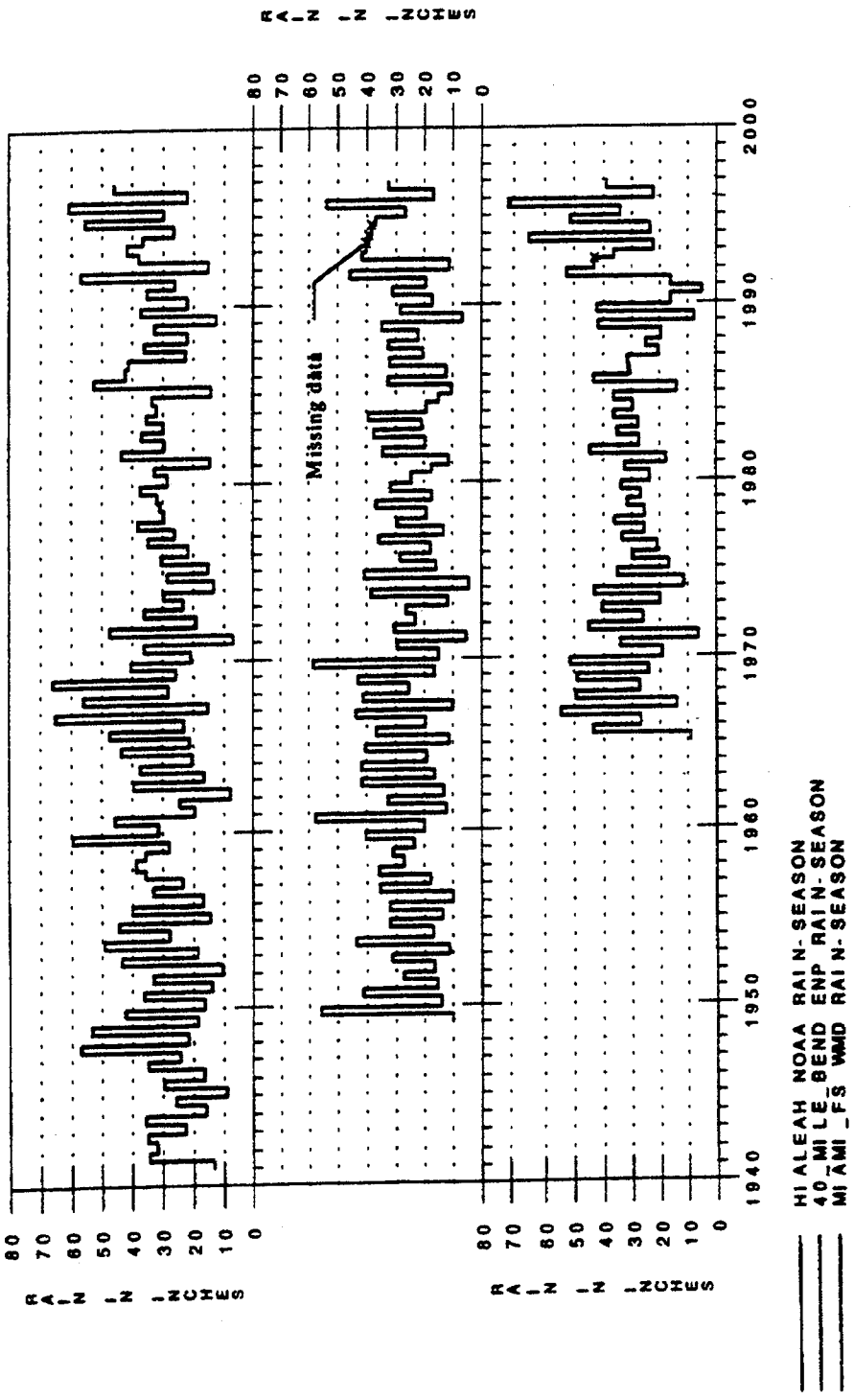


Figure 92. POR Seasonal Rainfall at Hialeah (top), Forty-Mile Bend (middle), and Miami Field Station (bottom)

(Taken from *Test Iteration 7, Year One, Hydrologic Monitoring Report, Draft*, August 1997.)

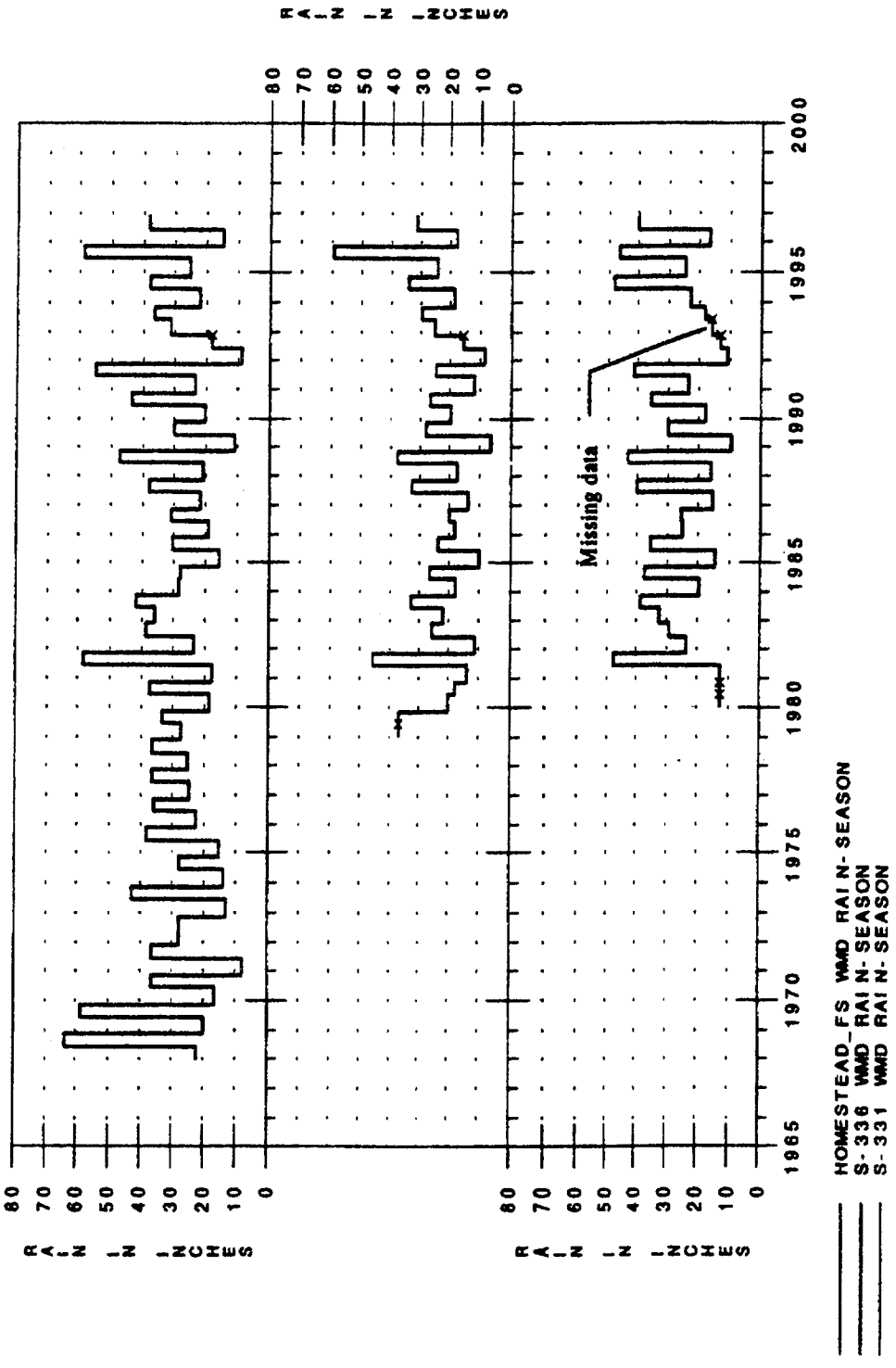


Figure 93. POR Seasonal Rainfall at Homestead Field Station (top), S-336 (middle), and S-331 (bottom)

(Taken from *Test Iteration 7, Year One, Hydrologic Monitoring Report, Draft*, August 1997.)

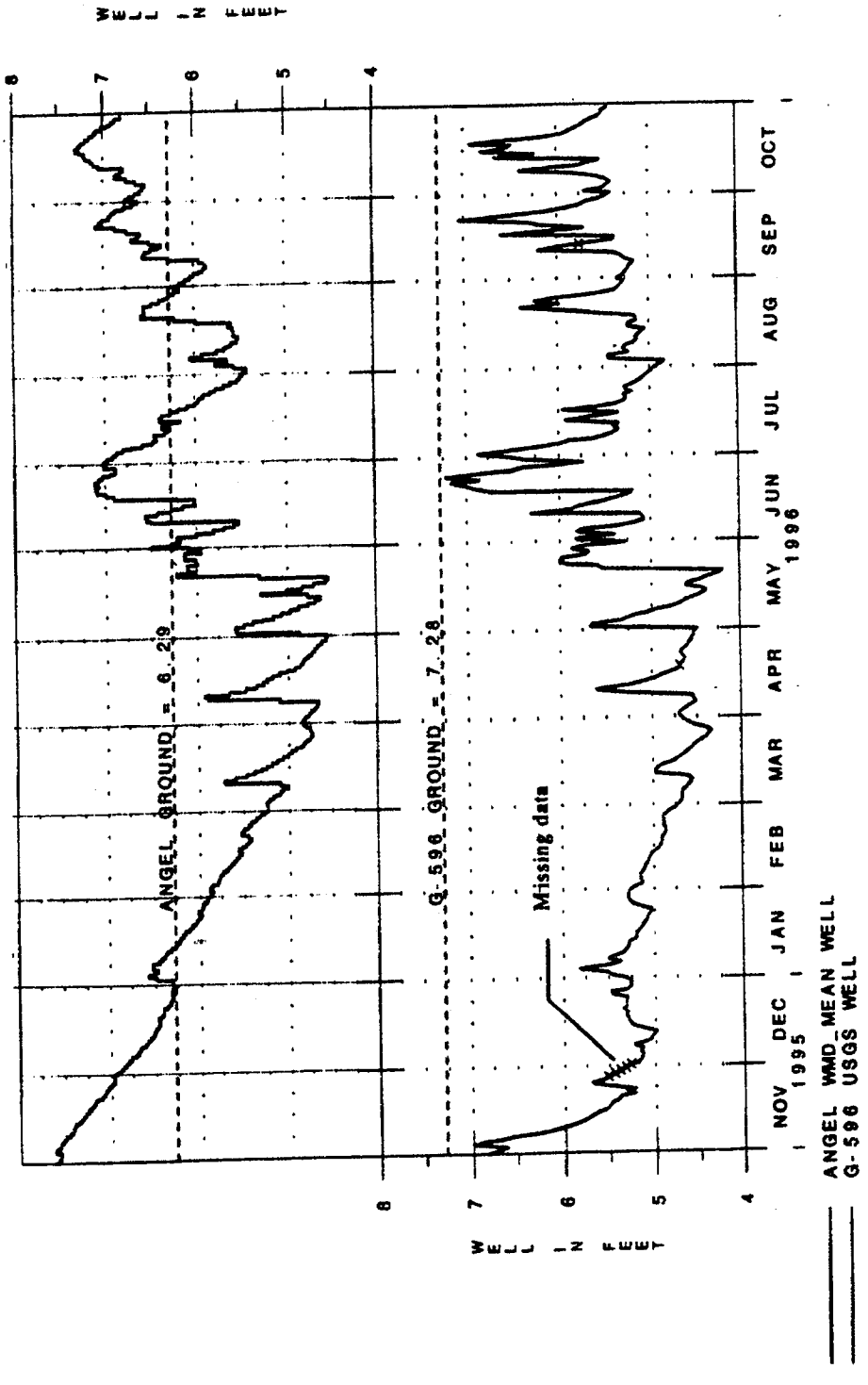


Figure 94. Test 7, Year One Daily Water Levels in the 8.5 Square Mile Area. Angles Well (top) is Recorded by SFWMD as Daily Average, JG-596 (bottom) is Recorded by the USGS as Daily Maximum

(Taken from *Test Iteration 7, Year One, Hydrologic Monitoring Report, Draft,* August 1997.)

Table 25. Comparison of Test 7, Year One Dry Season to Previous Dry Season Rain Totals and Water Level Averages for 8.5 Square Mile Area

	Regional and Local Rain (in)					Canal Stage (ft)		ENP Water Level (ft)		8.5 SMA Water Level (ft)	
	Forty Mile Bend	Miami F.S.	Homestead F.S.	S-336	S-331	S-336 HW	S-331 HW	NESRS-2	G-3273	G-596	Angel
Dry 96	16.90	22.23	14.62	17.87	16.84	5.57	4.55	6.97	6.43	5.13	5.87
Rain Qualifier	105%	105%	71%	I	I						
v. Dry 40-68	+0.65	I	--	--	--	--	--	--	--	+0.10	--
v. Dry 68-82	+1.63	+1.42	-5.00	I	I	I	--	I	--	+1.05	--
v. Dry 82-91	+0.29	+1.88	-7.21	+2.73	-2.43	+0.67	I-0.02	+0.90	I	+0.37	I
v. Dry 91-95	-2.10	-4.42	-7.21	-1.18	-2.57	-0.18	-0.25	+0.15	+0.24	-0.12	+0.21
v. Dry POR	+0.74	+1.14	-5.90	+1.66	-2.16	+0.34	-0.08	+0.70	+0.64	+0.42	+0.96
Mean	16.16	21.09	20.52	16.21	19.00	5.23	4.63	6.27	5.79	4.71	4.91
Standard Deviation	5.42	6.86	6.59	5.34	6.15	0.69	0.49	0.64	0.77	1.05	0.91
Skew Coefficient	0.04	-0.43	0.11	-0.19	0.41	-0.63	-1.67	-0.32	-0.20	0.17	-0.19

Ground surface elevation for Angel is 6.29 ft and for G-596 is 7.28 ft.

-- =Data not available
I =Insufficient Data

(Taken from *Test Iteration 7, Year One, Hydrologic Monitoring Report, Draft*, August 1997).

Table 26. Comparison of Year One Test 7 Wet Season to Previous Wet Season Rain Totals and Water Level Averages for 8.5 Square Mile Area

	Regional and Local Rain (in)					L-31N Canal Stage (ft)		ENP Water Level (ft)		8.5 SMA Water Level (ft)	
	Forty Mile Bend	Miami F.S.	Homestead F.S.	S-336	S-331	S-336 HW	S-331 HW	NESRS-2	G-3273	G-596	Angel
Wet 96	32.81	39.31	38.20	31.41	39.88	6.09	4.61	6.98	6.75	5.741	6.42
Rain Qualifier	89%	97%	95%	I	I						--
v. Wet 40-68	-6.45	I	--	--	--	--	--	--	--	-0.18	--
v. Wet 68-82	-1.33	+1.88	-0.66	I	I	I	--	I	--	+0.31	I
v. Wet 82-91	+0.21	+4.53	+0.01	+3.39	+3.57	+0.93	-0.18	+0.54	I	+0.39	-0.04
v. Wet 91-95	-11.68	-16.80	-6.10	-9.65	+2.28	+0.09	-0.13	-0.10	-0.07	-0.05	+0.54
v. Wet POR	-3.85	-1.27	-1.89	+0.06	+2.80	+0.47	-0.15	+0.35	+0.34	+0.09	5.88
Mean	36.65	40.58	40.09	31.35	37.08	5.62	4.76	6.63	6.41	5.62	0.59
Standard Deviation	8.78	12.05	10.07	10.06	8.50	0.57	0.28	0.45	0.69	0.75	0.59
Skew Coefficient	0.43	-0.02	1.01	1.48	-0.74	-0.42	0.75	-0.67	-1.53	0.11	-0.19

Ground surface elevation for Angel is 6.29 ft and for G-596 is 7.28 ft.

-- =Data not available
I =Insufficient Data

(Taken from *Test Iteration 7, Year One, Hydrologic Monitoring Report, Draft*, August 1997).

Table 27. Comparison of Test 7, Year One Water Levels to POR for Bird Drive Basin

		ENP	WCA-3B	Canal Stage			Bird Drive Basin	
				L-31N	C-4			
		NESRS-2	CA3B-SE	S-336 HW	S-336 TW	G-119 TW	G-855	G-3439
	POR	1976-1996	1984-1996	1978-1996	1978-1996	14988-1996	1973-1996	1987-1996
Dry	Dry 196	6.97	7.59	5.57	5.69	4.56	4.50	4.23
	1996 v. POR	+0.70	+1.32	+0.34	+0.26	+0.51	+0.53	+0.34
	POR Mean	6.27	6.27	5.23	5.43	4.05	3.97	3.89
	Standard Deviation	0.64	1.44	0.69	0.73	0.75	0.73	0.69
	Skew Coefficient	-0.32	-0.46	-0.63	-0.94	-*0.43	-0.44	-0.13
Wet	Wet 1996	6.98	7.38	6.09	6.23	5.41	5.42	5.24
	1996 v. POR	+0.35	+0.53	+0.47	+0.33	+0.55	+0.65	+0.47
	POR Mean	6.63	6.85	5.62	5.90	4.86	4.77	4.77
	Standard Deviation	0.45	0.81	0.57	0.48	0.61	0.46	0.58
	Skew Coefficient	-0.67	-1.13	-0.42	-1.04	-0.87	0.24	-0.59

(Taken from *Test Iteration 7, Year One, Hydrologic Monitoring Report, Draft*, August 1997).

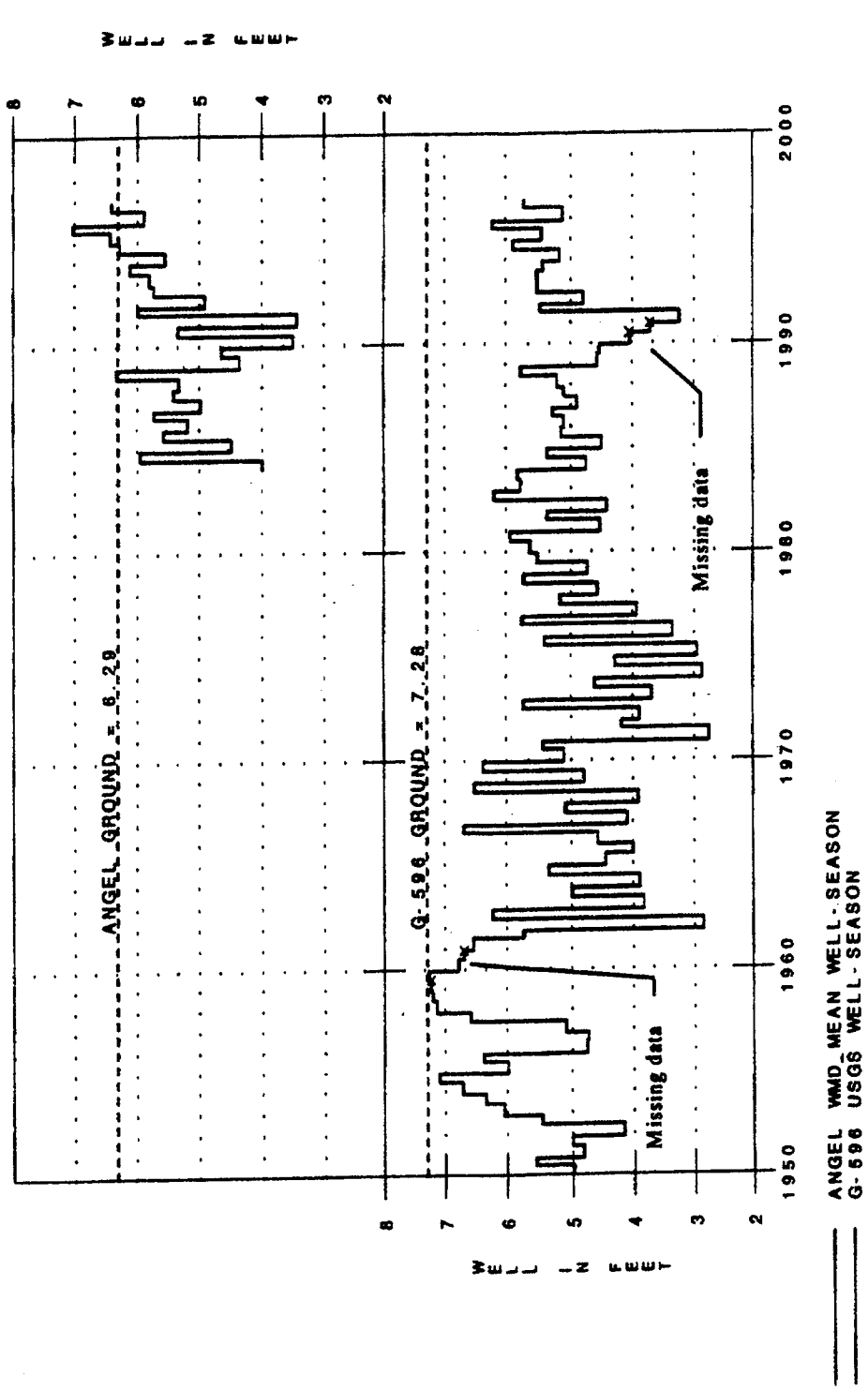
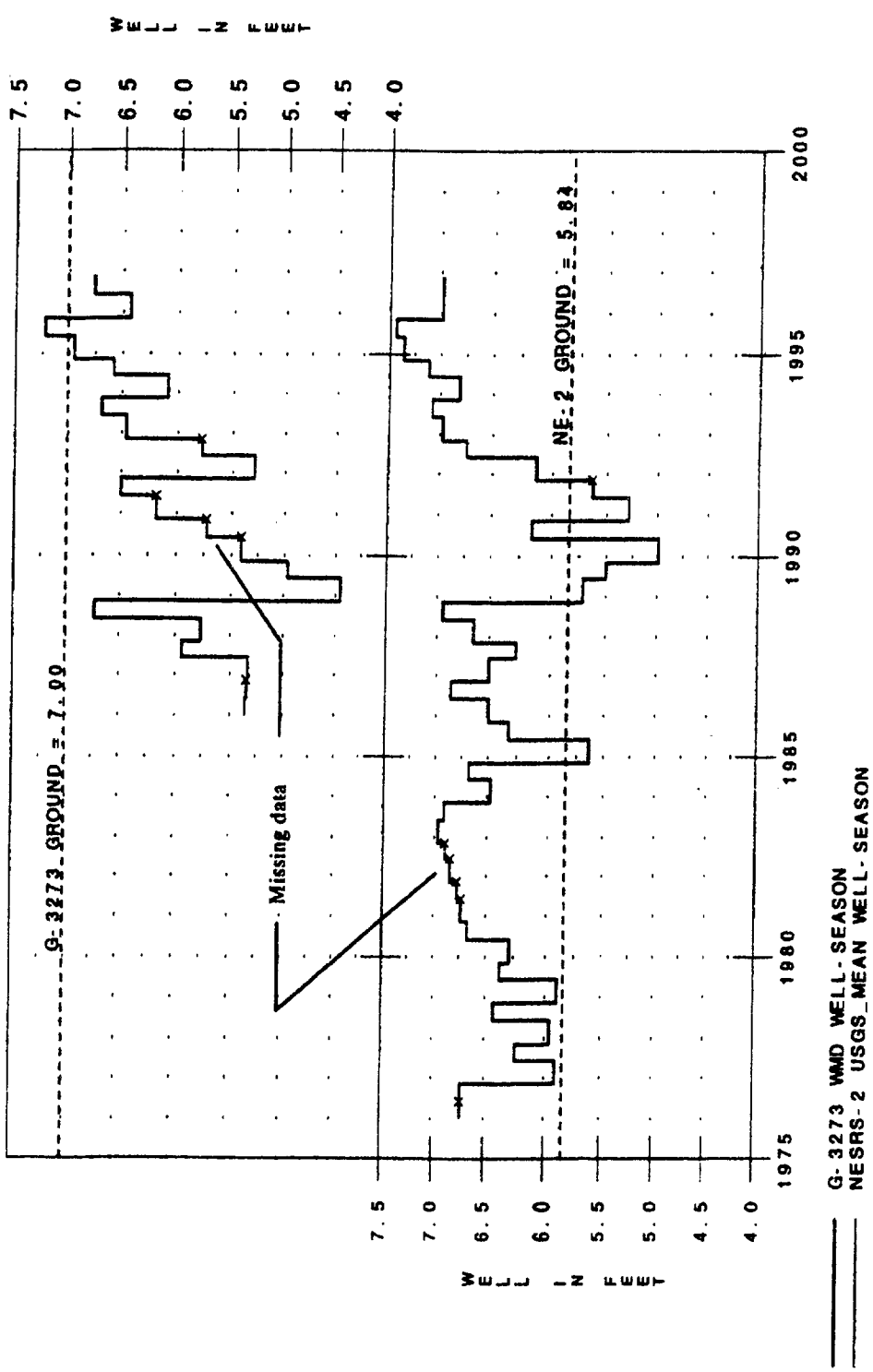


Figure 95. POR Seasonal Water Levels for 8.5 Square Mile Area at Angels Well (top) and G-596 (bottom)

(Taken from *Test Iteration 7, Year One, Hydrologic Monitoring Report, Draft*, August 1997).

Figure 96. POR Seasonal Water Levels in Northeast Shark River Slough at G-3273 (top) and NESRS-2 (bottom)



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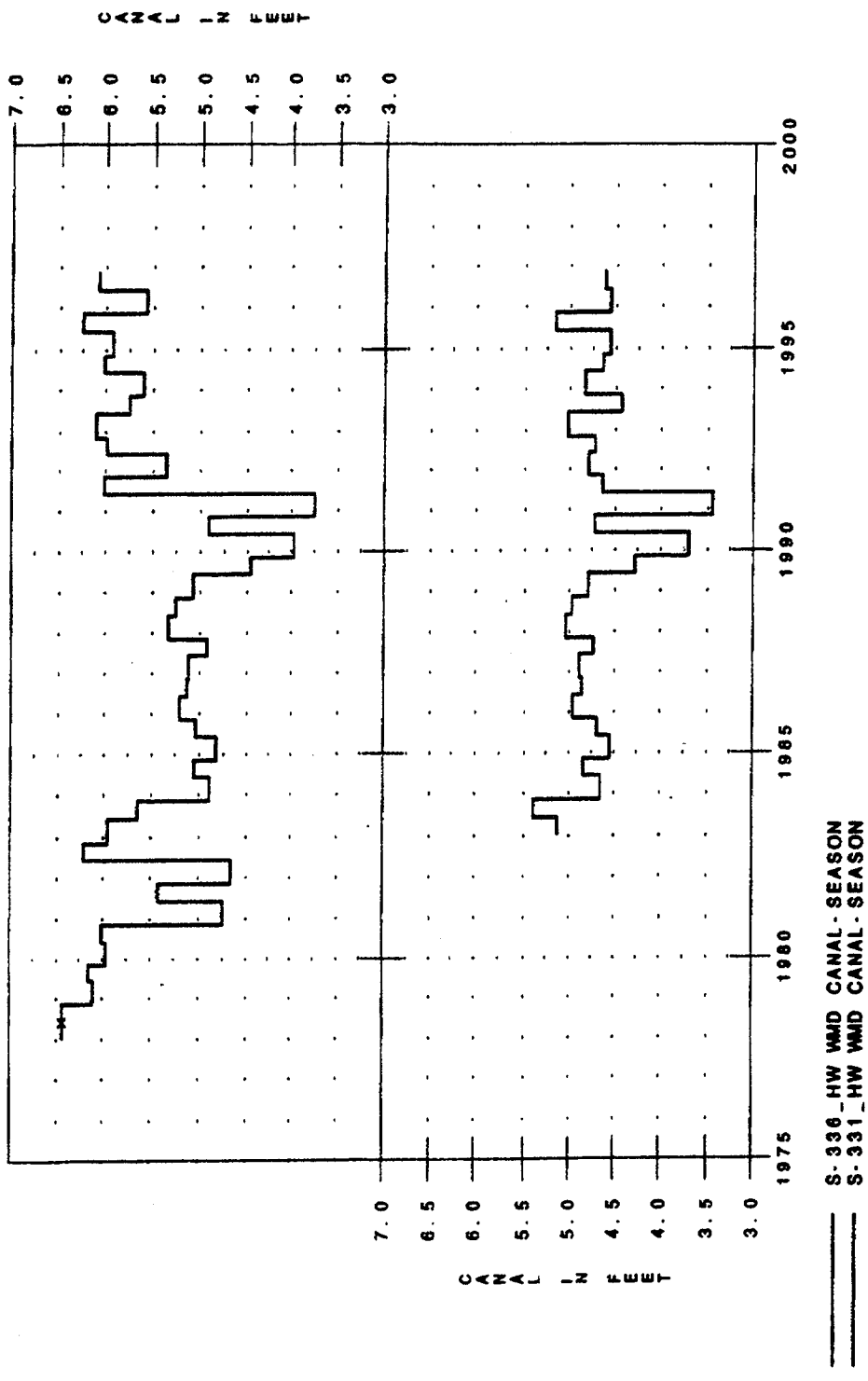


Figure 97. POR Seasonal Water Levels in the L-31N Canal. The Northern Reach, Between G-211 and S-334/S-336 is Represented by S-336 Headwater (top). The Middle Reach, Between G-211 and S-331, is Represented by S-331 Headwater (bottom)

(Taken from *Test Iteration 7, Year One, Hydrologic Monitoring Report, Draft*, August 1997).

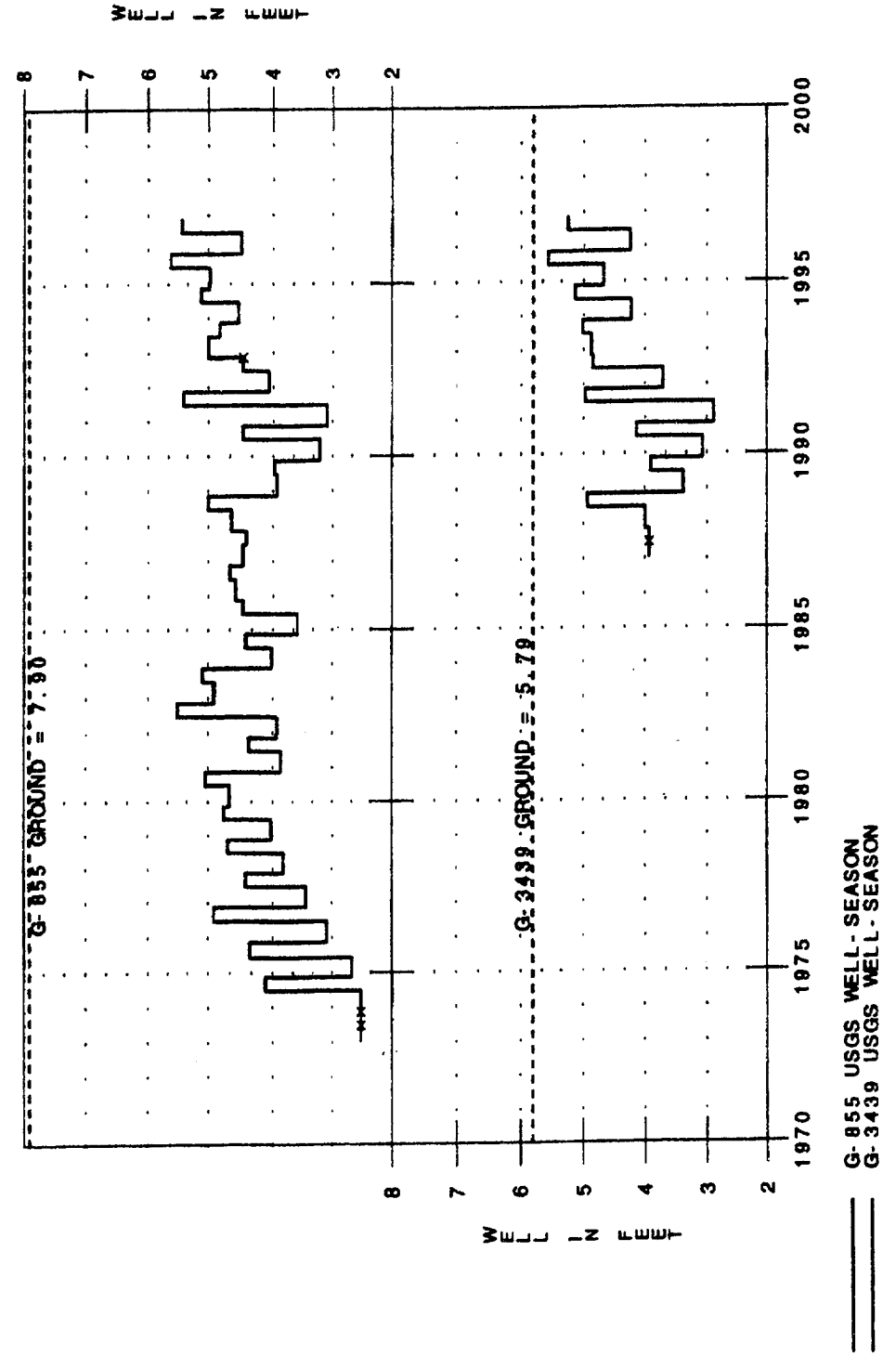


Figure 98. POR Seasonal Water Levels in the Bird Drive Basin at G-855 (top) and G-3439 (bottom). Ground Elevations at Monitoring Stations are Shown for Reference

(Taken from *Test Iteration 7, Year One, Hydrologic Monitoring Report, Draft*, August 1997).

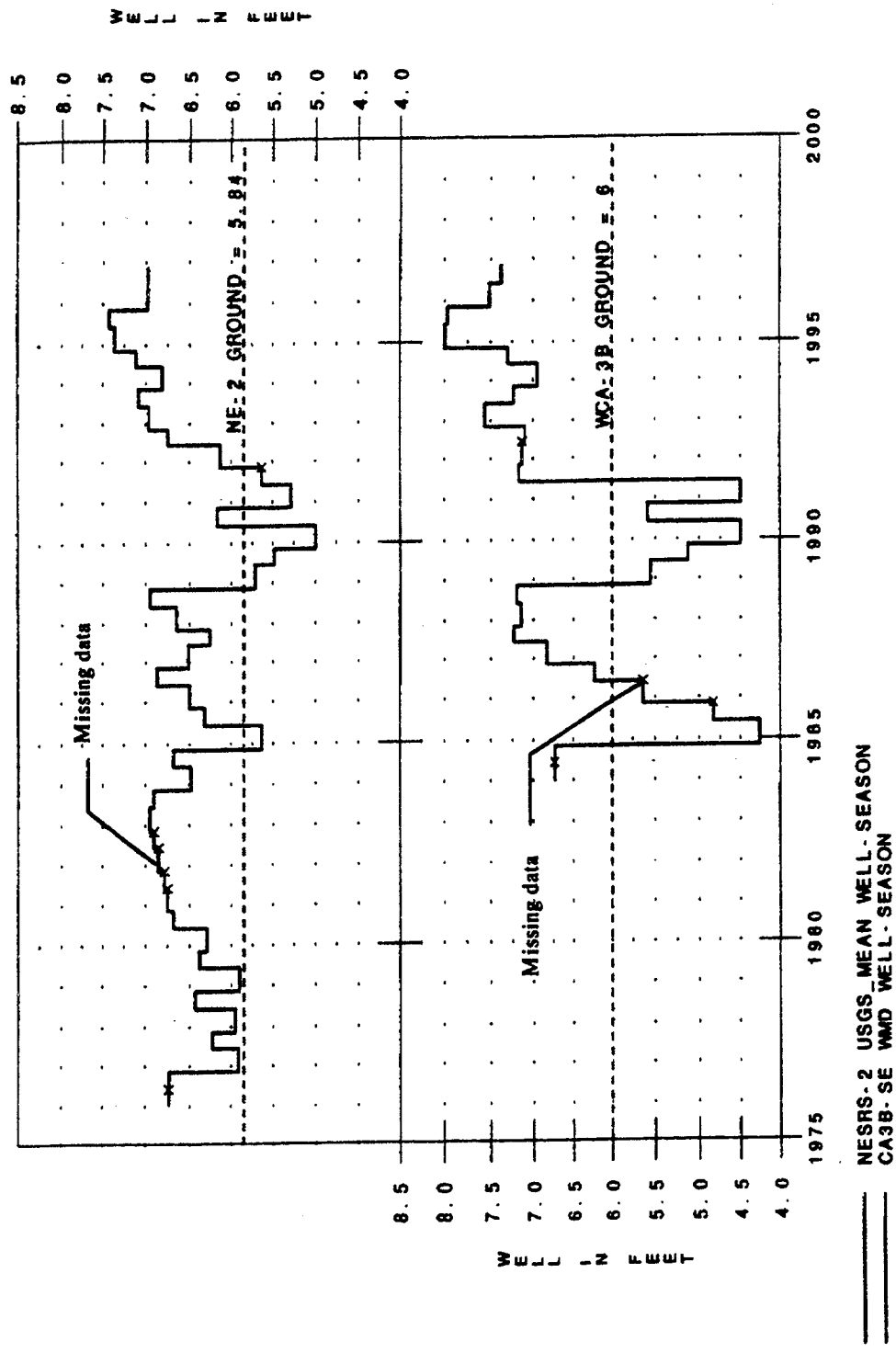


Figure 99. POR Seasonal Water Levels in Northeast Shark River Slough at NESRS-2 (top) and in Water Conservation Area 3B at CA3B-SE (bottom). Ground Elevations at Monitoring Stations are Shown for Reference.

(Taken from *Test Iteration 7, Year One, Hydrologic Monitoring Report, Draft*, August 1997).

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF
Planning Division
Environmental Branch

OCT 23 2000

Mr. Stephen W. Forsythe
State Supervisor
U.S. Fish and Wildlife Service
1339 20th Street
Vero Beach, Florida 32960-3559

Dear Mr. Forsythe:

This concerns Endangered Species Act coordination on the proposed North Water Detention Area for existing pump station S-332B. The present land use in the project area consists of recently abandoned farm fields and mango groves. In conversations with your staff, it is our understanding that the listed species of possible concern for this project are the Florida panther, Cape Sable seaside sparrow, eastern indigo snake, wood stork, and snail kite.

Similarly as with our original coordination on S-332B and its West Water Detention Area, we are providing the following determination of effect on each species.

1. Wood stork and snail kite: Not likely to adversely affect. There is no nesting habitat for these species within the project impact area, and, as wide-ranging opportunistic feeders, there would also be no effect on their foraging.

2. Eastern indigo snake: Not likely to adversely affect because the standard agreed-upon protection measures for the species will be observed during construction.

3. Cape Sable seaside sparrow: Not likely to adversely affect. There is no habitat for the species in the project area. Designated Critical Habitat exists in Everglades National Park, immediately west of the original West Water Detention Area. Enclosed as Attachment 1 with Tabs A, C, and D is a letter to the Florida Department of Environmental Protection that provides information on operations of S-332B that support our determination for the sparrow.

4. Florida panther: Not likely to adversely affect. A site reconnaissance was conducted on October 18, 2000 in the accompaniment of Jason Osbourne, Sonny Bass's biotechnician. After reviewing Mr. Osbourne's observations, Mr. Bass concluded that "the area in question is marginal panther habitat". Enclosed as Attachment 2 is a copy of Mr. Bass's response to our email requesting his input and providing our report on the reconnaissance.

As you are aware, the proposed project is an essential part of our plan of protection for the Cape Sable seaside sparrow for this and subsequent years until the Modified Water Deliveries project is implemented. As such, we request immediate and expeditious attention be given to this coordination to bring it to a conclusion in the nearest future.

Sincerely,

James C. Duck

James C. Duck
Chief, Planning Division

Enclosures

Attachment 1

Planning Division
Environmental Branch

Mr. Kirby Green
Deputy Director of the Department of Environmental Protection
Department of Environmental Protection
3900 Commonwealth Boulevard, Mail Station 15
Tallahassee, Florida 32399-3000

Dear Mr. Green:

This letter is in Response to your June 23, 2000 RAI(2) for Operation and Maintenance of the S-332B Pump Station, FDEP File no 0165910-001-GL. The Corps has authorization to continue operation of this pump station under an Emergency Order through October 26th, 2000

We have been advised that this RAI response is necessary in order for the DEP to proceed with processing of this permit in a timely manner. The goal of this letter is issuance of a operating WQC prior to the expiration of the emergency order. The answers to your question are referenced to the original questions and are provided in the enclosed narrative. Modeling results are provided as an attachment to the body of the narrative.

If your staff should have any questions, please feel free to call Mr. Jim Riley at 904-232-2438 or Mr. Jim McAdams at 904-232-2117.

Sincerely,

Richard E. Bonner, P.E.
Deputy District Engineer
for Project Management

Enclosures

Copies Furnished:

Mr. Frank Nearhoof, Department of Environmental Protection
3900 Commonwealth Boulevard, Mail Station 3500, Tallahassee
Florida 32399-3000
Mr. Jerry Brooks, Deputy Director of the Division of Water
Resource Management, Department of Environmental Protection
3900 Commonwealth Boulevard, Mail Station 3500, Tallahassee

Florida 32399-3000
Ms. Melissa Meeker, Florida Department of Environmental Protection, South East District, Director of District Management, Department of Environmental Protection, Post Office Box 15425, West Palm Beach, Florida 33416-5425
Mr. Mitnick Department of Environmental Protection, Post Office Box 15425, West Palm Beach, Florida 33416-5425
Mr. Eric Bush Department of Environmental Protection, Ground Floor, 400 West Bay Street, Jacksonville, Florida

Mr Richard Bray Department of Environmental Protection 3900 Commonwealth Boulevard, Mail Station 3500, Tallahassee Florida 32399-3000

(DEP comments are in plain text, Corps responses in italics)

1. (Previously Items 3, 5E, and 5C in RAI-1) More detailed information regarding the operations of the S-332B pump station is needed. There appears to be a significant deviation between the Corps' modeling results and the minimization of surface overflows from the detention area. Specifically, the Corps' modeling of ISOP operations proposes using the station to pump between 325 and 500 cubic feet per second (cfs) with the intent of on-site groundwater seepage of these volumes within the detention area. However, field tests of the pump station indicate that sustained pumping rates above~190cfs would result in regular overflows from the detention area into Everglades National Park (ENP) and endangered sparrow habitat. Such overflows from the detention area would constitute surface water discharges that are not likely to be beneficial to endangered sparrow habitats and may not comply with the requirements of the Consent Decree (Case No. 88-1886-CIV-HOEVELER), which sets surface inflow concentration limits for total phosphorus entering ENP. Additionally, recent activities to scrape down the surface layers of soil within the detention area have proven unsuccessful at increasing percolation rates to targeted levels to obtain on-site detention.

Accordingly, please provide the following information related to the proposed operation of the S-332B pump station:

a. Modified operations criteria that would meet the requirements of the Reasonable and Prudent Alternatives (RPAs) contained in the Biological Opinion to protect the habitats of the endangered sparrow (U.S. Fish and Wildlife Service's February 19, 1999, Biological Opinion), and that minimize potentially harmful surface water discharges to downstream receiving waters, including ENP. Include operating criteria that adjust for the various hydrological conditions expected including wet/dry seasonality (wet/dry conditions), sparrow-nesting season criteria, and extreme storm events.

   Please see tab A for the current operations criteria for the S-332B detention area

b. Scientifically valid calculations for the modified operations criteria described in a. above, including percolation rates, pumping rates/volumes, and calculated surface water discharges via the overflow weir into ENP. ***The S-332B basin capacity chart was developed from pumping data collected during 2 full system pump tests and from subsequent operations over the last 3 months.***

The capacity chart appears reasonable and seems to match up fairly well with field observations. In general the basin capacity is controlled by a number of factors including the basin size, the vertical permeability of the limestone "caprock", the thickness of the caprock, and the head differential/gradient (as measured between the basin stage and the ambient groundwater elevation in the surrounding area). For instance, if the basin is full with the water level at 8.36 NVGD feet NGVD (spillway crest elevation) and the ambient groundwater elevation observed in the Everglades is 5 feet NGVD, the estimated maximum steady state percolation rate would be approximately 156 CFS. Obviously, if the head differential is less than that, the percolation rate would be less. The attached capacity chart(see tab B) shows the relationship between percolation rates and water elevation
can be used to estimate the capacity based on observed field conditions.

c. Any other supporting data justifying the implementation of the modified operations criteria, including modeling results and actual real-time field collected data from tests of the pump station.

Please see the following responses to items 3a-3c and tab C. Tab C is a table that contains modeling results of areas east of S-332B. Basically, it is a part of the performance measures of 95base simulation and four IOP alternatives. The first column of the table lists specific cells in the C-111 basin and agricultural area in row-column format. For example, the first cell listed as R10C25 is a 2x2 cell located in row 10 and column 25 (see Tab D for the 2x2 cells and grid). The remaining columns of the table describe land surface elevation, peak stage, stage at highest 10th percentile, and percent of time stage above root zone for each cell for each simulation. The website, http://hpm.saj.usace.army.mil/index.html *may also be viewed for further information.*

2. (Previously Item 5B in RAI-1) Since there is a likelihood of surface water discharges from the detention area to downstream receiving waters, more information is needed regarding the water quality of the potential discharge. Specifically, please provide the following:

a. Please provide the "provisional" or "data being reviewed internally for administrative errors" mentioned in the E-mail from your staff dated June 16, 2000. Please continue to update your website with the data as soon as it becomes available and advise the Department of such updates accordingly.

In an August 16, 2000 phonecon between staff of the SFWMD, DEP and Corps it was agreed the data would be sent straight to the DEP in the future as it was generated, as well as "provisional data" being posted on the web in PDF format. Currently Mr. Ken Weaver of DEP is having the data directly transferred electronically to him. We believe that all current data that is available to the Corps, past and present, has been provided to Mr. Weaver. The Corps is in the process of placing the entire database on the Corps internet site in pdf format.

b. Please provide the missing water quality data, or an explanation for the missing data, for the months of October, November, and December of 1999, and February of 2000. Provide electronic copies of all data to the Department via E-mail or on disk/CD in Excel format.

This data has been provided by E-Mail on 17 Aug, 2000 in lotus spreadsheet format. Any data available to the Corps has been directly provided through our contractor to Mr Ken Weaver of DEP.

c. Provide a status report for activities being conducted to investigate and correct the consistent variation between your contracted lab and the Department's lab as described in the memorandum dated June 19, 2000, from Mr. Tom Park to Mr. Jim Riley.

Analysis was conducted for interlaboratory calibration between the DEP Lab, the SFWMD Lab and the Corps contractor lab(which a subcontracting lab to the SFWMD lab as well). The end results were conclusive in that there were no apparent systematic differences in the results of the three labs for the period of record for June and July of 2000. Prior to that there are data differences that are still being investigated. DEP has the lead on this issue. The Corps believes that the continuation of close coordination between the three labs will ensure accurate data is generated. To be able

to validate future data the Corps also believes that split analyses of known phosphorus levels must(where the digestion process is also tested as one parameter) continue between the three labs. The Corps has been informed that the SFMWD (with DEP's involvement if desired by DEP) will be performing an audit of the Corps contract analysis lab, PPB (which is also a contract lab of the SFWMD). This is a audit that is a requirement of the SFWMD contract with PPB and routinely is done every 6 months

3. (Previously Item 6 in RAI-1) Additional information is needed regarding flood control issues and existing water uses related to the proposed operation of the pump station. Specifically, provide the following:

a. Modeling data or flood control-related performance indicators that provide a comparison between current conditions and those caused by the proposed operations. You indicate on page 4 of your response to RAI-1 that water levels to the east of the canal (L-31N) would remain at current levels; provide the calculations or models to support said statement.

b. Provide analysis of other data that may be useful in assessing potential flooding impacts from the proposed S-332B pump station, such as groundwater well monitoring data that was collected from last year's test of the S-332D pump station.

c.Provide an analysis with calculations of alternatives for potential activities that provide flood control, such as the potential for flooding fallow or inactive farms in the region, or temporarily flooding farms where the owners have specifically relinquished their rights for flood control, i.e. the George E. Wright Farms under Lease Agreement No. C-9088.

Response to 3a, 3b and 3c Also see tab C which is a table showing the results of the Corps modeling. The George E. Wright Farms(located in the Frog Pond area) are not affected by the operation of the S-332B facility

ISOP9d calls for a flow of 325cfs at S-332B when the stages in L-31N exceed 4.7 ft. This will produce

stages greater than is required by the Biological Opinion in the sparrow regions (sub-populations C and F). Earlier modeling indicated a minimum of 200 cfs at S-332B was required to essentially equal the BO requirements. Assuming a pumping rate of 325 cfs at S-332B (when L-31N is above 4.7 ft), the weir overflowed about 14 percent of the time (over a 31-year period of record). Assuming a pumping rate of 200 cfs at S-332B, the weir overflowed only about 3 percent of the time. For the 31-year period of record (1965 to 1995) used in modeling, no flood control operations at S-332B were predicted (when S-332B would go up to 500 cfs for canal stages of more than 5.2 feet). However, an event like Hurricane Irene in 1999 (for the current detention area) may have resulted in a flood control operation for a very short period (less than one week) to maintain the canal stages.

Due to the concern for potential water quality impacts during weir overflow from the seepage reservoir at S-332B, ISOP9d has operated at a maximum pumping of 250 cfs at S-332B when L-31N is above 4.7 ft. During a recent high water event in L-31N, a maximum of 250 cfs was pumped at S-332B for several days and the weir overflowed at about a maximum 150 cfs flow during that period - more typically about 100 cfs, during that event. While further modeling is required to provide a more accurate assessment of pumping requirement at S-332B will be, the value is expected to be about 250 cfs, when overflow occurs for the existing detention area to meet the B.O. For the record, the 4 samples of water overflowing the weir during this event (week of Sept.18, 2000) taken over 3 days, indicated no detectable mercury or pesticides and very low levels of nutrients (total phosphorus range of 7-10 ppb).

Modeling of the planned future condition (which includes new seepage reservoir), predicts no overflow will be required to meet the BO requirements and only rarely (did not occur in the 31-year period of modeling) when flood control operations might be required to overflow the weirs. The Corps current intent is to build the additional detention area that it has been discussing with DEP. This additional detention area would be directly to the north east of the existing detention area. Two of the pipes from the existing temporary S-332B pump station would be diverted to this new proposed detention area. The requirement to overflow the

detention areas under even extreme events would be greatly reduced by the addition of this new detention area. If an extreme event did occur with this new proposed system addition, the intent would be overflow from the new detention area. The new detention areas emergency weir would discharge towards the eastern side of the detention area, away from the ENP wholly onto former agricultural lands completely owned by the SFWMD.(However it should be noted that under extreme weather conditions it may still be necessary to overflow at both weir locations with the maximum pumping rate of 575 cfs.)

4. (Previously Items 4 and 6 of RAI-1) Thank you or submitting the monitoring plan. The proposed monitoring stations comprised of grab sampling, autosamplers, and groundwater monitoring wells appear to be located in areas that will provide an adequate representation of the water quality of the inflow and outflow waters and seepage inputs to groundwater. However, more information is needed in the monitoring plan regarding the following issues:

a. Please propose and describe monitoring activities with frequencies and locations that will ensure that the requirements of the Consent Decree (referenced above) will be met.

The monitoring that is currently underway includes monitoring at the

1) Pump Intake: a hydrolab (ph, temperature, conductivity etc at intervals of several hours), an autosampler for total phosphorus(8 hour intervals), weekly grab samples (total phosphorus, TKN, ammonia, nitrate/nitrite, ortho Phosphorus, color, turbidity and total suspended solids. Pesticides taken at the pump intake only when pesticides are sampled in the detention area(standing water must be present). The intent is to scale back the pesticides sampling once a good baseline is established.

2) Detention Area: Grab samples are taken at the weir if overflowing (as safety conditions permit) or if at least one ft of standing water in the basin, south side of berm and east side of berm (both about midway on the berm section) and the overflow weir. Analysis to include total phosphorus, TKN, ammonia, nitrate/nitrite,ortho Phosphorus, color, turbidity and total suspended solids. The overflow weir has

an autosampler drawing discrete samples for total phosphorus(8 hour intervals) as well as a hydrolab (ph, temperature, conductivity etc taken at intervals of several hours).

3) Wells in the 332B area: Three samples were taken prior to any pumping event to help establish a baseline. Pesticides were included in the baseline. Following this set of samples, biweekly samples have been taken while pumping is ongoing otherwise weekly well sampling is occurring. The analysis is performed for the well samples is total phosphorus, TKN, ammonia, nitrate/nitrite,ortho phosphorus, color, turbidity and total suspended solids. Pesticides being taken quarterly for two events and then going to a 6 month interval. It is the intent to reduce the well sampling if it is practical. If the new detention area is built, a series of water quality well clusters will be placed around the new detention area. It will be a similar arrangement to what is already in place at the existing detention area and would have the same sampling frequencies and analysis done.

b. Propose and describe monitoring activities with frequencies and locations that will be conducted to assess the impacts of the operation of the pump station on existing habitat of the endangered sparrow. This should include a thorough evaluation of the habitat before, during, and after operation of the pump station, including hydrological analyses, biological, and vegetative analyses with species inventories, percent coverages, and numbers of nesting sparrows in the areas to be impacted by the project. This pre-to post-analysis is needed for an adequate assessment of project impacts on the critical habitat for the endangered sparrow.

The Corps currently has an ongoing monitoring program of the sparrow populations that it funds the Everglades National Park to conduct. The Corps is not conducting a vegetative analysis nor does it think it necessary at this point in time. Currently one of the goals of the S-332B pump station is to eliminate woody vegetation that is disruptive to sparrow breeding success. The ENP is routinely in the area with its bird population study staff and consulted in the area of the vegetation response.

c.

Propose and describe monitoring activities with frequencies and locations that will be conducted to assess flooding impacts and to ensure that, at a minimum, existing levels of flood protection will be maintained, except for temporary flooding of fallow / inactive farms and farms that have lease agreements relinquishing their rights for flood control.

Monitoring activities for S-332B will include at a minimum the following:

1. Use of a Stilling Well in L-31N canal approximately 100 feet north of Pump Station S-332B monitoring canal stages being sent continuously by microwave to South Florida Water Management District (SFWMD). The data is then sent to USACE Jacksonville District (Corps) on one hour intervals.

2. Use of stilling well in each Detention Basin. The stilling well will monitor water levels continuously and be sent by microwave to South Florida Water Management District (SFWMD). The data is then sent to the Corps on one hour intervals.

3. Various groundwater gages in the vicinity of S-332B will be utilized to determine the groundwater levels and the effects of rainfall and pumping in the immediate area. The various gages are operated by ENP (Everglades National Park), SFWMD, and the U.S. Geological Survey (USGS). Water levels at the gage sites will be taken at different time intervals and received by the Corps at different time intervals. The intervals the data is received will be 1hour to 24 hours. The time intervals of the readings are generally 1hour. Current gages to be utilized are as follows:

RG-1 , ENP Gage, 4 miles northwest of S-332B detention area
RG-2 , ENP Gage, 2 miles west of S-332B detention area
RG-3, ENP Gage, 50' west of S-332B detention area spillway
RG-4, ENP Gage, south end of detention area
RG-5, ENP Gage, 800' east of S-332B detention area.
RG-6, ENP Gage, 800' east of S-332B detention area
CR-1, ENP Gage, 2.5 miles south of S-332B detention area
CR-2, ENP Gage, 3 miles southwest of S-332B detention area.
Rutzke, SFWMD Gage, 1.75 miles south of S-332B detention area.
S196A, USGS Gage, 4 miles southeast of S-332B detention area
G1363, USGS Gage, 4 miles east of S-332B detention area
HUMBLE, SFWMD Gage, 2 miles northeast of S-332B detention area

G789, USGS Gage, 3 miles southeast of S-332B detention area

TAB A

S-332B

The current configuration of S-332B is one pump station consisting of four 125 cfs diesel pumps and one 75 cfs pump located in the L-31N canal which pump through a 66 inch pipe (75cfs pump) and four 79 inch pipes (125 cfs) to a single detention area. The current detention area is approximately 160 acres with a storage capacity of approximately 365 acre-ft. The detention area contains one 1500 feet long weir on the southwest corner of the detention area. The weir crest elevation is 8.36 ft-NGVD. Based on the performance of the detention area (i.e. percolation rates) and the requirements of the RPA for the U.S Fish and Wildlife Services' Biological Opinion, designs for a second detention area have been made which utilize the performance parameters from the existing detention area. This new detention area would reduce the occurrences of overflow of the weir and allow for approximately double the percolation rates we obtain at the present. In the event of overflow (if two detention areas are available) we could utilize the northern detention area which has been designed with a weir on the east side allowing flow to return toward L-31N canal on adjacent lands. Included in the second detention area is a test PSTA (Periphyton Storm Treatment Area). Pumping schemes will be utilized to follow the criteria below and allow the northern detention area to overflow the weir there before overflowing the weir in the existing detention, area to the southwest of the proposed detention area. This would only be done in the case of severe or intense rainfall. The purpose of these pumping regimes would be to minimize direct surface water discharges into the Everglades National Park. This test area will be valuable information to the degree of treatment derived from the geology and the biology of the area. The following criteria for pump station S-332B has been developed based on field performance tests of the pump station and hydrologic modeling performed. As new modeling information is obtained, we may adjust criteria to reflect this. At present the contractor that built the pump station (Harry Pepper and Associates) is operating the structure based on our criteria, but once telemetry is placed on the station by South Florida Water Management District (SFWMD) and Harry Pepper and Associates, SFWMD will operate the structure remotely utilizing our criteria.

The on and off criteria have been adjusted to allow for the drawdown in the canal during actual operations. The drawdown due to pumping is approximately 0.20 feet at the staff gage located north of the S-332B intake pipes. *Currently the staff gage in the L-31N canal is reading 0.36 feet lower than NGVD due to an error in the ENP bench mark. The following operational elevations have been adjusted to reflect what the staff gage actually reads. A new survey is being done in order to correct the staff gage. Jacksonville District Water Management and Meteorology staff contact Harry Pepper & Associates, the contractor for operation, with the hours of operation or any special instructions. The operating criterion applies on all conditions for "normal" day to day situations as well as in preparation for a significant tropical storm or extra tropical storm with forecasted significant rainfall.

S-332B Turn on criteria:*

1. Begin pumping 75 cfs (or 125 cfs if electric not functioning) when staff gage in L-31N reads 4.34 ft (4.7 ft, NGVD), assuming no drawdown prior to pumping.
2. If the water level in L-31N canal at the staff gage increases to 4.54 ft (4.9 ft, NGVD), turn 2nd pump on to total 200 cfs. It is recognized that pumping 200 cfs (75 cfs + 125 cfs), if the electric pump is functioning, or 250 cfs (125 cfs + 125 cfs) if unable to use the electric pump, may cause the weir to overflow.
   a) The contractor is to notify the USACE Jacksonville staff should overflow seem likely. Notification should be made to one of the following individuals:

Tracy Hendren **pager pin #: 187-2606 work: 904/232-1185 home: 904/879-0163

Susan Sylvester	**pager pin #: 187-2602	work: 904/232-1720	home: 904/384-5154
Jim Vearil	**pager pin #: 187-2601	work: 904/232-2142	home: 904/573-9624

TAB A (continued)

**Pager access is 1-800-759-8888 then enter the seven digit PIN # and follow instructions.

b) Jacksonville staff will contact the appropriate chain of command as available: Chief, Hydrology and Hydraulics Branch, Chief Engineering Division, and the District Engineer.
c) Contractor is to Inspect berm for degradation due to seepage or wave action. In case of berm breach, or serious structural degradation of the berm, or supporting area of the weir, contact one of the individuals listed above.

3. If the water level in L-31N canal at the staff gage increases to 4.64 ft (5.0 ft, NGVD), then turn on a third pump 325 cfs.
4. If the water level in L-31N canal at the staff gage does not decrease below 4.74 ft (5.1 ft, NGVD) turn on a fourth pump 450 cfs. It is assumed that by this time, the S-176 is opened full and S-332D is pumping.
5. If the water level in L-31N canal at the staff gage continues to increase to 4.84 ft (5.2 ft, NGVD), turn 5th pump on to total 500 (or 575 if commercial electrical power is available) cfs.

S-332B Turn off criteria:**

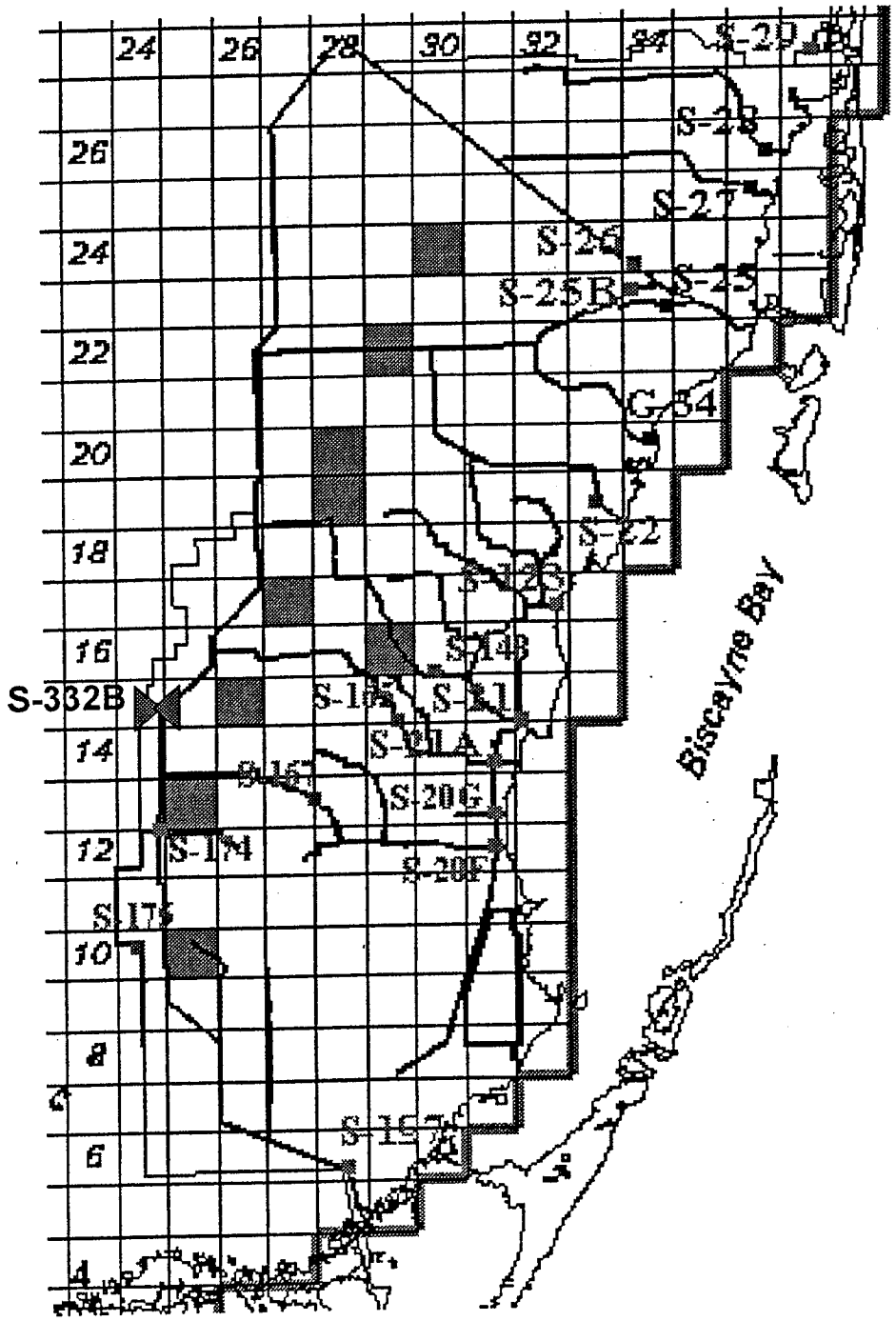
1. If 4 diesel pumps and 1 electric pump are running and If the water level in L-31N canal at the staff gage has receded to 4.64 ft (5.0 ft, NGVD) , cut back to 450 cfs.
2. If 3 diesel pumps and 1 electric pump are running and If the water level in L-31N canal at the staff gage has receded to 4.54 ft (4.9 ft, NGVD), cut back to 325 cfs.
3. If 2 diesel pumps and 1 electric pump are running and If the water level in L-31N canal at the staff gage has receded to 4.44 ft (4.8 ft, NGVD), cut back to 200 cfs.
4. If 1 diesel pump and 1 electric pump are running and If the water level in L-31N canal at the staff gage has receded to 4.34 ft (4.7 ft, NGVD), cut back to 75 cfs (or 125 cfs if 75 cfs pump is not functioning). Utilize pumping scheme to avoid water levels exceeding 7.7 ft (8.06 ft NGVD) on the staff gage in the detention area when water levels on the staff gage in L-31N canal at the pump station are between 4.34 ft (4.7 ft NGVD) and 3.84 ft (4.2 ft NGVD).
5. If the water level in L-31N canal at the staff gage is 3.84 ft (4.2 ft, NGVD), cease pumping.
6. Pumps numbered 4 and 5 would be diverted to the new detention area when it is constructed.

Tab C is a table that contains modeling results of areas east of S-332B. Basically, it is a part of the performance measures of 95base simulation and four IOP alternatives. The first column of the table lists specific cells in the C-111 basin and agricultural area in row-column format. For example, the first cell listed as R10C25 is a 2x2 cell located in row 10 and column 25 (see Tab D for the 2x2 cells and grid). The remaining columns of the table describe land surface elevation, peak stage, stage at highest 10^{th} percentile, and percent of time stage above root zone for each cell for each simulation.

TAB D

SFWMM GRID OF

Lower East Coast Service Area 3



Attachment 2

From: Sonny_Bass@nps.gov on 10/20/2000 02:17 PM

To: Jon Moulding/CESAJ/SAJ02@CESAJ
cc: heather_mcsharry@fws.gov@SMTP@Exchange, Elmar G Kurzbach/CESAJ/SAJ02@CESAJ, Cheryl P Ulrich/CESAJ/SAJ02@CESAJ
Subject: Re:Panther Habitat within Proposed S-332B North Water Detent

Jon,

Based on the observations of Jason Osbourne, and our panther radio-tracking data, it is my opinion that the area in question is marginal habitat. The area is old farm fields and probably provides limited resources for panthers.

Sonny

_____Reply Separator_____
Subject: Panther Habitat within Proposed S-332B North Water Detention
Author: "Moulding; Jon SAJ" <Jon.Moulding@saj02.usace.army.mil>
Date: 10/20/00 9:03 AM

Sonny,

Thanks for allowing your biotech, Jason Osbourne, to accompany me on subject reconnaissance trip Wednesday. We walked the entire area looking for signs of panther and making observations on possible panther habitat. We noted the following.

1. Fresh panther tracks (several days old) along a dirt farm roadway in the northeast corner of the area. It is not known if this is a radio-collared panther. The panther sitings database you recently sent had only two records within the project area. These were of panther #16 (first collared in 1986 and died earlier in the year) and were located in what now is abandoned farm fields near the center of the area.

2. Two deer foraging in the middle of a recently abandoned farm field in the north central portion of the area.

3. Two possible panther habitat areas consisting of mango groves in varying states of abandonment. One (about 26 acres) in the east central portion of the area was well manicured (no ground or shrub layer), with orderly rows of mature trees and closed canopy. The other (about 60 acres) in the northwest corner with smaller mango trees, more open canopy, and overgrown weedy shrub layer (this area was flooded). All other areas, except for a narrow perimeter of tall dense grasses, were farm fields in varying stages of abandonment.

I understand from Jason that he has/will report to you on the possible habitat observations and you will provide your opinion on whether they represent suitable/important cover habitat for the panther in the area. Please respond by email to me and Heather McSharry. As always, a prompt response would be very much appreciated. If we get ESA clearance we will want to begin the construction process immediately. Thanks // Jon

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<P><FONT SIZE=2 FACE="Helv">Sonny,</FONT>
</P>

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From: "Moulding, Jon SAJ" <Jon.Moulding@saj02.usace.army.mil>
To: sonny_bass@nps.gov
Cc: heather_mcsharry@fws.gov, "Kurzbach, Elmar G SAJ"
   <Elmar.G.Kurzbach@saj02.usace.army.mil>, "Ulrich, Cheryl P SAJ"
   <Cheryl.P.Ulrich@saj02.usace.army.mil>

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF
Planning Division
Environmental Branch

DEC 2 1 2000

Mr. James J. Slack
Field Supervisor
U.S. Fish and Wildlife Service
1339 20th Street
Vero Beach, Florida 32960

Dear Mr. Slack:

This concerns Endangered Species Act (ESA) coordination on the proposed North Water Detention Area for Pump Station 332B (S-332B). Your staff requested additional information to support the "not likely to adversely affect" determination on the Florida panther and Cape Sable seaside sparrow that we provided in our letter of October 23, 2000.

We would like to conduct ESA coordination on these two species separately because the necessary panther information is now available. As you are aware, the proposed detention area is critical for the sparrow protection plan for 2001 and subsequent years until the Mod Waters project is completed. The construction process for the area must begin immediately to ensure that it will be ready for the beginning of next year's wet season. Your concurrence with our panther determination will allow construction to begin. Since the sparrow concerns are operational in nature, we would not begin operations for the area pending further coordination on that species.

To supplement previously furnished information on the panther, we contacted Mr. Sonny Bass of Everglades National Park, a recognized panther expert. Our e-mailed questions to him and his response are enclosed. In summary, Mr. Bass's opinion is that the proposed North Water Detention Area is fringe habitat that panthers use less than 10% of the time, and its loss would not significantly affect the species. Further, its loss would probably not limit their movements.

We believe that this information further supports our determination that the proposed project would not be likely to adversely affect the panther. We request your concurrence with