MEMORANDUM

To: Elizabeth Wong, PE (City of North Port)
From: Dave DeLoach, PE; Trillian Baldassari, PE
Copy: Rod Ghioto, PE
File: 14-00400-00

Subject: Task 1.4 Big Slough Flood Reduction Study, Potential Solutions for Hydraulic Evaluation

January 30, 2017

Potential Solutions for Hydraulic Evaluation

As discussed in the Big Slough Flood Reduction Study Project Plan, this project builds upon prior work performed while advancing and supplementing flood reduction concepts previously developed by others. This memorandum briefly summarizes potential solutions which have been considered, including data needs and constraints on implementation, and identifies a specific set of alternatives selected from among the potential solutions for hydraulic evaluation. Information presented in this memorandum addresses the following elements of the Project Plan (Task 1.3).

- Formulate List of Potential Solutions for Hydraulic Evaluation
  - Describe Each Potential Solution and Any Known or Expected Obstacles to Success
  - Identify Additional Data Needs to Support Hydraulic Evaluation
  - Meeting to Review and Discuss List of Potential Solutions
  - Select a Set of Alternatives from Among Potential Solutions for Hydraulic Evaluation

<u>Potential Solutions and Obstacles to Success</u>

One-page descriptions of potential solutions (Attachment 1) were distributed for review and discussion by team members. These solutions may be applicable to either Task 1 Myakkahatchee Creek at I-75 and Jockey Club areas or Task 2 regional flood reduction objectives, or both.

Flood reduction solutions that were formulated generally included:

- Internal Flow Diversion and Increased Conveyance Capacity
- External Flow Diversion
- Offsite Storage
- Gate Operations
- Floodproofing
- Property Acquisition
- Elevation of Roadways

Meeting to Review and Discuss List of Potential Solutions

A project team meeting was held on December 20, 2016 to discuss potential solutions to achieve flood reduction and to develop a selected set of alternatives for hydraulic evaluation. For each concept, prior work and findings were discussed and expected obstacles to success were considered. Comments from the meeting are included in Attachment 2. From this collaboration, a set of alternatives were selected by the team for Task 1 and Task 2 hydraulic evaluations. Hydraulic evaluations will serve to better inform the team as to effectiveness of the individual solutions and will point the way toward a preferred plan for improvements.

Selected Alternatives for Hydraulic Evaluation

The following set of alternatives were selected by the team for hydraulic evaluations.

Internal Flow Diversion and Increased Conveyance Capacity

- Parallel Relief Channel Construction

  A new, parallel canal could be constructed from the northern City boundary to Price Boulevard along Tier 1 and Tier 2 lots that have been acquired on the west side of the Myakkahatchee Creek. The additional conveyance may reduce flow rate and thus peak stages along the main channel from start to end of the parallel relief channel.

- Channel Improvements along R-580

  The R-580 waterway's bottom profile could be reconfigured, creating a more uniform and hydraulically efficient conveyance way. Improvement of the R-580 Waterway would induce more flow eastward from Big Slough along the City's northern boundary toward Creighton Waterway, resulting in reduced flows and flood stages in Myakkahatchee Creek.

- R-36 Improvements to South of WCS-101

  A whole series of improvements could be made to canal segments and structures to enhance the overall conveyance capacity of the R-36 waterway system. The additional stormwater conveyance capacity may induce higher westward flow out of Big Slough at the north boundary of the City. Diverting those higher flows southward to WCS-101 would reduce flow and stages along the more flood prone segments of Myakkahatchee Creek.

- Snover Waterway to Cocoplum Waterway

  Improvements could be made to existing structures along Snover Waterway and beneath Price Boulevard to increase flow through canals that connect with Cocoplum Waterway. The additional conveyance capacity may induce higher eastward flow out of Big Slough into Snover Waterway. Diverting those higher flows southward to Cocoplum Waterway would reduce flow and stages along the more flood prone segments of Myakkahatchee Creek.

- Other Miscellaneous Improvements

  Canals and structures throughout the area will be reviewed for opportunities to increase conveyance.

External Flow Diversion

- Connection to Deer Prairie Slough

  Stormwater flows could be diverted westward to the adjacent Deer Prairie Slough watershed, reducing flow through the City. Several variations could be considered, including gravity and pumped diversions both with and without added storage facilities.

- Enhanced Discharges Along Southern Boundary to Port Charlotte – Tidal Outfalls Only

  Structures located within the Cocoplum Waterway and discharging beneath Hillsborough Boulevard could be improved to facilitate increased discharges into the adjacent Port Charlotte conveyance system. Additional conveyance capacity would effectively divert stormwater southward and may reduce flooding throughout the southern portion of the City.

Offsite Storage

- Constrain Inflows to City with Increased Upstream Floodplain Storage

  Raise existing earthen berms on the northwest City boundary at the intersection of Big Slough canal with R-36 and R- 580 waterways. Also, raise earthen weirs farther north at the intersection of Big Slough canal and Power Line Road. Improvements would leave the Big Slough canal as the only conveyance system into the western portion of the City. Inflows would be reduced, dropping peak stages along Myakkahatchee Creek.

- Creation of Upstream Detention, Reservoirs, or Joint Use Facilities

  One or more detention ponds, reservoirs, or joint-use facilities could be constructed to provide offsite upstream stormwater detention. The facilities would reduce inflow rates and thus peak stages along Myakkahatchee Creek.

Acquisition

- Purchase of Flood Prone Lands and/or Flood Prone Structures

  Some communities turn to property acquisition to mitigate flood risk by establishing permanent, public open space and to get homeowners in flood-prone areas permanently out of harm's way. In North Port, many lots have already been acquired on the west side of the Myakkahatchee Creek to serve as a linear park. Additional acquisition may be considered to remove other lands and/or structures from the 100-year floodplain. Removal of those properties would reduce future flood-related damages but would not impact flood levels.

<u>Additional Data Needs to Support Hydraulic Evaluation</u>

No additional data needs were identified during the meeting. Additional information will be gathered during subsequent meetings, such as regarding the Deer Prairie Slough restoration project. Field survey will be postponed until needed during Task 1.8.1 Finalize Recommended Plan and Project Deliverables.

Attachment 1: Team Meeting – Discussion Sheets

The following one-page descriptions of potential solutions were distributed for review and discussion at the December 20, 2016 team meeting.

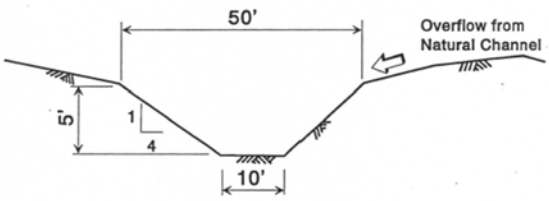
Increased Conveyance Capacity - Parallel Relief Channel Construction

Description and Potential Performance Improvement: A new, parallel canal could be constructed from the northern City boundary to Price Boulevard along Tier 1 and Tier 2 lots that have been acquired on the west side of the Myakkahatchee Creek. The additional conveyance may reduce flow rate and thus peak stages along the main channel from start to end of the parallel relief channel.

Prior Work Performed: The relief channel under consideration by CDM (1993) would have reached from the northern boundary of the city to the Snover waterway. The relief channel was conceived to act as a parallel conveyance for peak storm flows and be integrated into a linear park system along the Big Slough. CDM proposed that the channel would be about be 5 feet deep, have gentle grassed side slopes, and would be dry except during extreme storm events. The concept was brought forward as a main component of the 1993 master plan for improvements but was never constructed, apparently due to environmental permitting issues.

Constraints on Implementation: While the relief channel would be constructed within Tier 1 and Tier 2 lots that have been (or are being) acquired by the City, not all lands are currently in City ownership. Also, no improvements were proposed by CDM at the Tropicaire or I-75 crossings to accommodate reconfiguration of the main and parallel relief channels, and this may be a point of greater focus by DES given concerns that hydraulic deficiencies at those two crossings may have contributed to past flooding. Construction impacts to existing wetlands would likely be significant and require mitigation. Depending on the design of the parallel relief channel, it is possible that some wetlands would be created by the project, but it is unlikely that impacts would be entirely offset by the channel design and at least some wetland mitigation would need to be performed offsite. Also, depending on design performance, any reduction in flow attenuation along the main channel may result in higher flows downstream of the relief channel, which would need to be addressed by other means (i.e., downstream improvements).

Data Needs for Evaluation: none – DES will employ the existing watershed model, terrain information, and parcel ownership data to perform a feasibility evaluation of this flood reduction concept.



Parallel Relief Channel (as Conceived by CDM, 1993)

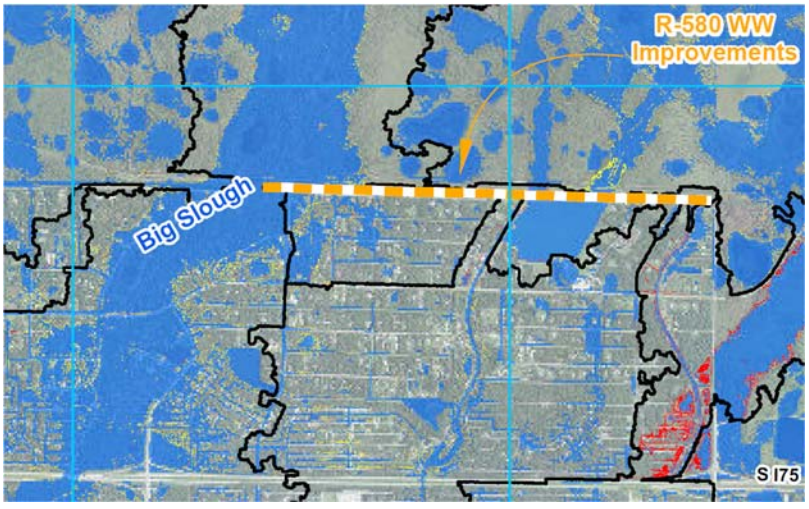
Diversion of Flow within North Port Drainage System - Channel Improvements along R-580

Description and Potential Performance Improvement: The R-580 waterway's bottom profile could be reconfigured, creating a more uniform and hydraulically efficient conveyance way. Improvement of the R-580 Waterway would induce more flow eastward from Big Slough along the City's northern boundary toward Creighton Waterway, resulting in reduced flows and flood stages in Myakkahatchee Creek.

Prior Work Performed: The channel improvements under consideration by Ardaman (2014) assumed a flat ditch along its entire length at elevation 15.0 feet, NAVD. The current bottom sags to elevation 15.0 feet at its mid-point and reaches 17.7 feet and 23.0 feet at its western and eastern ends, respectively. Results indicated small improvements (peak stage reductions) near Big Slough. However, inducing additional flow through Creighton Waterway caused additional flooding near I-75.

Constraints on Implementation: While channel improvements would be contained within existing right of way boundaries along the R-580 waterway, construction access may require additional temporary easements. There would likely be temporary construction impacts to existing wetlands. Subsurface conditions are not well-defined and there may be unknown utility conflicts or other issues that will need to be addressed by the waterway improvement design. Also, depending on hydraulic performance, any increase in conveyance capacity of the waterway may result in higher stages and flows downstream along the Creighton Waterway which would need to be addressed by other means (i.e., additional downstream improvements).

Data Needs for Evaluation: none – DES will employ the existing watershed model, terrain information, and parcel ownership data to perform a feasibility evaluation of this flood reduction concept.



R-580 Waterway Improvements (as Conceived by Ardaman, 2014)

Increase Conveyance Capacity - Channel Improvements along R-24 and R-32

Description and Potential Performance Improvement: Dredging of the R-24 and R-32 waterways could add two to three feet of depth, creating more hydraulically efficient conveyance ways downstream of Price Boulevard. Improvement of the waterways would induce more flow eastward toward Big Slough and reduce flooding along Price Boulevard and on some local streets located north of the R-32 canal.

Prior Work Performed: The channel improvements under consideration by Ardaman (2014) assumed dredging 2,300 feet of R-24 canal and 1,800 feet of R-32 canal to add approximately 2 to 3 feet of depth; and installing one extra parallel 36-inch pipe at an existing culvert crossing located between an Indian burial ground and the R-32 canal. Results indicated that West Price Boulevard would not overtop during the 25-year storm event and flooding would be reduced on some local streets (Dundee Ave, Surf Ave, and San Salvador Road) located north of R-32 canal. The model predicted that the 100-year maximum stage at West Price Boulevard will be reduced from 18.2 to 17.5 feet NAVD88. West Price Boulevard would still overtop by 0.2 feet over the crown of the road at the lowest section during the 100-year storm event. However, the road would be passable per City of North Port LOS criteria. Model results also indicated that there will be no adverse impacts in downstream areas.

Constraints on Implementation: While channel improvements would be contained within existing right of way boundaries along the R-24 and R-32 waterways, construction access may require additional temporary easements. There would likely be temporary construction impacts to existing wetlands. Subsurface conditions are not well-defined and there may be unknown utility conflicts or other issues that will need to be addressed by the waterway improvement design. It should be noted that the City is not allowed to disturb the 50-foot wide drainage right-of-way through the Indian burial ground.

Data Needs for Evaluation: none – DES will employ the existing watershed model, terrain information, and parcel ownership data to perform a feasibility evaluation of this flood reduction concept.

R-24 and R-32 Waterway Improvements (as Conceived by Ardaman, 2014)

Increased Conveyance Capacity - Increased Culvert Capacity of R-36 Canal at I-75

Description and Potential Performance Improvement: The existing R-36 canal culvert crossing at I-75 is comprised of two (2) 7.5' x 6' box culverts and could be improved by placing additional parallel box culverts to provide greater conveyance capacity. Increasing the capacity of the R-36 Canal at I-75 may reduce water levels in upstream areas.

Prior Work Performed: Ardaman's 2014 existing condition model results indicated that more than two feet of head difference occurs across this structure during the 100-year storm event. Under proposed BMP conditions, model results indicated that a peak stage reduction of up to 0.6 feet occurs upstream of the crossing. However, a stage increase of approximately 0.6 feet was found to result in downstream areas. Mitigation of flooding in downstream areas was beyond the scope of Ardaman's evaluation. It is notable that by reducing peak stage upstream of I-75 reduced discharges were observed from the R-36 Canal westward into the adjacent Deer Prairie Slough watershed for the proposed BMP condition. The reduced westward overflow causes an increased volume to remain within the North Port area. It may be possible to mitigate downstream stage increases by discharging westward to Deer Prairie Slough north of I-75 at lower elevations while matching existing condition peak flow rates.

Constraints on Implementation: Any conveyance improvements beneath I-75 would comprise a major undertaking. While culvert improvements would likely be contained within existing road right of way boundaries, construction access may require additional temporary easements. There would likely be temporary construction impacts to existing wetlands. Subsurface conditions are not well-defined and there may be unknown utility conflicts or other issues that will need to be addressed by the design. Depending on hydraulic performance, and as noted above, increase in capacity of the crossing may result in higher stages and flows downstream of I-75 which would need to be addressed by other means (i.e., adjustments to flows toward Deer Prairie Slough and/or additional downstream improvements).

Data Needs for Evaluation: none – DES will employ the existing available watershed model, terrain information, and parcel ownership data to perform an evaluation of this flood reduction concept.

R-36 Canal Culvert Crossing Improvements at I-75 (as Conceived by Ardaman, 2014)

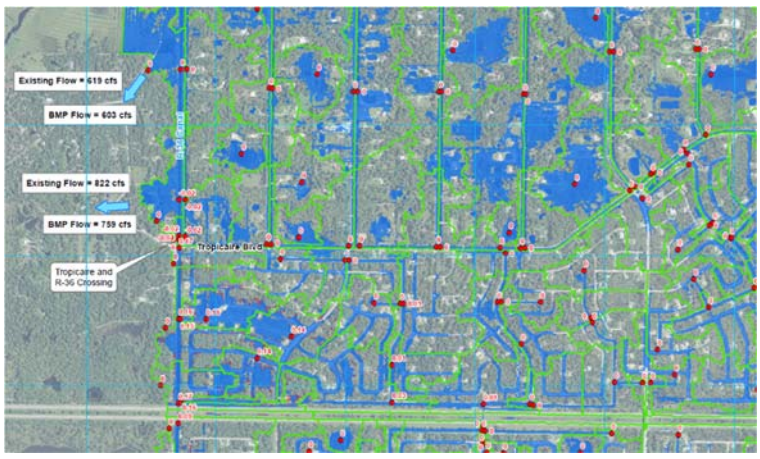
Increased Conveyance Capacity - Increased Culvert Capacity of R-36 Canal at Tropicaire

Description and Potential Performance Improvement: The existing R-36 canal culvert crossing at Tropicaire is comprised of two (2) 5-foot diameter RCP culverts and could be improved by placing additional culverts to provide greater conveyance capacity. Increasing capacity of the R-36 Canal at Tropicaire may reduce upstream water levels, particularly in association with other R-36 improvements.

Prior Work Performed: Ardaman's 2014 existing condition model results indicated that up to three feet of head difference occurs across this structure during various storm events. Under proposed BMP conditions, model results indicated a peak stage reduction of approximately 0.8 feet upstream of the crossing. However, a stage increase of up to 1.1 feet was found to result in downstream areas. Mitigation of flooding in downstream areas was beyond the scope of Ardaman's evaluation. During all events, discharges from the R-36 canal westward into the adjacent Deer Prairie Slough watershed were observed north of Tropicaire Boulevard. The proposed BMP results in a reduction of those discharges to Deer Prairie Slough and a resulting increased total volume remaining within the North Port area. It may be possible to mitigate downstream stage increases resulting from culvert improvements by discharging westward to Deer Prairie Slough at lower elevations while matching existing condition peak flow rates.

Constraints on Implementation: While culvert improvements would likely be contained within existing road right of way boundaries, construction access may require additional temporary easements. There would likely be temporary construction impacts to existing wetlands. Subsurface conditions are not well-defined and there may be unknown utility conflicts or other issues that will need to be addressed by the design. Depending on hydraulic performance, and as noted above, increase in capacity of the crossing may result in higher stages and flows downstream of Tropicaire which would need to be addressed by other means (i.e., adjustments to flows toward Deer Prairie Slough and/or additional downstream improvements).

Data Needs for Evaluation: none – DES will employ the existing available watershed model, terrain information, and parcel ownership data to perform an evaluation of this flood reduction concept.



R-36 Canal Culvert Crossing Improvements Tropicaire (as Conceived by Ardaman, 2014)

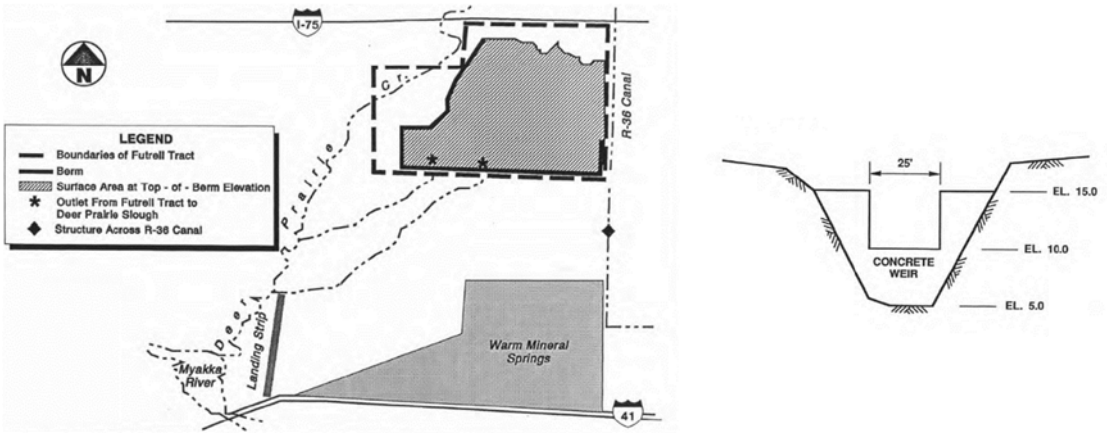
Flow Diversion Away from North Port Drainage System - Connection to Deer Prairie Slough

Description and Potential Performance Improvement: Stormwater flows could be diverted westward to the adjacent Deer Prairie Slough watershed, reducing flow through the City. Several variations could be considered, including gravity and pumped diversions both with and without added storage facilities.

Prior Work Performed: CDM (1993) considered a diversion plan which called for a pumping station and weir near Price Boulevard on the R-36 canal to convey stormwater to a bermed storage area on the Futrell tract. Release from the tract to Deer Prairie Slough would be at the existing rate and would take a week to drain down under 25-year/24-hour storm conditions. CDM's diversion channel option called for two weirs to convey stormwater to a channel located south of the Futrell tract, directly connected to Deer Prairie Slough. The weir discharge rate would closely match the pumping capacity and would also discharge only under storm conditions. Ardaman (2014) contemplated two earthen overflow weirs to enhance the R-36 waterway connectivity with Deer Prairie Slough canal and R-36 canal capacity was doubled by replacing its existing cross-section with a 60-foot bottom width trapezoidal channel with 4:1 side slopes. Each of the prior concepts had similar outcomes in reducing flooding along the R-36 canal.

Constraints on Implementation: A range of technical and non-technical issues would need to be addressed in order to implement a diversion into Deer Prairie Slough. This BMP would involve construction of new facilities, maintenance activities, real estate acquisition, and would likely require detailed hydrologic and hydraulic evaluation of the Deer Prairie Slough watershed to support statewide environmental resource permitting. For a storage component, impacts to existing wetlands could be significant and require mitigation. Also, depending on design performance, any increase in rate or volume of flow to Deer Prairie Slough would need to be addressed, and outcomes would need to be proven compatible with the ongoing Deer Prairie Slough Restoration Project.

Data Needs for Evaluation: none – DES will employ the existing available watershed model, terrain information, and parcel ownership data to perform an evaluation of this flood reduction concept.



Diversion to Deer Prairie Slough, Pumped with Storage on Futrell Tract (as Conceived by CDM, 1993)

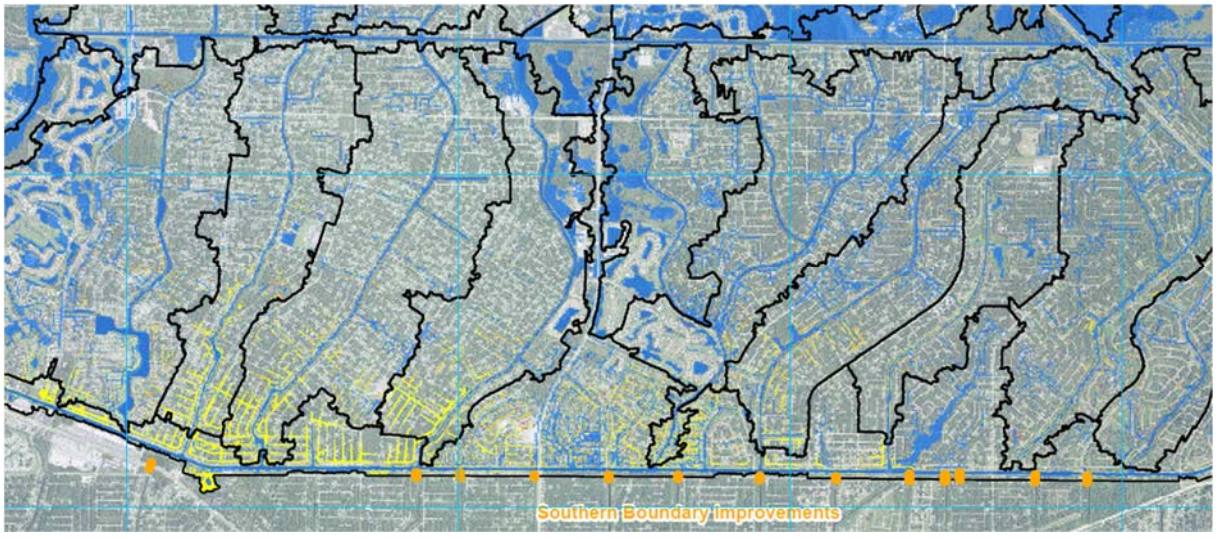
Increased Conveyance Capacity - Enhanced Discharges Along Southern Boundary to Port Charlotte

Description and Potential Performance Improvement: Structures located within the Cocoplum Waterway and discharging beneath Hillsborough Boulevard could be improved to facilitate increased discharges into the adjacent Port Charlotte conveyance system. Additional conveyance capacity would effectively divert stormwater southward and may reduce flooding throughout the southern portion of the City.

Prior Work Performed: This alternative was evaluated by Ardaman (2014) for information purposes, as it is understood that allowing additional flows into Port Charlotte may not be desirable. Six lateral weirs along the Cocoplum waterway and thirteen structures beneath Hillsborough Boulevard were doubled in size. Results indicated that improvements relative to house flooding were not significant. However, roads experienced a considerable flood reduction between Sumter Boulevard and Atwater Drive.

Constraints on Implementation: Enhancing the southerly flow of stormwater out of North Port would involve conveyance improvements, construction of new structures and/or reconditioning of existing structures, maintenance activities, real estate acquisition, and evaluation of receiving waters through hydrologic and hydraulic modeling. As the receiving water system is comprised of both controlled and tidal canals, additional channel and/or structural improvements may need to be made in downstream areas to mitigate the impacts of the diversion.

Data Needs for Evaluation: none – DES will employ the existing available watershed model, terrain information, and parcel ownership data to perform an evaluation of this flood reduction concept.



Diversion for Enhanced Discharge to Port Charlotte (as Conceived by Ardaman, 2014)

Diversion of Flow within North Port Drainage System - R-36 Improvements to South of WCS-101

Description and Potential Performance Improvement: A whole series of improvements could be made to canal segments and structures to enhance the overall conveyance capacity of the R-36 waterway system. The additional stormwater conveyance capacity may induce higher westward flow out of Big Slough at the north boundary of the City. Diverting those higher flows southward to WCS-101 would reduce flow and stages along the more flood prone segments of Myakkahatchee Creek.

Prior Work Performed: Improvements to the complete R-36 system have not been evaluated, although local improvements to portions of that system have been evaluated in a piecemeal fashion.

Constraints on Implementation: Channel improvements along the R-36 waterway may require additional right of way acquisition, and construction access may require additional temporary easements. There would likely be temporary construction impacts to existing wetlands. Subsurface conditions are not well-defined and there may be unknown utility conflicts or other issues that will need to be addressed by the waterway improvement design. Also, depending on hydraulic performance, any increase in conveyance capacity of the waterway may result in higher stages and flows downstream of WCS-101 which would need to be addressed by other means (i.e., additional downstream improvements).

Data Needs for Evaluation: none – DES will employ the existing available watershed model, terrain information, and parcel ownership data to perform an evaluation of this flood reduction concept.

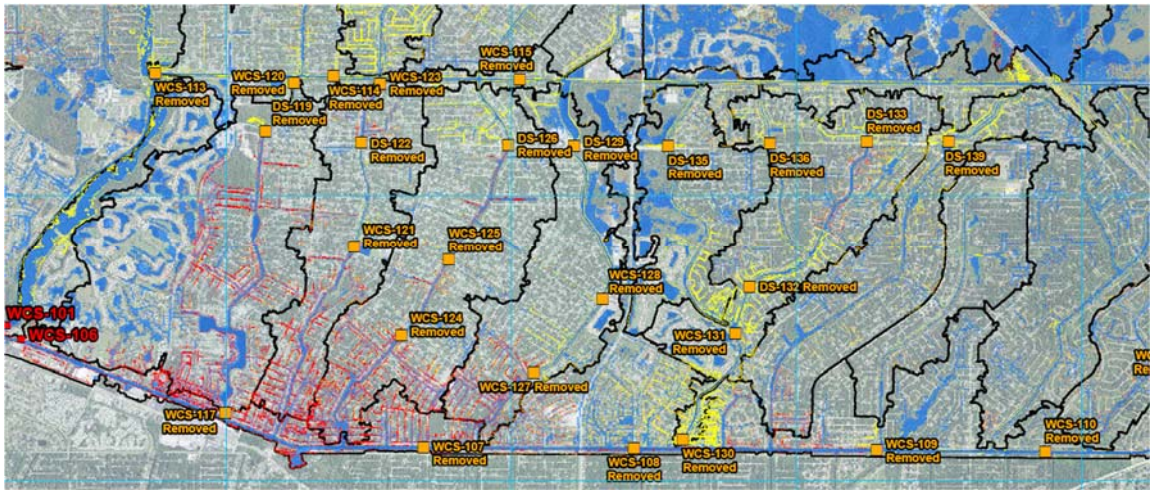
Diversion of Flow within North Port Drainage System - Snover Waterway to Cocoplum Waterway

Description and Potential Performance Improvement: Improvements could be made to existing structures along Snover Waterway and beneath Price Boulevard to increase flow through canals that connect with Cocoplum Waterway. The additional conveyance capacity may induce higher eastward flow out of Big Slough into Snover Waterway. Diverting those higher flows southward to Cocoplum Waterway would reduce flow and stages along the more flood prone segments of Myakkahatchee Creek.

Prior Work Performed: Specific improvements to the Snover-Cocoplum system have not been explicitly evaluated. Ardaman (2014) did evaluate overall system capacity assuming no losses due to water control structures or drop structures (i.e., water control structures and drop structures were removed). Results of that evaluation provide an indication that flood stages could be reduced north of Price Boulevard and along Bass Point waterway but operational controls or mitigation would be required to avoid or address increased flooding between South Toledo Boulevard and South Sumter Boulevard.

Constraints on Implementation: Structure improvements along Snover Waterway and Price Boulevard should be performed within existing right of way, but construction access may require temporary easements. There would likely be temporary construction impacts to existing wetlands. Subsurface conditions are not well-defined and there may be unknown utility conflicts or other issues that will need to be addressed by the design. Also, depending on hydraulic performance, any increase in conveyance capacity of the affected system may result in higher stages and flows in flood prone areas downstream which would need to be addressed by other means (i.e., additional downstream improvements).

Data Needs for Evaluation: none – DES will employ the existing available watershed model, terrain information, and parcel ownership data to perform an evaluation of this flood reduction concept.



Diversion of Flows Southward, by System-wide Structure Removal (as Conceived by Ardaman, 2014)

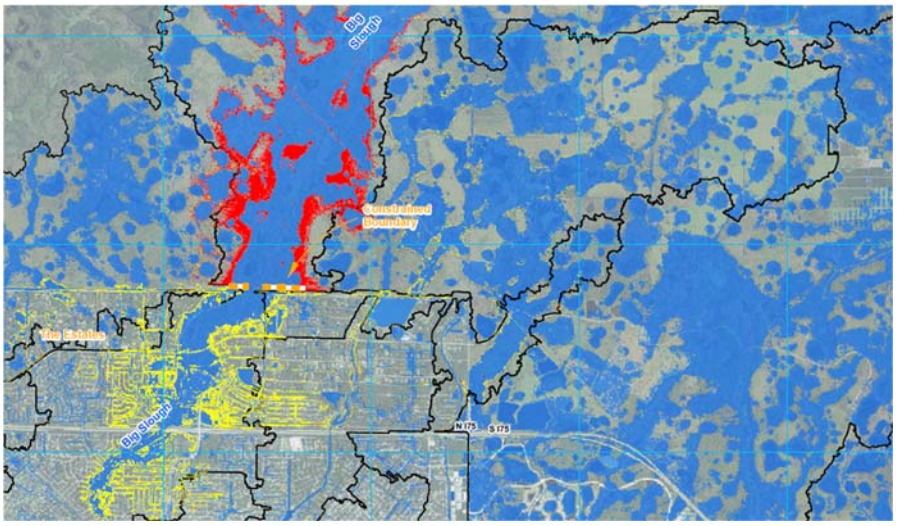
Storage – Constrain Inflows to City with Increased Upstream Floodplain Storage

Description and Potential Performance Improvement: Raise existing earthen berms on the northwest City boundary at the intersection of Big Slough canal with R-36 and R- 580 waterways. Also, raise earthen weirs farther north at the intersection of Big Slough canal and Power Line Road. Improvements would leave the Big Slough canal as the only conveyance system into the western portion of the City. Inflows would be reduced, dropping peak stages along Myakkahatchee Creek.

Prior Work Performed: Ardaman developed this BMP concept to constrain the rate and volume of water coming from offsite areas through the Big Slough canal prior to entering the City in the Estates area. Results indicated approximately 0.5 feet flood stage reduction near the Big Slough canal from the City's northern boundary to just south of I-75. However, flood stages increase approximately 1.0 foot in offsite areas north of the R-36 and R-580 waterways. Variations on the concept could consider performance under smaller storm events (Ardaman focused on the 100-year event) and installation of a flow control structure at the northern boundary.

Constraints on Implementation: Offsite lands where floodplain storage is increased are not currently in City ownership, and acquisition or easements would be required. Depending on the extent of modifications required, it is possible that wetlands would be impacted by raising berms. Hydroperiod impacts to upstream existing wetlands would need to be evaluated.

Data Needs for Evaluation: none – DES will employ the existing available watershed model, terrain information, and parcel ownership data to perform an evaluation of this flood reduction concept.



Constrained Inflows and Increased US Floodplain Storage (as Conceived by Ardaman, 2014)

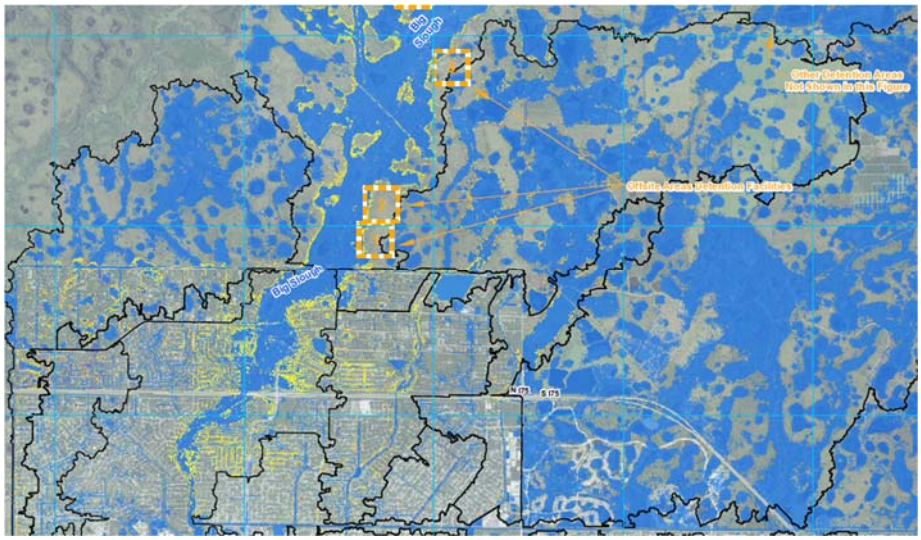
Storage – Creation of Upstream Detention, Reservoirs, or Joint Use Facilities

Description and Potential Performance Improvement: One or more detention ponds, reservoirs, or joint-use facilities could be constructed to provide offsite upstream stormwater detention. The facilities would reduce inflow rates and thus peak stages along Myakkahatchee Creek.

Prior Work Performed: CDM (1993) considered upstream detention consisting of a berm designed to detain flood waters north of the city and slowly release those waters after the peak flows had passed. Six foot berms were proposed with a total storage capacity of 4,000 acre feet and 1 foot of freeboard. Little flood reduction was evident when compared to the other alternatives and the amount of land necessary to achieve little benefit restricted the viability of this alternative. Ardaman developed a concept for creation of seven (7) individual 100-acre detention facilities located on upland sites along Big Slough canal. Each stormwater detention area was linked to the Big Slough canal by a 500-foot weir and held a volume of about of 600 acre-feet for a total of 4,200 ac-ft of storage. Results indicated relatively small reduction in water surface elevations on the order of 0.1 to 0.6 feet along Big Slough.

Constraints on Implementation: Land acquisition and cost of construction will certainly be constraining factors. Construction impacts to existing wetlands could be significant and require mitigation.

Data Needs for Evaluation: none – DES will employ the existing available watershed model, terrain information, and parcel ownership data to perform an evaluation of this flood reduction concept.



Upstream Detention Storage (as Conceived by Ardaman, 2014)

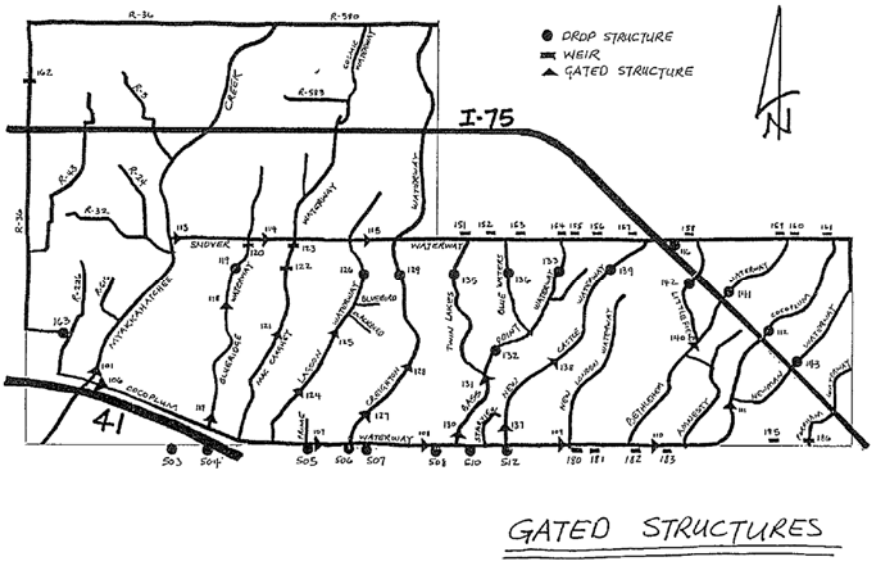
Operational – Drawdown and Other Changes to Schedule of Gate Operations

Description and Potential Performance Improvement: Modifications could be made to existing gate operation schedules to facilitate early drawdown and/or redirection of flows within the North Port drainage system. Creation of initial storage capacity and re-routing of flows may relieve pressure on some flood-prone areas including Myakkahatchee Creek, particularly under lesser storm events.

Prior Work Performed: Ardaman (2014) investigated several concepts associated with gate operations including system-wide and localized (R-36 Canal) drawdown. Generally, drawdown was found to be ineffective in lowering 100-year flood elevations. However, a more rigorous evaluation of gate operations to both draw down initial water levels and re-route flows under a variety of storm event scenarios has not specifically been performed, and gate operation schedule changes may prove more effective when combined with other structural modifications to the system in order to obtain a greater flood reduction benefit or mitigate impacts of other improvements.

Constraints on Implementation: Changes to the operational schedule should consider factors beyond flood control performance, including but not limited to environmental, water supply, and aesthetic impacts of canal drawdown. Evaluations should consider drawdown using existing infrastructure as well as identify infrastructure improvements to expedite drawdown, and such infrastructure improvements may present additional constraints on implementation.

Data Needs for Evaluation: none – DES will employ the existing available watershed model, terrain information, and parcel ownership data to perform an evaluation of this flood reduction concept.



Locations of Gated Structures (City of North Port, 2005)

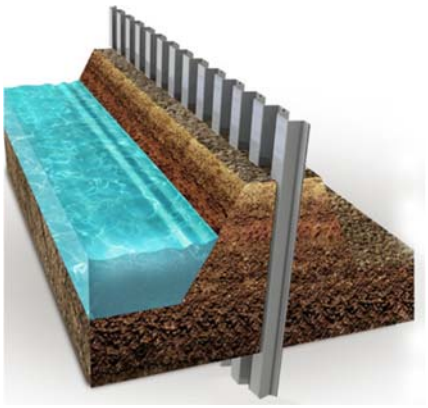
Floodproofing – Including Large-scale Concepts such as Raising Roads and Flood Barrier Walls

Description and Potential Performance Improvement: Floodproofing of existing infrastructure can reduce recurrent damages in areas where flood elevations cannot be cost-effectively reduced by other means. Floodproofing is any combination of structural and non-structural additions, changes, or adjustments to structures which reduce or eliminate flood damage to property, facilities, structures and their contents. In the context of this project, we include raising of flood prone roads and installation of flood walls to protect flood prone areas as examples of large-scale floodproofing. Flood proofing can be included along with other designs. For example, a permanent or temporary flood barrier wall could be incorporated into the linear park flow diversion concept to increase the level protection provided in that footprint.

Prior Work Performed: Ardaman (2014) investigated raising approximately 1,900 feet of West Price Boulevard to an elevation above the predicted 100-year flood stage. Model results indicated no adverse impacts or increase in stages upstream or downstream of the improvement for any modeled storm event. Cost and right-of-way requirements to raise the road were not addressed. Preliminary testing of other flood proofing concepts (e.g., raising roads and homes in flood prone areas located adjacent to Myakkahatchee Creek) was performed, but findings were not well-documented.

Constraints on Implementation: Floodproofing can often be accomplished within existing right of way, although construction access may require additional temporary easements and there can be impacts to existing wetlands. Subsurface conditions are not well-defined and there may be unknown utility conflicts or other issues that will need to be addressed by the floodproofing improvement design. Also, depending on hydraulic performance, any large-scale flood proofing of facilities such as raising of roads may result in higher stages upstream unless sufficient storage or flow capacity is provided in the design.

Data Needs for Evaluation: none – DES will employ the existing available watershed model, terrain information, and parcel ownership data to perform an evaluation of this flood reduction concept.



Raising of Road (as Conceived by Ardaman, 2014) and Barrier Wall (as illustrated by Crane Materials International, 2016)

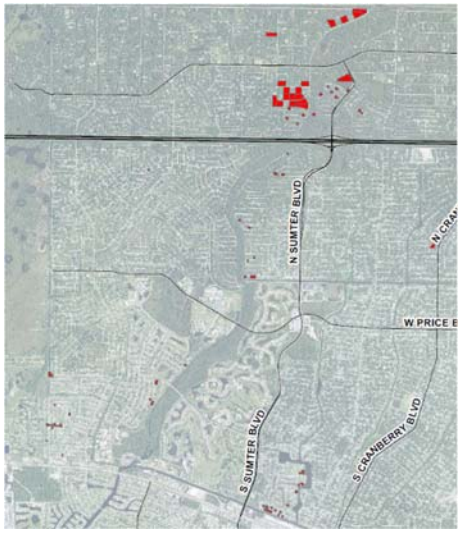
Acquisition – Purchase of Flood Prone Lands and/or Flood Prone Structures

Description and Potential Performance Improvement: Some communities turn to property acquisition to mitigate flood risk by establishing permanent, public open space and to get homeowners in flood-prone areas permanently out of harm's way. In North Port, many lots have already been acquired on the west side of the Myakkahatchee Creek to serve as a linear park. Additional acquisition may be considered to remove other lands and/or structures from the 100-year floodplain. Removal of those properties would reduce future flood-related damages but would not impact flood levels.

Prior Work Performed: CDM's preliminary evaluation (1993) considered that purchase of flooded lands would preclude flooding damage by preventing development of the property but would not prevent roadway flooding. Based upon their preliminary analyses, purchase of flooded lands was removed from consideration. Ardaman (2012) recommended that the City of North Port purchase habitable structures in which flooding is predicted in the 100-year event, as purchasing the affected properties may be more cost effective than implementing other BMPs. About 100 parcels were identified to be surveyed and for finished floor elevations to be compared with modeled 100-year event flood stages, to determine which properties are damaged in the 100-year event.

Constraints on Implementation: Constraints are related to cost, funding, and property availability. Property acquisition is generally performed through voluntary buyout programs presented to homeowners in neighborhoods that have been subject to repeated flooding. As such, acquisition depends upon having willing sellers and reaching an agreement on fair market value of properties. For eligible communities, FEMA typically funds a portion of the cost of property acquisition with the municipality contributing the remaining amount.

Data Needs for Evaluation: none – DES will employ the existing available watershed model, terrain information, and parcel ownership data to perform an evaluation of this flood reduction concept.



Properties to be Surveyed for Finished Floor Elevation (as Identified by Ardaman, 2014)

Attachment 2: Team Meeting – Comments on Potential Solutions

Summary of meeting minutes from December 20, 2016 team meeting

Increased Conveyance Capacity - Parallel Relief Channel Construction

Meeting comments: Staff indicated that this project would need to show promise with properties acquired to date or with additional properties which could reasonably be expected to be acquired by means other than eminent domain.

Diversion of Flow within North Port Drainage System - Channel Improvements along R-580

Meeting comments: Staff was interested in seeing this concept brought forward in the master plan, noting that they cannot currently control the amount of water entering the system during a large storm event. DES was directed to look at existing gate schedules or improvements, as well as installation of gates on the MacCaughey and Lagoon Waterway crossings that could assist with making the flow diversion and improve flood control performance under smaller events.

Increase Conveyance Capacity - Channel Improvements along R-24 and R-32

Meeting comments: Staff directed DES to remove this concept from the master plan – outside current areas of interest, already evaluated sufficiently in prior analyses, and provides local improvements which may be better addressed through future raising of Price Boulevard.

Increased Conveyance Capacity - Increased Culvert Capacity of R-36 Canal at I-75

Meeting comments: None (see discussion on R-36 Improvements to South of WCS-101).

Increased Conveyance Capacity - Increased Culvert Capacity of R-36 Canal at Tropicaire

Meeting comments: None (see discussion on R-36 Improvements to South of WCS-101).

Flow Diversion Away from North Port Drainage System - Connection to Deer Prairie Slough

Meeting comments: Staff inquired whether it is possible to determine how much stormwater historically moved into Deer Prairie Slough from the Big Slough and City of North Port systems prior to construction of canals by GDC. DES staff indicated that a rough calculation could be made but that it wouldn't have much of an effect on decision making. Rather, we should gather and review available information on the Deer Prairie Slough restoration project and coordinate with District staff on potential offsite inflow restoration. City staff requested that the District share any reports that are available and identify individuals to contact for a January follow-up meeting. DES staff inquired as to the status of the Futrell tract and City staff indicated that the District did not look favorably on using the tract for a reservoir. Additional District staff could be invited to attend the follow-up meeting to discuss alternate uses of the Futrell tract that might be of mutual benefit.

Increased Conveyance Capacity - Enhanced Discharges Along Southern Boundary to Port Charlotte

Meeting comments: City staff asked DES to focus on the two tidal canals (Apollo and Jupiter waterways) for enhanced discharge. The city replaced dilapidated metal pipes and gates in 2007. Staff indicated that they receive water level complaints in the Cocoplum and Toledo Blade waterways and they would like for DES to look at enhanced discharge from the Cocoplum Waterway.

Diversion of Flow within North Port Drainage System - R-36 Improvements to South of WCS-101

Meeting comments: Team agree to include this concept in the master plan, understanding that it also encompasses improvements to existing culverts at Tropicaire and I-75. During prior analysis, some coordination was held with FDOT and concept was shelved because of downstream impacts which were beyond the scope of that earlier analysis. Window of opportunity may have closed with FDOT on near-term improvements at I-75. One concern is whether the downstream infrastructure can handle the increased flow without substantial modification. Staff pointed out that the WCS-101 structure is tidally influenced and suggested evaluation should consider worst case tidal conditions.

Diversion of Flow within North Port Drainage System - Snover Waterway to Cocoplum Waterway

Meeting comments: Staff indicated that there may be an opportunity to store more water in the existing canal system for smaller events by raising gates. DES pointed out that the Panacea community discharges to some of those canals and that raising levels may have adverse impacts on those upstream stormwater management systems.

Storage – Constrain Inflows to City with Increased Upstream Floodplain Storage

Meeting comments: The team agreed that prior work focused mainly on larger storm events and that this project may be able to achieve benefits for smaller storms with upstream impacts that might be successfully mitigated.

Storage – Creation of Upstream Detention, Reservoirs, or Joint Use Facilities

Meeting comments: Staff indicated that the City Manager recently toured (and is interested in developing facilities similar to) the Celery Fields in Sarasota County and inquired as to whether additional District funding might be available in the project combined flood reduction and water quality benefits. Staff also pointed out that operating and maintaining multiple offsite reservoirs (six were considered in the prior evaluation) would be challenging.

Operational – Drawdown and Other Changes to Schedule of Gate Operations

Meeting comments: The team agreed that City staff have a firm grasp on gate operations, by virtue of working with the system for decades including during large flood events, and an evaluation of wholesale changes to gate operations is not needed. Localized changes to allow diversions (as part of other concepts listed here) may still be made.

Floodproofing – Including Large-scale Concepts such as Raising Roads and Flood Barrier Walls

Meeting comments: City staff indicated that raising roads out of the floodplain, pumping for stormwater control, and installation of flood barriers were not appealing options for large-scale flood reduction. These concepts, including raising roads, may be considered (as part of other concepts listed here).

Acquisition – Purchase of Flood Prone Lands and/or Flood Prone Structures

Meeting comments: City staff indicated that acquisition should be considered as part of the master plan.