



# **BCB Flood Protection Level of Service (BCB FPLOS) - Project Final Report**

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## Purpose of BCB FPLOS Study

- Evaluate the state and performance of BCB water management system
- Identify under-performing canal segments
- Investigate effects of Sea Level Rise and future land use on the BCB FPLOS
- Support BCB Capital Program and Strategic Planning efforts by identifying immediate and long term needs of the primary canals & structures

- Focus on primary system in the major watersheds
- Evaluating effects of changes in Land Use and Sea Level Rise on Flood Protection Level of Service

[sfwmd.gov](http://sfwmd.gov)





# Project Activities

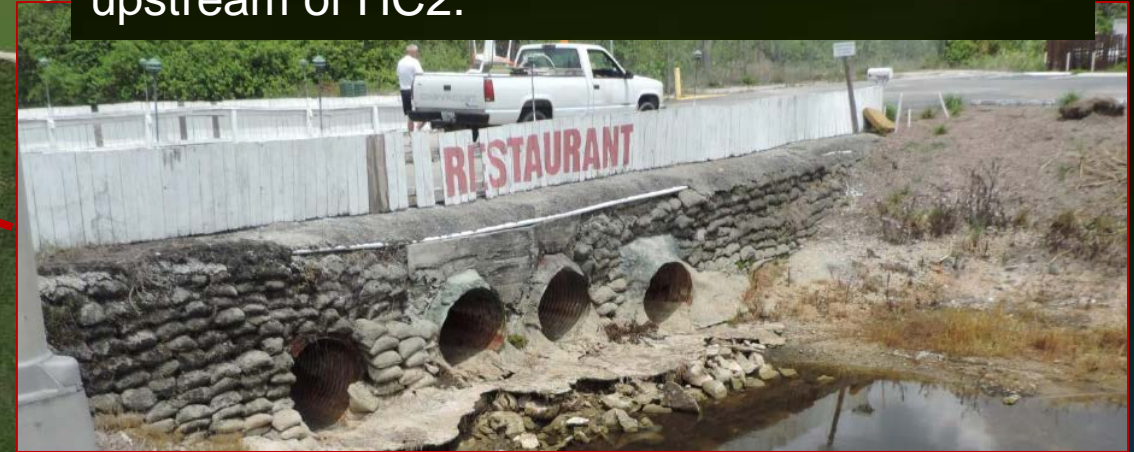
- Develop Water Control Operations Atlas Completed
- Modify and recalibrate model Recalibrated Henderson-Belle Meade area
- Assess Flood Protection for Existing Conditions
  - Golden Gate Completed
  - Cocohatchee, Faka Union, Henderson Completed
- Determine impact of sea level rise and land use changes on flood protection
  - Golden Gate Completed
  - Cocohatchee, Faka Union, Henderson Completed

# Site Inspections of Henderson Creek



Main model error was the incorrect representation of culverts at a bridge to a restaurant on Collier Blvd between A Better Way and Rattlesnake Hammock Road.

These culverts limit flow, raise peak flood stages upstream of bridge. Impact extends upstream of HC2.





## Flood Protection Level of Service Metrics:

### Canal

- Maximum Stage Profiles
- Discharge Capacity of sub-basins

### Land

- Maximum Flood Depth Map
- Flood Duration Map

### Tidal Structure (Sea Level Rise)

- Structure Capacity During Surge
- Peak Stage Upstream of Structure Caused by Surge & SLR

## Current Flood Protection LOS: Maximum Stage Profiles

Canal Segment	FPLOS – overall	FPLOS –localized	Comment
Cocohatchee	10 to 25 year	5 year	Concerns in area upstream of COCO3
Henderson	10 to 25 year	5 year	Bridge Constriction
Faka Union	10 year	<5 year	Over- conservative  Modeling of Low-Density Urban Lands needs improvement
Miller	10 year	5 year	



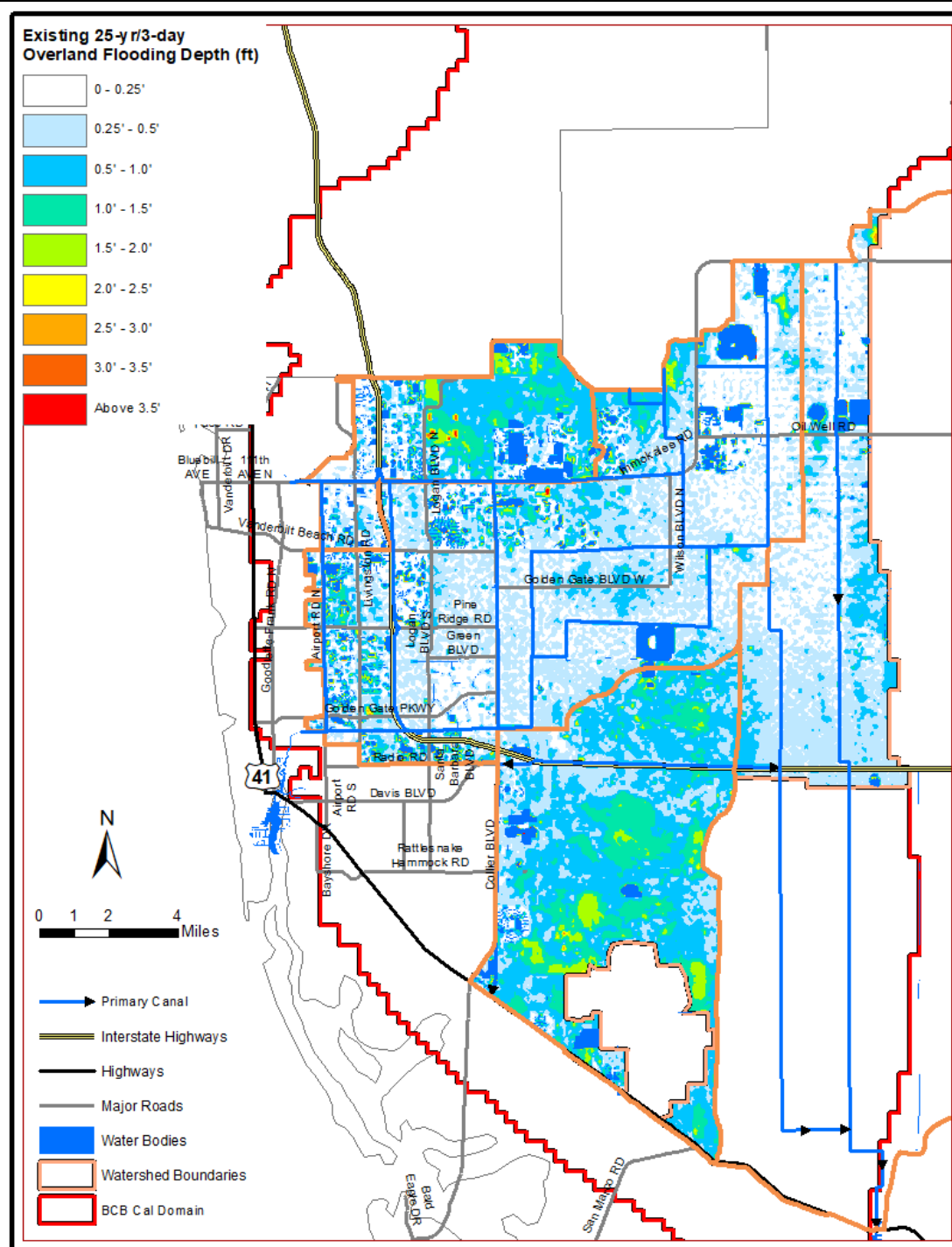


# Inundation Map for 25-Year Storm: Current Conditions

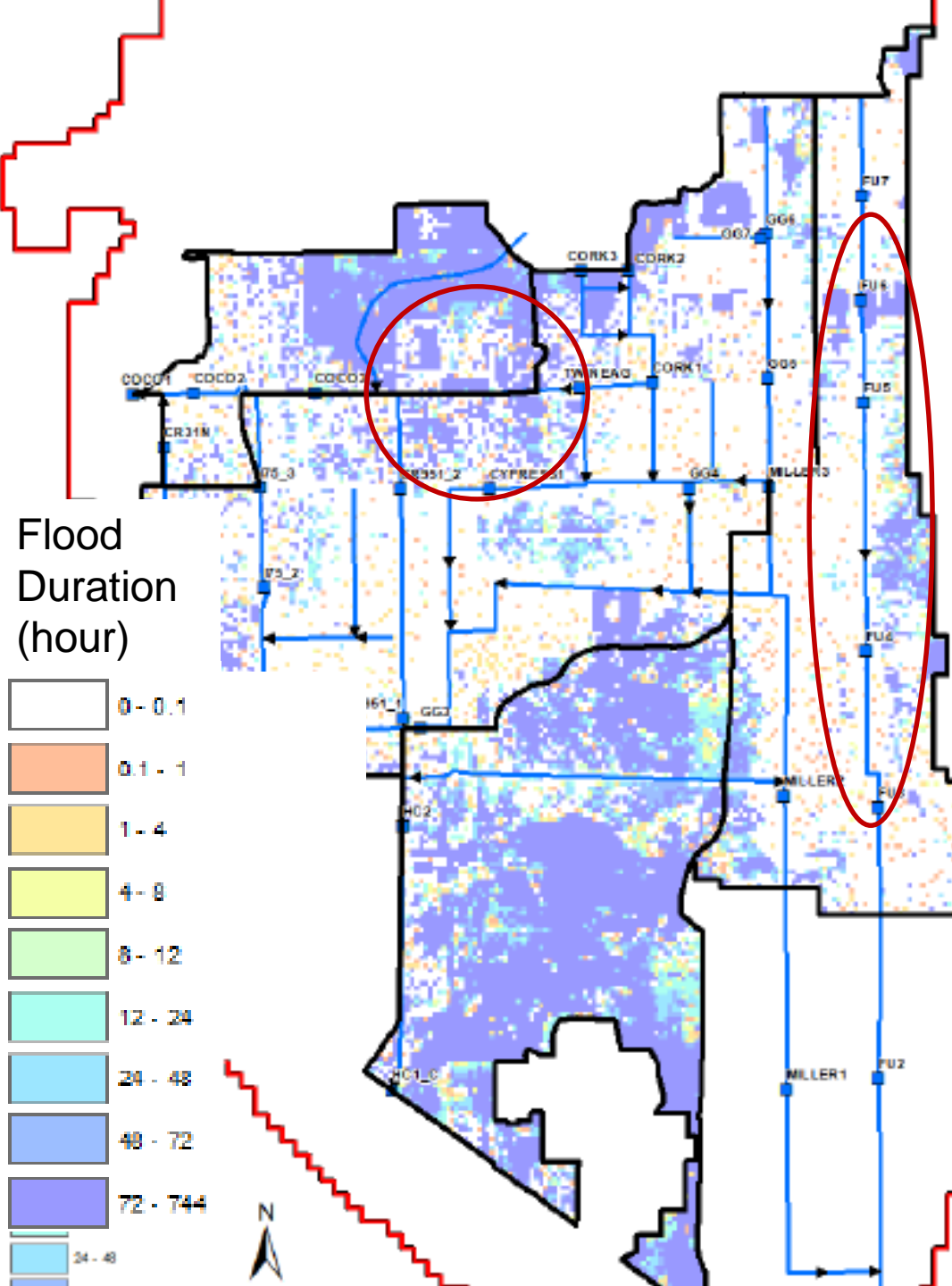
Natural areas show the greatest extents and depths of flooding.

Most of the newer developments remain relatively flood free. Conversely, Golden Gate Estates was predicted to be mostly inundated for the 100-y storm event with flood depths ranging from 0.25 to 2.0 feet.

The most severely flooded areas within Golden Gate Estates were predicted to be in those areas furthest from the Faka Union and Miller Canals with depth increasing with distance from canals.



# Flood Duration Map for 10-y Event: Current Conditions

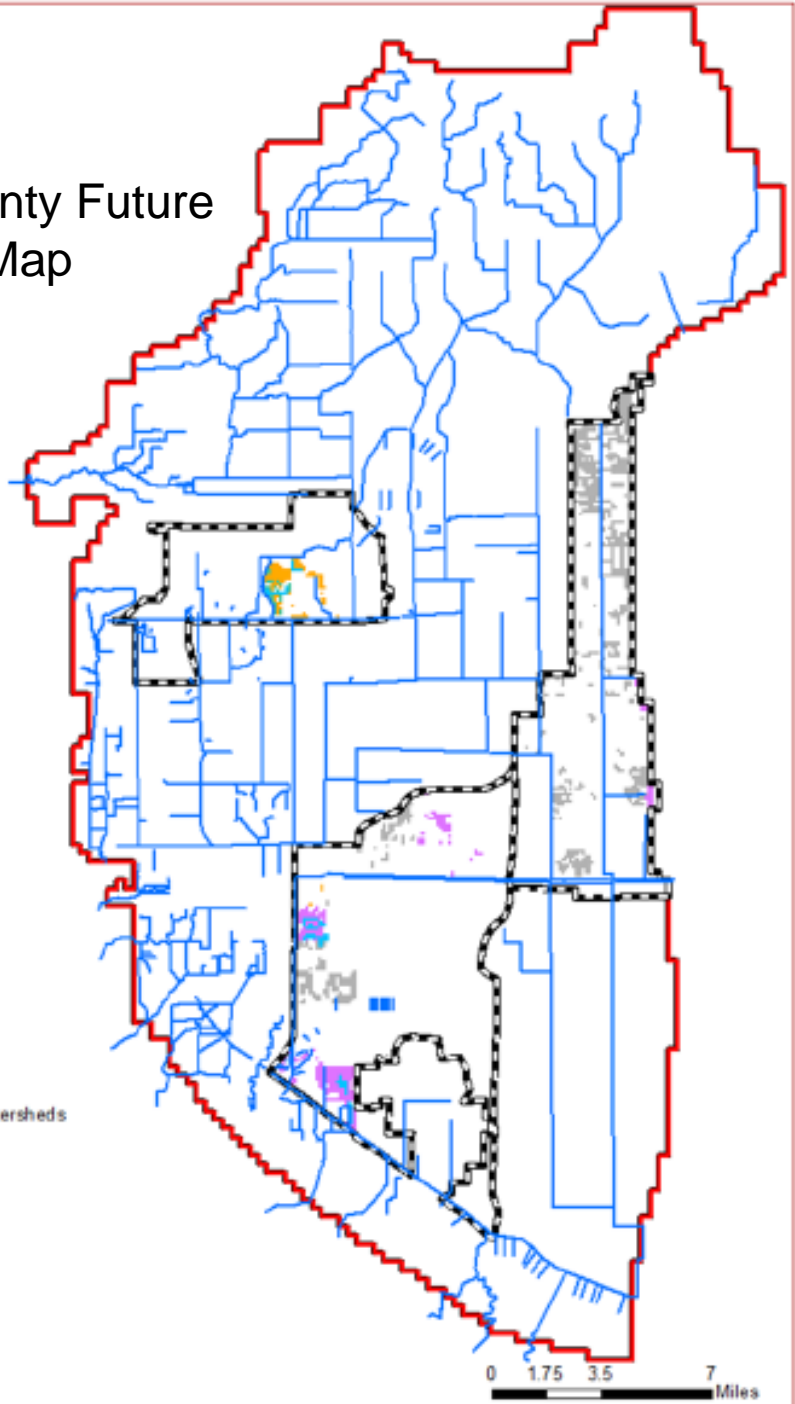


Most of the Primary Canal System can carry the 10-y Design Event.

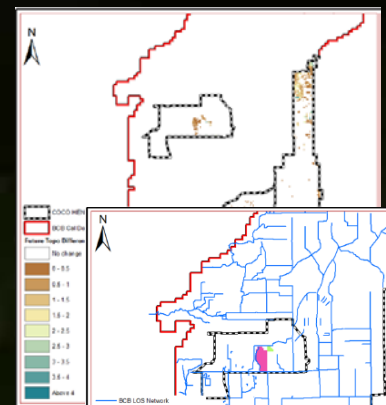
Areas with long flood durations are either low-lying areas or areas with limited secondary drainage.



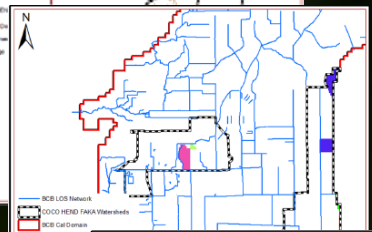
Collier County Future Land Use Map



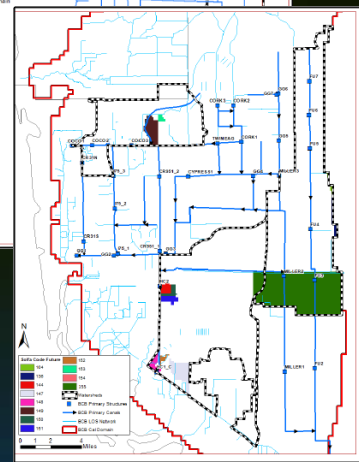
# 2065 Future Conditions: modeling change in Land Use



Changes in Topo

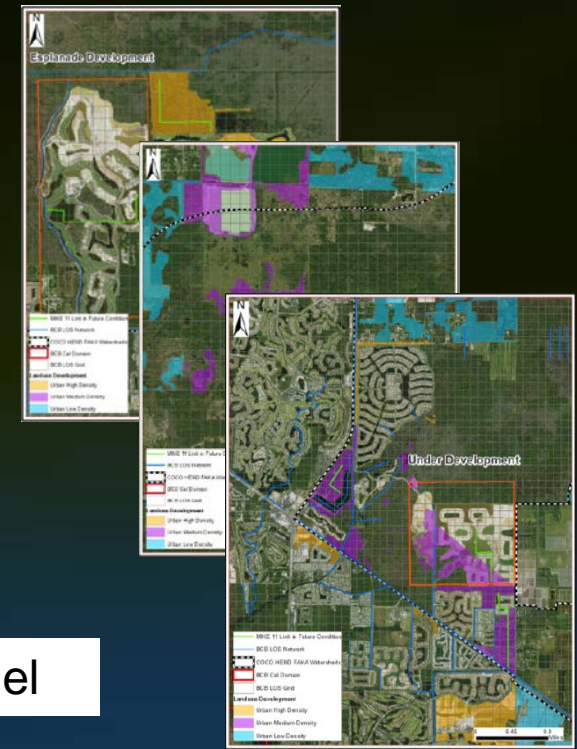


Drain Code Changes



Overland Flow Barriers

Stormwater Management Systems [detention ponds and discharge structure sized to County D.C.]

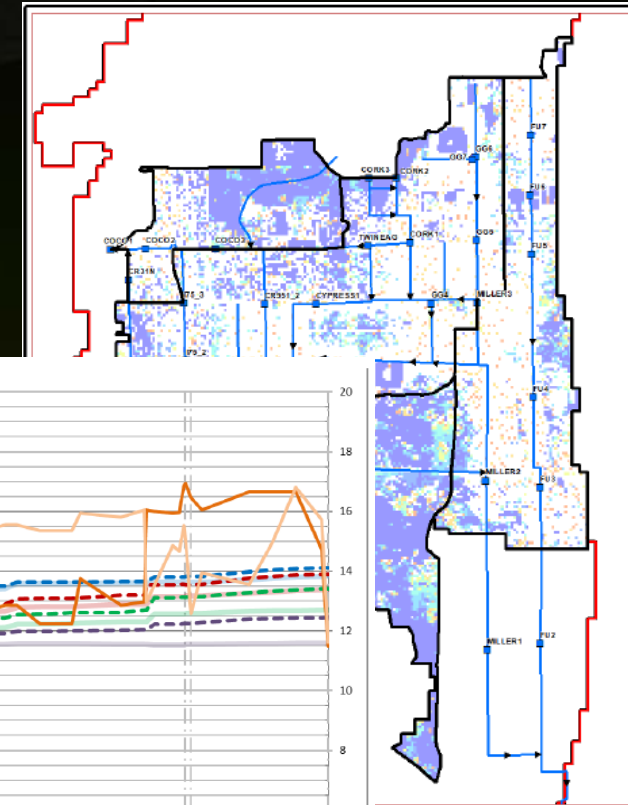
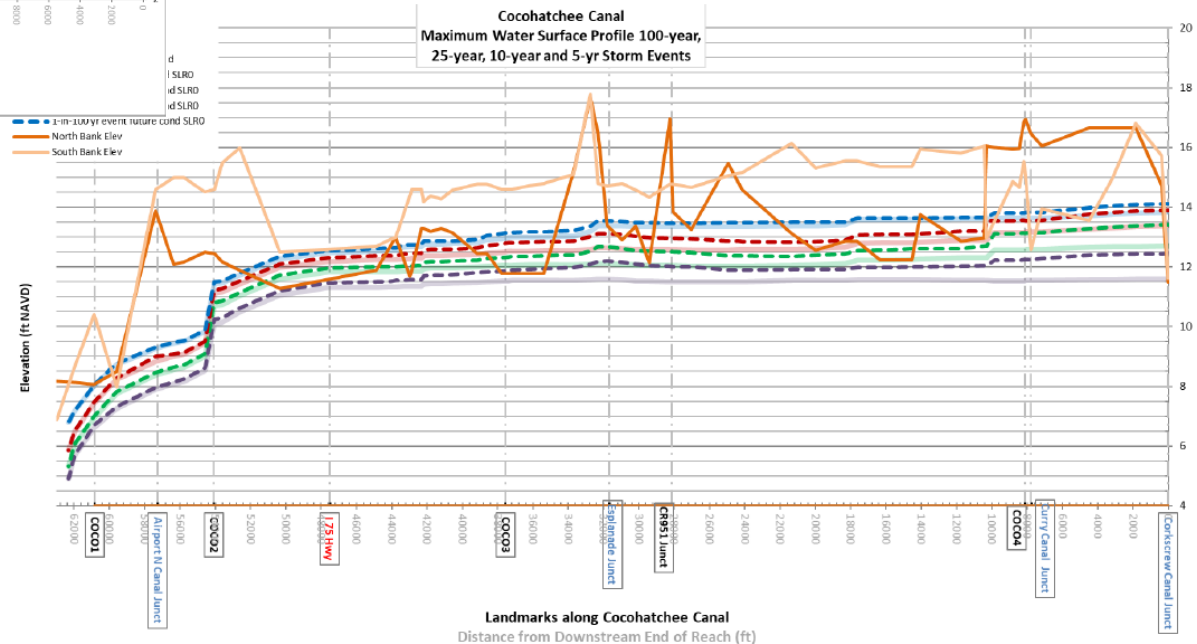
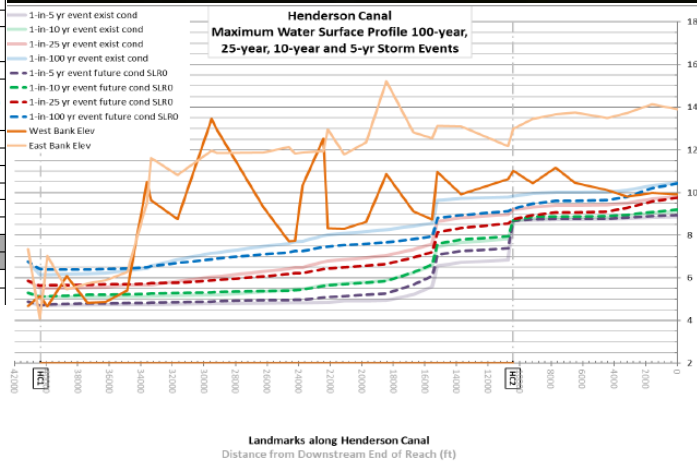


add PSRP levee and pumps to Model



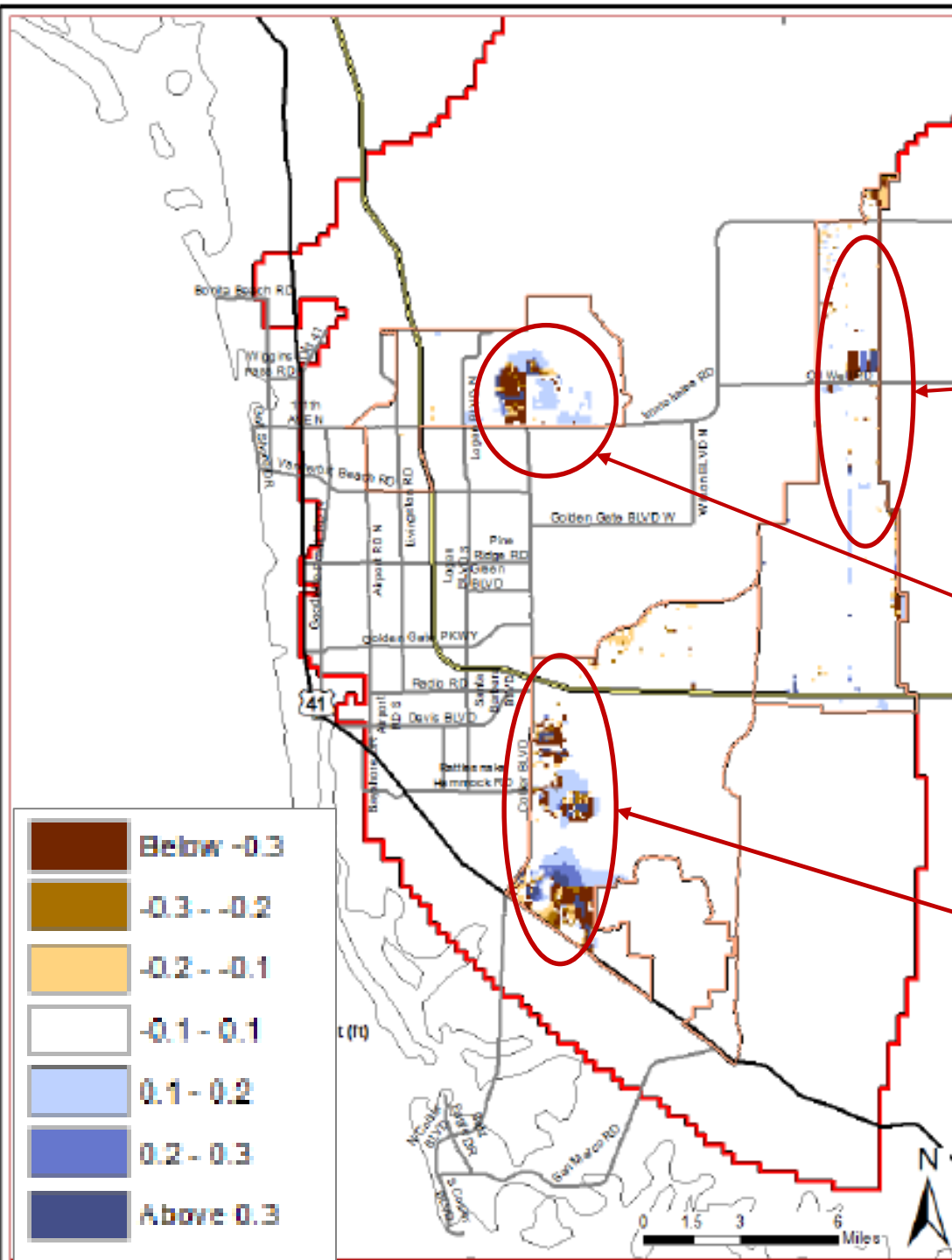
# Impact of Land Use Change on Discharge Capacity, Flood Duration, Inter-basin Flows and Canal Stage are Minor

Structure\ Segment	Inflow Point(s)	Outflow Point(s)	Water Control Catchment Area (sq.mi)	25-year Peak Discharge Capacity (cfs/sq.mi)	
				Current	Future
HC2	BEGINNING OF HENDERSON	HC2	3.07	14	15
HC1	HC2	HC1	71.08	87	82
COCO3	BEGINNING OF COCOHATCHEE, BEGINNING OF CR951	COCO3	17.03	25	30
COCO2	COCO3	COCO2	6.08	80	75
COCO1	AirportN, COCO2	COCO1	3.37	100	98
FU7	FU7	FU7	4.09	48	83
FU6	FU7	FU6	3.90	54	55
FU5	FU6	FU5	4.81	39	46
FU4	FU5	FU4	11.66	47	49
FU3	FU4	FU3	8.39	42	67
Miller2	Miller3, C-1 Connector	Miller2	11.93	50	
FU Pump	FU4	FU Pump	14.88		33
Miller Pump	Miller3, C-1 Connector	Miller Pump	15.56		



	5-Year		10-Year		25-Year		100-Year	
	Current	Future	Current	Future	Current	Future	Current	Future
COCO4 Positive (into Golden Gate)	26	48	45	58	51	61	54	58
COCO4 Negative (into Cocohatchee)	0	0	-10	-32	-21	-23	-34	-38
Miller3 (into Miller Canal)	218	240	311	326	436	409	503	467
C-1 Connector (into Miller Canal)	45	20	45	32	38	38	33	43

# Impact of Land Use Change: Changes in Flood Depth (25-y)



Miller and Faka Union

Coco3

Henderson Creek / Belle Meade

# 2065 Future Conditions: Sea Level Rise

Change in Initial  
Water Table Stage  
(SLR3)

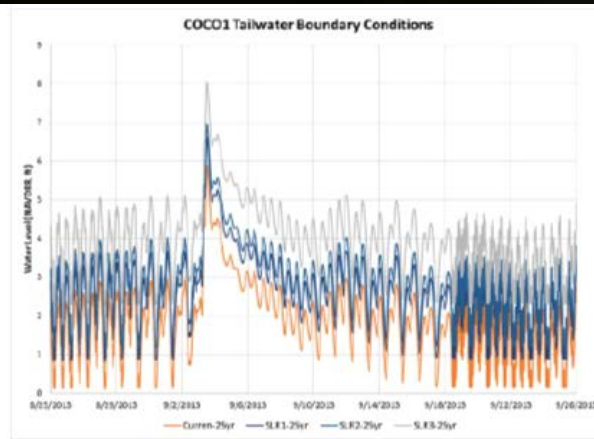
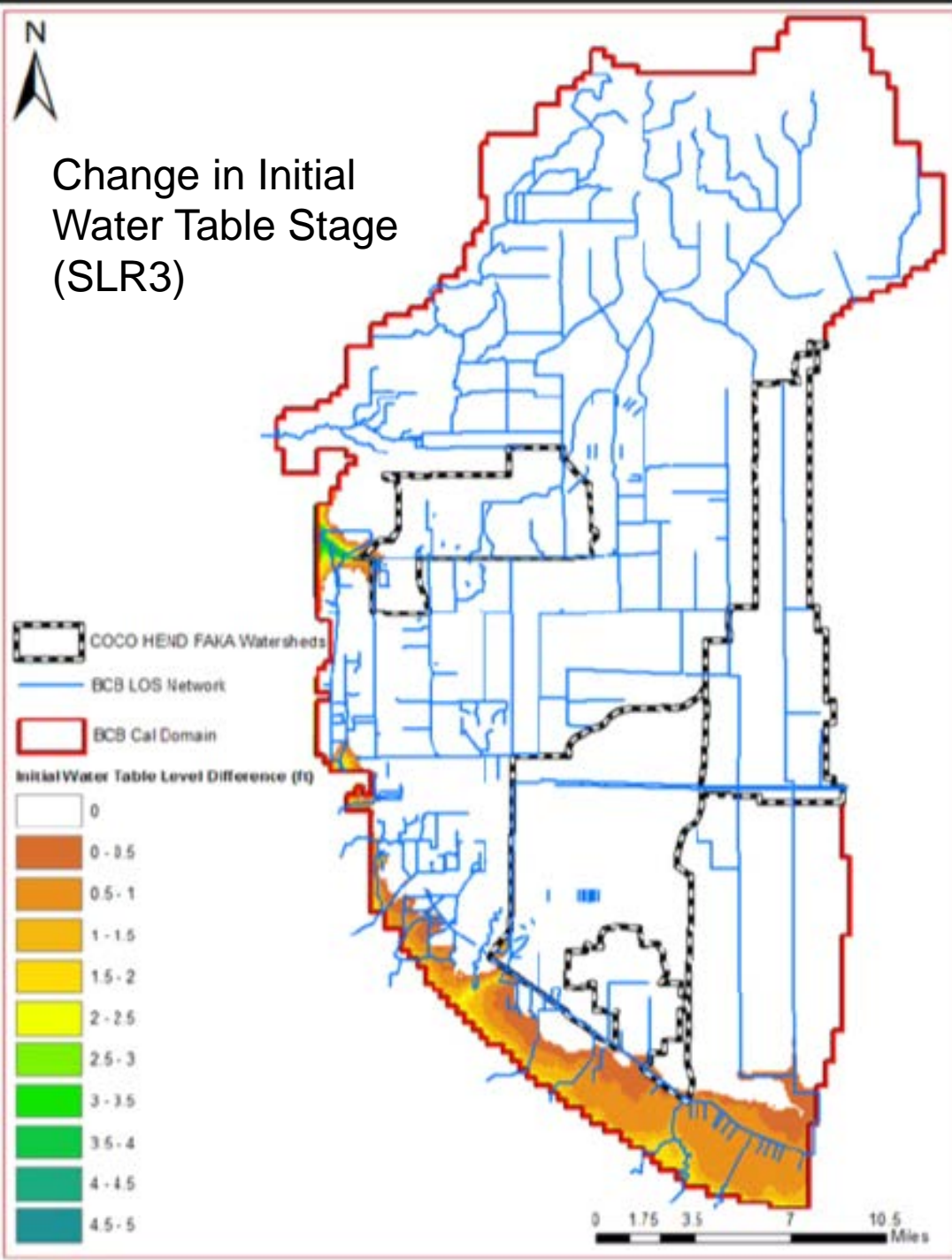


Figure 5.2.1 – COCO1 Tailwater Boundary Conditions for Future Sea Level (25-year event)

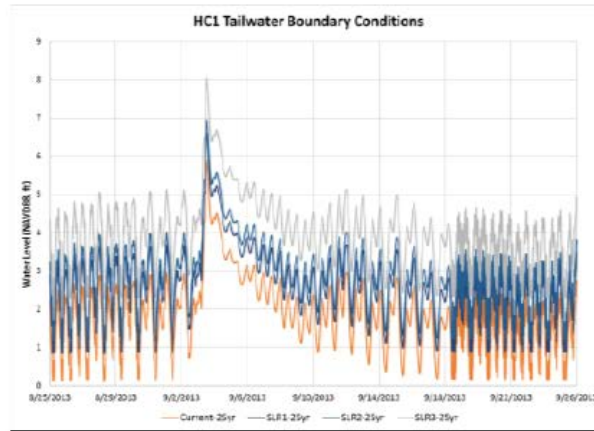
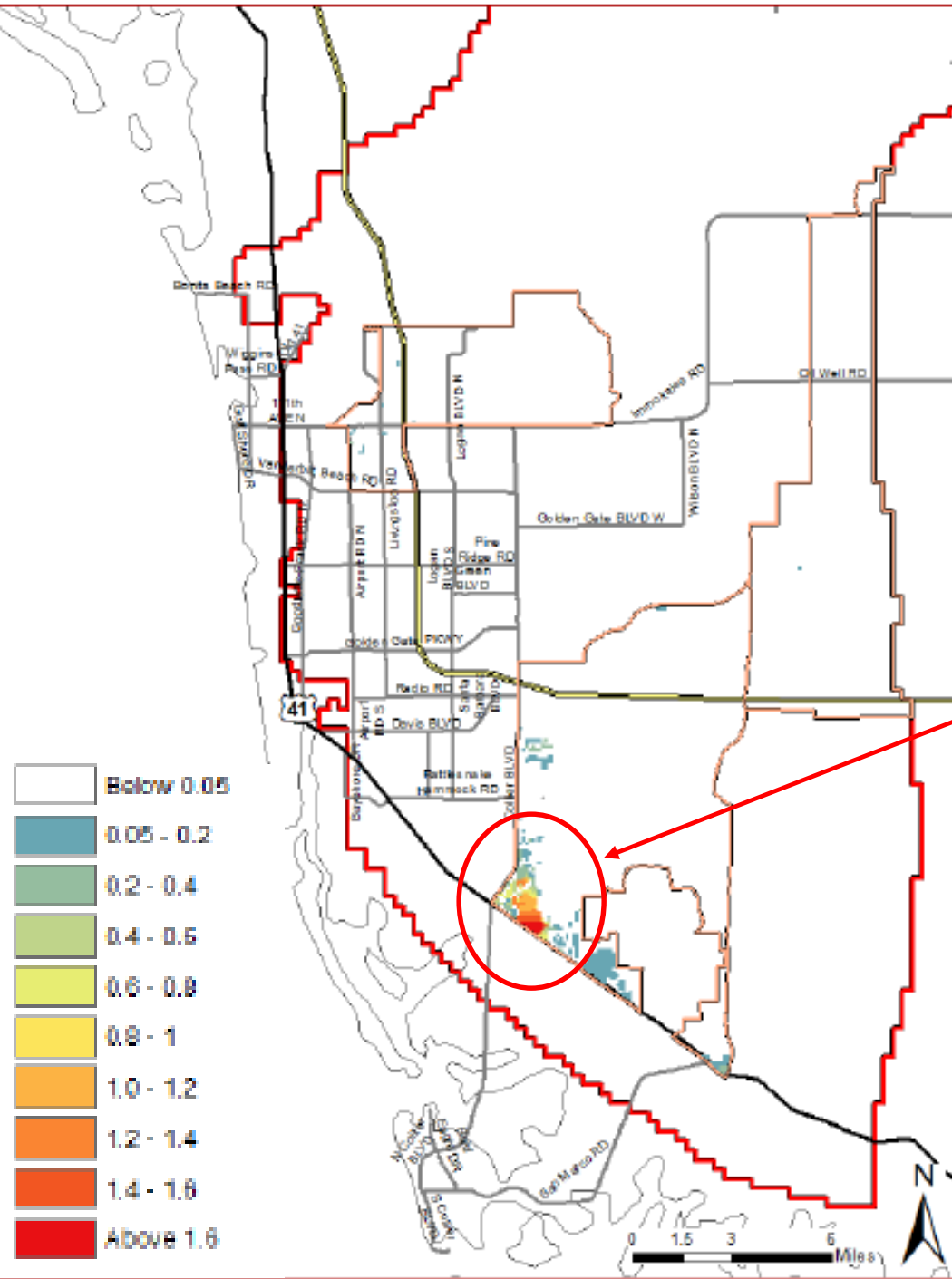


Figure 5.2.2 – HC1 Tailwater Boundary Conditions for Future Sea Level (25-year event)

Tidal Stages at  
COCO1 and HC1  
for SLR1 (0.73 ft),  
SLR2 (1.06 ft) ,  
and SLR3 (2.17  
feet) with 25-y  
tailwater surge



# 25-year Inundation Difference Map: Future SLR3 minus current



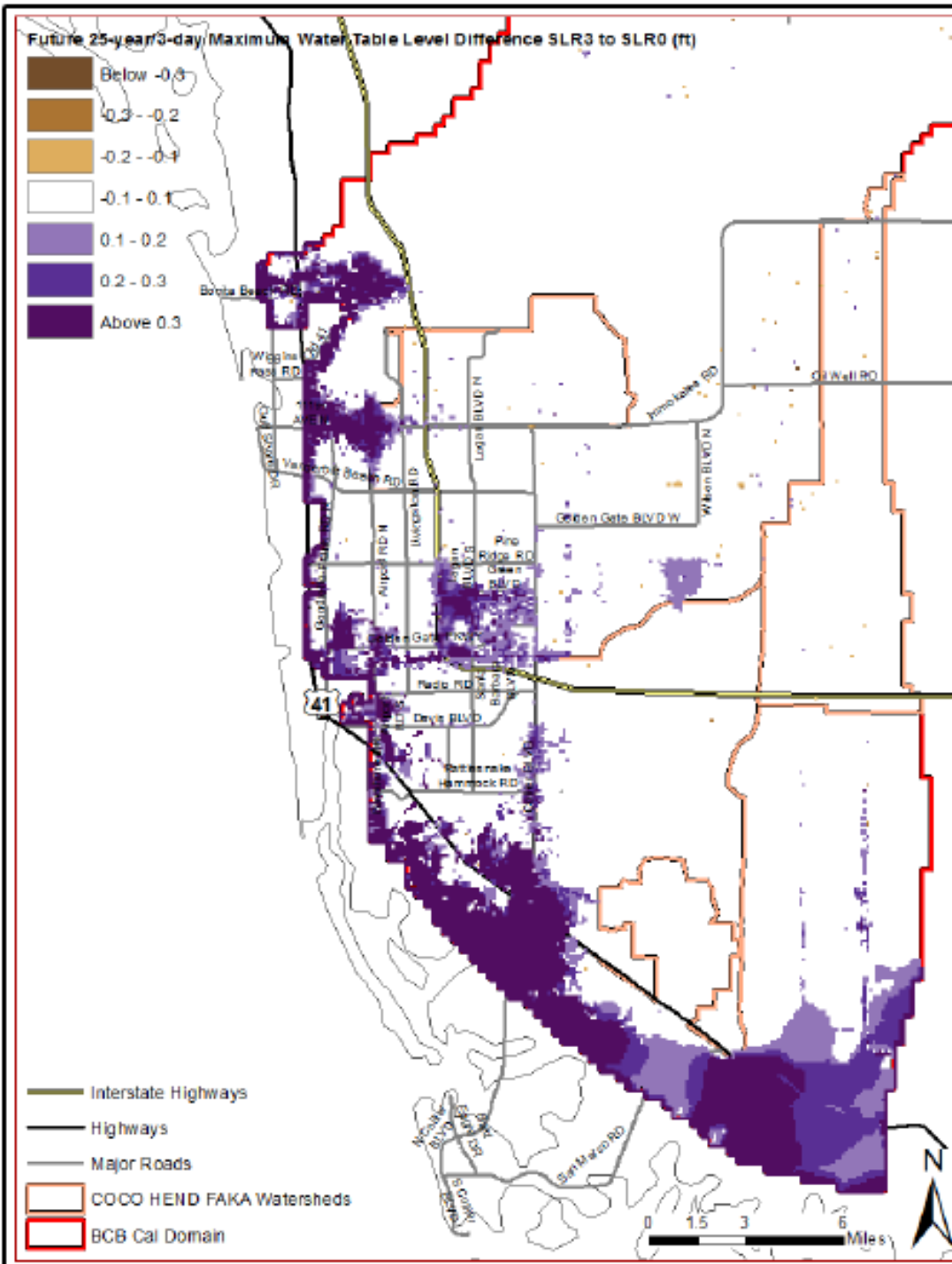
Only the lower part of Henderson/Bell Meade shows significant increase in flood depth due to sea level rise

Note: Tidal Areas were not considered in this study

## Difference in Maximum Groundwater Level: Future SLR3 minus Current

Sea Level Rise will bring water table closer to ground surface in low lying areas of County.

more flooding,  
higher canal stages,  
water quality issues



## SUMMARY OF FINDINGS – for Current Conditions

### General:

The canal networks in all watersheds can handle a 10-year 3-day design storm.

### Areas of concern:

- I-75 Canal, Corkscrew Canal, Golden Gate Canal between GG3 and GG4, Henderson Creek Canal upstream of HC2.
- Conveyance limitations were found in the upper and middle reach of the Golden Gate canal system, including Cypress Canal
- Prolonged road flooding in the Faka Union system was found even though primary canals have sufficient capacity

### Sites of concern:

- low-lying areas near the COCO3, immediately upstream of HC1 and upstream of GG3



## **SUMMARY OF FINDINGS – for Future Land Use**

### General:

No widespread degradation of flood protection level of service as a result of projected land use changes in the Golden Gate or Faka Union watersheds.

### Areas of Concern:

- Low-lying area near HC1 structure; area downstream of HC2, COCO3 to COCO4, CORKSCREW Canal

### Sites of Concern:

- Upstream of GG4 in the Golden Gate Canal, near the COCO3 structure, downstream of the CORK3 structure, west of the COCO4 structure, and upper reaches of the Miller Canal

## **SUMMARY OF FINDINGS –Sea Level Rise Scenarios**

The Cocohatchee, Golden Gate and Faka Union systems are not significantly impacted by sea level rise though higher sea levels will raise water levels in low-lying coastal regions and these higher water tables make these areas more susceptible to rainfall-based flooding.

The Henderson/Belle Meade system is susceptible to sea level rise. The impact is greater at Henderson Creek than at the other watersheds because of the low topography that makes the HC1 structure susceptible to backwater effects associated with storm surge and sea level rise.

# Initiatives supported by BCB LOS study findings

## Initiatives in Proposed 5-year Capital Improvement Plan

- I-75 / Cocohatchee Canal Interconnect
- I-75 Canal Improvements (Pine Ridge to Green)
- Cypress Canal Improvements
- Miller Canal Improvements

## Other Initiatives

- Golden Gate Main - Regional Storage
- Henderson Creek - Removal of constriction



# Questions?

