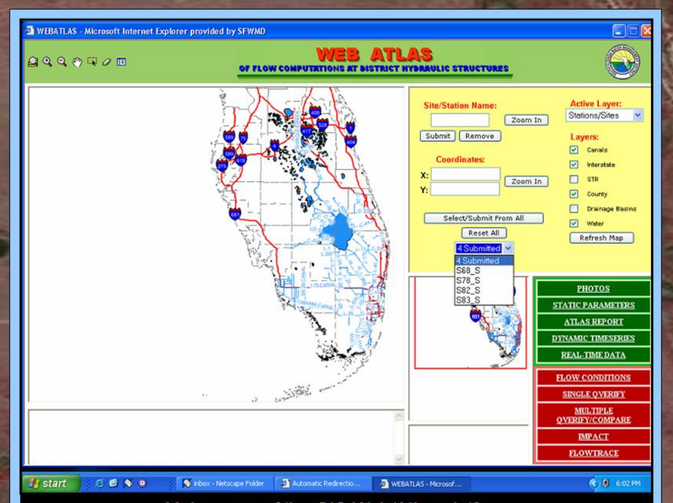
SOUTH FLORIDA WATER MANAGEMENT DISTRICT

A GIS/WEB-BASED ATLAS

Of Flow Computations At District Hydraulic Structures



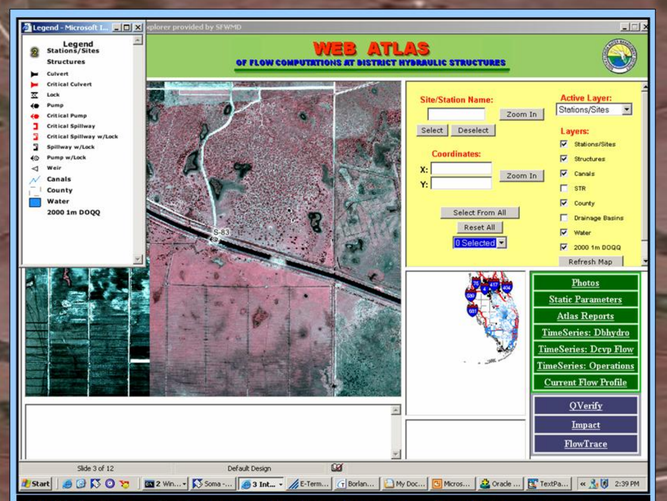
Main menu of the GIS Web/Atlas platform

INTRODUCTION

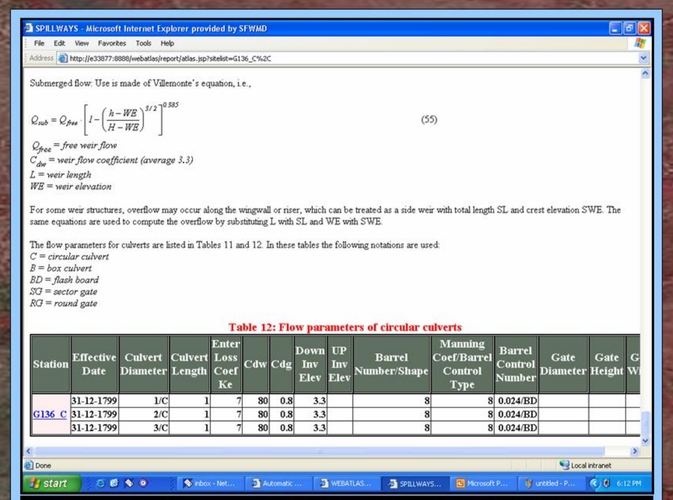
The Atlas is a Web/GIS platform that is based on Arc IMS and consists of a dynamic GIS map of all District hydraulic structures including spillways, pumps, weirs, and culverts.

OBJECTIVE

The main objective of this project is to develop a Web/GIS based platform in which flow computational procedures at District hydraulic structures are documented. This platform is in a website format with a GIS map of all District structures with dynamic links to corresponding flow computation equations or procedures.



Multiple ways of selecting a structure: through a dropdown menu, entering name in a box, or by clicking on the name of the structure from the map



Submerged flow: Use is made of Villemonte's equation, i.e.,

$$Q_{sub} = Q_{free}\left[1-\left(\frac{h-WE}{H-WE}\right)^{3/2}\right]^{0.585} \quad (55)$$

Q_{free} = free weir flow
C_{dw} = weir flow coefficient (average 3.3)
L = weir length
WE = weir elevation

For some weir structures, overflow may occur along the wingwall or riser, which can be treated as a side weir with total length SL and crest elevation SWE. The same equations are used to compute the overflow by substituting L with SL and WE with SWE.

The flow parameters for culverts are listed in Tables 11 and 12. In these tables the following notations are used:
C = circular culvert
B = box culvert
BD = flash board
SG = sector gate
RG = round gate

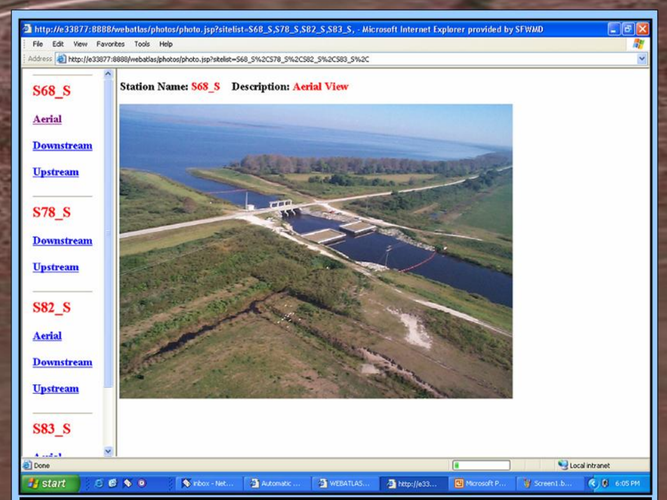
Table 12: Flow parameters of circular culverts

Station	Effective Date	Culvert Diameter	Culvert Length	Enter Loss Coef Ke	Cdw	Cdg	Down Inv Elev	UP Inv Elev	Barrel Number/Shape	Manning Coef/Barrel Control Type	Barrel Control Number	Gate Diameter	Gate Height	G W
G136_C	31-12-1799	1/C	1	7	80	0.8	3.3		8	8	0.024/BD			
	31-12-1799	2/C	1	7	80	0.8	3.3		8	8	0.024/BD			
	31-12-1799	3/C	1	7	80	0.8	3.3		8	8	0.024/BD			

Atlas report of flow computational procedure at the selected structure

BENEFITS TO THE DISTRICT

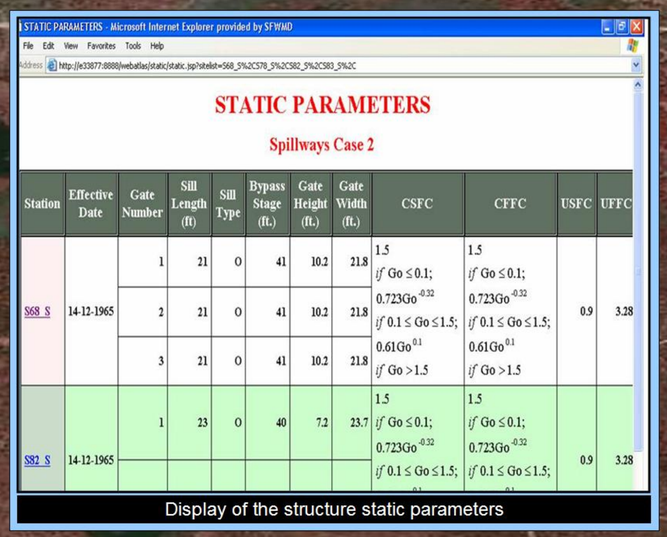
The benefits of this project include an accurate and readily accessible database of the flow computational procedures at all District structures. Other benefits include a more efficient dissemination of information, cost savings from a decrease in flow computational procedure requests, and an overall improved operation of the Hydrology and Hydraulics Division.



Three choices for the display of structure photos: aerial, upstream, and downstream

CONCLUSION AND SUMMARY

The Web/Atlas GIS project is primarily an online documentation of the flow computational procedures at District hydraulic structures. Other features include graphical display of real time flow conditions, historical flow records, and previously measured field conditions at a site.

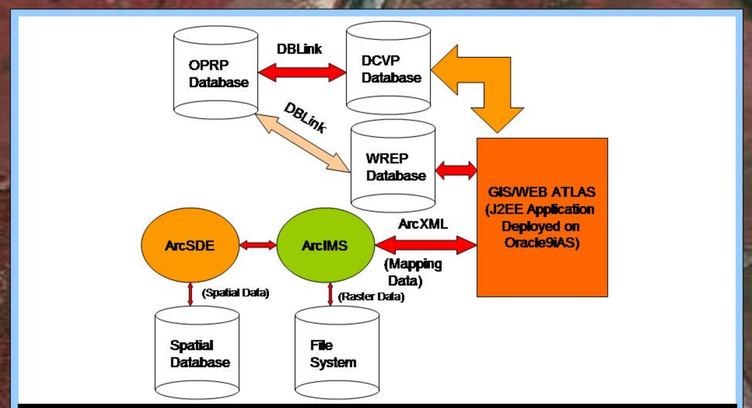


STATIC PARAMETERS

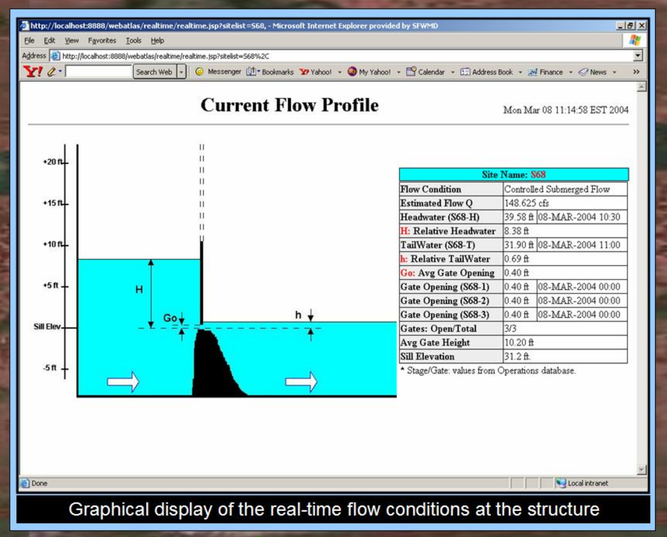
Spillways Case 2

Station	Effective Date	Gate Number	Sill Length (ft)	Sill Type	Bypass Stage (ft.)	Gate Height (ft.)	Gate Width (ft.)	CSFC	CFFC	USFC	UFFC
S68_S	14-12-1965	1	21	0	41	10.2	21.8	1.5 if Go ≤ 0.1; 0.723Go^-0.32 if 0.1 ≤ Go ≤ 1.5; 0.61Go^0.1 if Go > 1.5	1.5 if Go ≤ 0.1; 0.723Go^-0.32 if 0.1 ≤ Go ≤ 1.5; 0.61Go^0.1 if Go > 1.5	0.9	3.28
		2	21	0	41	10.2	21.8				
		3	21	0	41	10.2	21.8				
S82_S	14-12-1965	1	23	0	40	7.2	23.7	1.5 if Go ≤ 0.1; 0.723Go^-0.32 if 0.1 ≤ Go ≤ 1.5;	1.5 if Go ≤ 0.1; 0.723Go^-0.32 if 0.1 ≤ Go ≤ 1.5;	0.9	3.28

Display of the structure static parameters



Data flow diagram for the GIS/Web-based Atlas Application



Current Flow Profile

Mon Mar 08 11:14:58 EST 2004

Site Name: S68	
Flow Condition	Controlled Submerged Flow
Estimated Flow Q	148.625 cfs
Headwater (S68-H)	39.58 ft 08-MAR-2004 10:30
H: Relative Headwater	8.38 ft
TailWater (S68-T)	31.90 ft 08-MAR-2004 11:00
h: Relative TailWater	0.69 ft
Go: Avg Gate Opening	0.40 ft
Gate Opening (S68-1)	0.40 ft 08-MAR-2004 00:00
Gate Opening (S68-2)	0.40 ft 08-MAR-2004 00:00
Gate Opening (S68-3)	0.40 ft 08-MAR-2004 00:00
Gates: Open/Total	3/3
Avg Gate Height	10.20 ft
Sill Elevation	31.2 ft

* Stage/Gate: values from Operations database.

Graphical display of the real-time flow conditions at the structure

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