

Sarasota County Watershed Model Conversion and Maintenance

(RPS202061 MN)

Upper Myakka Model Update Report

August 2024

Prepared For:

Sarasota County
1001 Sarasota Center Boulevard
Sarasota, Florida 34240

Under Contract 2021-269

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1. Introduction

Collective Water Resources (Collective) performed an update of the Interconnected Pond and Routing Version 4 (ICPR4) model and associated Geographic Watershed Information System (GWIS) Version 2.1 geodatabase to include recent developments based on the best data currently available, incorporate additional overland connections for the 500-year storm event, and to address watershed boundary gaps and overlaps with adjacent watersheds for eight Sarasota County watersheds as requested by Sarasota County (County). Collective performed these updates to eight watersheds models as assigned by the County, which includes:

- Dona Bay/Roberts Bay Coastal Fringe,
- Lemon Bay Coastal Fringe,
- Sarasota Bay Coastal Fringe,
- Hudson Bayou,
- Lemon Bay (Alligator Creek, Forked Creek, Woodmere Creek, Gotfried Creek, and Ainger Creek),
- Roberts Bay (Hatchett Creek and Curry Creek),
- Upper Myakka River (Big Slough, Deer Prairie Slough, Howard Creek, and Flatford Swamp), and
- Whitaker Bayou

This report summarizes the model update task and preliminary modeling results for the Upper Myakka (UM) watershed. This is a deliverable under Task 2, Model Update, of Agreement 2021-269 for professional services in support of Watershed Model Conversion and Maintenance. These model updates build upon the work previously completed by Collective under this agreement in converting the ICPR version 3 model and associated GWIS Version 1.6 geodatabase, documented in *Task 1.2 Model Conversion Adjustment and Results Comparison Upper Myakka Watershed* technical memorandum, finalized on June 6, 2022.

2. Developments

Collective reviewed the watershed's GWIS data provided by the County relative to 2020 aerial imagery to identify developments that have been constructed or show groundbreaking as of the 2020 imagery but are not reflected in the model and GWIS data. **Table 1** summarizes the recent development identified within the watershed having an impact on the intermediate and/or regional hydrology and hydraulics and warranted updates to the watershed model. The associated Southwest Florida Water Management District (SWFWMD) Environmental Resource Permit (ERP) number is also included in Table 1. For the UM watershed, it should be noted that Lakepark Estates Phase 1, a 400-lot single family residential subdivision approved under ERP 43-41933-2 (County's permit 15-1554773-DS), was flagged in Agreement 2021-269 to be included in the update of the Dona Bay (DB) watershed; however, it was subsequently determined that the development primarily falls within the limits of the UM. Construction of this development was not apparent within the 2020 aerials, and

according to the SWFWMD's permit database construction did not commence until March 2022. This development will need to be included in the UM model under a future maintenance activity.

Table 1. Summary of Developments included with Model Update

| Name | SWFWMD ERP |
|--------------|------------|
| Indian Lakes | 43-28204-3 |

3. Topographic Data Voids

The most recent digital topographic data for the county was published by the United States Geological Service (USGS) in partnership with the Florida Department of Emergency Management (FDEM) reflecting light detection and ranging (lidar) data acquisition between November 30, 2018, and January 10, 2019 (Dewberry 2020). The Sarasota County project was completed as part of the Florida Peninsular 2018 D19 DRRA project. Lidar products available from USGS for the county include classified LAS point files, breaklines, digital elevation model (DEM) rasters, and associated reports for a total of 694 5,000 feet by 5,000 feet tiles (approximately 622 square miles) across the county.

The SWFWMD provided enhancements of the Sarasota County lidar products including additional breakline features for waterbodies and building footprints. SWFWMD produced a countywide, DEM raster (as an IMAGINE Image file, floating point, 32-bit, 1 band) with 2.5 feet by 2.5 feet cell size referenced to North American Datum of 1983 with the 2011 Adjustment (NAD83_2011) horizontal datum, Florida State Plane Zone West coordinate system and North American Vertical Datum of 1988 (NAVD88) vertical datum. This 2019 SWFWMD DEM served as the base topographic layer for the model updates performed in the watershed.

Collective reviewed the 2019 SWFWMD DEM against the grading and surface elevations defined in the plans for the developments listed in Table 1 as well as 2020 aerial imagery and confirmed the developments are reflected in the DEM. No topographic voids were identified for this watershed. At the request of the County, Collective projected the 2019 SWFWMD DEM to the North American Datum of 1983 with the HARN Adjustment (NAD83_HARN) horizontal datum.

4. Model Development Updates

For each development listed in Table 1, the design plans and other relevant permit information were obtained from the District's ERP data warehouse application – Water Management Information System (WMIS). If available, the as-built plans were used for the updates, otherwise the approved permit set was utilized. For the development selected for this update, the as-builts were available and the County also provided existing, revised existing, and proposed conditions ICPR3 models.

The plans were reviewed to identify the sheets that have relevant information to the GWIS being updated. The plan view sheets and a model schematic (if available in the permit files) were exported

to image files (JPEG), clipped to the limits of the development, and georeferenced in ArcMap to make it easier to correlate the existing GWIS features to the modifications shown in the plans.

Next, a new ArcMap MXD file was created with the following data:

- The GWIS to be updated under this task
- The original GWIS - for comparison purposes
- The GWIS of adjacent watersheds, as needed
- The georeferenced plan sheets and permit model schematic
- The 2019 SWFWMD DEM
- Current aerial imagery (2020 and 2022 from the County's image service)
- Current 2020 land use feature class
- County impervious area (IA) feature class

Any modifications/updates to the GWIS were noted in the *Comment* field of the appropriate feature class. The elevation datum of the plans was noted so that, if needed, plan elevations were converted to NAVD88 using a conversion factor of -1.08 feet.

4.1. Hydrologic Parameterization Methodology

Collective's overall hydrologic parameterization approach for model updates is summarized below. Specifics related to the individual development included in this update are presented in section 4.3.

The design plans and permit information are reviewed to identify any appropriate changes to the basin boundaries. When available, the model schematic from the permit application is used as a guide, considering the permit model may have been developed to a differing level of detail than appropriate for the watershed model. The permit model's basins, hydraulic features, and 2019 DEM are collectively used to perform any needed modifications to the ICPR_BASIN feature class.

For any basins that are modified, they are reviewed to determine if revisions to the time of concentration (TOC) and IA are required.

TOCs for modified small, urban basins with minimum TOCs (10 minutes) originally assigned are maintained. If the estimated flow path for a revised basin changes by more than 10-percent from the original basin, a revised flow path is digitized and the Natural Resources Conservation Service (NRCS) TR55 methodology used to calculate new TOC(s), which is/are entered into the *TC [min]* field of the ICPR_BASIN feature class.

If the revised basin area differs by more than one-percent from the original, it is reviewed to determine if changes to the curve number (CN) and IA/directly connected impervious area (DCIA) are needed. If the overall land use remains the same, no adjustment is needed. However, if the land use or the acres of IA/DCIA change, the land use and impervious area mapping are used to update these values. Where needed, buildings, roads, and other impervious areas are digitized to obtain complete IA coverage for the revised basins.

Next, the IA is assigned as either directly connected or non-directly connected and the acreage of each determined. The revised curve number is calculated using the County-approved methodology as described below (Sarasota County 2021):

- The DCIA is not used to calculate the CN
- Pervious area assigned a CN of 78
- NDCIA assigned a CN of 98
- Basin CN calculated using: $CN = ((A_{pervious} * 78) + (A_{NDCIA} * 98)) / (A_{pervious} + A_{NDCIA})$, where A is the area in acres and the subscript indicates the type of area (pervious or NDCIA).

Any updated *CurveNumber*, *PctImpervious*, and *PctDCIA* fields are entered into the ICPR4_Simple_Basin, ICPR4_CURVE_NUMBER_ZONES, and ICPR4_IMPERVIOUS_ZONES tables of the GWIS geodatabase accordingly.

4.2. Hydraulic Connectivity and Parameterization Methodology

Collective's overall approach to updating hydraulic connectivity and parameterization for new developments is summarized below. Specifics related to the individual development included in this update are presented in Section 4.3.

The as-built and approved construction plans are reviewed to identify any hydraulic features that should be included in the model, such as:

- Pipes connecting stormwater ponds
- Stormwater system trunk lines
- Control structures
- Outfall pipes
- New/modified channels
- New/modified stormwater ponds

Features that would not typically be included in the watershed model/GWIS include:

- Local drainage systems
- Individual inlets along the trunk lines
- Exfiltration trenches

The georeferenced plan sheets are compared to the existing GWIS to identify differences. Where possible, existing node and link names are maintained, though the location and connectivity may be changed.

Nodes

New nodes are placed at the following locations:

- For stormwater trunklines, new nodes would be placed at manholes/junction boxes where the pipe diameter changes or to divide exceptionally long runs of pipe.
- Stormwater ponds

Where appropriate, basins are subdivided to load to the new nodes. The *INITIAL_STAGE* field of the ICPR_NODE feature class of new or modified nodes is updated to be the elevation of the invert of the lowest connecting pipe or the normal water elevation of a connected water body, whichever is highest.

For nodes associated with basins that are modified, the storage is updated using the ArcHydro Drainage Area Characterization (DAC) tool with the 2019 DEM as the elevation raster input. If a channel link is inside the modified basin, the Storage_Exclusion_Polygon feature class is updated to include the channel and its area excluded from the DAC storage calculations.

Pipe Links

The georeferenced plans are reviewed to identify both new pipes to be added to GWIS and ones that should be modified. Potential updates to pipe links would be:

- Changes in connectivity (upstream and downstream nodes)
- Pipe diameter and material
- Length
- Inverts
- Entrance and exit losses

New pipes are added to the ICPR_LINK feature class and, for both new and modified pipes, the appropriate parameter changes are made to the associated PIPE_BARREL table.

Drop Structure Links

Drop structures have both pipe and weir components and are most commonly used for watershed modeling to simulate control structures. Plans are reviewed to identify new drop structures and existing ones that were modified or differ from current model parameters. New/modified drop structure links are set to use the “interval halving” solution method based on the County’s standard by setting the *Solution* field to “Combined” and the *Increments* field to “0” in the DROP_STRUCTURE table.

The PIPE_BARREL and WEIR tables are modified as needed to capture parameters of the drop structure’s components. WEIR table entry updates would typically include:

- Weir shape
- Weir type

- Weir crest
- Weir span and rise
- Weir discharge coefficient

[Structural Weir Links](#)

For purposes of the watershed GWIS updates, structural weirs are manufactured structures controlling flow between two points that do not have an integrated pipe component like a drop structure does. The structural weirs are added to the ICPR_LINK feature class and associated WEIR table entries completed.

[Surface Overflow Weirs](#)

Surface overflow weirs (SOWs) simulate flow across basin boundaries. When basins are modified, they are examined to determine if existing SOW(s) cross(es) basin boundary segments that were modified. If so, the cross-section representing the ground elevations of the modified basin segment is generated to replace the existing cross-section and the ArcGIS 3D Analyst Stack Profile tool is used to obtain station/elevation data to define the cross-section's geometry. The associated WEIR table entry is updated with the crest elevation (minimum cross-section elevation) and the ICPR_XSECT_STATIONS table data replaced with the new data.

For modified basin segments without an existing SOW, they are reviewed to determine if they are likely to have flow across them for the 500-year/24-hour design storm. If so, a new SOW link is added to the ICPR_LINK feature class, a cross-section added to the ICPR_XSECT feature class, and the associated WEIR and ICPR_XSECT_STATIONS tables completed.

[Channels](#)

If a development area includes a channel (natural or constructed), it is reviewed to determine if any modifications are necessary to GWIS. Potential modifications may include:

- Existing channel connectivity changing
- Existing channel length, inverts, or geometry changing
- A new channel was constructed

For existing channels that are modified, the ICPR_LINK and ICPR_XSECT feature classes and the CHANNEL and ICPR_XSECT_STATIONS tables are modified as appropriate.

For new channels, a new channel link is added to the ICPR_LINK feature class and new channel cross-sections added to the ICPR_XSECT feature class. The CHANNEL table entries are completed, and design plan data combined with the 2019 DEM are used to complete the ICPR_XSECT_STATIONS table entries.

4.3. ERP 43-28204-3, Indian Lakes

The updates for ERP 43-28204-3 included modifications to basins, nodes, pipes, drop structures, surface overflow weirs, and cross-sections as shown in **Figure 1**.

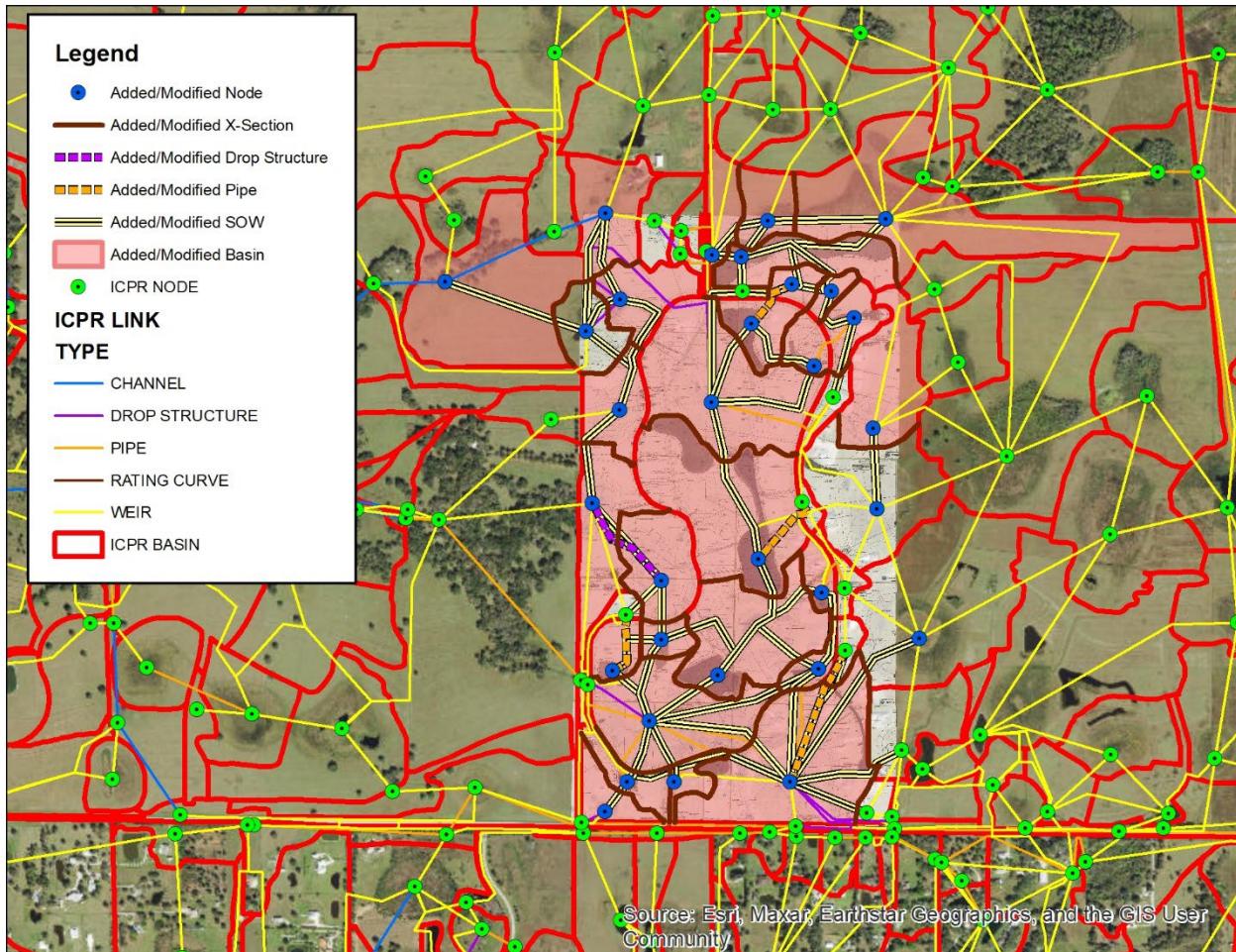


Figure 1. ERP 43-28204-3 Updates

The updates included:

- **Basins** – 28 basins were added/modified, and the associated node storage, TOC, CN, and IA were updated
- **Nodes** – 31 nodes were added/modified
- **Pipes** – four pipe links was added/modified along with the associated pipe barrel table entries
- **Drop Structures** – four drop structure links were added/modified, and the associated pipe barrel and weir tables were updated
- **Surface Overflow Weirs** – 49 surface overflow weir links were added/modified along with their associated cross-sections and weir table entries.

4.4. Miscellaneous Updates

Two nodes had their storage modified to correct excessive warning messages that were causing ICPR4 to crash.

4.5. QA/QC Process Description

The GWIS/ICPR4 model undergoes QAQC checks both during and after the update process. During the update process, when a new feature or table entry was added, the connections to all the related tables were verified, and the data inputs were checked to ensure they matched plan set data.

After the development updates were initially completed, the revised data were reviewed for reasonableness. The GWIS was exported to csv format, imported to ICPR4, and the model simulated for the 100-year/24-hour storm. The model results were reviewed for reasonableness.

Additionally, the GWIS updates were independently reviewed by another member of the project team based on QAQC checklist prepared by Collective for this model update task and provided as a separate deliverable.

5. Adjacent Watershed Connectivity and Boundary Updates

Since the County's watershed models have been developed and updated over the course of several decades, relying on the best available data at the time, individual watershed's basin delineations may not match those of adjacent watersheds. Included in the model updates for this project, Collective is tasked to review and update model elements along shared watershed boundaries and will be merging coastal fringe watersheds with their respective mainland model(s). It should be noted that the project scope does not include updating the basin/watershed boundaries based on the current 2019 DEM.

UM watershed borders the DB and Lower Myakka (LM) watersheds. The geometric union of the UM's ICPR_BASIN feature class was computed with all the adjacent watersheds' basin feature classes to generate polygons of the gaps and overlaps between the basins. The gaps and overlaps by watershed are listed below.

UM and DB

- Gaps: 412
- Overlaps: 98

UM and LM

- Gaps: 0
- Overlaps: 0

Gaps were reviewed against the 2019 DEM and hydraulic features and assigned to the appropriate watershed. Similarly, the overlaps were reviewed and assigned to be kept in one watershed and removed for the other. The GWIS of each watershed was updated appropriately based on these gap/overlap assignments. Sixteen UM basins had their area changed by more than one-percent as

part of the watershed check and had their associated CN, IA, and node storage updated. Five of the basins were modified enough to require an update to the TOC. Four SOWs and their associated cross-sections were also updated.

6. 500-year/24-hour Interconnectivity Updates

Most of the County's watershed models were developed and parameterized to simulate design storm events up to and including the 100-year/24-hour storm. Collective, as directed by the County, developed additional SOW interconnectivity to ensure overland flow routing occurs within the model during the 500-year/24-hour design storm. A preliminary ICPR4 model was generated from the GWIS based on the development and watershed boundary updates completed in the watershed and used to simulate the 500-year/24-hour storm. Preliminary, node peak stages were used to generate a level-pool floodplain raster to facilitate the identification of missing overflow weir connectivity. The basins were reviewed to identify locations where:

- The floodplain raster abutted a basin boundary and there was not an associated SOW link
- The floodplain raster abutted a basin boundary with an associated SOW, but the cross-section did not cover the entire basin boundary segment along the floodplain.

Three hundred ninety-nine (399) SOWs and the associated cross-sections were added or modified.

7. Summary of Changes

A total of 44 basins, 56 nodes, and 465 links were added or modified as part of the updates completed by Collective. **Table 2** summarizes the basin, node, link, and cross section changes compared to the converted adjusted ICPR4 model and GWIS v2.1 geodatabase prepared by Collective for the County in June 2022. In addition to the changes to these features, associated hydrologic and hydraulic parameters within the UM watershed were updated as previously discussed in this report.

Table 2. Summary of Model Feature Changes

| Feature | Converted Adjusted ICPR4 Model (June 2022) | Updated ICPR4 Model (April 2023) | Added/Modified As Part Of Update |
|------------|--|----------------------------------|----------------------------------|
| ICPR_BASIN | 1007 | 1008 | 44 |
| ICPR_NODE | 1045 | 1053 | 56 |
| ICPR_LINK | 1793 | 2200 | 465 |
| ICPR_XSECT | 1382 | 1805 | 452 |

8. Response to Model Update Peer Review Comments

On May 23, 2023, Collective received peer review comments related to the development updates as well as general ICPR4 quality control/quality assurance (QAQC) comments generated from a tool developed by Jones Edmunds for the County. Comments were provided in a comment shapefile (five comments), a technical memorandum (three general comments), and an Excel spreadsheet summarizing the ICPR4 QAQC tool results. Collective reviewed the provided comments and addressed all comments from the memo and comment geodatabase. Most of the items flagged by the QAQC tool reflect comments outside of the update areas and are outside the scope of this project; these are future maintenance items to be addressed in subsequent updates. Those QAQC tool items that fell with updated areas were addressed according to the responses noted in the appended spreadsheet.

Additionally, during the process of addressing review comments, Collective adjusted basin boundaries to eliminate remaining gaps and overlaps with the adjacent watersheds (Dona Bay and Lower Myakka) and added additional interconnections to be consistent with the surface overflow links represented in these adjacent watersheds.

Revised GWIS geodatabase and ICPR4 model have been provided addressing comments along with updates to both the comment shapefile and QAQC Tool summary spreadsheet noting Collective's responses.

9. Model Verification

Model verification was not performed for the UM watershed, since there are no relatively recent water level or flow data available within the watershed for model calibration and validation purposes.

10. Model Boundary Conditions Updates

The UM watershed boundary and boundary interconnections required updates to be consistent with adjacent watersheds. Collective coordinated with Jones Edmunds to update basin boundaries to resolve basin gaps and overlaps and connectivity with both DB and LM. As needed, associated node storage, TOC, CN, and IA were updated for revised UM basins. Hydraulic links were also reviewed by Collective to ensure consistency with adjacent watersheds, which required both adding and modifying link features and updating parameter data (e.g., to/from nodes, etc.).

Since all County watersheds are being updated concurrently, the UM watershed was merged into a countywide watershed model by Jones Edmunds to establish boundary conditions efficiently and consistently for all watersheds at once. During the process of merging the watersheds into the countywide master model, Jones Edmunds performed the following (Jones Edmunds 2024):

- Additional updates to basin delineations to eliminate gaps and overlaps
- Renamed nodes and links to eliminate duplicate names between watersheds
- Addressed link/node topology errors

- Updated spatial features to match model inputs
- For features represented in adjacent models but reflecting mismatched information, reviewed and retained the features with the more credible source

Jones Edmunds provided Collective the merged, countywide GWIS 2.1 geodatabase and ICPR4 model with simulation results for the 10-year/24-hour, 25-year/24-hour, 50-year/24-hour, 100-year/24-hour, and 500-year/24-hour design storm events. The Type II Florida-Modified rainfall distribution was maintained for all watersheds. Rainfall amounts for each storm event applied to all watersheds are summarized in **Table 3**.

Table 3. Design Storm Rainfall Depths for Countywide Model

| Rainfall Return Period and Duration | Rainfall Depth (inches) |
|-------------------------------------|-------------------------|
| 10 years/24 hours | 7.0 |
| 25 year/24 hours | 8.0 |
| 50 years/24 hours | 9.0 |
| 100 years/24 hours | 10.0 |
| 500 years/24 hours | 12.4 |

Collective extracted the UM watershed from the countywide master model into a new, separate GWIS 2.1 geodatabase. Boundary stage time series were assigned based on the results of the countywide model for all storm events. An ICPR4 model was generated by Collective from the extracted, UM geodatabase and all simulations were executed. Collective performed a review of the results of the extracted model to confirm consistency with the countywide model.

11. Floodplain Development

Node peak results of the 100-year/24-hour simulation and the previously discussed 2019 DEM (see Section 3) were used by Collective to generate level-pool floodplains for the UM watershed. Additional processing was performed to remove gaps and holes and delete insignificantly small inundation polygons applying a threshold of 2,500 square feet. Results were compared with preliminary floodplain information developed by Collective after responding to model update peer review comments (see Section 8) as well as flood zone “AE” mapping provided by the County with the original UM ICPR3 model and GWIS version 1.6 geodatabase.

Basins 187171 and 187717 have waterbodies with higher water level elevations burned into the 2019 DEM by SWFWMD compared to the DEM used to originally develop the model. The peak stage predicted by the current version of the model is below the water level reflected in the 2019 DEM;

therefore, no flood inundation is automatically mapped in these basins. To address the artificially high-water elevations reflected in the 2019 DEM, Collective added the previously mapped flood zone polygons for these waterbodies.

Additionally, during the floodplain review, several basins were flagged as future fixes to update node storage and initial stages for basins where differences between the original DEM and the 2019 DEM are significant enough to affect flooding.

12. Response to Boundary Conditions Updates and Floodplain Peer Review

On March 19, 2024, Jones Edmunds provided peer review comments related to the boundary condition updates and floodplain delineation performed by Collective. **Table 4** summarizes the comments received and Collective's responses.

Table 4. Peer Review Comments and Responses Related to Boundary Condition Updates and Floodplain Mapping

| Peer Review Comment | Response |
|---|---|
| The model and geodatabase are missing links 187651W4 and 214W2 that were in the previous submittals | <i>Links are included in updated GWIS and model submittal.</i> |
| There are minor differences in the model results compared to the geodatabase | <i>ICPR_NODE_RESULTS updated to reflect current model simulation peak stages.</i> |
| All standard pipe sizes should be updated with the original pipe sizes (e.g., 11.8-inch-x-18.4-inch should be 12-inch-x-18-inch). | <i>Justification for this request is needed. Pipe dimensions were adjusted for model conversion to account for differences in how ICPR3 and ICPR4 non-standard pipes geometries are determined and to satisfy peak stage metrics for model conversion, per scope of work. Reverting these dimensions to original, non-standard sizes is a considerable effort, will impact stages throughout the model, and not per Collective's current scope of work.</i> |

| Peer Review Comment | Response |
|--|---|
| <p>Jones Edmunds reviewed the level-pool floodplains for the 100-year/24-hour design storm event. The mapped floodplains are generally consistent with the peak water-surface elevations at the model nodes; however, the post-processing appears to overestimate the floodplain extent in some locations. An example is shown in Figure 1 where the lighter blue polygon illustrates the level-pool extent and the dark blue polygon is the raster that depicts the inundation cells.</p> | <p><i>Post-processing of floodplain to remove minor floodplain areas and fill minor gaps is consistent with the approach employed by Jones Edmunds for other Sarasota County watersheds. Raw, level-pool floodplain can be provided as well, if County desires.</i></p> |

13. Flood Protection Level of Service

Collective performed an existing conditions, stormwater quantity Level of Service (LOS) analysis of all basins in the UM watershed in accordance with the LOS and design criteria described in the County's Unified Development Code (UDC), Appendix C14 (Sarasota County, 2023). More specifically, Collective evaluated the LOS for buildings and road access based on the criteria summarized in **Table 5**. Site flooding was not included in the analysis.

Table 5. Sarasota County Stormwater Quantity LOS Design Criteria

| Category | Type | Storm Design |
|-------------|--------------|---|
| Building | All | Finished floor elevation greater than or equal to 100-year/24-hour peak flood elevation |
| Road Access | Evacuation | No flooding at outside edge of pavement from 100-year/24-hour design storm |
| | Arterial | Less than 6-inches of flooding at outside edge of pavement from 100-year/24-hour design storm |
| | Collector | Less than 6-inches of flooding at outside edge of pavement from 25-year/24-hour design storm |
| | Neighborhood | Less than 6-inches of flooding at outside edge of pavement from 10-year/24-hour design storm |

The methodology to assess LOS within the watershed is similar in approach to previous assessments performed for the County. The following sections detail the supporting data and methodology used by Collective to evaluate both buildings and roadway access.

13.1 Building LOS Methodology

Collective utilized the *BuildingFootprint* feature class published by Sarasota County and available from ArcGIS Online to identify buildings where the estimated finished floor elevations (FFE) are below the 100-year/24-hour flood elevations. FFEs were estimated for all buildings as follows:

- Building polygons were buffered to the outside by five feet.
- The mean and maximum surface elevations within the five-foot buffer polygon were determined from the 2019 SWFWMD DEM.
- For all buildings except mobile and manufactured housing, the average of the mean and maximum elevations was used to establish the FFEs.
- For mobile and manufactured housing, one foot was added to average of the mean and maximum elevations to establish the FFEs.

Each building was intersected with associated basin(s) and the FFE compared to the associated basin's 100-year/24-hour flood elevation. Each building where the FFE is less than the flood elevation was flagged as deficient and compared to the flood depth grid. Non-habitable structures, defined as having a square footage of less than 400 square feet (ICC, 2023), were removed from the list. Additionally, buildings no longer visible in recent aerial imagery (i.e., 2020 and 2023) were removed. Lastly, buildings constructed after 2020, which are not reflected in the updated DEM and aerials indicate a topographic void, were not flagged. **Appendix A** includes a table summarizing the LOS deficient structures for the watershed as well as a map illustrating the locations. A total of 66 buildings within the watershed have been identified as stormwater LOS deficient.

13.2 Road Access LOS Methodology

For the road access assessment, Collective utilized the *Streets* feature class published by Sarasota County and available from ArcGIS Online to identify roadway segments within the watershed that do not meet the access criteria established by the County. The Street feature class was supplemented with information from the County's *Thoroughfare* feature class (also available via ArcGIS Online) to classify the *Streets* segments as Evacuation, Arterial (both major and minor arterials not identified as Evacuation routes), or Collector (both major and minor collectors not identified as Evacuation routes). Remaining segments were classified as Neighborhood roads.

For this analysis, Collective assumed the *Streets* layer reflects the roadway centerlines. Edge of pavement elevation for each road segment was estimated assuming the centerline represents the crown elevation, and the edge of pavement is 12-feet offset with a 2-percent cross slope from the crown (equivalent to 0.24-feet below crown elevation). The *Streets* layer, along with the 2019 DEM, floodplain mapping and depth rasters for the 10-year/24-hour, 25-year/24-hour, and 100-year/24-hour storm events were used by Collective to identify the segments of roadways where the flooding depth exceeds the LOS criteria and flagged these as deficient. Small (i.e., less than 25 linear feet), isolated segments of roadways were removed from the list. Additionally, flagged roadways were

visually reviewed for reasonableness. Street segments that were constructed post-2020, and not reflected in the model updates and associated DEM, were not flagged. Duration of flooding for each deficient segment was estimated as well.

Table 6 summarizes, by road classification and LOS status, the length of roadway and percentage of total length for the roads located within the watershed. **Appendix B** includes a detailed list identifying each road segment not satisfying the County's design criteria as well as a figure illustrating their locations. Lengths represent roadway segments as defined by the County's mapping, not the length of edge of pavement inundated by the specific storm event. A total of 25 roadway segments has flood depths greater than or equal to the depths identified in Table 5 along some portion of the roadways' edges. Seven of these roadway segments are deficient due to flooding associated within two or more basins/nodes.; these are reflected in Appendix B, Table B-1, where street information is duplicated (e.g., Street ID numbers, street name, etc.) but unique node names, stages, flood depth, and durations are presented. For example, Fruitville Road segment ST_102012_000309 is deficient due to flooding associated with nodes UM203, UM303, and UM341.

It should be noted that during the course of Collective's quality assurance review, additional future updates were identified for nodes 185364 and 187793 since current initial stages are above the edge of roadway elevations for Myakka Stage Park Road and Oakford Road, which results in durations of flooding equaling the full simulation duration (96 hours). Accordingly, the associated level of service deficiencies assigned to these roadway segments (Street IDs ST_102012_007090, ST_102012_024434 and ST_102012_024131) should be reassessed with the updates.

Table 6. Road Access LOS Summary by Roadway Classification

| LOS Roadway Classification | Meets Stormwater LOS Criteria | Linear Feet | Percent of Total LOS Roadway Classification |
|-----------------------------------|--------------------------------------|--------------------|--|
| Evacuation | Yes | 18,854 | 32.2 |
| | No | 35,510 | 67.8 |
| Arterial | Yes | 0 | 0.0 |
| | No | 24,446 | 100 |
| Collector | Yes | 8,578 | 43.7 |
| | No | 11,039 | 56.3 |
| Neighborhood | Yes | 41,274 | 14.0 |
| | No | 253,534 | 86.0 |

14. Response to Level of Service Peer Review

Two peer review comments from Jones Edmunds were received on July 22, 2024, about the draft level of service analysis results. Comments and Collective's responses are summarized in **Table 7** below and have been addressed in the relevant tables and figures with Appendix B. Additionally, total length of roadway and percentage of total length by roadway classification and level of service status have been updated and are presented in **Table 8**.

Table 7. Peer Review Comments and Responses Related to Level of Service Analysis

| Peer Review Comment | Response |
|---|---|
| ST_102012_019359 doesn't appear to be FPLOS deficient according to the flood depth raster | <i>Concur; Roadway segment has been removed.</i> |
| Several road segments are duplicated spatially | <i>Duplicates were included to indicate multiple basins/nodes contributing to FPLOS deficiencies. Duplicates were removed and only the basin/node contributing to the greatest amount of flooding depth is presented.</i> |

Table 8. Final Road Access LOS Summary by Roadway Classification

| LOS Roadway Classification | Meets Stormwater LOS Criteria | Linear Feet | Percent of Total LOS Roadway Classification |
|----------------------------|-------------------------------|----------------|---|
| Evacuation | Yes | 18,854 | 32.2 |
| | No | 35,510 | 67.8 |
| Arterial | Yes | 0 | 0.0 |
| | No | 24,446 | 100 |
| Collector | Yes | 8,578 | 43.7 |
| | No | 11,039 | 56.3 |
| Neighborhood | Yes | 39,305 | 13.3 |
| | No | 255,502 | 86.7 |

15. Conclusions and Recommendations

The Upper Myakka watershed was converted by Collective from ICPR3 to ICPR4, updated to reflect the Indian Lakes development, updated to address gaps and overlaps with the adjacent Dona Bay and Lower Myakka watersheds, updated to add surface overland flow connections, and updated to reflect improved boundary condition stages generated by Jones Edmunds from a countywide Master Model. Updated model results were used by Collective to map level pool floodplains and generate depth grids. Floodplain information was used to perform a flood protection level of service assessment of buildings and roadways within the watershed. Based on the available information and assumptions used for the level of service assessment, most of the deficient structures appear to flood from not only the 100-year/24-hour design storm but the 10-year/24-hour event as well. Twenty-four roadway segments, mostly neighborhood roads, have been identified as deficient.

Throughout the course of the project, Collective developed a list of recommended updates for items that fell outside of the project's scope of work. In total 159 future update items were noted, ranging from updating basin delineations and cross section geometry to align with current surface topography, updating node storage, verifying hydraulic structure sizes and/or inverts, adjusting initial stages, as well as general modeling improvements (such as adjusting the lowest storage point to be at or below the lowest pipe invert associated with the node). These recommendations are reflected as point features ("UM_future_fixes" within the "Misc" feature dataset) included in the final GWIS geodatabase.

16. References

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Appendix A

Stormwater LOS Deficient Buildings

Table A-1. Stormwater LOS Deficient Buildings

| FACILITY ID | Address | Building Type | FFE (ft) | Node | Stage 100YR (ft) | Stage 25YR (ft) | Stage 10YR (ft) |
|--------------------|------------------------|---|-------------|----------|------------------------|-----------------------|-----------------------|
| BF_05172017_400398 | 722 OAK BEND WAY | Single Family Detached | 32.96 | 187301 | 33.01 | 32.09 | 31.6 |
| BF_05292020_421955 | 13552 HERITAGE WAY | Single Family Detached | 36.47 | 187764.2 | 37.1 | 36.96 | 36.89 |
| BF_08182016_222986 | 9910 GARVETT | Single Family Detached | 45.15 | 187191 | 45.38 | 45.22 | 44.94 |
| BF_08182016_225488 | 9040 TRYFON BLVD A 104 | AG- Grazing Land Soil Capability Class | 44.57 | 187506 | 44.62 | 44.14 | 43.84 |
| BF_08182016_225746 | 1140 VIRGINIA DR | Single Family Detached | 45.13 | 187208.8 | 46.16 | 45.77 | 45.58 |
| BF_08182016_227883 | 14400 COVENANT WAY | AG - Cropland Soil Capability Class 2 | 41.95 | 187501 | 42.87 | 42.23 | 41.98 |
| BF_08182016_228333 | 4233 OAKHURST CIR E | Single Family Detached | 49.26 | 188007.2 | 49.97 | 49.8 | 49.7 |
| BF_08182016_228336 | 4233 OAKHURST CIR E | Single Family Detached | 48.90 | 188007 | 49.88 | 49.7 | 49.6 |
| BF_08182016_228459 | 16419 WINBURN PL | Single Family Detached | 49.56 | 188006 | 49.85 | 49.68 | 49.58 |
| BF_08182016_233473 | 1190 SHALLOW RUN RD | Multiple Single Fam Dwellings | 32.42 | 187300 | 32.99 | 32.07 | 31.57 |
| BF_08182016_233518 | 1190 SHALLOW RUN RD | Multiple Single Fam Dwellings | 32.66 | 187300 | 32.99 | 32.07 | 31.57 |
| BF_08182016_234142 | 15190 FRUITVILLE RD | Single Family Detached | 49.91 | 187910.4 | 49.92 | 49.42 | 49.02 |

| FACILITY ID | Address | Building Type | FFE (ft) | Node | Stage 100YR (ft) | Stage 25YR (ft) | Stage 10YR (ft) |
|--------------------|---------------------|--|---------------------|-------------|---------------------------------|--------------------------------|--------------------------------|
| BF_08182016_234226 | 15190 FRUITVILLE RD | Single Family Detached | 49.57 | 187925 | 49.92 | 49.42 | 49.02 |
| BF_08182016_234355 | 4000 RUGER RANCH RD | Single Family Detached | 50.64 | 187925.2 | 50.79 | 50.32 | 49.84 |
| BF_08182016_234493 | 4000 RUGER RANCH RD | Single Family Detached | 50.07 | 187925.2 | 50.79 | 50.32 | 49.84 |
| BF_08182016_234538 | 810 LENA LN | Single Family Detached | 49.06 | 187910.2 | 49.92 | 49.42 | 49.02 |
| BF_08182016_234577 | 810 LENA LN | Single Family Detached | 49.20 | 187910.2 | 49.92 | 49.42 | 49.02 |
| BF_08182016_234591 | 730 MYAKKA RD | AG - Ornamentals | 49.20 | 187987 | 49.41 | 49.33 | 49.27 |
| BF_08182016_235742 | 850 PALM VIEW WAY | Multiple Single Fam Dwellings | 31.56 | 187243 | 32.99 | 32.06 | 31.56 |
| BF_08182016_235798 | 920 LENA LN | Single Family Detached | 49.69 | 187909.2 | 49.92 | 49.42 | 49.02 |
| BF_08182016_236681 | 960 LENA LN | Single Family Detached | 48.84 | 187909 | 49.91 | 49.41 | 49.01 |
| BF_08182016_236917 | 12845 N BRANCH RD | Single Family Detached | 32.04 | 187243 | 32.99 | 32.06 | 31.56 |
| BF_08182016_238241 | 12707 N BRANCH RD | Single Family Detached | 32.04 | 187243 | 32.99 | 32.06 | 31.56 |
| BF_08182016_244370 | 1901 JOSHUA DR | Single Family Detached | 40.58 | 187855 | 40.83 | 40.41 | 40.2 |
| BF_08182016_247504 | 15720 RAWLS RD | AG- Grazing Land Soil Capability Class | 44.50 | 185631.4 | 44.76 | 44.67 | 44.62 |

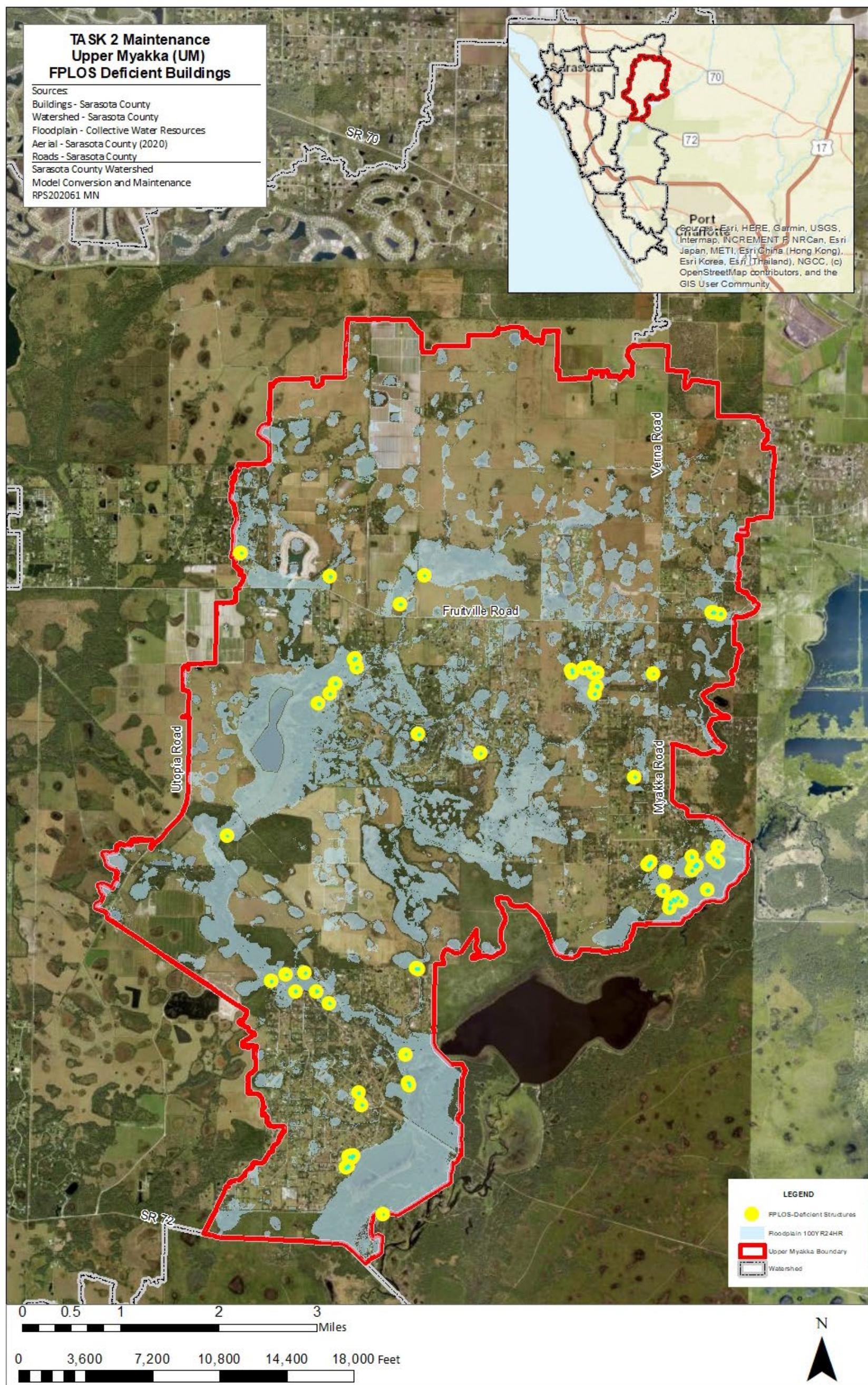
| FACILITY ID | Address | Building Type | FFE (ft) | Node | Stage 100YR (ft) | Stage 25YR (ft) | Stage 10YR (ft) |
|--------------------|----------------------|---|---------------------|-------------|---------------------------------|--------------------------------|--------------------------------|
| BF_08182016_255242 | 11708 FRUITVILLE RD | AG- Grazing Land Soil Capability Class | 30.73 | 187076 | 31.62 | 31.06 | 30.71 |
| BF_08182016_256134 | 4610 HIDDEN RIVER RD | AG- Grazing Land Soil Capability Class | 19.87 | 185626.4 | 20.12 | 20.12 | 20.12 |
| BF_08182016_257148 | 4561 HIDDEN RIVER RD | Single Family Detached | 19.83 | 185623 | 20.12 | 20.12 | 20.12 |
| BF_08182016_257239 | 4570 HIDDEN RIVER RD | Single Family Detached | 18.20 | 185627.1 | 20.12 | 20.12 | 20.12 |
| BF_08182016_257355 | 4570 HIDDEN RIVER RD | Single Family Detached | 18.14 | 185627.1 | 20.12 | 20.12 | 20.12 |
| BF_08182016_257457 | 4570 HIDDEN RIVER RD | Single Family Detached | 15.99 | 185627 | 20.12 | 20.12 | 20.12 |
| BF_08182016_257482 | 3711 HIDDEN RIVER RD | Single Family Detached | 25.06 | 185612.6 | 27.95 | 27.92 | 27.87 |
| BF_08182016_257580 | 3711 HIDDEN RIVER RD | Single Family Detached | 25.17 | 185612.6 | 27.95 | 27.92 | 27.87 |
| BF_08182016_257624 | 4545 HIDDEN RIVER RD | Single Family Detached | 19.25 | 185627.1 | 20.12 | 20.12 | 20.12 |
| BF_08182016_257791 | 3711 HIDDEN RIVER RD | Single Family Detached | 24.89 | 185612.6 | 27.95 | 27.92 | 27.87 |
| BF_08182016_257843 | 4545 HIDDEN RIVER RD | Single Family Detached | 16.69 | 185623 | 20.12 | 20.12 | 20.12 |
| BF_08182016_258308 | 4521 HIDDEN RIVER RD | Single Family Detached | 18.11 | 185627.1 | 20.12 | 20.12 | 20.12 |
| BF_08182016_258539 | 0 HIDDEN RIVER RD | Residential vacant site | 19.73 | 185623 | 20.12 | 20.12 | 20.12 |

| FACILITY ID | Address | Building Type | FFE (ft) | Node | Stage 100YR (ft) | Stage 25YR (ft) | Stage 10YR (ft) |
|--------------------|------------------------|----------------------------------|---------------------|-------------|---------------------------------|--------------------------------|--------------------------------|
| BF_08182016_260968 | 4438 COCO RIDGE CIR | Single Family Detached | 17.38 | 185618 | 20.12 | 20.12 | 20.12 |
| BF_08182016_261111 | 4405 HIDDEN RIVER RD | Single Family Detached | 19.84 | 185620 | 20.12 | 20.12 | 20.12 |
| BF_08182016_262054 | 4410 HIDDEN RIVER RD | Single Family Detached | 18.47 | 185618 | 20.12 | 20.12 | 20.12 |
| BF_08182016_262360 | 4400 HIDDEN RIVER RD | Single Family Detached | 18.51 | 185618 | 20.12 | 20.12 | 20.12 |
| BF_08182016_262535 | 4400 HIDDEN RIVER RD | Single Family Detached | 18.02 | 185618 | 20.12 | 20.12 | 20.12 |
| BF_08182016_262569 | 4410 HIDDEN RIVER RD | Single Family Detached | 16.42 | 185618 | 20.12 | 20.12 | 20.12 |
| BF_08182016_262819 | 4388 HIDDEN RIVER RD | Multiple Single Fam Dwellings | 20.06 | 185618 | 20.12 | 20.12 | 20.12 |
| BF_08182016_263565 | 4384 HIDDEN RIVER RD | Single Family Detached | 19.58 | 185618 | 20.12 | 20.12 | 20.12 |
| BF_08182016_270212 | 4920 MYAKKA VALLEY TRL | Single Family Detached | 33.64 | 185532.2 | 34.8 | 33.69 | 32.43 |
| BF_08182016_270253 | 4920 MYAKKA VALLEY TRL | Single Family Detached | 31.93 | 185532.2 | 34.8 | 33.69 | 32.43 |
| BF_08182016_270829 | 4852 ROCKING HORSE LN | Single Family Detached | 26.71 | 185807 | 27.08 | 26.24 | 25.74 |
| BF_08182016_271039 | 4822 ROCKING HORSE LN | Single Family Detached | 26.45 | 187036 | 27.17 | 26.41 | 25.98 |
| BF_08182016_271746 | 5010 VANDERIPE RD | Single Family & Other Bldg | 26.23 | 187007 | 27.48 | 26.95 | 26.65 |

| FACILITY ID | Address | Building Type | FFE (ft) | Node | Stage 100YR (ft) | Stage 25YR (ft) | Stage 10YR (ft) |
|--------------------|-----------------------|-------------------------------|---------------------|-------------|---------------------------------|--------------------------------|--------------------------------|
| BF_08182016_272794 | 4930 OLD RANCH RD | Single Family Detached | 25.03 | 185808.4 | 25.24 | 24.6 | 24.15 |
| | | Multiple Single Fam Dwellings | | | | | |
| BF_08182016_272859 | 5112 HOWARD CREEK RD | Dwellings | 26.83 | 185730 | 27.26 | 26.74 | 26.45 |
| BF_08182016_274099 | 5178 ROCKING HORSE LN | Single Family Detached | 22.99 | 185806 | 24.06 | 23.38 | 22.98 |
| BF_08182016_280239 | 5781 OLD RANCH RD | Single Family Detached | 17.07 | 185522 | 18.81 | 18.81 | 18.8 |
| | | Multiple Single Fam Dwellings | | | | | |
| BF_08182016_282414 | 5925 OLD RANCH RD | Dwellings | 18.42 | 185380 | 18.79 | 18.78 | 18.78 |
| BF_08182016_282725 | 6017 OLD RANCH RD | Single Family Detached | 17.94 | 185380 | 18.79 | 18.78 | 18.78 |
| BF_08182016_283514 | 6114 SHEPS ISLAND RD | Single Family Detached | 32.59 | 185486 | 33.18 | 32.98 | 32.87 |
| BF_08182016_288513 | 6931 OLD RANCH RD | Single Family Detached | 26.99 | 185460 | 30.13 | 29.86 | 29.69 |
| BF_08182016_288541 | 6931 OLD RANCH RD | Single Family Detached | 26.99 | 185460 | 30.13 | 29.86 | 29.69 |
| BF_08182016_288590 | 6953 OLD RANCH RD | Single Family Detached | 28.16 | 185460 | 30.13 | 29.86 | 29.69 |
| BF_08182016_288682 | 6931 OLD RANCH RD | Single Family Detached | 26.21 | 185460 | 30.13 | 29.86 | 29.69 |
| | | Multiple Single Fam Dwellings | | | | | |
| BF_08182016_289180 | 2304 INGRAM AVE | Dwellings | 26.99 | 185460 | 30.13 | 29.86 | 29.69 |
| | | Multiple Single Fam Dwellings | | | | | |
| BF_08182016_289294 | 2304 INGRAM AVE | Dwellings | 29.24 | 185460 | 30.13 | 29.86 | 29.69 |

| FACILITY ID | Address | Building Type | FFE (ft) | Node | Stage 100YR (ft) | Stage 25YR (ft) | Stage 10YR (ft) |
|--------------------|---------------------------|-------------------------------------|---------------------|-------------|---------------------------------|--------------------------------|--------------------------------|
| BF_08182016_291692 | 3900 COMMONWEALTH BLVD | Parks - Natural Areas, Preserves | 18.48 | 185386 | 18.73 | 18.73 | 18.73 |
| BF_08182016_399510 | 6389 SINGLETREE TRL | Single Family Detached | 32.55 | 185486 | 33.18 | 32.98 | 32.87 |

Figure A-1. Location Map of LOS Deficient Buildings





Appendix B

Stormwater LOS Deficient Roadways

Table B-1. Stormwater LOS Deficient Roads

Lengths represent roadway segments as defined by the County's mapping layer, not the length of edge of pavement inundated by the specific storm event.

| Street ID | Full Street Name | From Address Left | To Address Left | From Address Right | To Address Right | FPLOS_Road_Class | Road Centerline Length (feet) | NODENAME | EOP (feet) | FPLOS Design Storm | Max Stage 100yr/24hr (feet) | Max Stage 25yr/24hr (feet) | Max Stage 10yr/24hr (feet) | FPLOS Depth (feet) | Duration (hours) |
|------------------|----------------------|-------------------|-----------------|--------------------|------------------|------------------|-------------------------------|----------|------------|--------------------|-----------------------------|----------------------------|----------------------------|--------------------|------------------|
| ST_102012_025570 | MYAKKA RD | 16001 | 16699 | 16000 | 16698 | Collector | 8578 | 185629 | 19.98 | 25YR/24HR | 20.82 | 20.82 | 20.82 | 0.84 | 43.75 |
| ST_102012_000309 | FRUITVILLE RD | 15001 | 15899 | 15000 | 15598 | Evacuation Route | 5177 | UM341 | 54.02 | 100YR/24HR | 54.46 | 54.35 | 54.3 | 0.44 | 14.50 |
| ST_102013_036241 | FRUITVILLE RD | 12301 | 12899 | 12300 | 12898 | Evacuation Route | 3808 | 187189 | 42.46 | 100YR/24HR | 43.15 | 42.89 | 42.41 | 0.69 | 16.00 |
| ST_102012_000875 | VERNA RD | 1100 | 1698 | 1101 | 1699 | Evacuation Route | 2348 | 188018 | 60.22 | 100YR/24HR | 60.61 | 60.21 | 60 | 0.39 | 8.25 |
| ST_102012_001219 | VERNA RD | 2 | 498 | 1 | 499 | Evacuation Route | 1605 | UM303 | 54.86 | 100YR/24HR | 55.14 | 55.04 | 54.99 | 0.28 | 13.75 |
| ST_102012_025329 | VERNA RD | 1700 | 2498 | 1701 | 2499 | Evacuation Route | 3917 | 188026 | 70.73 | 100YR/24HR | 71.04 | 70.98 | 70.85 | 0.31 | 10.75 |
| ST_102012_023645 | HIDDEN RIVER RD | 4517 | 4799 | 4516 | 4798 | Neighborhood | 4413 | 185627.1 | 15.86 | 10YR/24HR | 20.12 | 20.12 | 20.12 | 4.26 | 64.00 |
| ST_102012_030611 | HIDDEN RIVER RD | 0 | 0 | 4488 | 4514 | Neighborhood | 762 | 185627.1 | 17.57 | 10YR/24HR | 20.12 | 20.12 | 20.12 | 2.55 | 42.00 |
| ST_102012_030613 | HIDDEN RIVER RD | 4487 | 4515 | 0 | 0 | Neighborhood | 702 | 185627.1 | 16.89 | 10YR/24HR | 20.12 | 20.12 | 20.12 | 3.23 | 46.00 |
| ST_102012_007090 | MYAKKA STATE PARK RD | 0 | 0 | 9501 | 9501 | Neighborhood | 1249 | 185364 | 17.37 | 10YR/24HR | 18.71 | 18.71 | 18.71 | 1.34 | 96.00 |
| ST_102012_024434 | MYAKKA STATE PARK RD | 0 | 0 | 0 | 0 | Neighborhood | 1809 | 185364 | 17.26 | 10YR/24HR | 18.71 | 18.71 | 18.71 | 1.45 | 96.00 |
| ST_102012_005564 | MYAKKA VALLEY TRL | 5201 | 5281 | 5200 | 5282 | Neighborhood | 3032 | 185552 | 20.01 | 10YR/24HR | 20.95 | 20.91 | 20.89 | 0.88 | 12.00 |
| ST_102012_023883 | MYAKKA VALLEY TRL | 5283 | 5321 | 5284 | 5370 | Neighborhood | 1395 | 185560 | 20.82 | 10YR/24HR | 21.91 | 21.88 | 21.86 | 1.04 | 89.50 |
| ST_102012_017077 | N BRANCH RD | 13701 | 13999 | 13700 | 13998 | Neighborhood | 1701 | 187806 | 42.95 | 10YR/24HR | 44.59 | 44.49 | 44.43 | 1.48 | 84.25 |
| ST_102012_021466 | OAKFORD RD | 801 | 999 | 800 | 998 | Neighborhood | 1807 | 187810 | 44.85 | 10YR/24HR | 45.65 | 45.56 | 45.5 | 0.65 | 6.50 |
| ST_102012_024131 | OAKFORD RD | 1401 | 2099 | 1382 | 2098 | Neighborhood | 2468 | 187793 | 42.1 | 10YR/24HR | 43.83 | 43.75 | 43.71 | 1.61 | 96.00 |
| ST_102012_022412 | PALM VIEW RD | 901 | 1165 | 900 | 1164 | Neighborhood | 1031 | 187250 | 34.79 | 10YR/24HR | 35.48 | 35.4 | 35.35 | 0.56 | 5.00 |
| ST_102012_021342 | PINE RIDGE LN | 801 | 999 | 800 | 998 | Neighborhood | 871 | 187802 | 39.73 | 10YR/24HR | 41.14 | 41.09 | 41.07 | 1.34 | 11.75 |
| ST_102012_011221 | ROCKING HORSE LN | 4801 | 5199 | 4800 | 5198 | Neighborhood | 4053 | 185575 | 22.82 | 10YR/24HR | 25.19 | 24.57 | 24.13 | 1.31 | 33.00 |
| ST_102012_004680 | RUGER RANCH RD | 3500 | 4098 | 3501 | 4099 | Neighborhood | 2365 | 187926.2 | 48.41 | 10YR/24HR | 50.88 | 50.58 | 50.43 | 2.02 | 24.50 |
| ST_102012_026559 | WHIDDEN RD | 16001 | 16799 | 16000 | 16798 | Neighborhood | 6939 | 187999 | 39.24 | 10YR/24HR | 41.01 | 40.54 | 40.23 | 0.99 | 6.25 |
| ST_102012_022644 | WILD CITRUS RD | 13201 | 13299 | 13200 | 13298 | Neighborhood | 658 | 187250 | 34.36 | 10YR/24HR | 35.48 | 35.4 | 35.35 | 0.99 | 19.75 |
| ST_102012_006006 | WINBURN DR | 16451 | 16799 | 16450 | 16798 | Neighborhood | 1418 | 188009 | 53.49 | 10YR/24HR | 54.6 | 54.54 | 54.5 | 1.01 | 16.50 |
| ST_102012_032499 | WINBURN DR | 16027 | 16449 | 16024 | 16448 | Neighborhood | 2633 | 188009 | 53.54 | 10YR/24HR | 54.6 | 54.54 | 54.5 | 0.96 | 15.75 |

Figure B-1. Location Map of LOS Deficient Roadways

