STORMWATER ANALYSIS

FOR

LONGBOAT KEY VILLAGE

Prepared for:

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EXECUTIVE SUMMARY

The Town of Longboat Key (Town) has previously commissioned a flood risk study for the Longboat Key Village (Village) community to evaluate recommendations to reduce and improve the duration of flooding. The original study was conducted by Boyle Engineering Corporation, dated October 2000, and was updated by DMK, dated December 2016. The 2016 study included updated decision support modeling (ICPR3) and provided alternatives including Tideflex valves and pump stations to help relieve flooding concerns. In 2018 Kimley-Horn Associates, Inc. (Kimley-Horn) was contracted to conduct a peer review of the 2016 DMK study. Recommendations from the peer review are to be addressed though this study.

The Village is a low-lying community at the north end of the Longboat Key and is an area of concern subject to sunny day flooding sunny day flooding due to high tides and king tides and subject to increasing flood risks due to Sea Level Rise (SLR). For the current study, Kimley-Horn was contracted by the Town to revise the alternatives based on impacts of rainfall, tidal events and SLR on the roadways and infrastructure in the areas of concern and to identify projects to mitigate impacts.

The impacts of rainfall, tidal events and SLR on the area of concern were identified through inundation mapping and revising the DMK Hydraulic & Hydrologic model (ICPR4). The ICPR4 model was revised to verify the recommendations in this report. The flood risks referenced in this report included:

- Observed High Tide Inundation (*observed 1.8 ft tide on May 18, 2022*)
- Mean Higher-High Water (MHHW) + 2050 SLR (Intermediate High)
- Observed High Tide + 2050 SLR (Intermediate High)
- 25-Year/24-Hour Design Storm with MHHW Tailwater
- 25-Year/24-Hour Design Storm with Observed High Tide Tailwater
- 25-Year/24-Hour Design Storm with MHHW + 2050 SLR (Intermediate High) Tailwater
- 25-Year/24-Hour Design Storm with Observed High Tide + 2050 SLR (Intermediate High) Tailwater

Inundation Mapping is provided in ***Appendix A***. The 25-Year/24-Hour Design Storm floodplain mapping is provided in ***Appendix B.***

Site-specific strategies discussed in ***Section 3 - Project Recommendations*** in subsection 3.3 – Longboat Key Village Capital Projects were developed to contend with the unique flood threads that are found within the Village community. Additionally, Kimley-Horn has provided opinions of probable cost for the identified capital improvement project in ***Appendix C***. The identified projects may be designed and constructed concurrently, or as stand-alone projects based on available funding.

Supplemental Study

Longboat Key Village residents raised additional concerns in the project area requiring survey data to evaluate alternatives. The Town of Longboat Key commissioned a supplemental study to update the Longboat Key Village Stormwater Assessment and Alternatives. The Supplemental study included survey services including Finished Floor Elevations, Stormwater Infrastructure Elevations, and Topographic Survey. Preliminary survey and the revised final survey submittals were reviewed, and data incorporated into the stormwater modeling (ICPR4) to evaluate pump locations; a holding facility (surface water pond), and pump and pond combination to supplement road reconstruction and prioritize improvements. Opinion of Probable Cost for pump locations to supplement road reconstruction were developed. Four Scenarios were evaluated assuming construction of all four phases as the base design:

Scenario 1 - Phase 1-4 (base) – pipe improvements with road reconstruction / elevation

Scenario 2 - Phase 1-4 with Pond

Scenario 3 - Phase 1-4 with Pump

Scenario 4 - Phase 1-4 with Pond and Pump

The Scenario 1 (base design) provides the greatest relative peak stage reductions throughout the project area. For Scenario 2, the addition of the pond provides insignificant additional benefit in the immediate are of the pond, but not significant for the overall project area. For Scenario 3, addition of a pump provides minimal additional, but not significant for the overall project area. In Scenario 4, the pond and the pump were included with the base design and had some additional benefit over the base design.

SCENARIO	Relative Peak Stage Reduction (FT)	IMPLEMENTATION
1	0.2 to 1.2	Initial phase of implementation for improved resiliency of the Longboat Key Village
2	Additional 0.01 to 0.06	Benefits are limited by groundwater elevation and king tides. May provide additional benefit once the seawalls and roadways are elevated.
3	Additional 0.01 to 0.30	Addition of a pump or multiple pumps becomes effective during a future condition where the seawalls are elevated and prior to additional roadway reconstruction / elevation
4	Additional 0.01 to 0.50	May provide additional benefit once the seawalls and roadways are elevated.

Costs were updated for each roadway phase 1 – 4, a pump site, and the pond site based on FDOT Historical Item Averages Statewide 6-Month Revolving Cost Information as of September 23, 2024, with contingency added. Opinion of Probable Costs can be found in Section 4 and in **Appendix C**.

Grant Funding for Property Acquisition

Grant funding information for property acquisition to remove structures from risk is provided below. The FEMA bulletin regarding property acquisition is provided in ***Appendix E***:

1. Funds may be available after a presidentially declared disaster.
2. Funding source is the Hazard Mitigation Grant Program
3. Local officials determine if funding is requested from the state.
4. The state will review the requests and will determine the communities that will be considered for buyouts.
5. Seventy-five percent of any buyout cost is paid by FEMA and the rest is paid by the state and/or local government.
6. Properties usually are in Special Flood Hazard Areas and are primary residences.

- Buyouts are voluntary.
- FEMA will review all proposals to ensure regulatory requirements are met and the acquisition is environmentally sound and cost-effective.
- If a home is eligible for acquisition, the homeowner is offered a pre-disaster fair-market value for the property as determined by a certified appraiser. There is an appeals process.
- If the homeowner still owes a mortgage on the home, the balance due will be deducted and paid to the lienholder.
- The structure is then demolished. The land use is restricted to open space in perpetuity and deeded to the local government.
- Projects that are not approved because of limited funding are kept on file in the event that funding becomes available in the future.

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ABBREVIATIONS

BFE	Base Flood Elevation
CIP	Capital Improvement Plan
CRS	Community Rating System
DEM	Digital Elevation Model
EC	Elevation Certificate
FEMA	Federal Emergency Management Agency
FFE	Finished Floor Elevation
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
GIS	Geographic Information System
MHHW	Mean Higher-High Water
MLLW	Mean Lower-Low Water
NAVD88	North American Vertical Datum of 1988
NFIP	National Flood Insurance Program
NGVD29	National Geodetic Vertical Datum of 1929
NOAA	National Oceanic and Atmospheric Administration
OHT	Observed High Tide
SFHA	Special Flood Hazard Areas
SLR	Sea Level Rise
SWFWMD	Southwest Florida Water Management District
USGS	United States Geological Survey

DEFINITIONS

100-Year/24-Hour Rainfall Event: A rainfall event with the estimated probability of a 1% chance of happening in any given year.

25-Year/24-Hour Rainfall Event: A rainfall event with the estimated probability of a 4% chance of happening in any given year.

Adaptive Measures: A strategy, project, plan, or policy, that aims to increase resilience to acute shocks or chronic stresses.

Base Flood: The Flood having a one percent chance of being equaled or exceeded in any given year, also known as the 100-year Flood.

Base Flood Elevation (BFE): The highest elevation of the water surface associated with the Base Flood.

Check Valve: Structure in the stormwater management system for controlling flow to allow discharge without backflow from saltwater sources.

Chronic Stresses: Weaken fabric of a community on a daily or cyclical basis (i.e. sea level rise, undersized infrastructure, etc.).

Critical Facility: An integral and readily identifiable facility such as schools, nursing homes, hospitals, police, fire and emergency response installations, installations which produce, use, or store hazardous materials or hazardous waste, or other facilities that would potentially create a danger to the public health, safety, or welfare if the facility was compromised by flooding.

Community Rating System (CRS): A voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the National Flood Insurance Program (NFIP).

Conveyance: Elements of the stormwater management system that can be open (roadside ditches / swales) or closed (pipes) to provide a flow path for stormwater runoff.

Coastal Communities: Communities adjacent to the sea.

Coastal Flooding: Flooding in coastal communities caused by either sea level rise, storm intensification or both.

Coastal High Hazard Area: The area subject to high velocity waters caused by, but not limited to, hurricane wave wash. The area is designated on a Flood Insurance Rate Map (FIRM) as Zone V1-30, or VE.

Digital Elevation Model (DEM): Representation of bare ground (bare earth) topographic surface of the earth excluding trees, building, and any other surface objects.

Effective Flood Insurance Rate Map: Official map of a community on which FEMA has delineated the Special Flood Hazard Areas (SFHAs), the Base Flood Elevations (BFEs) and the risk premium zones applicable to the community.

Elevation Certificate (EC): is a document to verify elevations such as the lowest floor elevation of the property and the BFE at the time the EC was issued. The elevation certificate includes the FEMA flood zone and other building characteristics / elevations.

Erosion: The displacement of the upper layer of soil by wind or water to transport material from one location to another location.

Federal Emergency Management Agency (FEMA): The federal agency responsible for leading the Nation's efforts to prepare for, protect and mitigate against, respond to, and recover from the impacts of natural disasters and man-made incidents or terrorist events.

Flood or Flooding: A general and temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland or tidal waters, or the unusual and rapid accumulation or runoff of surface waters from any source, or an abnormal tidal surge, or by some similarly unusual and unforeseeable event which results in Flooding.

Flood Insurance Rate Map (FIRM): An official map of a community, on which the Federal Emergency Management Agency (FEMA) has delineated both the Special Flood Hazard Areas (SFHA) and the risk premium zones applicable to the community. The latest FIRM issued for Sarasota County or Manatee County is referred to as the effective FIRM.

Flood Insurance Study (FIS): The official hydraulic and hydrologic report provided by the Federal Emergency Management Agency (FEMA). The report contains Flood profiles, as well as the Flood Insurance Rate Maps, Flood Boundary Floodway Maps, the water surface elevation of the Base Flood, and other related information.

Flood Level: The elevation of water on dry surfaces caused by an event.

Floodplain: Any land area susceptible to being inundated by water from any source (see definition of "Flood or Flooding".

Floodplain Level of Services: Established depth tolerances for flooding during specified rainfall events.

Floodplain Level of Service Deficiency: Locations of standing water depth in excess of established floodplain level of service.

Inlet: Structure in the stormwater management system where surface water enters to closed system.

King Tide: A predictable especially high tide that occurs when the full or new moon is closest to the Earth in orbit, typically occurs twice a year.

Lowest Floor: A building's lowest enclosed area (including Basement). The Floodplain Administrator shall not consider an unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage other than a Basement to be the building's Lowest Floor, provided that such enclosure does not violate the applicable non-elevation design requirements of this Article.

Mean Higher-High Water (MHHW): The average of the higher high-water height of each tidal day observed over the National Tidal Datum Epoch.

Mean Lower-Low Water (MLLW): The average of the lower low water height of each tidal day observed over the National Tidal Datum Epoch.

Mean Sea Level (MSL): For the purposes of the National Flood Insurance Program, the datum to which Base Flood Elevations are shown on a community's Flood Insurance Rate Map and other legally adopted flood studies are referenced.

National Flood Insurance Program (NFIP): Managed by FEMA, the National Flood Insurance Program provides federally backed flood insurance to property owners in participating communities.

National Tidal Datum Epoch: The specific 19-year period adopted by the National Ocean Service as the official time segment over which tide observations are taken and reduced to obtain mean values (e.g., mean lower low water, etc.) for tidal datums. It is necessary for standardization because of periodic and apparent secular trends in sea level. The present NTDE is 1983 through 2001 and is actively considered for revision every 20-25 years. Tidal datums in certain regions with anomalous sea level changes (Alaska, Gulf of Mexico) are calculated on a Modified 5-Year Epoch.

National Oceanic and Atmospheric Administration (NOAA): United States federal agency responsible for monitoring the climate and the environment.

Non-Special Flood Hazard Area: An area that is in a moderate-to-low risk flood zone designated as Zone X or (Shaded) X, B, or C, as defined on the effective Flood Insurance Rate Maps (FIRM).

North American Vertical Datum of 1988 (NAVD88): The vertical datum used for vertical control surveying and for the effective FEMA FIRM products in Manatee and Sarasota Counties.

Observed High Tide (OHT): Kimley-Horn staff documented a high tide event on May 18, 2022. The event was recorded at elevation 1.8 feet NAVD88.

Pre-FIRM Structures: Structures for which the start of construction commenced on or before June 15, 1971, or the adoption of earliest FIRM.

Pressure Head: The difference in the upstream and downstream surface elevations required to activate the check valve so that fluid can flow to the receiving waterbody.

Resiliency: Capacity of individuals, institutions, businesses, and systems within a community to survive, adapt, and grow, no matter what kinds of chronic stresses and acute shocks they experience. Planning for an uncertain future.

Saltwater Marsh: Coastal wetlands that are flooded and drained by salt water brought in by the tides. They are marshy because the soil may be composed of deep mud and peat. Saltwater marshes protect shorelines from erosion by buffering wave action and provide water quality improvements by filtering nutrients from stormwater runoff and trapping sediments.

Sea Level Rise: The increasing water level of the oceans over time.

Special Assessment District: A district created to fund improvements to a neighborhood and/or community or to provide additional services based on community desires for a group of properties that share in the benefit and cost of the service provided.

Special Flood Hazard Areas (SFHA): or Area of special flood hazard means the land in the floodplain subject to a one percent or greater chance of Flooding in any given year. These areas are designated as Zones A, Al through A30, AE, VI through V30, or VE and defined on the effective Flood Insurance Rate Maps (FIRM).

Stormwater Management System: Engineered system designed to convey stormwater runoff away from road surfaces and properties.

Sunny Day Flooding: Standing water on roadways occurring without a rainfall event and due to a high tide event.

Tailwater: Waters located immediately downstream from a Stormwater Management System.

Tailwater Condition: Tailwater depth (fixed or variable) used to evaluate the function of a Stormwater Management System.

Vulnerability: The predisposition for an asset to be adversely impacted.

Water Level: The elevation of water on or off land.

1. INTRODUCTION

Kimley-Horn Associates, Inc. (Kimley-Horn) has been contracted by the Town of Longboat Key (Town) to update the Longboat Key Village Stormwater Assessment and Alternatives based on the revised sea level rise predictions based on the NOAA Technical Report NOS CO-OPS 083, dated January 2017 and to look at additional alternatives including road reconstruction and elevation. As a part of the analysis, stormwater modeling and Geographic Information System (GIS) mapping was performed to gain an understanding of the current storm flooding conditions. Stormwater modeling was performed using the Interconnected Channel and Pond Routing Version 4 (ICPR4) software. GIS mapping was used to visualize predicted flooding in the Village community with different tidal conditions, as well as tide conditions combines with a 25-year storm event.

Figure 1: Project Location

The project objective is to provide the Town and the residents of the Village with recommendations to mitigate the current stormwater conditions. The Village Stormwater Analysis consisted of two primary sources of standing water described below:

Sunny Day Flooding

Tidal and sunny day flooding refers to the flooding of streets, parking areas, and property with salt water solely from the tides and not from a rainfall event. Using available tidal data from the National Oceanic and Atmospheric Administration (NOAA) and the 2018 Florida Digital Elevation Model (DEM) from the United Stated Geological Survey (USGS), Kimley-Horn quantified and visualized the extents of the tidal flooding in the Village community. This tidal flooding was investigated based on the Mean Higher-High Water (MHHW), the Observed High Tide (OHT), and both of those sea levels with the additional rise estimated by the NOAA Intermediate High SLR in 2050.

Rainfall Event Flooding

Kimley-Horn evaluated the current conditions of the Village's stormwater infrastructure by converting the ICPR3 model, used in the 2016 DMK study, to ICPR4. The ICPR4 model was then revised based on stormwater survey data provided by the Town, the 2018 Florida DEM Lidar from USGS, plans from the Town, and the construction plans from the 2003 drainage improvements by Boyle Engineering (ERP #44.23853.000).

Kimley-Horn used the stormwater model and 2018 Lidar to visualize the existing flooding occurring throughout the community during the 25-Year/24-Hour storm event. Four tailwater conditions were used in the evaluation – the MHHW, the OHT, and both of those sea levels with the additional rise estimated by the NOAA Intermediate High SLR in 2050. The analysis enabled areas of concern to be located within the community's infrastructure.

2. STORMWATER ANALYSIS

2.1 Data Collection

All horizontal data referenced in this analysis uses the Florida State Plane Coordinates of NAD83/11 Florida West Zone and all vertical elevation data is referenced to the NAVD88 vertical datum. Readily available data recorded in the NGVD29 vertical datum was converted to the NAVD88 vertical datum by subtracting 0.98 feet from the NGVD29 elevations (NGVD29 – 0.98 ft = NAVD88).

ICPR3 to ICPR4 Conversion

Kimley-Horn received the ICPR3 model files that DMK used during their stormwater assessment and analysis of alternatives. These files were converted using the built-in ICPR3 to ICPR4 converter within the ICPR4 software. The new ICPR4 files were cross checked with the input reports from the original ICPR3 files to ensure all information has been converted correctly.

Backflow Preventors

Kimley-Horn verified head loss curve information for backflow preventors identified in the DMK study and on the Boyle as-built plans. The Town has installed WaStop check valves since the DMK study and the model was updated with head loss curve information for the WaStop values.

SWFWMD Environmental Resource Permits

Kimley-Horn collected permits, plan sets, and as-builts from the Southwest Florida Water Management District's (SWFWMD) Environmental Resources Permit (ERP) database to aid in the development of the ICPR4 model. Information for the Longboat Key Drainage Improvements (ERP #44.23853.000) were available from SWFWMD.

GIS Files

The Town provided GIS data for stormwater conveyance infrastructure *(Stormwater Survey.gdb),* which included inlet / structure and outfall locations, pipe locations, and some additional information regarding the location of check valves. Since the Village community is a part of Manatee County, GIS data regarding parcel information, land use, and roadway infrastructure was downloaded from Manatee County's open-source GIS database. A summary of GIS files used for this analysis are as follows:

- Manatee County Parcels
- Manatee County Building Footprint
- Manatee County Roads

- Town of Longboat Key Stormwater Inventory (*StormWaterSurvey.gdb*)
  - Outfalls
  - Pipes
  - Inlets / Structures

2018 DEM

The 2018 Florida Peninsular Digital Elevation Model (DEM) was published by USGS on the USGS Science Base-Catalog and is in the vertical datum of NAVD88. The data collection for the DEM was conducted from November 2018 to January 2019; thus, the DEM does not include topographical changes that took place after January 2019.

Survey Data

For the Phase 1 - 4 proposed project areas of the Village Community, project area survey data was collected by Hyatt Survey Services (Hyatt). The survey data collection was completed in September 2024. Data collected included an Elevation Survey of the finished floors in the project area; a Stormwater Infrastructure Survey collecting elevations, dimensions, and pertinent data related to the stormwater infrastructure; and a Topographic Survey of roadways and adjacent areas. Data was incorporated into the ICPR4 model for evaluation of the proposed projects.

Sea Level Projection Data

The 2017 NOAA SLR Projections (Intermediate High) were utilized in this stormwater analysis. The closest NOAA tidal benchmark station to the project area is 8726520 – St. Petersburg, FL. See Figure 2, Figure 3, and Table 1*: NOAA 2017 Sea Level Change Data* below for inputs and projection data.

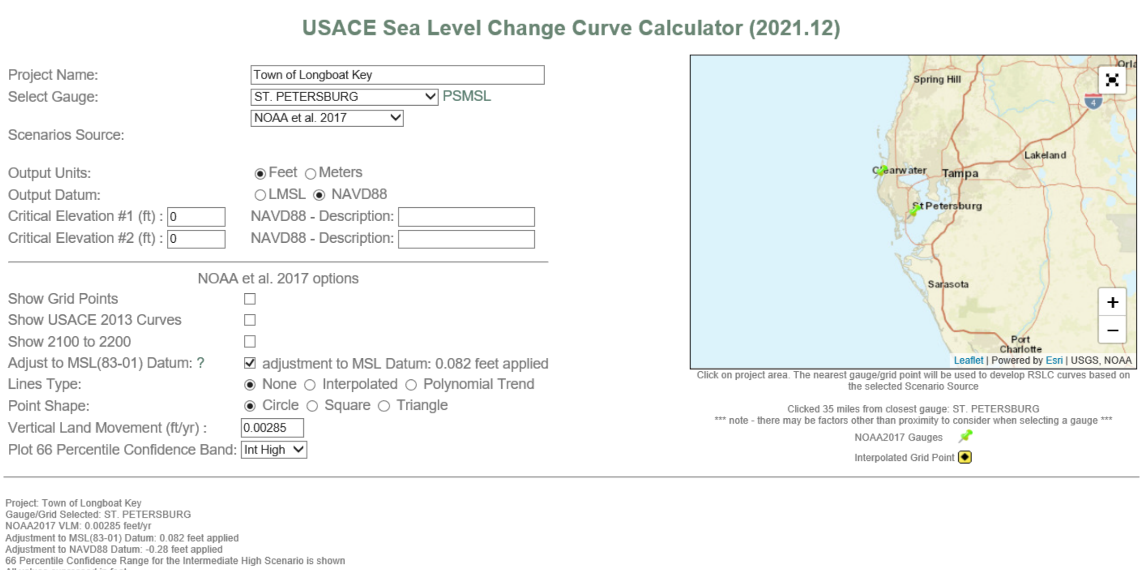


Figure 2: US Army Corps of Engineers data inputs.

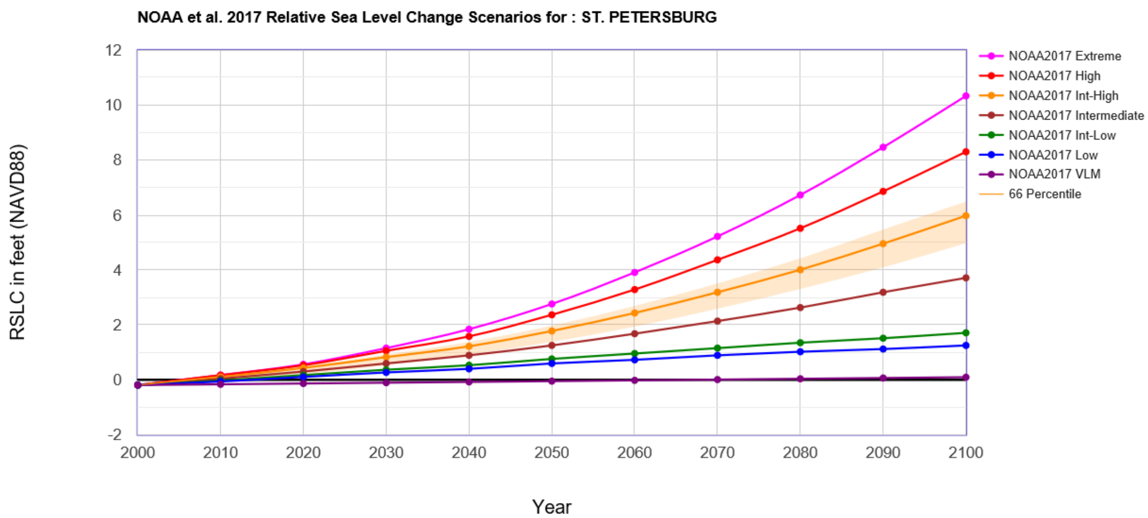


Figure 3: NOAA 2017 Relative Sea Level Change data.

Table 1: NOAA 2017 Sea Level Change Data

Town of Longboat Key
Scenarios for ST. PETERSBURG
NOAA2017 VLM: 0.00285 feet/yr
All values are expressed in feet

Year	NOAA2017 VLM	NOAA2017 Low	NOAA2017 Int-Low	NOAA2017 Intermediate	NOAA2017 Int-High	NOAA2017 High	NOAA2017 Extreme
2000	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19
2010	-0.16	-0.06	-0.03	0.04	0.10	0.17	0.17
2020	-0.14	0.10	0.17	0.30	0.43	0.53	0.56
2030	-0.11	0.27	0.36	0.59	0.82	1.05	1.15
2040	-0.08	0.40	0.53	0.89	1.22	1.58	1.84
2050	-0.05	0.59	0.76	1.25	1.78	2.37	2.76
2060	-0.02	0.73	0.95	1.68	2.43	3.28	3.91
2070	0.01	0.89	1.15	2.14	3.19	4.37	5.22
2080	0.03	1.02	1.35	2.63	4.01	5.52	6.73
2090	0.06	1.12	1.51	3.19	4.96	6.86	8.47
2100	0.09	1.25	1.71	3.71	5.97	8.30	10.34

2.2 Hydraulic and Hydrology Modeling

The stormwater modeling for this analysis was conducted using Interconnected Channel and Pond Routing, Version 4 (ICPR4). This model was received from the Town as ICPR3 files developed as a part of the DMK Stormwater Assessment and Alternatives study. The

ICPR3 model was converted into ICPR4 using the built in ICPR3 to ICPR4 converter. The model was then revised based on the 2018 peer review performed by Kimley-Horn, 2018 DEM, Town of Longboat Key Stormwater Inventory (*StormWaterSurvey.gdb*), ERPs, specifications for backflow preventors, and the topographic survey performed by Hyatt. The existing DMK model was in NGVD29 and was converted to NAVD88 using a conversion factor of -0.98 ft (NGVD29 Elev – 0.98 FT = NAVD88 Elev). Basins, nodes, and links were revised to best represent the existing drainage patterns.

Basin Delineation

Using the 2018 LiDAR data and the locations of stormwater inlets, drainage basins were delineated to represent the existing conditions in the Village community. The 2018 LiDAR data helped determine where the high points within the road were and how much area contributed to which inlets. The nodes in the model are representative of 3 or 4 inlets that all are connected to the same outfall; thus, basins include area that drains to any of the inlets that have the same outfall.

Schematic Design and Input

Kimley-Horn revised the parameters for the basins including curve numbers (CN) and time of concentration (Tc) based upon the methodology described in the TR-55 manual. The CN was calculated based on the lot size of each parcel using the TR-55 guidelines for the associated CN. Boundary conditions were added and are representative of various sea level elevations. Mean Higher-High Water (MHHW) level was used as the standard condition for this analysis. MHHW elevation was obtained by the NOAA Tidal Benchmark using station 8726384 – Port Manatee, FL and all elevations were converted to NAVD88 vertical datum.

Overland weirs were drawn between basins at the boundary to show flow across the basins. Links were updated using ERP #44.23853.000 and the Longboat Key Stormwater Inventory GIS data. Any invert elevations from the ERP were converted from NGVD29 to NAVD88. Pipes in the Village community with backflow preventors are represented by a rating curve link and a head loss curve provided by the manufacturer.

Design Storm

For this analysis, the 25-Year/24-Hour rainfall event was used with four boundary conditions. The cumulative rainfall data was retrieved from the SWFWMD Applicant Handbook II and is provided in Table 2.

Table 2: Design Storm Event

Reoccurrence Interval (Years)	Duration (Hours)	Cumulative Rainfall (Inches)	Rainfall Distribution
25	24	8.0	SCS Type II FL Modified

Observed High Tide (OHT) elevations are from a site visit on May 18, 2022 to the Sleepy Lagoon neighborhood located just south of the Longboat Key Village. with information coming from NOAA Tides and Currents station 8726384 – Port Manatee, FL for May 18th, 2022. The 2050 SLR projection is based on the intermediate high of station 8726520 – St. Petersburg and was added to both the MHHW and the OHT to create the other two tidal scenarios. The boundary conditions are in Table 3.

Table 3: 25YR-24hr Boundary Stage Conditions

Boundary Condition	Elevation (ft)*
MHHW	0.6
OHT	1.8
MHHW + 2050 SLR	2.4
OHT + 2050 SLR	3.6

* All Elevations are in NAVD88

2.3 Floodplain and Inundation Mapping

Kimley-Horn developed GIS maps to illustrate the existing flooding extent for tidal and rainfall events. These maps utilized ArcGIS Pro and the 2018 Florida Peninsular DEM to create polygons that identify areas of standing water in each scenario.

Inundation Maps

Inundation maps were created to visualize the extent to which the Village community was flooding with salt water during various high tide events. Inundation maps, or tidal flooding maps, were created for the OHT, MHHW + 2050 SLR, and OHT + 2050 SLR. Inundation Mapping is provided in ***Appendix A***. A tidal event equal to the observed high (1.8 ft) resulted in flooding along Longboat Dr E, Russell St, Lois Ave, and Bayside Dr. The MHHW + 2050 SLR of an elevation of 2.4 ft resulted in major flooding in most of all the streets within the community. While the OHT + 2050 SLR of an elevation of 3.6 ft further increased flooding and nearly inundated the entire community. The combined inundation map (Map A-4) shows the progression of flooding within the community across the different conditions.

Floodplain Maps

Floodplain maps were created based upon the ICPR4 model results using the 25-Year/24-Hour Design Storm with the four boundary conditions listed above. The maps are provided in ***Appendix B***. Each storm simulation resulted in flooding that affected every road in the community, even with the boundary condition set at the lowest value of 0.6 ft. The 25-Year/24-Hour Design Storm with the highest boundary condition of 3.6 ft resulted in nearly the entire community impacted by some amount of standing water both in the road right-of-way and on private property.

3. PROJECT RECOMMENDATIONS

To mitigate and adapt to current and future threats to infrastructure from storm events, sea level rise, and tidal influences, implementation of mitigation strategies can increase resiliency and reduce flood risk.

3.1 General Projects

Kimley-Horn has developed a list of recommended mitigation strategies to reduce flood risk for the surface water discharging to the Sarasota Bay and ultimately the Gulf of Mexico. General mitigation strategies that could be applied within the Kimley-Horn project area are as follows:

Road reconstruction: Using the available topographic data, roadways are evaluated for elevation and reconstruction. Looking at the adjacent properties, King Tide, and SLR data, maximum elevations are set to improve access and the effectiveness of the conveyance system. As SLR progresses, future road elevation and reconstruction may be needed. With elevation of the roadway, the function of the check valves will also improve providing additional access improvement.

Additional inlets and pipes: Install additional inlets along roadway right-of-way where ponding occurs to provide a flow path for surface water runoff / ponding areas. Additional inlets increase underground storage capacity for storm runoff but may be dependent on the tide / tailwater conditions. Added inlets are incorporated in the road reconstruction projects.

Upsizing existing pipes: Upsizing existing pipes will increase the capacity of the stormwater system. A majority of the existing pipes are 12” and 15” pipes, thus increasing pipe sizes will bring the Village community up in stormwater standards.

As SLR progresses, these applications may become less effective. In the development of plans, consideration should be made for expected project life cycle when selecting from these options.

3.2 General Projects to Address SLR and King Tide

The general mitigation strategies below could be implemented anywhere within the project boundary or other areas in the Town as deemed necessary:

Hardened Pump Stations: Elevation and reconstruction of roadways in the Village will provide an initial adaptive phase. Over time, the addition of small, localized pump stations can provide a secondary level flood protection to supplement the road reconstruction benefits for both public and private property. Small pump stations would have the capability to reduce the depth and duration of roadway flooding with raised electrical equipment above the Base Flood Elevation.

The effectiveness and efficiency of the pump stations would be limited by the seawall elevations / overland flow connections between the road right-of-way and the Sarasota Bay. Pump stations can be installed in areas with existing point source discharges to the receiving waters and surrounding drainage areas can be routed to the pump station for piped discharge to the receiving water. The pump stations may be evaluated separately, or in coordination with future roadway elevation phases.

Check Valves: Maintenance of check valves at outfalls will mitigate backflow of tidal waters into the system and increases underground storage capacity in system for storm runoff. Replacement / addition of check valves or inline check valves provides additional protection from tidal / salt waters. Inline check valves may facilitate the maintenance and reduce long term maintenance costs; however, inline check valves may require larger junction boxes to facilitate maintenance and replacement. The maintenance effectiveness verses the additional costs and space requirements will need to be evaluated prior to using inline check valves. Check valves would be implemented and maintained by the Town in the public stormwater management system. See Figure 8 below.

Figure 4: Check Valve

Seawall Improvements: Raising seawalls would provide greater resilience to wave action and storm surge. A seawall analysis would need to be completed and the Town would need to determine a cost-effective seawall elevation to meet the Town's Level of Service. Seawall elevation would be the responsibility of each property owner as the seawalls are on private property. The Town can implement enforcement mechanisms to require seawall elevation when certain circumstances trigger the enforcement or under a Special Assessment District with the Town coordinating a capital improvement project to elevate all seawalls at one time.

3.3 Longboat Key Village Capital Projects

The recommended Longboat Key Village Capital projects are road reconstruction projects and were identified for the community based on the low elevation and topography of the roads, right-of-way, and projected SLR.

During the design phase careful attention to the finished floor elevations of adjacent homes is critical to set the final grade of the road. Considerable coordination will be necessary with each property owner to ensure the elevation change does not adversely impact the private properties. The elevation of the roadway will create a greater head differential to improve the function of check valves. While the road elevation projects will provide relief from sunny day flooding (King Tides), the improvements will have limited benefits during extreme weather events, storm surge, and hurricanes.

The Village community has an approximate right-of-way of 60-feet to 80-feet for most streets. When reconstructing the road, adjusting the proposed elevation based on elevation certificates and keeping construction tie backs in mind is important. Road reconstruction will require driveway reconstruction, grading, and landscape.

Depending on the existing utilities and stormwater management placement, permanent utility and drainage easements may be required at some locations to be determined during design. This allows for the optimization of the stormwater management system and provide future access to maintain the system.

Proposed Capital Improvement Projects and the opinions of probable cost for identified projects are included in ***Appendix C.*** The road reconstruction for the Village community has been divided into four phases. Project phasing is based on the elevations for the project areas in the Stormwater Inventory (*StormWaterSurvey.gdb*); the 2018 Florida Peninsular DEM published by USGS; and known problem areas. The project phasing also accounted for the interim construction phases such that construction of a phase should have minimal adverse impact to areas in the future phases:

Phase 1 – Road Reconstruction and Drainage Improvements (Resiliency and Expansion Project. Optional Pump Station and Pond)

The Phase 1 area, including Longboat Drive E, Fox Street, Russell Street, Basyside Drive, Broadway, and Lois Avenue, was identified as a known problem area that is susceptible to SLR, King Tide flooding, and standing water during rainfall events that are concurrent with a high tide. In Phase 1, the lowest grate elevation according to the Stormwater Inventory is 0.80 NAVD88. Reconstructing the road will increase the elevation difference between the inlets and the discharge point. With the elevated roadway, the increase in the head differential will improve the function of the system during a rainfall event and minimize sunny day flooding.

In addition to road reconstruction, drainage improvements including increased pipe sizes and adding new pipes and inlets in areas where there are no existing inlets. If a rainfall event happens concurrent with a king tide, the increased pipe sizes will provide additional storage volume until the tide recedes.

WaStop check valves are in place and provide protection for the area from sunny day flooding. A proactive inspection and maintenance program will be critical to the function of the system. ***See Figure C-1 in Appendix C***.

Additional improvements evaluated within Phase 1 included a hardened pump station and / or construction of a pond. The pond site located at the intersection of Lois Avenue and Broadway Avenue provides some storage and minimal flood reduction at the inlets in the immediate area. The changes in the roadway profiles (elevation of the roadways) are limited by the adjacent house elevations combined with the low elevations within the community, the pond does not create a significant improvement for flood reduction.

The addition of a pump station at the outfall located at the intersection of Russell Street and Bay Side Drive will reduce flood duration and allow the stormwater system to drain during high tides. However, a pump station will not be effective as when tide elevations breach low points within the seawalls and shoreline.

Phase 2 – Road Reconstruction, Drainage Improvements and Shoreline Stabilization (Resiliency and Expansion Project)

The Phase 2 area includes Linley Street and Bayside Drive to Cedar Street. The lowest elevation in Phase 2 is on Bayside Drive at 1.3 NAVD88. It is recommended that the road be elevated along Bayside Drive and at the intersection of Linley Street and Poinsettia Avenue. On the east side of Bayside Drive directly next to the bay it is a low-lying area that allows for overland flow from the bay during tide events. This low lying-area is a small beach area that is at an elevation lower than some high tides. Sunny day flooding is observed. The road reconstruction design should evaluate and include improvements to limit the overland flow and provide shoreline stabilization while preserving the public function and access to the shoreline.

The lowest elevation on Linley Street is 1.0 NAVD88. The intersection of Linley Street and Poinsettia Avenue is hydraulically connected to the bay and is influenced during high tide events and causes sunny day flooding. With the elevated roadway, the increase in the head differential will improve the function of the system during a rainfall event and minimize sunny day flooding.

In addition to road reconstruction, drainage improvements including increased pipe sizes and adding new pipes and inlets in areas where there are no existing inlets. If a rainfall event happens concurrent with a king tide, the increased pipe sizes will provide additional storage volume until the tide recedes.

WaStop check valves are in place and provide protection for the area from sunny day flooding, but the overland flow from the low-lying area along Bayside Drive circumvents the check valves. A proactive inspection and maintenance program will be critical to the function of the system. ***See Figure C-2 in Appendix C***.

Phase 3 – Road Reconstruction and Drainage Improvements (Resiliency and Expansion Project)

The Phase 3 area includes Longboat Court Longboat Drive North Poinsettia Ave and a portion of Russell Street. The lowest elevation in Phase 3 is along Longboat Court at 0.9 NAVD88. The outfall for the stormwater infrastructure at Longboat Drive N and Longboat Court currently does not have backflow preventor to prevent sunny day flooding. In addition, there is a low-lying area just before the intersection of Lands End Drive and Longboat Court where overland flow occurs. This area is lower than some high tides and sunny day flooding is observed. The road reconstruction design should evaluate and include improvements to limit the overland flow.

In addition to road reconstruction, drainage improvements including increased pipe sizes and adding new pipes and inlets in areas where there are no existing inlets. With the elevated roadway, the increase in the head differential will improve the function of the system during a rainfall event. If the rainfall event happens concurrent with a king tide, the increased pipe sizes will provide additional storage volume until the tide recedes.

One outfall has an existing WaStop check valve and another overland flow connection in the Lands End development allows water from the bay to circumvent the check valve. The roadway reconstruction design needs to address the low-lying area to provide additional protection for the public roads. ***See Figure C-3 in Appendix C***.

Phase 4 - Road Reconstruction, Drainage Improvements and Saltwater Marsh (Resiliency, Expansion, and Water Quality Project)

The Phase 4 area includes Longboat Drive South between Cedar Street and Jackson way and a portion of Cedar Street including an unimproved right-of-way west of Longboat Drive South. The lowest grate elevation in Phase 4 is 1.0 NAVD88. The outfall at the intersection of Longboat Drive South and Cedar Street, does not currently have a backflow preventor. The DMK ICPR3 model shows that the outfall pipe partially blocked. Recently, the Town cleared out the outfall located in the Cedar Street right-of-way to improve the positive outflow from the roadways. During king high tides, the area can still experience sunny day flooding.

The lowest elevation on Jackson Way is 1.5 NAVD88. The current outfall is adjacent to a private seawall and is potentially not operating at full capacity. From a site visit, it was seen that the pipe has barnacles and debris on and around the outfall. Reestablishing the pipe outfall and ensuring the operation of the backflow preventor.

Designing a saltwater marsh in the Cedar Street right-of-way provides a filter system for overland runoff and can incorporate a graded, positive outflow from Longboat Drive South. Planting can be selected to optimize the water quality benefits. The saltwater marsh would include saltwater tolerant plants up to an elevation determined in design as necessary to minimize maintenance and replacement planting. ***See Figure C-4 in Appendix C.***

3.4 Proposed Hydraulic and Hydrology Modeling

For an overall look at the general projects that are recommended for Phase 1 through Phase 4, a base Proposed Conditions Model (PCM) in the Interconnected Channel and Pond Routing, Version 4 (ICPR4) software was created. This model implements all drainage improvements for all the phases. Being consistent with how the existing Hydraulic and Hydrology model was created, proposed nodes in the model are representative of 3 or 4 inlets that all are connected to the same outfall; thus, basins include area that drains to any of the inlets that have the same outfall. Existing pipes were upsized to accommodate the additional inlets, and the necessary proposed pipes were added.

In addition to the base PCM model, three models were created to evaluate the optional pump and pond improvements. The pump and the pond were analyzed independently and then the pump and pond were evaluated as a combined system.

Proposed Hydraulic and Hydrology Models:

1. Scenario 1 - Phase 1-4 (base) – pipe improvements with road reconstruction / elevation
2. Scenario 2 - Phase 1-4 with Pond
3. Scenario 3 - Phase 1-4 with Pump
4. Scenario 4 - Phase 1-4 with Pond and Pump

The pond was modeled with the bottom at MHHW, 0.58 feet NAVD88, and the top of bank at elevation 2.0 feet NAVD88. The inflow pipe was modeled as a bubbler structure. The outfall structure has an outflow weir at elevation 1.08 feet NAVD88. Comparing the base Phase 1-4 model with the implementation of a pond, the stage reduction was mostly around the immediate area adjacent to the pond.

The pump was modeled as a rating curve with an estimated operating head table. For this preliminary analysis, the operating head table and on / off elevations for the pump were estimated for the pump specifications. The implementation of a pump had some benefit for flood reduction and discharging stormwater during high tide. However, if tides are at elevations that overtop the seawalls and / or shorelines the pump is no longer effective.

The pond and the pump were in the final model to evaluate the combined system. The flood reduction benefit of the pump and the pond provided negligible additional benefit.

Exhibits of the Proposed Hydraulic and Hydrology Models and the results of a node stage comparison can be found in ***Appendix D***.

4. OPINION OF PROBABLE COSTS

In Table 4, a summary of the Opinion of Probable Costs for the Longboat Key Village Capital Projects – Phase 1 through 4 and costs for the Pump and Pond Options.

Table 4: Summary of Opinion of Probable Costs

SUMMARY - OPINION OF PROBABLE CONSTRUCTION COSTS				
ITEM	**DESCRIPTION**	**QTY**	**UNIT**	**AMOUNT**
LOGBOAT KEY VILLAGE CAPITAL PROJECTS				
Phase 1	Road Reconstruction and Drainage Improvements	1	LS	$2,794,600
Phase 2	Road Reconstruction, Drainage Improvements, and Shoreline Stabilization	1	LS	$1,445,656
Phase 3	Road Reconstruction and Drainage Improvements	1	LS	$1,701,402
Phase 4	Road Reconstruction, Drainage Improvements, and Saltwater Marsh	1	LS	$1,198,462
Pump (EA)	Road Reconstruction and Drainage Improvements	1	LS	$110,000
Pond Site	Road Reconstruction and Drainage Improvements	1	LS	$65,000
Note: Costs developed based on FDOT Historical Item Averages Statewide 6-Month Revolving Cost Information as of September 23, 2024, with contingency added.				
Disclaimer: The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.				

5. FUNDING SOURCES

Stormwater services are currently provided using various funding sources including property taxes. Funding sources for the capital improvements to seawalls, roadways, and the stormwater management system may include special assessments based on property benefits.

A dedicated funding source for stormwater management system maintenance and capital improvements provides a funding source that can be reliably leveraged for matching grant funds including Southwest Florida Water Management District Cooperative Funding and Federal Grant programs.

Projects developed for flood control and mitigation need to be added to the Local Mitigation Strategy (LMS) for eligibility of federal funding programs.

In the development of a mitigation and adaptation plan, regional projects will increase funding opportunities. Additional grant opportunities may be available for improvements for emergency management ingress and egress.

6. CONCLUSION

Mitigation and adaptation strategies are designed to increase resiliency, but the prioritization and order of execution is critical to that success. The mitigation and adaptation recommendations suggested in this report will provide benefit to transportation mobility, emergency access to the community, and private property preservation.

As more communities are threatened by climate threats such as sea level rise and storm intensification the Town can capitalize on available grant funding to address the needs in the Town to maintain a safe and prosperous future for its citizens and businesses.

REFERENCES

1. NOAA Tides & Currents. (n.d.). Retrieved from https://tidesandcurrents.noaa.gov/map/index.html?region=Florida
2. NOAA Sea Level Change Curve Calculator. (n.d.). Retrieved from https://coast.noaa.gov/digitalcoast/tools/curve.html
3. NOAA Tidal Datums. (n.d.). definitions Retrieved from https://tidesandcurrents.noaa.gov/datum_options.html

APPENDIX A: INUNDATION MAPS

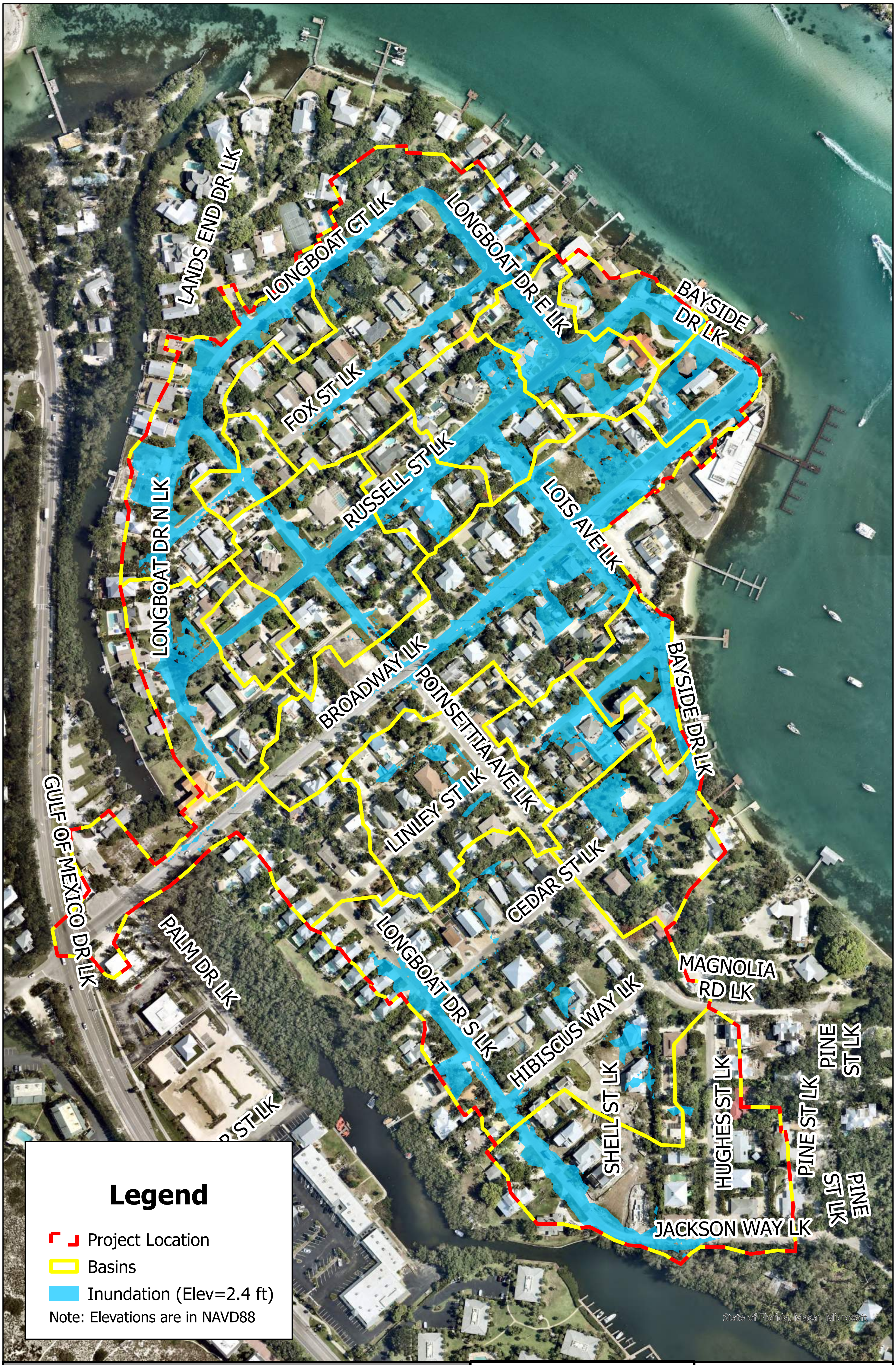
Observed High Tide Inundation

Longboat Key Village

October 2024

Kimley»Horn

A-1



MHHW + 2050 SLR (Intermediate High)

Longboat Key Village

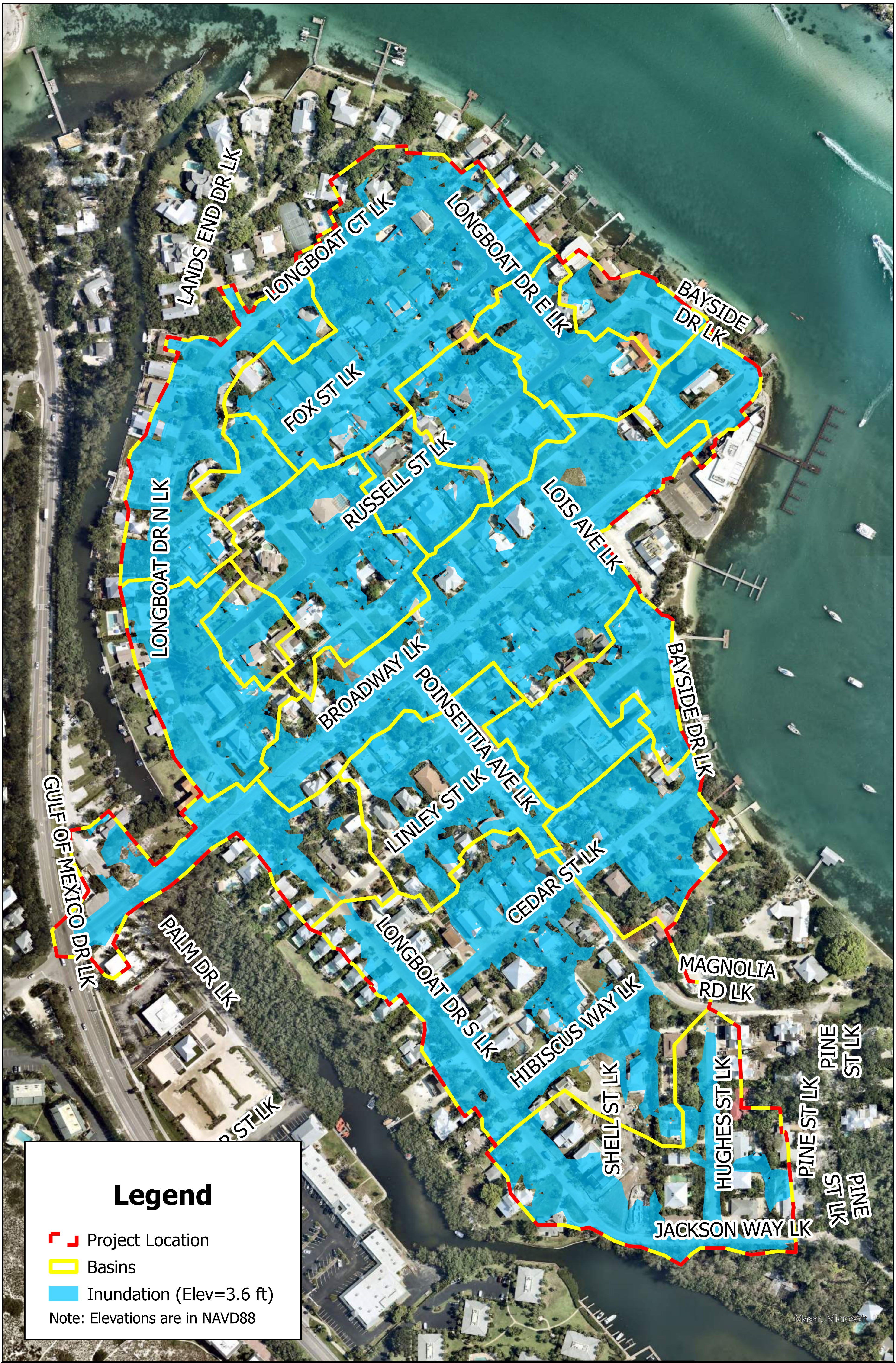
October 2024

0 125 250 Feet

N

Kimley»Horn

A-2



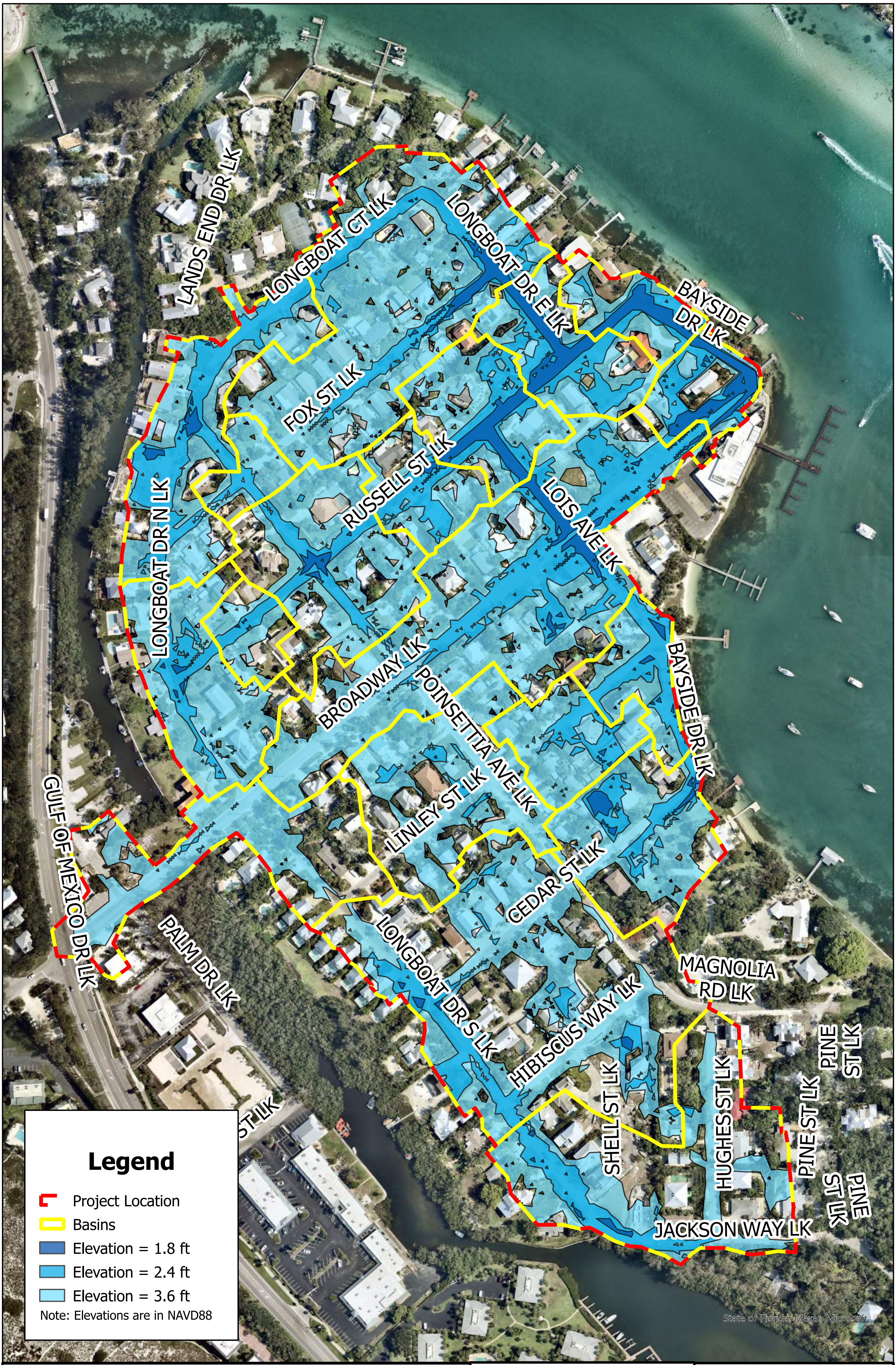
Observed High Tide + 2050 SLR (Intermediate High)

Longboat Key Village

October 2024

0 125 250 Feet N

Kimley»Horn A-3



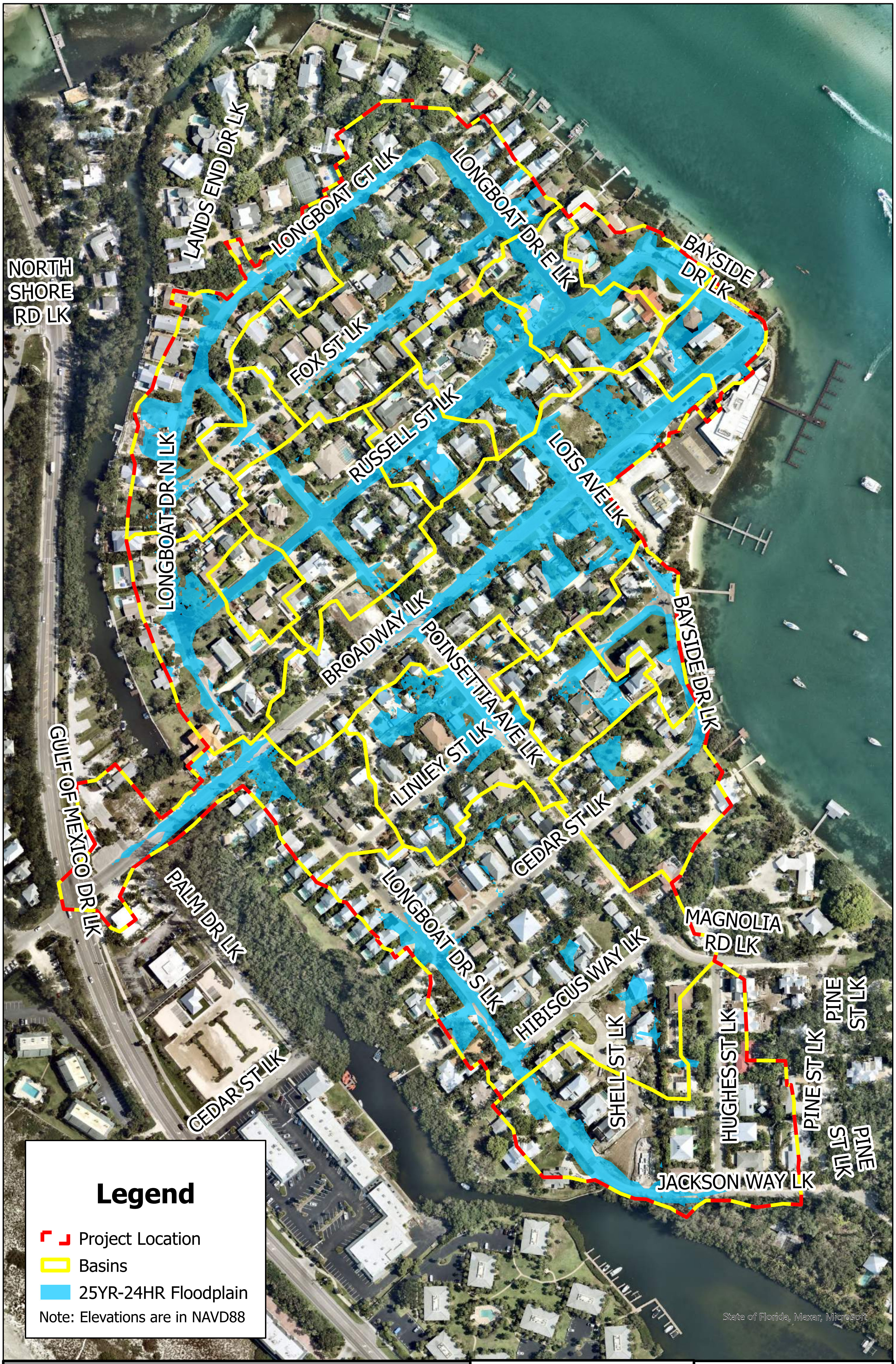
Combined Inundation Map

Longboat Key Village

October 2024

Kimley»Horn A-4

APPENDIX B: FLOODPLAIN MAPS



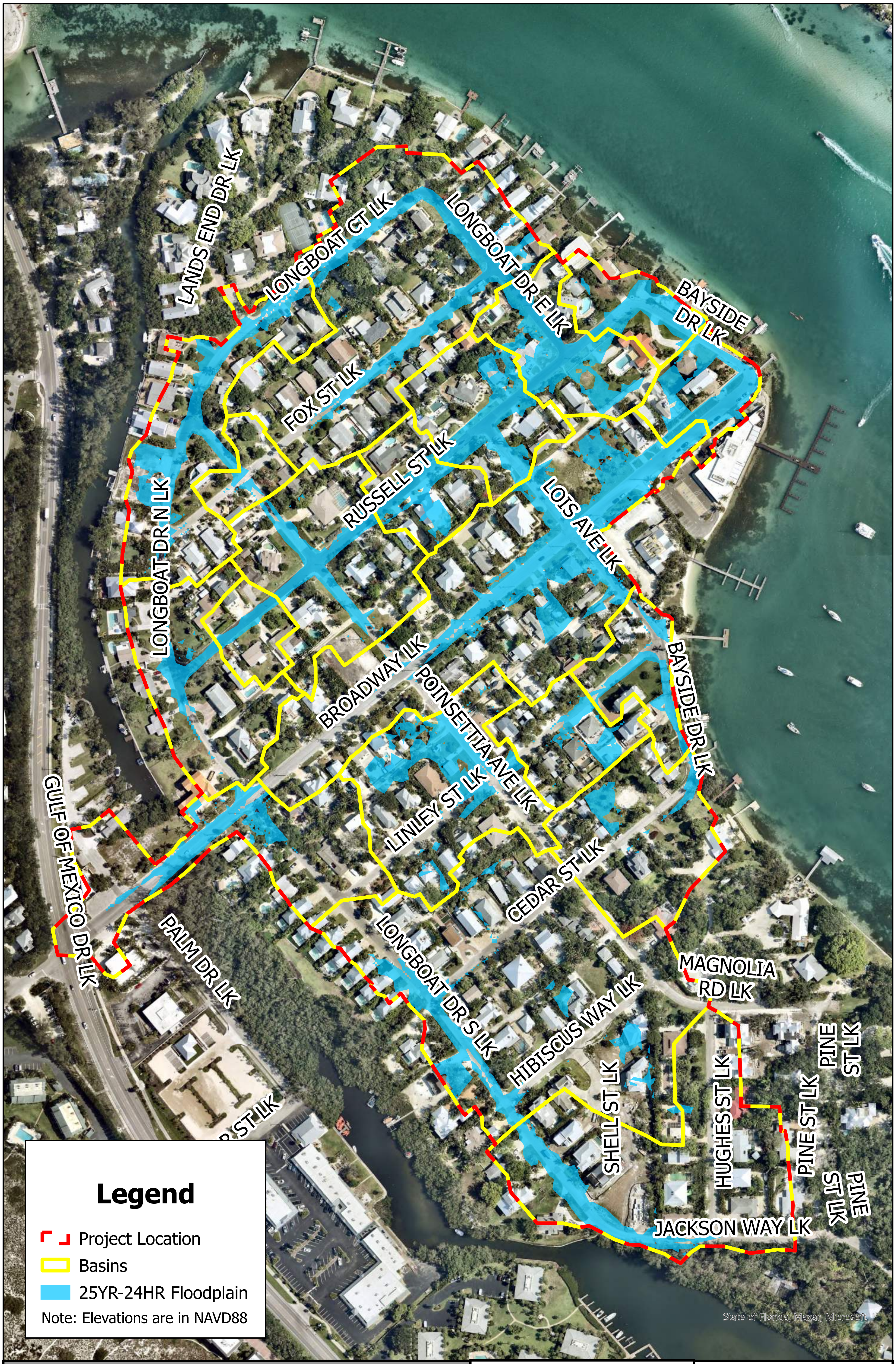
25YR-24HR Storm w/ MHHW of 0.6 ft

Longboat Key Village

October 2024

0 125 250 Feet N

Kimley»Horn B-1



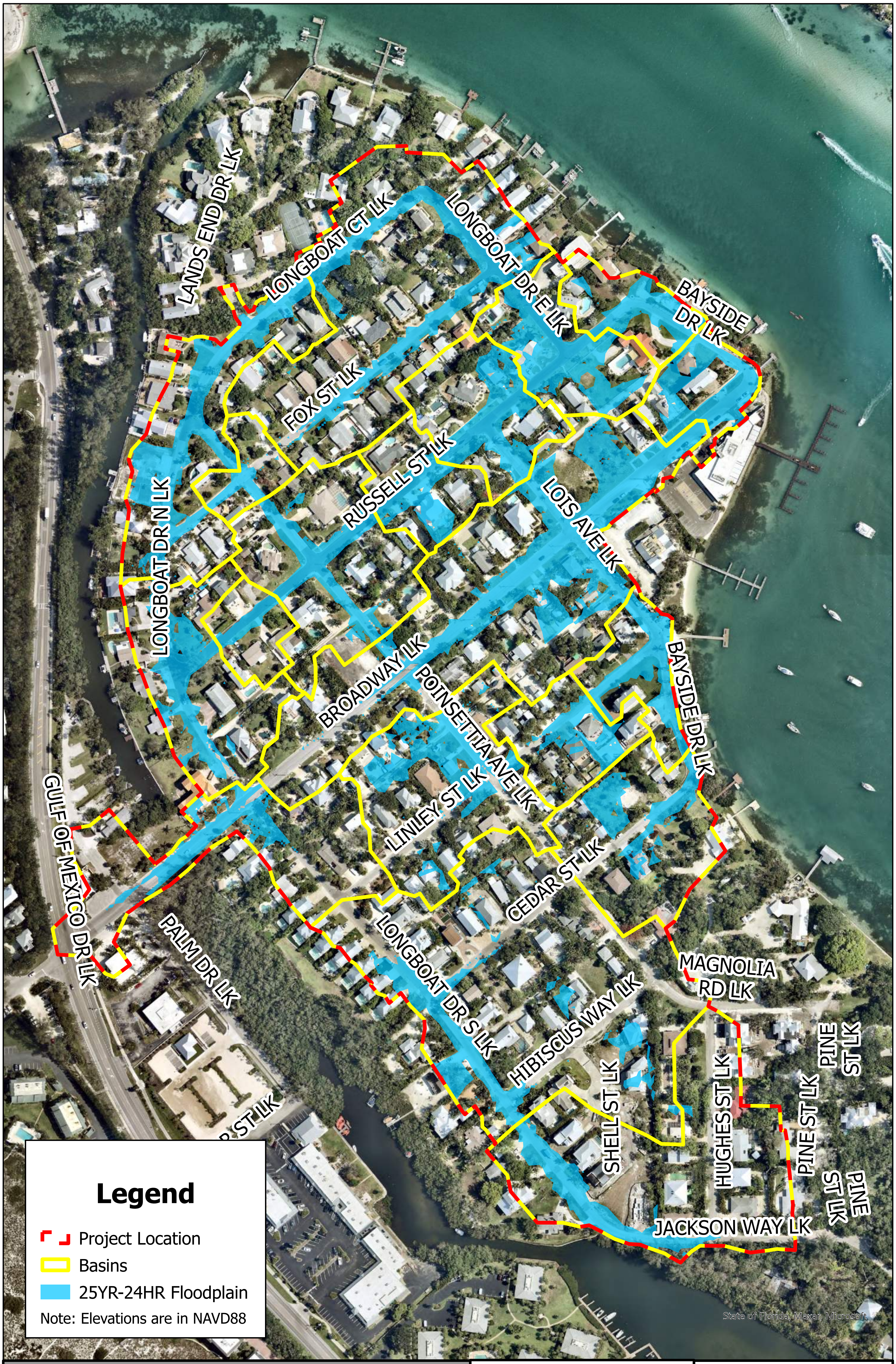
25YR-24HR Storm w/ Observed Tide

Longboat Key Village

October 2024

0 125 250 Feet N

Kimley»Horn B-2



25YR-24HR Storm w/ MHHW + 2050 SLR

Longboat Key Village

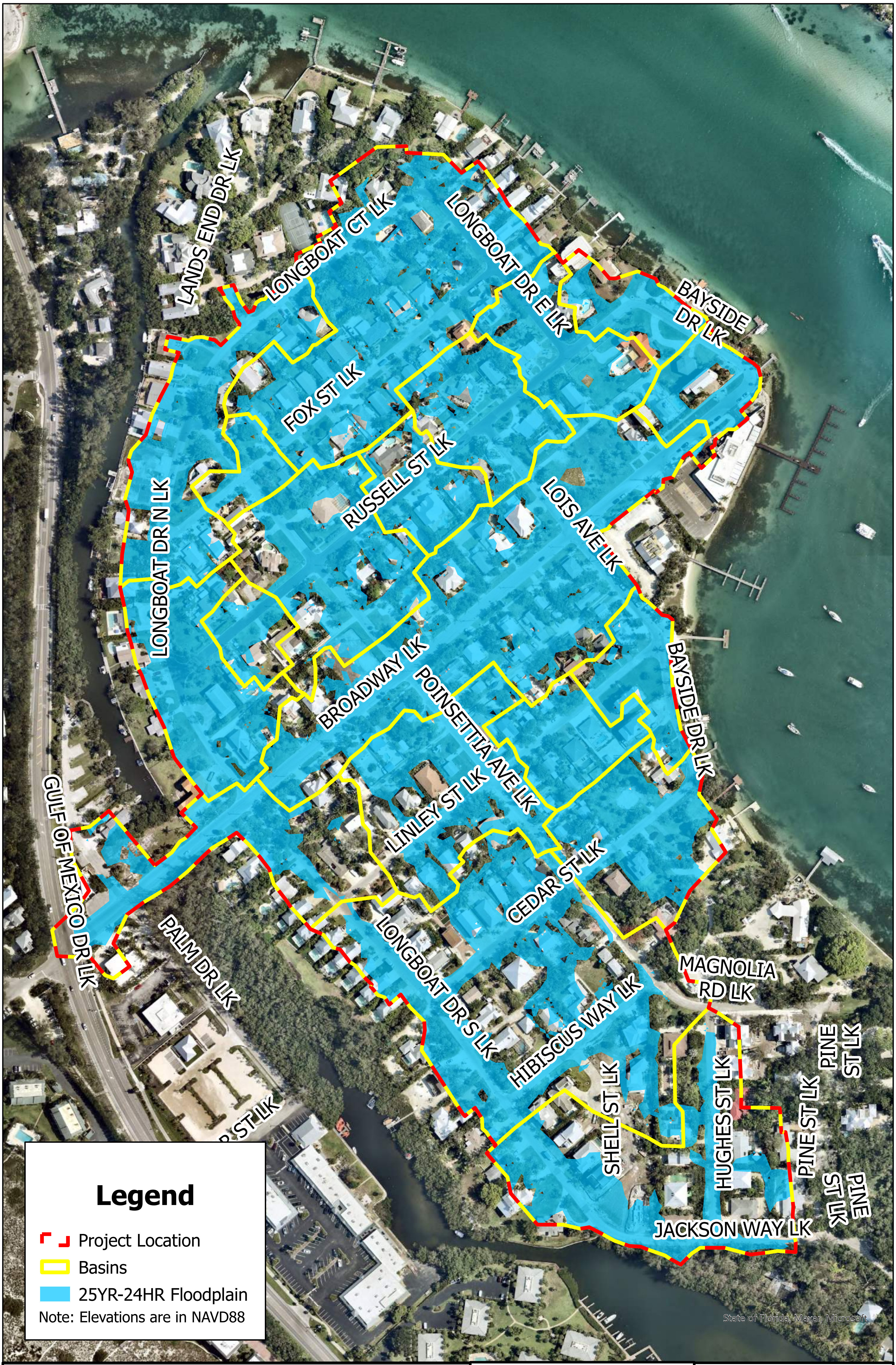
October 2024

0 125 250 Feet

N

Kimley»Horn

B-3



25YR-24HR Storm w/ Observed Tide + 2050 SLR

Longboat Key Village

October 2024

Kimley»Horn B-4

APPENDIX C: PROPOSED PROJECTS

Phase 1 - Road Reconstruction and Drainage Improvements

- Type: Resiliency and Expansion Project

Phase 2 - Road Reconstruction, Drainage Improvements and Shoreline Stabilization

- Type: Resiliency and Expansion Project

Phase 3 - Road Reconstruction and Drainage Improvements

- Type: Resiliency and Expansion Project

Phase 4 - Road Reconstruction, Drainage Improvements and Saltwater Marsh

- Type: Resiliency, Expansion, and Water Quality Project

Phase 1

Longboat Key Village

October 2024

Town of Longboat Key

0 50 100 200 Feet

N

Kimley»Horn

C-1

Kimley»Horn

LONGBOAT KEY VILLAGE - PHASE 1 Road Reconstruction and Drainage Improvements					
DRAFT - CONCEPTUAL LEVEL ESTIMATE					
A. Materials	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
1	Erosion Control	1	LS	$ 72,587.00	$ 72,587.00
2	Excavation	500	CY	$ 23.00	$ 11,500.00
3	Embankment	1,400	CY	$ 36.00	$ 50,400.00
4	Optional Base, Base Group 6	1,700	CY	$ 35.00	$ 59,500.00
5	Asphalt Concrete Friction Course	850	TN	$ 251.00	$ 213,350.00
6	Superpave Asphaltic Concrete	850	TN	$ 233.00	$ 198,050.00
7	Inlets, Ditch Bottom, Type C, < 10'	10	EA	$ 10,576.00	$ 105,760.00
8	Nutrient Separation Baffle Box	2	EA	$ 26,000.00	$ 52,000.00
9	Pipe Culvert, Optional Material, Round, 18" S/CD	1,413	LF	$ 192.00	$ 271,296.00
10	Pipe Culvert, Optional Material, Round, 24" S/CD	1,280	LF	$ 247.00	$ 316,160.00
11	Pipe Culvert, Optional Material, Round, 30" S/CD	375	LF	$ 386.00	$ 144,750.00
12	Performance Turf (Sod)	10,800	SY	$ 6.00	$ 64,800.00
13	Landscape Restoration (Per Lot)	54	EA	$ 1,500.00	$ 81,000.00
14	Driveway Restoration (Per Lot)	54	EA	$ 3,000.00	$ 162,000.00
15	Utility Adjustments (Per Lot)	54	EA	$ 1,000.00	$ 54,000.00
16	Backflow prevention - Marine grade stainless steel	6	EA	$ 40,000.00	$ 240,000.00
SUBTOTAL BID PRICE					$ 2,097,153.00
B. Labor	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
1	Mobilization	1	LS	$ 120,979.00	$ 120,979.00
2	Maintenance of Traffic	1	LS	$ 181,468.00	$ 181,468.00
SUBTOTAL BID PRICE					$ 302,447.00
C. Fees Paid	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
1	General Conditions and Bonding	1	LS	$ 195,000.00	$ 195,000.00
2	Survey. Layout and Field Staking	1	LS	$ 120,000.00	$ 120,000.00
3	Final Record Drawings and Final Submittals	1	LS	$ 80,000.00	$ 80,000.00
SUBTOTAL BID PRICE					$ 395,000.00
TOTAL BASE BID PRICE (Subtotal Bid Price plus Contingency Allowance)					$ 2,794,600.00
OPTIONAL COSTS					
DESCRIPTION		**QTY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
OPTION 1: Pond (control structures, pipe, and excavation)		1	LS	$ 65,000.00	$ 65,000.00
OPTION 2: Pump (wet well, trash rack, nutrient separator)		1	LS	$ 110,000.00	$ 110,000.00
OPTION 3: Pond and Pump		1	LS	$ 175,000.00	$ 175,000.00

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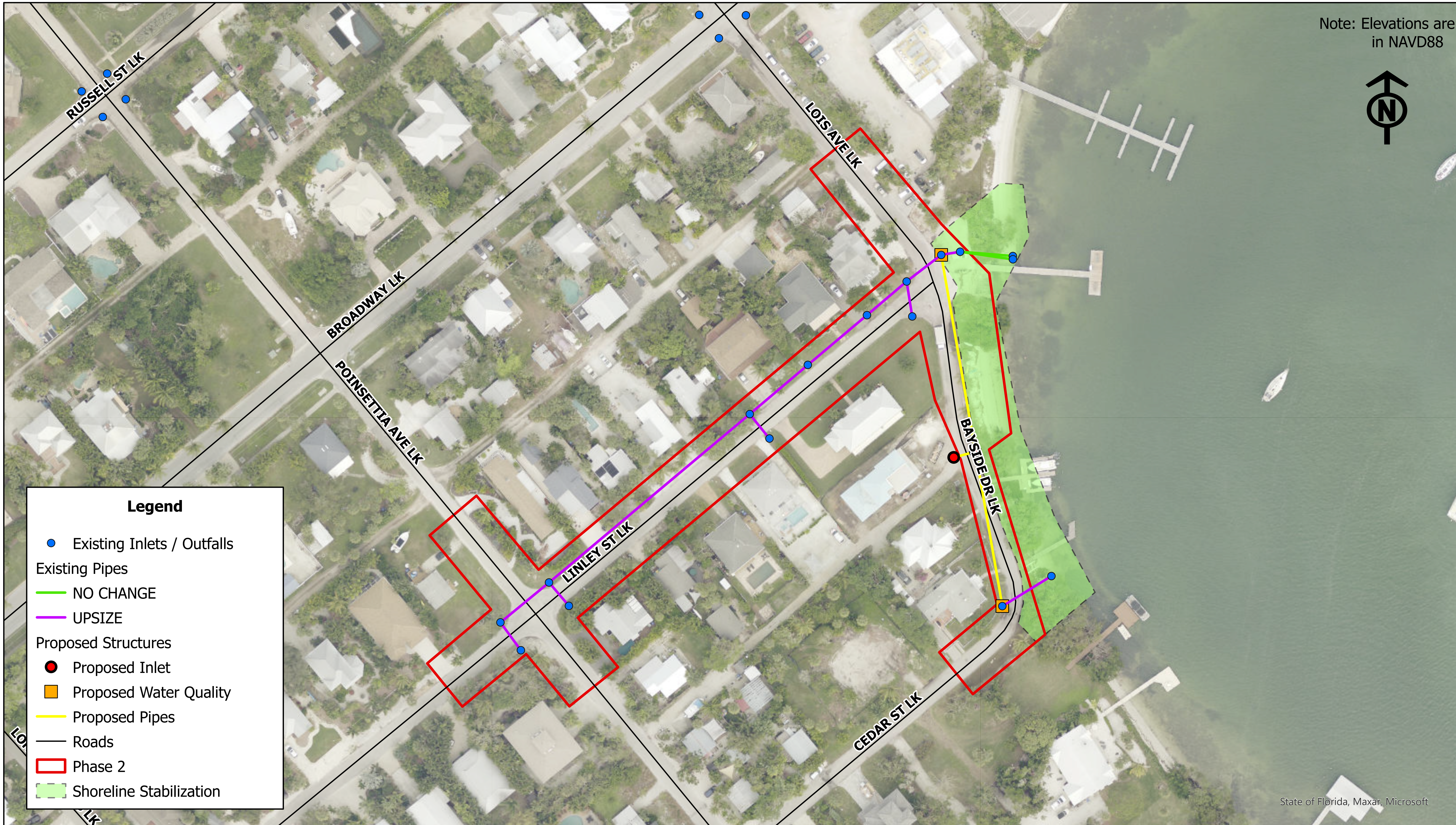

Phase 2

Longboat Key Village

October 2024

Town of Longboat Key

0 25 50 100 Feet

N

Kimley»Horn

C-2

Kimley»Horn

LONGBOAT KEY VILLAGE - PHASE 2 Road Reconstruction, Drainage Improvements and Shoreline Stabilization DRAFT - CONCEPTUAL LEVEL ESTIMATE					
A. Materials	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
1	Erosion Control	1	LS	$ 37,550.00	$ 37,550.00
2	Excavation	190	CY	$ 23.00	$ 4,370.00
3	Embankment	520	CY	$ 36.00	$ 18,720.00
4	Optional Base, Base Group 6	630	CY	$ 35.00	$ 22,050.00
5	Asphalt Concrete Friction Course	320	TN	$ 251.00	$ 80,320.00
6	Superpave Asphaltic Concrete	320	TN	$ 233.00	$ 74,560.00
7	Inlets, Ditch Bottom, Type C, < 10'	2	EA	$ 10,576.00	$ 21,152.00
8	Nutrient Separation Baffle Box	2	EA	$ 26,000.00	$ 52,000.00
9	Pipe Culvert, Optional Material, Round, 18" S/CD	895	LF	$ 192.00	$ 171,840.00
10	Pipe Culvert, Optional Material, Round, 24" S/CD	671	LF	$ 247.00	$ 165,737.00
11	Performance Turf (Sod)	4,600	SY	$ 6.00	$ 27,600.00
12	Landscape Restoration (Per Lot)	23	EA	$ 1,500.00	$ 34,500.00
13	Driveway Restoration (Per Lot)	23	EA	$ 3,000.00	$ 69,000.00
14	Utility Adjustments (Per Lot)	23	EA	$ 1,000.00	$ 23,000.00
15	Backflow prevention - Marine grade stainless steel	4	EA	$ 40,000.00	$ 160,000.00
16	Shoreline Stabilization	600	LF	$ 78.00	$ 46,800.00
17	Saltwater Tolerant Plants	1	LS	$ 60,000.00	$ 60,000.00
SUBTOTAL BID PRICE					$ 1,069,199.00
B. Labor	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
1	Mobilization	1	LS	$ 62,583.00	$ 62,583.00
2	Maintenance of Traffic	1	LS	$ 93,874.00	$ 93,874.00
SUBTOTAL BID PRICE					$ 156,457.00
C. Fees Paid	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
1	General Conditions and Bonding	1	LS	$ 110,000.00	$ 110,000.00
2	Survey. Layout and Field Staking	1	LS	$ 65,000.00	$ 65,000.00
3	Final Record Drawings and Final Submittals	1	LS	$ 45,000.00	$ 45,000.00
SUBTOTAL BID PRICE					$ 220,000.00
TOTAL BID PRICE (Subtotal Bid Price plus Contingency Allowance)					$ 1,445,656.00

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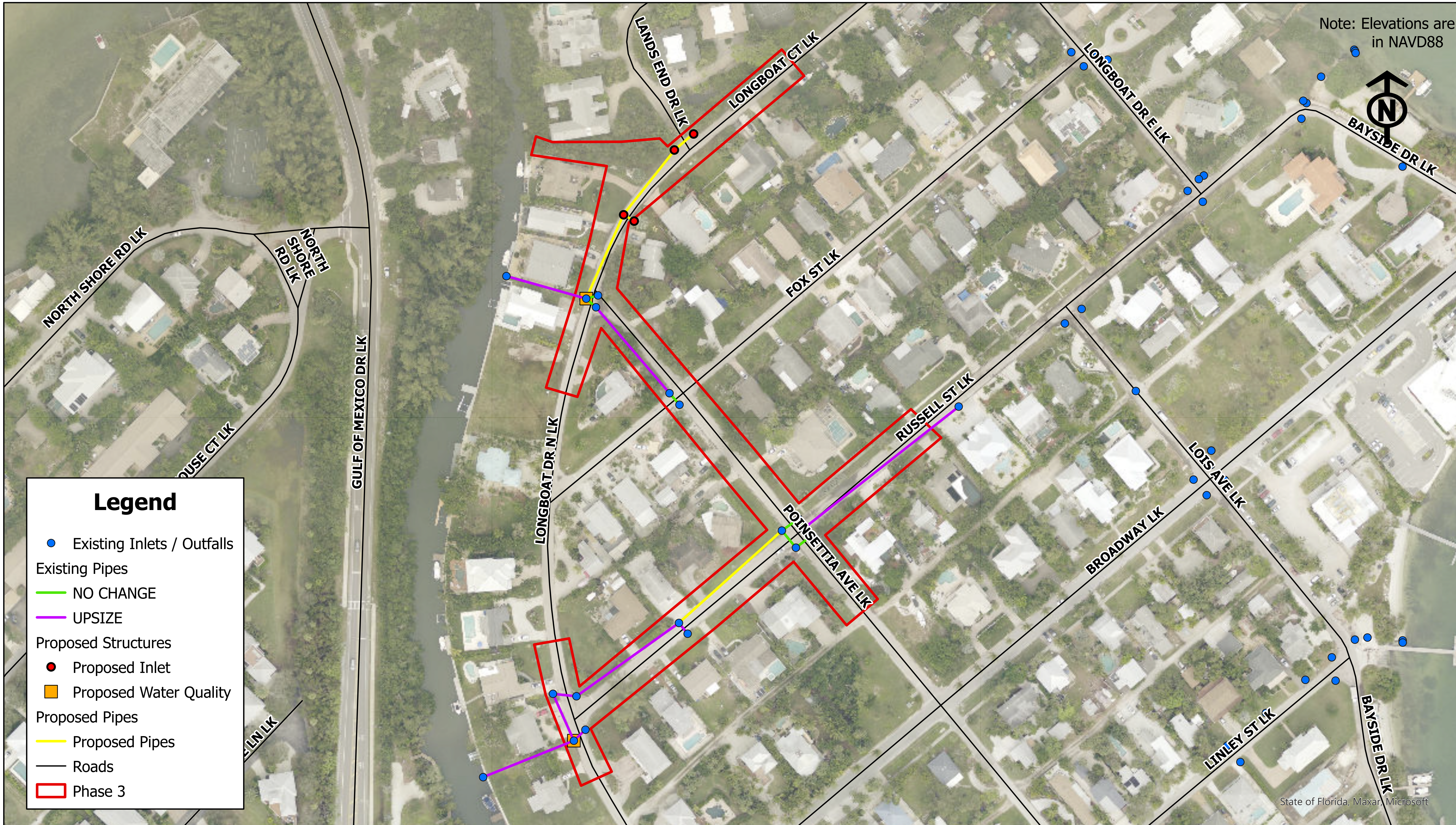

Phase 3

Longboat Key Village

October 2023

Town of Longboat Key

0 50 100 200 Feet

N

Kimley»Horn

C-3

Kimley»Horn

LONGBOAT KEY VILLAGE - PHASE 3 Road Reconstruction and Drainage Improvements DRAFT - CONCEPTUAL LEVEL ESTIMATE					
A. Materials	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
1	Erosion Control	1	LS	$ 44,193.00	$ 44,193.00
2	Excavation	290	CY	$ 23.00	$ 6,670.00
3	Embankment	800	CY	$ 36.00	$ 28,800.00
4	Optional Base, Base Group 6	970	CY	$ 35.00	$ 33,950.00
5	Asphalt Concrete Friction Course	480	TN	$ 251.00	$ 120,480.00
6	Superpave Asphaltic Concrete	480	TN	$ 233.00	$ 111,840.00
7	Inlets, Ditch Bottom, Type C, < 10'	4	EA	$ 10,576.00	$ 42,304.00
8	Nutrient Separation Baffle Box	2	EA	$ 26,000.00	$ 52,000.00
9	Pipe Culvert, Optional Material, Round, 18" S/CD	385	LF	$ 192.00	$ 73,920.00
10	Pipe Culvert, Optional Material, Round, 24" S/CD	1,020	LF	$ 247.00	$ 251,940.00
11	Pipe Culvert, Optional Material, Round, 30" S/CD	135	LF	$ 386.00	$ 52,110.00
12	Pipe Culvert, Optional Material, Round, 36" S/CD	160	LF	$ 456.00	$ 72,960.00
13	Performance Turf (Sod)	6,600	SY	$ 6.00	$ 39,600.00
14	Landscape Restoration (Per Lot)	33	EA	$ 1,500.00	$ 49,500.00
15	Driveway Restoration (Per Lot)	33	EA	$ 3,000.00	$ 99,000.00
16	Utility Adjustments (Per Lot)	33	EA	$ 1,000.00	$ 33,000.00
17	Backflow prevention - Marine grade stainless steel	4	EA	$ 40,000.00	$ 160,000.00
SUBTOTAL BID PRICE					$ 1,272,267.00
B. Labor	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
1	Mobilization	1	LS	$ 73,654.00	$ 73,654.00
2	Maintenance of Traffic	1	LS	$ 110,481.00	$ 110,481.00
SUBTOTAL BID PRICE					$ 184,135.00
C. Fees Paid	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
1	General Conditions and Bonding	1	LS	$ 120,000.00	$ 120,000.00
2	Survey. Layout and Field Staking	1	LS	$ 75,000.00	$ 75,000.00
3	Final Record Drawings and Final Submittals	1	LS	$ 50,000.00	$ 50,000.00
SUBTOTAL BID PRICE					$ 245,000.00
TOTAL BID PRICE (Subtotal Bid Price plus Contingency Allowance)					$ 1,701,402.00

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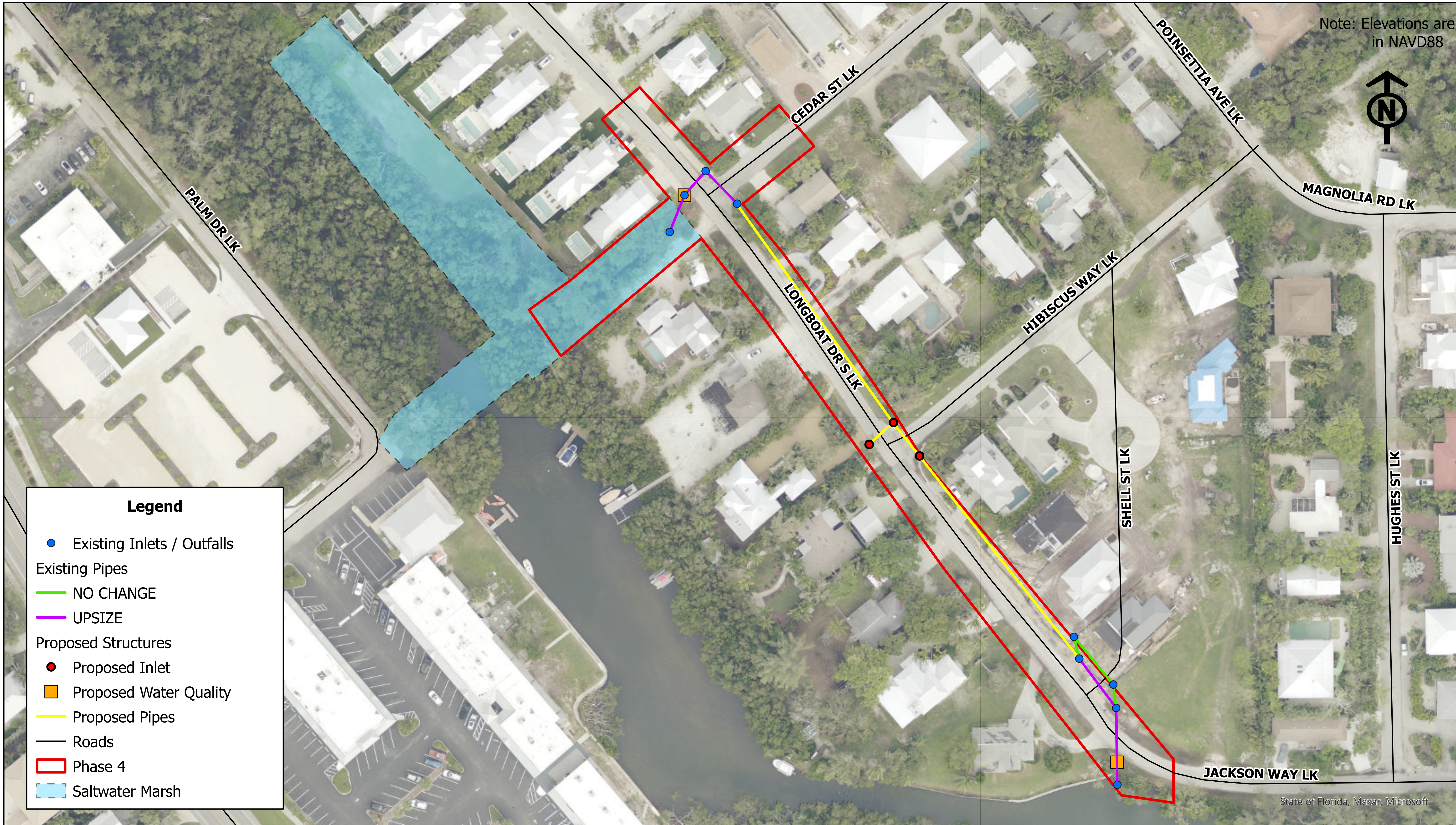


Phase 4

Longboat Key Village

October 2024

Town of Longboat Key

0 25 50 100 Feet

N

Kimley»Horn

C-4

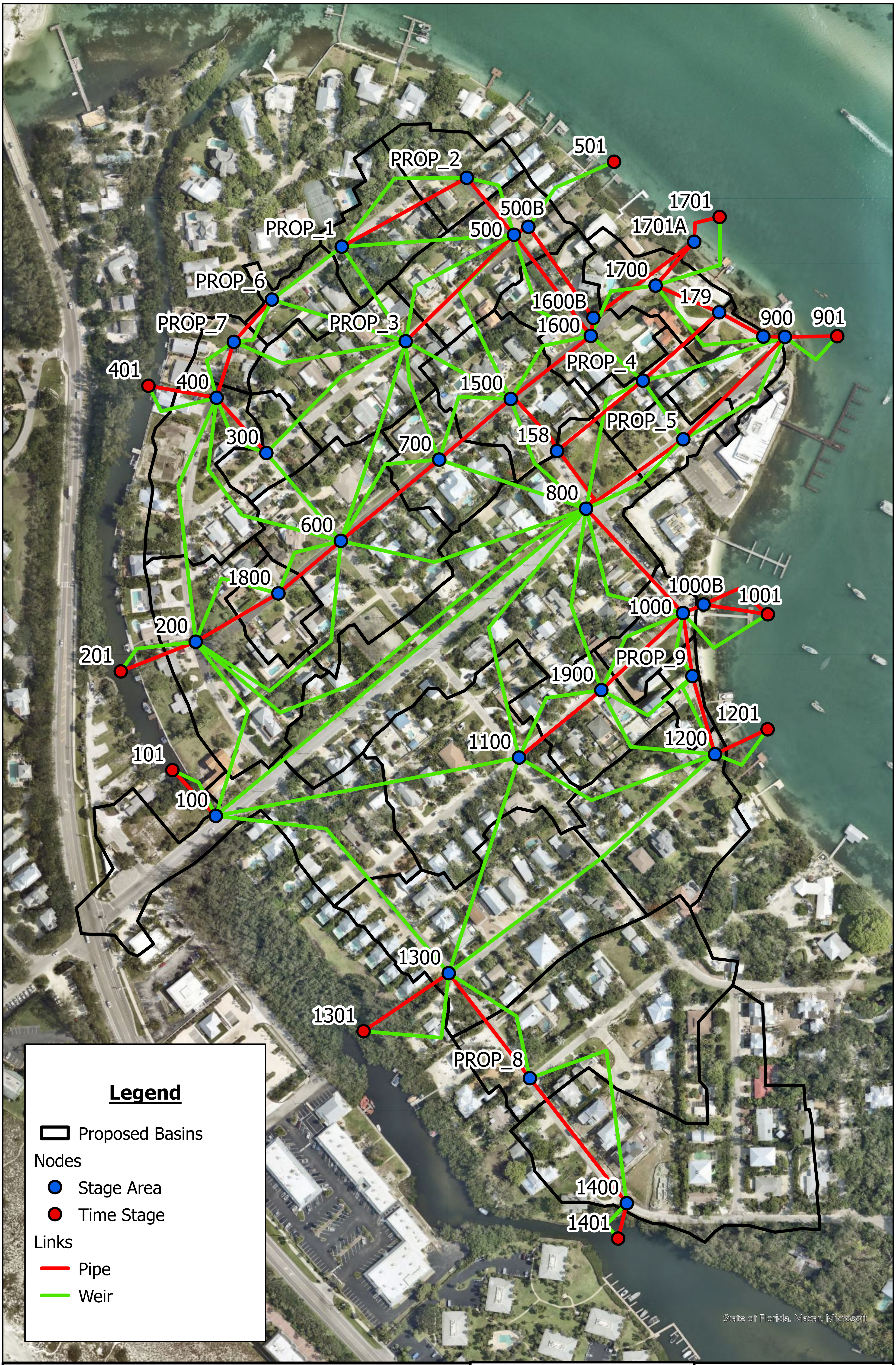
Kimley»Horn

LONGBOAT KEY VILLAGE - PHASE 4 Road Reconstruction, Drainage Improvements and Saltwater Marsh Creation					
DRAFT - CONCEPTUAL LEVEL ESTIMATE					
A. Materials	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
1	Erosion Control	1	LS	$ 31,129.00	$ 31,129.00
2	Excavation	1,640	CY	$ 23.00	$ 37,720.00
3	Embankment	1,880	CY	$ 36.00	$ 67,680.00
4	Optional Base, Base Group 6	460	CY	$ 35.00	$ 16,100.00
5	Asphalt Concrete Friction Course	230	TN	$ 251.00	$ 57,730.00
6	Superpave Asphaltic Concrete	230	TN	$ 233.00	$ 53,590.00
7	Inlets, Ditch Bottom, Type C, < 10'	3	EA	$ 10,576.00	$ 31,728.00
8	Nutrient Separation Baffle Box	2	EA	$ 26,000.00	$ 52,000.00
9	Pipe Culvert, Optional Material, Round, 18" S/CD	50	LF	$ 192.00	$ 9,600.00
10	Pipe Culvert, Optional Material, Round, 24" S/CD	840	LF	$ 247.00	$ 207,480.00
11	Performance Turf (Sod)	4,000	SY	$ 6.00	$ 24,000.00
12	Landscape Restoration (Per Lot)	20	EA	$ 1,500.00	$ 30,000.00
13	Driveway Restoration (Per Lot)	20	EA	$ 3,000.00	$ 60,000.00
14	Utility Adjustments (Per Lot)	20	EA	$ 1,000.00	$ 20,000.00
15	Backflow prevention - Marine grade stainless steel	2	EA	$ 40,000.00	$ 80,000.00
16	Saltwater Tolerant Plants	1	LS	$ 90,000.00	$ 90,000.00
SUBTOTAL BID PRICE					$ 868,757.00
B. Labor	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
1	Mobilization	1	LS	$ 51,882.00	$ 51,882.00
2	Maintenance of Traffic	1	LS	$ 77,823.00	$ 77,823.00
SUBTOTAL BID PRICE					$ 129,705.00
C. Fees Paid	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
1	General Conditions and Bonding	1	LS	$ 100,000.00	$ 100,000.00
2	Survey. Layout and Field Staking	1	LS	$ 60,000.00	$ 60,000.00
3	Final Record Drawings and Final Submittals	1	LS	$ 40,000.00	$ 40,000.00
SUBTOTAL BID PRICE					$ 200,000.00
TOTAL BID PRICE (Subtotal Bid Price plus Contingency Allowance)					$ 1,198,462.00

Disclaimer: The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

APPENDIX D: PROPOSED ICPR NODE COMPARISONS

DRAFT

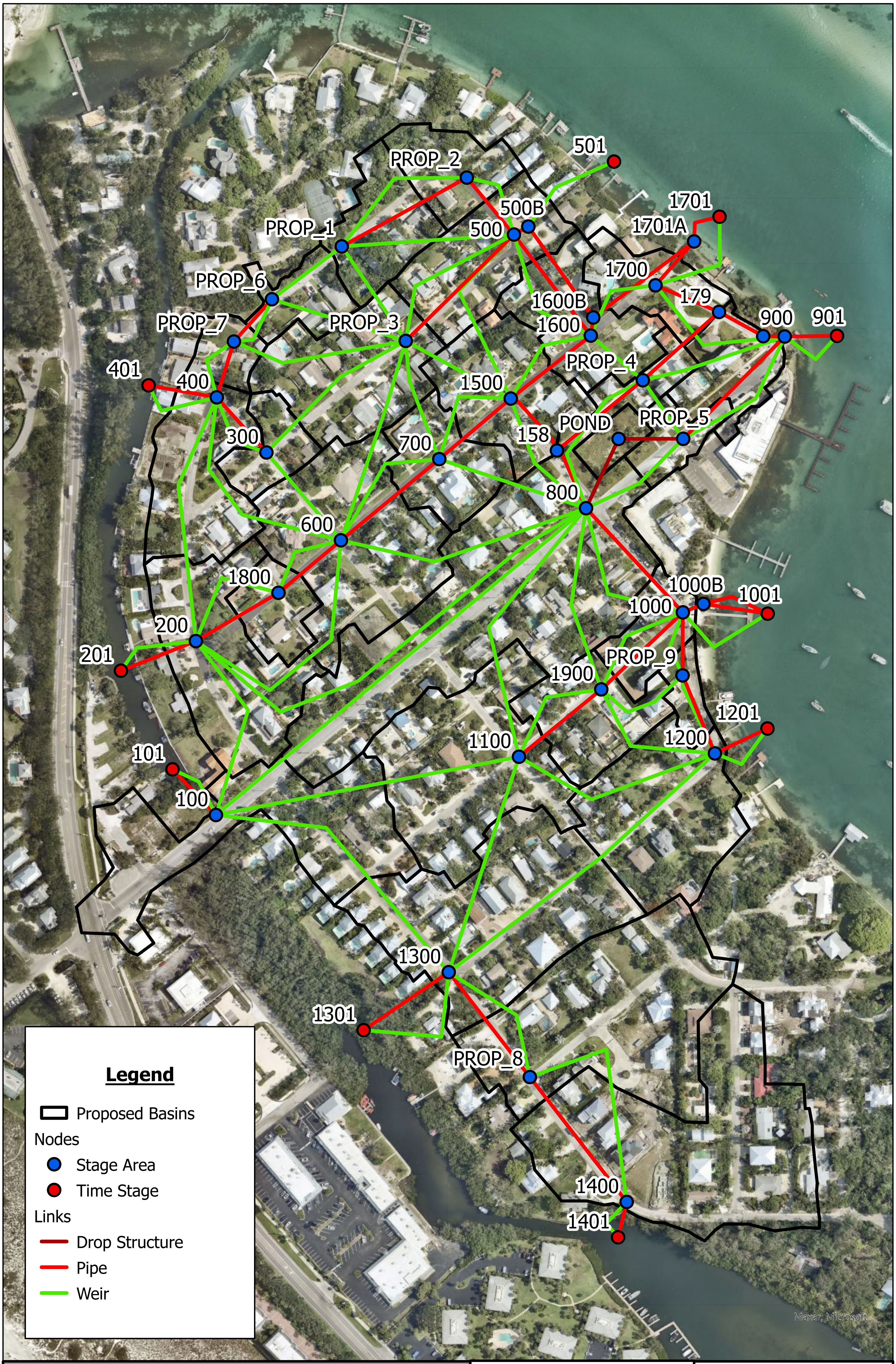


Base PCM Node Schematic

Longboat Key Village

October 2024

Kimley»Horn D-1

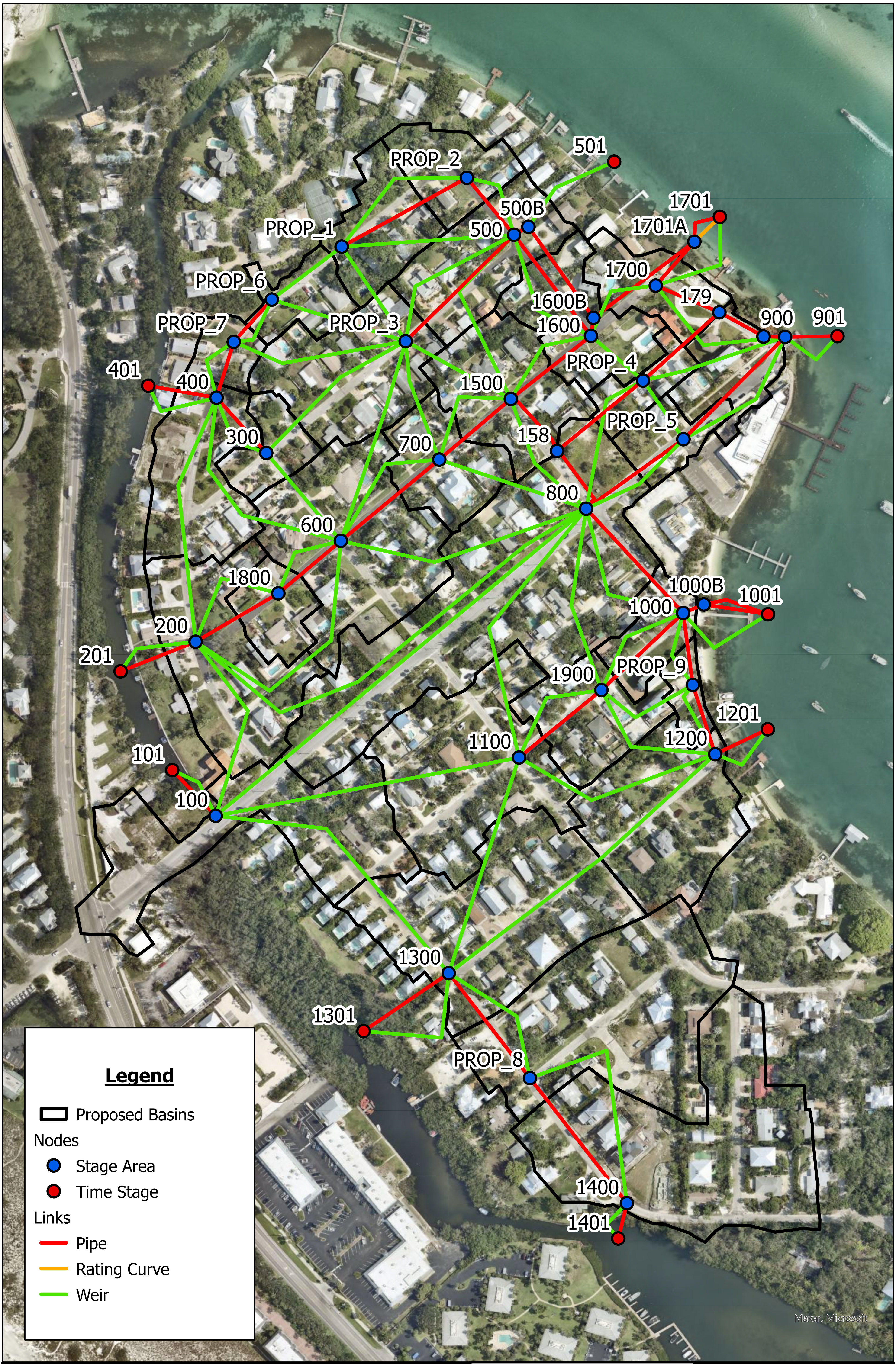


PCM with Pond Node Schematic

Longboat Key Village

October 2024

Kimley»Horn D-2



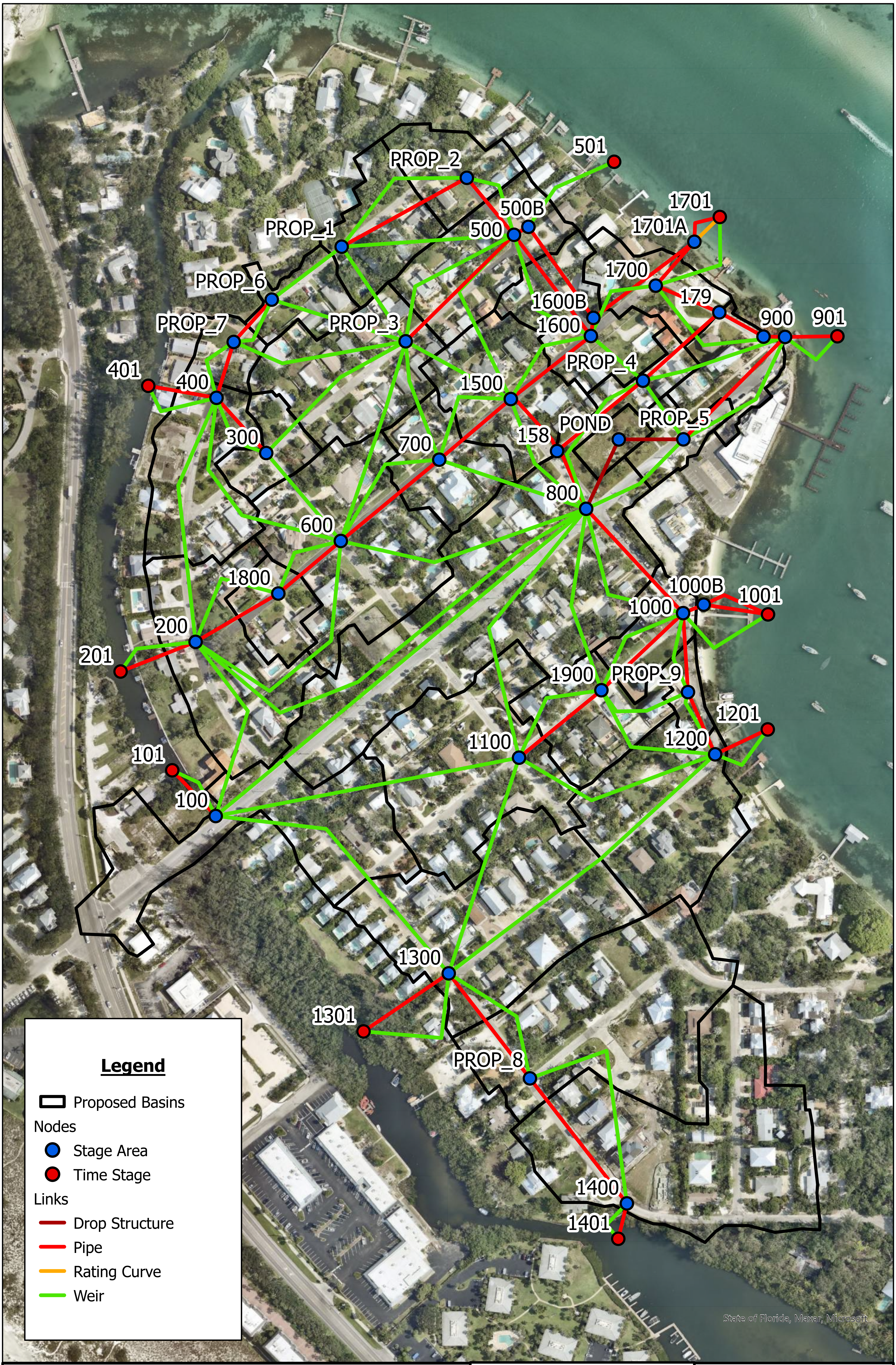
PCM with Pump Node Schematic

Longboat Key Village

October 2024

0 125 250 Feet N

Kimley»Horn D-3



PCM with Pond and Pump Node Schematic

Longboat Key Village

October 2024

0 125 250 Feet N

Kimley»Horn D-4

LBK Village Node Max Comparison

100-year MHHW RECM Comparison

	RECM	Phase 1-4		Pond		Pump		Pump & Pond	
Node Name	Revised Exisitng Conditions Model	Phase 1-4	Δ Stage (ft)	Pond	Δ Stage (ft)	Pump	Δ Stage (ft)	Pump & Pond	Δ Stage (ft)
100	2.81	2.81	0	2.81	0	2.81	0	2.81	0
1000	2.09	2.26	0.17	2.25	0.16	2.23	0.14	2.21	0.12
1000B	2.05	2.08	0.03	2.07	0.02	2.05	0	2.03	-0.02
1001	0.58	0.58	0	0.58	0	0.58	0	0.58	0
101	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1100	2.86	2.81	-0.05	2.81	-0.05	2.81	-0.05	2.81	-0.05
1200	2.06	2.05	-0.01	2.03	-0.03	2.01	-0.05	1.98	-0.08
1201	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1300	2.41	2.32	-0.09	2.32	-0.09	2.32	-0.09	2.32	-0.09
1301	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1400	2.38	2.31	-0.07	2.31	-0.07	2.31	-0.07	2.31	-0.07
1401	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1500	2.49	2.32	-0.17	2.3	-0.19	2.28	-0.21	2.27	-0.22
158	2.48	2.31	-0.17	2.3	-0.18	2.28	-0.2	2.26	-0.22
1600	2.48	2.31	-0.17	2.29	-0.19	2.27	-0.21	2.25	-0.23
1600B	2.42	2.28	-0.14	2.27	-0.15	2.21	-0.21	2.19	-0.23
1700	2.47	2.29	-0.18	2.28	-0.19	2.25	-0.22	2.24	-0.23
1701	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1701A	2.32	2.15	-0.17	2.14	-0.18	1.96	-0.36	1.94	-0.38
179	2.48	2.29	-0.19	2.28	-0.2	2.25	-0.23	2.24	-0.24
1800	2.51	2.26	-0.25	2.26	-0.25	2.26	-0.25	2.26	-0.25
1900	2.35	2.34	-0.01	2.34	-0.01	2.34	-0.01	2.34	-0.01
200	2.5	1.85	-0.65	1.84	-0.66	1.84	-0.66	1.84	-0.66
201	0.58	0.58	0	0.58	0	0.58	0	0.58	0
300	2.39	2.13	-0.26	2.13	-0.26	2.13	-0.26	2.13	-0.26
400	2.38	1.93	-0.45	1.92	-0.46	1.91	-0.47	1.91	-0.47
401	0.58	0.58	0	0.58	0	0.58	0	0.58	0
500	2.5	2.35	-0.15	2.34	-0.16	2.32	-0.18	2.32	-0.18
500B	2.49	2.34	-0.15	2.33	-0.16	2.31	-0.18	2.29	-0.2
501	0.58	0.58	0	0.58	0	0.58	0	0.58	0
600	2.51	2.33	-0.18	2.32	-0.19	2.31	-0.2	2.31	-0.2
700	2.5	2.33	-0.17	2.31	-0.19	2.29	-0.21	2.28	-0.22
800	2.49	2.31	-0.18	2.3	-0.19	2.28	-0.21	2.26	-0.23
900	2.48	2.28	-0.2	2.27	-0.21	2.24	-0.24	2.23	-0.25
900B	2.48	2.29	-0.19	2.27	-0.21	2.25	-0.23	2.23	-0.25
901	0.58	0.58	0	0.58	0	0.58	0	0.58	0
POND				2.31				2.27	-0.04
PROP_1		2.37		2.36	-0.01	2.36	-0.01	2.35	-0.02
PROP_2		2.36		2.35	-0.01	2.35	-0.01	2.34	-0.02
PROP_3		2.41		2.4	-0.01	2.4	-0.01	2.4	-0.01
PROP_4		2.3		2.29	-0.01	2.26	-0.04	2.25	-0.05
PROP_5		2.3		2.28	-0.02	2.26	-0.04	2.24	-0.06
PROP_6		2.23		2.23	0	2.22	-0.01	2.22	-0.01
PROP_7		2.06		2.05	-0.01	2.05	-0.01	2.04	-0.02
PROP_8		2.35		2.35	0	2.35	0	2.35	0

LBK Village Node Max Comparison										
100-year MHHW PCM Comparison										
	Phase 1-4		Pond			Pump			Pump & Pond	
Node Name	Phase 1-4		Pond	Δ Stage (ft)		Pump	Δ Stage (ft)		Pump & Pond	Δ Stage (ft)
100	2.81		2.81	0		2.81	0		2.81	0
1000	2.26		2.25	-0.01		2.23	-0.03		2.21	-0.05
1000B	2.08		2.07	-0.01		2.05	-0.03		2.03	-0.05
1001	0.58		0.58	0		0.58	0		0.58	0
101	0.58		0.58	0		0.58	0		0.58	0
1100	2.81		2.81	0		2.81	0		2.81	0
1200	2.05		2.03	-0.02		2.01	-0.04		1.98	-0.07
1201	0.58		0.58	0		0.58	0		0.58	0
1300	2.32		2.32	0		2.32	0		2.32	0
1301	0.58		0.58	0		0.58	0		0.58	0
1400	2.31		2.31	0		2.31	0		2.31	0
1401	0.58		0.58	0		0.58	0		0.58	0
1500	2.32		2.3	-0.02		2.28	-0.04		2.27	-0.05
158	2.31		2.3	-0.01		2.28	-0.03		2.26	-0.05
1600	2.31		2.29	-0.02		2.27	-0.04		2.25	-0.06
1600B	2.28		2.27	-0.01		2.21	-0.07		2.19	-0.09
1700	2.29		2.28	-0.01		2.25	-0.04		2.24	-0.05
1701	0.58		0.58	0		0.58	0		0.58	0
1701A	2.15		2.14	-0.01		1.96	-0.19		1.94	-0.21
179	2.29		2.28	-0.01		2.25	-0.04		2.24	-0.05
1800	2.26		2.26	0		2.26	0		2.26	0
1900	2.34		2.34	0		2.34	0		2.34	0
200	1.85		1.84	-0.01		1.84	-0.01		1.84	-0.01
201	0.58		0.58	0		0.58	0		0.58	0
300	2.13		2.13	0		2.13	0		2.13	0
400	1.93		1.92	-0.01		1.91	-0.02		1.91	-0.02
401	0.58		0.58	0		0.58	0		0.58	0
500	2.35		2.34	-0.01		2.32	-0.03		2.32	-0.03
500B	2.34		2.33	-0.01		2.31	-0.03		2.29	-0.05
501	0.58		0.58	0		0.58	0		0.58	0
600	2.33		2.32	-0.01		2.31	-0.02		2.31	-0.02
700	2.33		2.31	-0.02		2.29	-0.04		2.28	-0.05
800	2.31		2.3	-0.01		2.28	-0.03		2.26	-0.05
900	2.28		2.27	-0.01		2.24	-0.04		2.23	-0.05
900B	2.29		2.27	-0.02		2.25	-0.04		2.23	-0.06
901	0.58		0.58	0		0.58	0		0.58	0
POND			2.31						2.27	-0.04
PROP_1	2.37		2.36	-0.01		2.36	-0.01		2.35	-0.02
PROP_2	2.36		2.35	-0.01		2.35	-0.01		2.34	-0.02
PROP_3	2.41		2.4	-0.01		2.4	-0.01		2.4	-0.01
PROP_4	2.3		2.29	-0.01		2.26	-0.04		2.25	-0.05
PROP_5	2.3		2.28	-0.02		2.26	-0.04		2.24	-0.06
PROP_6	2.23		2.23	0		2.22	-0.01		2.22	-0.01
PROP_7	2.06		2.05	-0.01		2.05	-0.01		2.04	-0.02
PROP_8	2.35		2.35	0		2.35	0		2.35	0

LBK Village Node Max Comparison									
50-year MHHW RECM Comparison									
	RECM	Phase 1-4		Pond		Pump		Pump & Pond	
Node Name	Revised Exisitng Conditions Model	Phase 1-4	Δ Stage (ft)	Pond	Δ Stage (ft)	Pump	Δ Stage (ft)	Pump & Pond	Δ Stage (ft)
100	2.79	2.79	0	2.79	0	2.79	0	2.79	0
1000	2.06	2.1	0.04	2.08	0.02	2.06	0	2.05	-0.01
1000B	2.02	1.94	-0.08	1.92	-0.1	1.9	-0.12	1.89	-0.13
1001	0.58	0.58	0	0.58	0	0.58	0	0.58	0
101	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1100	2.84	2.77	-0.07	2.77	-0.07	2.77	-0.07	2.77	-0.07
1200	2.03	1.68	-0.35	1.65	-0.38	1.65	-0.38	1.64	-0.39
1201	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1300	2.37	2.25	-0.12	2.25	-0.12	2.25	-0.12	2.25	-0.12
1301	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1400	2.34	2.26	-0.08	2.26	-0.08	2.26	-0.08	2.26	-0.08
1401	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1500	2.44	2.21	-0.23	2.19	-0.25	2.17	-0.27	2.15	-0.29
158	2.43	2.21	-0.22	2.19	-0.24	2.16	-0.27	2.14	-0.29
1600	2.43	2.2	-0.23	2.18	-0.25	2.15	-0.28	2.13	-0.3
1600B	2.37	2.18	-0.19	2.16	-0.21	2.1	-0.27	2.07	-0.3
1700	2.42	2.19	-0.23	2.17	-0.25	2.13	-0.29	2.1	-0.32
1701	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1701A	2.28	2.07	-0.21	2.05	-0.23	1.86	-0.42	1.85	-0.43
179	2.43	2.18	-0.25	2.16	-0.27	2.12	-0.31	2.09	-0.34
1800	2.46	2.13	-0.33	2.12	-0.34	2.12	-0.34	2.11	-0.35
1900	2.32	2.3	-0.02	2.29	-0.03	2.29	-0.03	2.29	-0.03
200	2.45	1.48	-0.97	1.47	-0.98	1.47	-0.98	1.47	-0.98
201	0.58	0.58	0	0.58	0	0.58	0	0.58	0
300	2.34	1.86	-0.48	1.86	-0.48	1.85	-0.49	1.85	-0.49
400	2.33	1.59	-0.74	1.59	-0.74	1.58	-0.75	1.58	-0.75
401	0.58	0.58	0	0.58	0	0.58	0	0.58	0
500	2.45	2.27	-0.18	2.27	-0.18	2.26	-0.19	2.26	-0.19
500B	2.44	2.25	-0.19	2.25	-0.19	2.23	-0.21	2.23	-0.21
501	0.58	0.58	0	0.58	0	0.58	0	0.58	0
600	2.46	2.26	-0.2	2.26	-0.2	2.26	-0.2	2.25	-0.21
700	2.45	2.22	-0.23	2.2	-0.25	2.18	-0.27	2.16	-0.29
800	2.44	2.21	-0.23	2.19	-0.25	2.16	-0.28	2.14	-0.3
900	2.43	2.17	-0.26	2.15	-0.28	2.11	-0.32	2.07	-0.36
900B	2.43	2.18	-0.25	2.15	-0.28	2.11	-0.32	2.08	-0.35
901	0.58	0.58	0	0.58	0	0.58	0	0.58	0
POND				2.2				2.15	-0.05
PROP_1		2.31		2.31	0	2.31	0	2.31	0
PROP_2		2.3		2.3	0	2.29	-0.01	2.29	-0.01
PROP_3		2.35		2.35	0	2.35	0	2.35	0
PROP_4		2.19		2.17	-0.02	2.14	-0.05	2.11	-0.08
PROP_5		2.19		2.16	-0.03	2.12	-0.07	2.09	-0.1
PROP_6		2.14		2.14	0	2.14	0	2.13	-0.01
PROP_7		1.88		1.88	0	1.87	-0.01	1.87	-0.01
PROP_8		2.29		2.29	0	2.29	0	2.29	0

LBK Village Node Max Comparison										
50-year MHHW PCM Comparison										
	Phase 1-4		Pond			Pump			Pump & Pond	
Node Name	Phase 1-4		Pond	Δ Stage (ft)		Pump	Δ Stage (ft)		Pump & Pond	Δ Stage (ft)
100	2.79		2.79	0		2.79	0		2.79	0
1000	2.1		2.08	-0.02		2.06	-0.04		2.05	-0.05
1000B	1.94		1.92	-0.02		1.9	-0.04		1.89	-0.05
1001	0.58		0.58	0		0.58	0		0.58	0
101	0.58		0.58	0		0.58	0		0.58	0
1100	2.77		2.77	0		2.77	0		2.77	0
1200	1.68		1.65	-0.03		1.65	-0.03		1.64	-0.04
1201	0.58		0.58	0		0.58	0		0.58	0
1300	2.25		2.25	0		2.25	0		2.25	0
1301	0.58		0.58	0		0.58	0		0.58	0
1400	2.26		2.26	0		2.26	0		2.26	0
1401	0.58		0.58	0		0.58	0		0.58	0
1500	2.21		2.19	-0.02		2.17	-0.04		2.15	-0.06
158	2.21		2.19	-0.02		2.16	-0.05		2.14	-0.07
1600	2.2		2.18	-0.02		2.15	-0.05		2.13	-0.07
1600B	2.18		2.16	-0.02		2.1	-0.08		2.07	-0.11
1700	2.19		2.17	-0.02		2.13	-0.06		2.1	-0.09
1701	0.58		0.58	0		0.58	0		0.58	0
1701A	2.07		2.05	-0.02		1.86	-0.21		1.85	-0.22
179	2.18		2.16	-0.02		2.12	-0.06		2.09	-0.09
1800	2.13		2.12	-0.01		2.12	-0.01		2.11	-0.02
1900	2.3		2.29	-0.01		2.29	-0.01		2.29	-0.01
200	1.48		1.47	-0.01		1.47	-0.01		1.47	-0.01
201	0.58		0.58	0		0.58	0		0.58	0
300	1.86		1.86	0		1.85	-0.01		1.85	-0.01
400	1.59		1.59	0		1.58	-0.01		1.58	-0.01
401	0.58		0.58	0		0.58	0		0.58	0
500	2.27		2.27	0		2.26	-0.01		2.26	-0.01
500B	2.25		2.25	0		2.23	-0.02		2.23	-0.02
501	0.58		0.58	0		0.58	0		0.58	0
600	2.26		2.26	0		2.26	0		2.25	-0.01
700	2.22		2.2	-0.02		2.18	-0.04		2.16	-0.06
800	2.21		2.19	-0.02		2.16	-0.05		2.14	-0.07
900	2.17		2.15	-0.02		2.11	-0.06		2.07	-0.1
900B	2.18		2.15	-0.03		2.11	-0.07		2.08	-0.1
901	0.58		0.58	0		0.58	0		0.58	0
POND			2.2						2.15	-0.05
PROP_1	2.31		2.31	0		2.31	0		2.31	0
PROP_2	2.3		2.3	0		2.29	-0.01		2.29	-0.01
PROP_3	2.35		2.35	0		2.35	0		2.35	0
PROP_4	2.19		2.17	-0.02		2.14	-0.05		2.11	-0.08
PROP_5	2.19		2.16	-0.03		2.12	-0.07		2.09	-0.1
PROP_6	2.14		2.14	0		2.14	0		2.13	-0.01
PROP_7	1.88		1.88	0		1.87	-0.01		1.87	-0.01
PROP_8	2.29		2.29	0		2.29	0		2.29	0

Kimley»Horn

LBK Village Node Max Comparison

25-year MHHW RECM Comparison

	RECM		Phase 1-4			Pond			Pump			Pump & Pond	
Node Name	Revised Exisitng Conditions Model		Phase 1-4	Δ Stage (ft)		Pond	Δ Stage (ft)		Pump	Δ Stage (ft)		Pump & Pond	Δ Stage (ft)
100	2.78		2.78	0		2.78	0		2.78	0		2.78	0
1000	2.02		1.91	-0.11		1.9	-0.12		1.88	-0.14		1.86	-0.16
1000B	1.99		1.77	-0.22		1.75	-0.24		1.74	-0.25		1.73	-0.26
1001	0.58		0.58	0		0.58	0		0.58	0		0.58	0
101	0.58		0.58	0		0.58	0		0.58	0		0.58	0
1100	2.81		2.72	-0.09		2.72	-0.09		2.72	-0.09		2.72	-0.09
1200	2		1.43	-0.57		1.42	-0.58		1.42	-0.58		1.41	-0.59
1201	0.58		0.58	0		0.58	0		0.58	0		0.58	0
1300	2.33		2.14	-0.19		2.14	-0.19		2.14	-0.19		2.14	-0.19
1301	0.58		0.58	0		0.58	0		0.58	0		0.58	0
1400	2.3		2.2	-0.1		2.2	-0.1		2.2	-0.1		2.2	-0.1
1401	0.58		0.58	0		0.58	0		0.58	0		0.58	0
1500	2.38		2.1	-0.28		2.09	-0.29		2.07	-0.31		2.05	-0.33
158	2.38		2.09	-0.29		2.07	-0.31		2.05	-0.33		2.03	-0.35
1600	2.38		2.08	-0.3		2.07	-0.31		2.04	-0.34		2.03	-0.35
1600B	2.32		2.07	-0.25		2.06	-0.26		2	-0.32		1.98	-0.34
1700	2.37		2.05	-0.32		2.03	-0.34		1.99	-0.38		1.97	-0.4
1701	0.58		0.58	0		0.58	0		0.58	0		0.58	0
1701A	2.23		1.96	-0.27		1.95	-0.28		1.77	-0.46		1.76	-0.47
179	2.37		2.02	-0.35		1.96	-0.41		1.88	-0.49		1.8	-0.57
1800	2.4		1.83	-0.57		1.81	-0.59		1.81	-0.59		1.8	-0.6
1900	2.3		2.23	-0.07		2.23	-0.07		2.23	-0.07		2.22	-0.08
200	2.4		1.22	-1.18		1.21	-1.19		1.21	-1.19		1.21	-1.19
201	0.58		0.58	0		0.58	0		0.58	0		0.58	0
300	2.27		1.49	-0.78		1.49	-0.78		1.48	-0.79		1.48	-0.79
400	2.26		1.28	-0.98		1.27	-0.99		1.27	-0.99		1.26	-1
401	0.58		0.58	0		0.58	0		0.58	0		0.58	0
500	2.39		2.21	-0.18		2.21	-0.18		2.2	-0.19		2.2	-0.19
500B	2.38		2.19	-0.19		2.18	-0.2		2.17	-0.21		2.16	-0.22
501	0.58		0.58	0		0.58	0		0.58	0		0.58	0
600	2.4		2.19	-0.21		2.19	-0.21		2.19	-0.21		2.18	-0.22
700	2.39		2.12	-0.27		2.1	-0.29		2.08	-0.31		2.07	-0.32
800	2.38		2.1	-0.28		2.09	-0.29		2.07	-0.31		2.06	-0.32
900	2.38		1.96	-0.42		1.8	-0.58		1.66	-0.72		1.46	-0.92
900B	2.38		1.98	-0.4		1.85	-0.53		1.73	-0.65		1.57	-0.81
901	0.58		0.58	0		0.58	0		0.58	0		0.58	0
POND						2.1						2.06	-0.04
PROP_1			2.26			2.26	0		2.25	-0.01		2.25	-0.01
PROP_2			2.24			2.24	0		2.23	-0.01		2.23	-0.01
PROP_3			2.3			2.3	0		2.3	0		2.3	0
PROP_4			2.06			2.03	-0.03		2	-0.06		1.96	-0.1
PROP_5			1.99			1.96	-0.03		1.96	-0.03		1.92	-0.07
PROP_6			1.9			1.89	-0.01		1.86	-0.04		1.86	-0.04
PROP_7			1.52			1.52	0		1.5	-0.02		1.5	-0.02
PROP_8			2.24			2.24	0		2.24	0		2.24	0

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LBK Village Node Max Comparison										
25-year MHHW PCM Comparison										
	Phase 1-4		Pond			Pump			Pump & Pond	
Node Name	Phase 1-4		Pond	Δ Stage (ft)		Pump	Δ Stage (ft)		Pump & Pond	Δ Stage (ft)
100	2.78		2.78	0		2.78	0		2.78	0
1000	1.91		1.9	-0.01		1.88	-0.03		1.86	-0.05
1000B	1.77		1.75	-0.02		1.74	-0.03		1.73	-0.04
1001	0.58		0.58	0		0.58	0		0.58	0
101	0.58		0.58	0		0.58	0		0.58	0
1100	2.72		2.72	0		2.72	0		2.72	0
1200	1.43		1.42	-0.01		1.42	-0.01		1.41	-0.02
1201	0.58		0.58	0		0.58	0		0.58	0
1300	2.14		2.14	0		2.14	0		2.14	0
1301	0.58		0.58	0		0.58	0		0.58	0
1400	2.2		2.2	0		2.2	0		2.2	0
1401	0.58		0.58	0		0.58	0		0.58	0
1500	2.1		2.09	-0.01		2.07	-0.03		2.05	-0.05
158	2.09		2.07	-0.02		2.05	-0.04		2.03	-0.06
1600	2.08		2.07	-0.01		2.04	-0.04		2.03	-0.05
1600B	2.07		2.06	-0.01		2	-0.07		1.98	-0.09
1700	2.05		2.03	-0.02		1.99	-0.06		1.97	-0.08
1701	0.58		0.58	0		0.58	0		0.58	0
1701A	1.96		1.95	-0.01		1.77	-0.19		1.76	-0.2
179	2.02		1.96	-0.06		1.88	-0.14		1.8	-0.22
1800	1.83		1.81	-0.02		1.81	-0.02		1.8	-0.03
1900	2.23		2.23	0		2.23	0		2.22	-0.01
200	1.22		1.21	-0.01		1.21	-0.01		1.21	-0.01
201	0.58		0.58	0		0.58	0		0.58	0
300	1.49		1.49	0		1.48	-0.01		1.48	-0.01
400	1.28		1.27	-0.01		1.27	-0.01		1.26	-0.02
401	0.58		0.58	0		0.58	0		0.58	0
500	2.21		2.21	0		2.2	-0.01		2.2	-0.01
500B	2.19		2.18	-0.01		2.17	-0.02		2.16	-0.03
501	0.58		0.58	0		0.58	0		0.58	0
600	2.19		2.19	0		2.19	0		2.18	-0.01
700	2.12		2.1	-0.02		2.08	-0.04		2.07	-0.05
800	2.1		2.09	-0.01		2.07	-0.03		2.06	-0.04
900	1.96		1.8	-0.16		1.66	-0.3		1.46	-0.5
900B	1.98		1.85	-0.13		1.73	-0.25		1.57	-0.41
901	0.58		0.58	0		0.58	0		0.58	0
POND			2.1						2.06	-0.04
PROP_1	2.26		2.26	0		2.25	-0.01		2.25	-0.01
PROP_2	2.24		2.24	0		2.23	-0.01		2.23	-0.01
PROP_3	2.3		2.3	0		2.3	0		2.3	0
PROP_4	2.06		2.03	-0.03		2	-0.06		1.96	-0.1
PROP_5	1.99		1.96	-0.03		1.96	-0.03		1.92	-0.07
PROP_6	1.9		1.89	-0.01		1.86	-0.04		1.86	-0.04
PROP_7	1.52		1.52	0		1.5	-0.02		1.5	-0.02
PROP_8	2.24		2.24	0		2.24	0		2.24	0

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LBK Village Node Max Comparison

10-year MHHW RECM Comparison

	RECM	Phase 1-4		Pond		Pump		Pump & Pond	
Node Name	Revised Exisitng Conditions Model	Phase 1-4	Δ Stage (ft)	Pond	Δ Stage (ft)	Pump	Δ Stage (ft)	Pump & Pond	Δ Stage (ft)
100	2.76	2.76	0	2.76	0	2.76	0	2.76	0
1000	1.96	1.65	-0.31	1.63	-0.33	1.62	-0.34	1.6	-0.36
1000B	1.93	1.54	-0.39	1.52	-0.41	1.51	-0.42	1.49	-0.44
1001	0.58	0.58	0	0.58	0	0.58	0	0.58	0
101	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1100	2.78	2.61	-0.17	2.6	-0.18	2.6	-0.18	2.59	-0.19
1200	1.97	1.14	-0.83	1.12	-0.85	1.13	-0.84	1.11	-0.86
1201	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1300	2.27	1.88	-0.39	1.88	-0.39	1.88	-0.39	1.88	-0.39
1301	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1400	2.25	2.08	-0.17	2.08	-0.17	2.08	-0.17	2.08	-0.17
1401	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1500	2.3	1.97	-0.33	1.95	-0.35	1.92	-0.38	1.9	-0.4
158	2.3	1.94	-0.36	1.9	-0.4	1.86	-0.44	1.83	-0.47
1600	2.3	1.96	-0.34	1.93	-0.37	1.9	-0.4	1.88	-0.42
1600B	2.25	1.95	-0.3	1.92	-0.33	1.85	-0.4	1.82	-0.43
1700	2.29	1.89	-0.4	1.84	-0.45	1.67	-0.62	1.57	-0.72
1701	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1701A	2.16	1.84	-0.32	1.81	-0.35	1.57	-0.59	1.51	-0.65
179	2.29	1.6	-0.69	1.49	-0.8	1.38	-0.91	1.31	-0.98
1800	2.33	1.31	-1.02	1.3	-1.03	1.29	-1.04	1.29	-1.04
1900	2.25	2.13	-0.12	2.12	-0.13	2.12	-0.13	2.11	-0.14
200	2.32	0.88	-1.44	0.88	-1.44	0.87	-1.45	0.87	-1.45
201	0.58	0.58	0	0.58	0	0.58	0	0.58	0
300	2.18	1.02	-1.16	1.02	-1.16	1.02	-1.16	1.02	-1.16
400	2.18	0.9	-1.28	0.9	-1.28	0.89	-1.29	0.89	-1.29
401	0.58	0.58	0	0.58	0	0.58	0	0.58	0
500	2.31	2.12	-0.19	2.11	-0.2	2.1	-0.21	2.1	-0.21
500B	2.3	2.09	-0.21	2.08	-0.22	2.06	-0.24	2.05	-0.25
501	0.58	0.58	0	0.58	0	0.58	0	0.58	0
600	2.33	2.08	-0.25	2.07	-0.26	2.06	-0.27	2.06	-0.27
700	2.31	1.99	-0.32	1.96	-0.35	1.94	-0.37	1.92	-0.39
800	2.3	1.97	-0.33	1.95	-0.35	1.92	-0.38	1.9	-0.4
900	2.3	1.03	-1.27	0.82	-1.48	0.76	-1.54	0.71	-1.59
900B	2.3	1.21	-1.09	1.03	-1.27	0.96	-1.34	0.9	-1.4
901	0.58	0.58	0	0.58	0	0.58	0	0.58	0
POND				1.95				1.9	-0.05
PROP_1		2.19		2.19	0	2.19	0	2.19	0
PROP_2		2.16		2.15	-0.01	2.14	-0.02	2.14	-0.02
PROP_3		2.24		2.24	0	2.24	0	2.24	0
PROP_4		1.83		1.75	-0.08	1.69	-0.14	1.64	-0.19
PROP_5		1.82		1.01	-0.81	1.64	-0.18	0.87	-0.95
PROP_6		1.17		1.17	0	1.17	0	1.16	-0.01
PROP_7		1.01		1.01	0	1	-0.01	1	-0.01
PROP_8		2.11		2.11	0	2.11	0	2.11	0

LBK Village Node Max Comparison										
10-year MHHW PCM Comparison										
	Phase 1-4		Pond			Pump			Pump & Pond	
Node Name	Phase 1-4		Pond	Δ Stage (ft)		Pump	Δ Stage (ft)		Pump & Pond	Δ Stage (ft)
100	2.76		2.76	0		2.76	0		2.76	0
1000	1.65		1.63	-0.02		1.62	-0.03		1.6	-0.05
1000B	1.54		1.52	-0.02		1.51	-0.03		1.49	-0.05
1001	0.58		0.58	0		0.58	0		0.58	0
101	0.58		0.58	0		0.58	0		0.58	0
1100	2.61		2.6	-0.01		2.6	-0.01		2.59	-0.02
1200	1.14		1.12	-0.02		1.13	-0.01		1.11	-0.03
1201	0.58		0.58	0		0.58	0		0.58	0
1300	1.88		1.88	0		1.88	0		1.88	0
1301	0.58		0.58	0		0.58	0		0.58	0
1400	2.08		2.08	0		2.08	0		2.08	0
1401	0.58		0.58	0		0.58	0		0.58	0
1500	1.97		1.95	-0.02		1.92	-0.05		1.9	-0.07
158	1.94		1.9	-0.04		1.86	-0.08		1.83	-0.11
1600	1.96		1.93	-0.03		1.9	-0.06		1.88	-0.08
1600B	1.95		1.92	-0.03		1.85	-0.1		1.82	-0.13
1700	1.89		1.84	-0.05		1.67	-0.22		1.57	-0.32
1701	0.58		0.58	0		0.58	0		0.58	0
1701A	1.84		1.81	-0.03		1.57	-0.27		1.51	-0.33
179	1.6		1.49	-0.11		1.38	-0.22		1.31	-0.29
1800	1.31		1.3	-0.01		1.29	-0.02		1.29	-0.02
1900	2.13		2.12	-0.01		2.12	-0.01		2.11	-0.02
200	0.88		0.88	0		0.87	-0.01		0.87	-0.01
201	0.58		0.58	0		0.58	0		0.58	0
300	1.02		1.02	0		1.02	0		1.02	0
400	0.9		0.9	0		0.89	-0.01		0.89	-0.01
401	0.58		0.58	0		0.58	0		0.58	0
500	2.12		2.11	-0.01		2.1	-0.02		2.1	-0.02
500B	2.09		2.08	-0.01		2.06	-0.03		2.05	-0.04
501	0.58		0.58	0		0.58	0		0.58	0
600	2.08		2.07	-0.01		2.06	-0.02		2.06	-0.02
700	1.99		1.96	-0.03		1.94	-0.05		1.92	-0.07
800	1.97		1.95	-0.02		1.92	-0.05		1.9	-0.07
900	1.03		0.82	-0.21		0.76	-0.27		0.71	-0.32
900B	1.21		1.03	-0.18		0.96	-0.25		0.9	-0.31
901	0.58		0.58	0		0.58	0		0.58	0
POND			1.95						1.9	-0.05
PROP_1	2.19		2.19	0		2.19	0		2.19	0
PROP_2	2.16		2.15	-0.01		2.14	-0.02		2.14	-0.02
PROP_3	2.24		2.24	0		2.24	0		2.24	0
PROP_4	1.83		1.75	-0.08		1.69	-0.14		1.64	-0.19
PROP_5	1.82		1.01	-0.81		1.64	-0.18		0.87	-0.95
PROP_6	1.17		1.17	0		1.17	0		1.16	-0.01
PROP_7	1.01		1.01	0		1	-0.01		1	-0.01
PROP_8	2.11		2.11	0		2.11	0		2.11	0

LBK Village Node Max Comparison

5-year MHHW RECM Comparison

	RECM		Phase 1-4			Pond			Pump			Pump & Pond	
Node Name	Revised Exisitng Conditions Model		Phase 1-4	Δ Stage (ft)		Pond	Δ Stage (ft)		Pump	Δ Stage (ft)		Pump & Pond	Δ Stage (ft)
100	2.74		2.74	0		2.74	0		2.74	0		2.74	0
1000	1.91		1.49	-0.42		1.46	-0.45		1.43	-0.48		1.4	-0.51
1000B	1.88		1.4	-0.48		1.36	-0.52		1.34	-0.54		1.31	-0.57
1001	0.58		0.58	0		0.58	0		0.58	0		0.58	0
101	0.58		0.58	0		0.58	0		0.58	0		0.58	0
1100	2.75		2.45	-0.3		2.43	-0.32		2.44	-0.31		2.42	-0.33
1200	1.94		0.95	-0.99		0.92	-1.02		0.93	-1.01		0.91	-1.03
1201	0.58		0.58	0		0.58	0		0.58	0		0.58	0
1300	2.22		1.64	-0.58		1.64	-0.58		1.64	-0.58		1.64	-0.58
1301	0.58		0.58	0		0.58	0		0.58	0		0.58	0
1400	2.21		1.8	-0.41		1.8	-0.41		1.8	-0.41		1.8	-0.41
1401	0.58		0.58	0		0.58	0		0.58	0		0.58	0
1500	2.23		1.84	-0.39		1.83	-0.4		1.78	-0.45		1.77	-0.46
158	2.23		1.78	-0.45		1.75	-0.48		1.68	-0.55		1.64	-0.59
1600	2.23		1.84	-0.39		1.83	-0.4		1.78	-0.45		1.76	-0.47
1600B	2.18		1.82	-0.36		1.81	-0.37		1.7	-0.48		1.68	-0.5
1700	2.22		1.66	-0.56		1.63	-0.59		1.3	-0.92		1.26	-0.96
1701	0.58		0.58	0		0.58	0		0.58	0		0.58	0
1701A	2.1		1.66	-0.44		1.62	-0.48		1.29	-0.81		1.26	-0.84
179	2.22		1.36	-0.86		1.32	-0.9		1.15	-1.07		1.11	-1.11
1800	2.26		1.1	-1.16		1.1	-1.16		1.09	-1.17		1.09	-1.17
1900	2.21		2.04	-0.17		2.02	-0.19		2.02	-0.19		2	-0.21
200	2.25		0.76	-1.49		0.76	-1.49		0.75	-1.5		0.75	-1.5
201	0.58		0.58	0		0.58	0		0.58	0		0.58	0
300	2.12		0.81	-1.31		0.81	-1.31		0.81	-1.31		0.81	-1.31
400	2.1		0.72	-1.38		0.72	-1.38		0.72	-1.38		0.72	-1.38
401	0.58		0.58	0		0.58	0		0.58	0		0.58	0
500	2.24		2.04	-0.2		2.04	-0.2		2.01	-0.23		2.01	-0.23
500B	2.23		2.01	-0.22		2	-0.23		1.96	-0.27		1.96	-0.27
501	0.58		0.58	0		0.58	0		0.58	0		0.58	0
600	2.27		1.97	-0.3		1.96	-0.31		1.94	-0.33		1.94	-0.33
700	2.23		1.88	-0.35		1.88	-0.35		1.86	-0.37		1.85	-0.38
800	2.23		1.82	-0.41		1.8	-0.43		1.7	-0.53		1.68	-0.55
900	2.23		0.75	-1.48		0.71	-1.52		0.71	-1.52		0.67	-1.56
900B	2.22		0.94	-1.28		0.9	-1.32		0.85	-1.37		0.81	-1.41
901	0.58		0.58	0		0.58	0		0.58	0		0.58	0
POND						1.8						1.68	-0.12
PROP_1			2.16			2.16	0		2.15	-0.01		2.15	-0.01
PROP_2			2.1			2.1	0		2.09	-0.01		2.09	-0.01
PROP_3			2.19			2.19	0		2.19	0		2.19	0
PROP_4			1.63			1.59	-0.04		1.48	-0.15		1.43	-0.2
PROP_5			1.49			0.81	-0.68		1.4	-0.09		0.78	-0.71
PROP_6			0.9			0.9	0		0.9	0		0.9	0
PROP_7			0.81			0.81	0		0.8	-0.01		0.8	-0.01
PROP_8			1.9			1.9	0		1.9	0		1.9	0

LBK Village Node Max Comparison

5-year MHHW PCM Comparison

	Phase 1-4		Pond			Pump			Pump & Pond	
Node Name	Phase 1-4		Pond	Δ Stage (ft)		Pump	Δ Stage (ft)		Pump & Pond	Δ Stage (ft)
100	2.74		2.74	0		2.74	0		2.74	0
1000	1.49		1.46	-0.03		1.43	-0.06		1.4	-0.09
1000B	1.4		1.36	-0.04		1.34	-0.06		1.31	-0.09
1001	0.58		0.58	0		0.58	0		0.58	0
101	0.58		0.58	0		0.58	0		0.58	0
1100	2.45		2.43	-0.02		2.44	-0.01		2.42	-0.03
1200	0.95		0.92	-0.03		0.93	-0.02		0.91	-0.04
1201	0.58		0.58	0		0.58	0		0.58	0
1300	1.64		1.64	0		1.64	0		1.64	0
1301	0.58		0.58	0		0.58	0		0.58	0
1400	1.8		1.8	0		1.8	0		1.8	0
1401	0.58		0.58	0		0.58	0		0.58	0
1500	1.84		1.83	-0.01		1.78	-0.06		1.77	-0.07
158	1.78		1.75	-0.03		1.68	-0.1		1.64	-0.14
1600	1.84		1.83	-0.01		1.78	-0.06		1.76	-0.08
1600B	1.82		1.81	-0.01		1.7	-0.12		1.68	-0.14
1700	1.66		1.63	-0.03		1.3	-0.36		1.26	-0.4
1701	0.58		0.58	0		0.58	0		0.58	0
1701A	1.66		1.62	-0.04		1.29	-0.37		1.26	-0.4
179	1.36		1.32	-0.04		1.15	-0.21		1.11	-0.25
1800	1.1		1.1	0		1.09	-0.01		1.09	-0.01
1900	2.04		2.02	-0.02		2.02	-0.02		2	-0.04
200	0.76		0.76	0		0.75	-0.01		0.75	-0.01
201	0.58		0.58	0		0.58	0		0.58	0
300	0.81		0.81	0		0.81	0		0.81	0
400	0.72		0.72	0		0.72	0		0.72	0
401	0.58		0.58	0		0.58	0		0.58	0
500	2.04		2.04	0		2.01	-0.03		2.01	-0.03
500B	2.01		2	-0.01		1.96	-0.05		1.96	-0.05
501	0.58		0.58	0		0.58	0		0.58	0
600	1.97		1.96	-0.01		1.94	-0.03		1.94	-0.03
700	1.88		1.88	0		1.86	-0.02		1.85	-0.03
800	1.82		1.8	-0.02		1.7	-0.12		1.68	-0.14
900	0.75		0.71	-0.04		0.71	-0.04		0.67	-0.08
900B	0.94		0.9	-0.04		0.85	-0.09		0.81	-0.13
901	0.58		0.58	0		0.58	0		0.58	0
POND			1.8						1.68	-0.12
PROP_1	2.16		2.16	0		2.15	-0.01		2.15	-0.01
PROP_2	2.1		2.1	0		2.09	-0.01		2.09	-0.01
PROP_3	2.19		2.19	0		2.19	0		2.19	0
PROP_4	1.63		1.59	-0.04		1.48	-0.15		1.43	-0.2
PROP_5	1.49		0.81	-0.68		1.4	-0.09		0.78	-0.71
PROP_6	0.9		0.9	0		0.9	0		0.9	0
PROP_7	0.81		0.81	0		0.8	-0.01		0.8	-0.01
PROP_8	1.9		1.9	0		1.9	0		1.9	0

Kimley»Horn

LBK Village Node Max Comparison

2-year MHHW RECM Comparison

	RECM	Phase 1-4		Pond		Pump		Pump & Pond	
Node Name	Revised Exisitng Conditions Model	Phase 1-4	Δ Stage (ft)	Pond	Δ Stage (ft)	Pump	Δ Stage (ft)	Pump & Pond	Δ Stage (ft)
100	2.72	2.72	0	2.72	0	2.72	0	2.72	0
1000	1.8	1.22	-0.58	1.19	-0.61	1.17	-0.63	1.15	-0.65
1000B	1.78	1.15	-0.63	1.13	-0.65	1.11	-0.67	1.09	-0.69
1001	0.58	0.58	0	0.58	0	0.58	0	0.58	0
101	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1100	2.7	2.11	-0.59	2.06	-0.64	2.08	-0.62	2.05	-0.65
1200	1.91	0.74	-1.17	0.72	-1.19	0.73	-1.18	0.71	-1.2
1201	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1300	2.16	1.22	-0.94	1.22	-0.94	1.22	-0.94	1.22	-0.94
1301	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1400	2.15	1.16	-0.99	1.16	-0.99	1.16	-0.99	1.16	-0.99
1401	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1500	2.12	1.7	-0.42	1.69	-0.43	1.58	-0.54	1.55	-0.57
158	2.12	1.51	-0.61	1.49	-0.63	1.38	-0.74	1.36	-0.76
1600	2.12	1.7	-0.42	1.69	-0.43	1.57	-0.55	1.55	-0.57
1600B	2.07	1.66	-0.41	1.65	-0.42	1.49	-0.58	1.47	-0.6
1700	2.11	1.38	-0.73	1.35	-0.76	1.01	-1.1	0.98	-1.13
1701	0.58	0.58	0	0.58	0	0.58	0	0.58	0
1701A	2.01	1.41	-0.6	1.39	-0.62	1.02	-0.99	1	-1.01
179	2.12	1.16	-0.96	1.13	-0.99	0.94	-1.18	0.91	-1.21
1800	2.2	0.97	-1.23	0.97	-1.23	0.96	-1.24	0.95	-1.25
1900	2.16	1.74	-0.42	1.69	-0.47	1.7	-0.46	1.66	-0.5
200	2.11	0.69	-1.42	0.69	-1.42	0.69	-1.42	0.69	-1.42
201	0.58	0.58	0	0.58	0	0.58	0	0.58	0
300	2.05	0.72	-1.33	0.72	-1.33	0.72	-1.33	0.72	-1.33
400	1.98	0.66	-1.32	0.66	-1.32	0.66	-1.32	0.66	-1.32
401	0.58	0.58	0	0.58	0	0.58	0	0.58	0
500	2.13	1.93	-0.2	1.93	-0.2	1.88	-0.25	1.88	-0.25
500B	2.12	1.89	-0.23	1.89	-0.23	1.82	-0.3	1.82	-0.3
501	0.58	0.58	0	0.58	0	0.58	0	0.58	0
600	2.21	1.81	-0.4	1.81	-0.4	1.76	-0.45	1.75	-0.46
700	2.12	1.78	-0.34	1.77	-0.35	1.71	-0.41	1.69	-0.43
800	2.12	1.44	-0.68	1.45	-0.67	1.34	-0.78	1.36	-0.76
900	2.12	0.7	-1.42	0.67	-1.45	0.66	-1.46	0.64	-1.48
900B	2.12	0.85	-1.27	0.82	-1.3	0.75	-1.37	0.72	-1.4
901	0.58	0.58	0	0.58	0	0.58	0	0.58	0
POND				1.45				1.36	-0.09
PROP_1		2.11		2.11	0	2.11	0	2.11	0
PROP_2		2.04		2.04	0	2.03	-0.01	2.03	-0.01
PROP_3		2.14		2.13	-0.01	2.13	-0.01	2.13	-0.01
PROP_4		1.38		1.35	-0.03	1.21	-0.17	1.18	-0.2
PROP_5		1.21		0.73	-0.48	1.14	-0.07	0.71	-0.5
PROP_6		0.77		0.77	0	0.77	0	0.77	0
PROP_7		0.72		0.72	0	0.72	0	0.72	0
PROP_8		1.43		1.43	0	1.43	0	1.43	0

Kimley»Horn

LBK Village Node Max Comparison										
2-year MHHW PCM Comparison										
	Phase 1-4		Pond			Pump			Pump & Pond	
Node Name	Phase 1-4		Pond	Δ Stage (ft)		Pump	Δ Stage (ft)		Pump & Pond	Δ Stage (ft)
100	2.72		2.72	0		2.72	0		2.72	0
1000	1.22		1.19	-0.03		1.17	-0.05		1.15	-0.07
1000B	1.15		1.13	-0.02		1.11	-0.04		1.09	-0.06
1001	0.58		0.58	0		0.58	0		0.58	0
101	0.58		0.58	0		0.58	0		0.58	0
1100	2.11		2.06	-0.05		2.08	-0.03		2.05	-0.06
1200	0.74		0.72	-0.02		0.73	-0.01		0.71	-0.03
1201	0.58		0.58	0		0.58	0		0.58	0
1300	1.22		1.22	0		1.22	0		1.22	0
1301	0.58		0.58	0		0.58	0		0.58	0
1400	1.16		1.16	0		1.16	0		1.16	0
1401	0.58		0.58	0		0.58	0		0.58	0
1500	1.7		1.69	-0.01		1.58	-0.12		1.55	-0.15
158	1.51		1.49	-0.02		1.38	-0.13		1.36	-0.15
1600	1.7		1.69	-0.01		1.57	-0.13		1.55	-0.15
1600B	1.66		1.65	-0.01		1.49	-0.17		1.47	-0.19
1700	1.38		1.35	-0.03		1.01	-0.37		0.98	-0.4
1701	0.58		0.58	0		0.58	0		0.58	0
1701A	1.41		1.39	-0.02		1.02	-0.39		1	-0.41
179	1.16		1.13	-0.03		0.94	-0.22		0.91	-0.25
1800	0.97		0.97	0		0.96	-0.01		0.95	-0.02
1900	1.74		1.69	-0.05		1.7	-0.04		1.66	-0.08
200	0.69		0.69	0		0.69	0		0.69	0
201	0.58		0.58	0		0.58	0		0.58	0
300	0.72		0.72	0		0.72	0		0.72	0
400	0.66		0.66	0		0.66	0		0.66	0
401	0.58		0.58	0		0.58	0		0.58	0
500	1.93		1.93	0		1.88	-0.05		1.88	-0.05
500B	1.89		1.89	0		1.82	-0.07		1.82	-0.07
501	0.58		0.58	0		0.58	0		0.58	0
600	1.81		1.81	0		1.76	-0.05		1.75	-0.06
700	1.78		1.77	-0.01		1.71	-0.07		1.69	-0.09
800	1.44		1.45	0.01		1.34	-0.1		1.36	-0.08
900	0.7		0.67	-0.03		0.66	-0.04		0.64	-0.06
900B	0.85		0.82	-0.03		0.75	-0.1		0.72	-0.13
901	0.58		0.58	0		0.58	0		0.58	0
POND			1.45						1.36	-0.09
PROP_1	2.11		2.11	0		2.11	0		2.11	0
PROP_2	2.04		2.04	0		2.03	-0.01		2.03	-0.01
PROP_3	2.14		2.13	-0.01		2.13	-0.01		2.13	-0.01
PROP_4	1.38		1.35	-0.03		1.21	-0.17		1.18	-0.2
PROP_5	1.21		0.73	-0.48		1.14	-0.07		0.71	-0.5
PROP_6	0.77		0.77	0		0.77	0		0.77	0
PROP_7	0.72		0.72	0		0.72	0		0.72	0
PROP_8	1.43		1.43	0		1.43	0		1.43	0

APPENDIX E: FEMA FACT SHEET - Acquisition of Property After a Flood Event

FACT SHEET: Acquisition of Property After a Flood Event

Release Date: November 13, 2018

If your home is flooded as a result of Hurricane Florence or has flooded repeatedly in the past and you are hoping for a buyout, there is some important information you should know.

After a presidentially declared disaster, local officials may decide to request money from the state to purchase properties that have either flooded or been determined substantially damaged.

The decision to offer buyouts is made by the state using money that FEMA allocates through its Hazard Mitigation Grant Program to reduce future disaster losses. Seventy-five percent of any buyout cost is paid by FEMA and the rest is paid by the state and/or local government.

It is not a simple process and requires agreement by your local government officials, the state and FEMA. It is important to note that many flooded properties don't qualify for a buyout, funding is limited and requests for funding may exceed available resources.

Buyouts are voluntary and no one is required to sell their property. It is a lengthy process and many factors are taken into consideration before a decision is rendered. What are the factors?

- After a disaster, the state sets priorities for how it will spend its FEMA mitigation funds and this may or may not include the acquisition of properties.
- Local officials will make the decision whether to request funds from the state to acquire flooded properties and owners interested in a buyout will express their interest via their local emergency manager or floodplain administrator.
- The state will review the requests and will determine the communities that will be considered for buyouts.
- Communities interested in buyouts will submit letters to the state and the state will review the proposals.
- FEMA will review all proposals and ensure that they follow regulation and are environmentally sound and cost-effective.

How do I know if my property is eligible?

Local officials will make the determination whether your home will be included in the request for buyout. The purpose of a buyout is to mitigate against future flood losses. To be eligible, properties usually are in Special Flood Hazard Areas and are primary residences.

My home is determined eligible, so what is next?

If a home is eligible for acquisition, the homeowner is offered a pre-disaster fair-market value for the property as determined by a certified appraiser. There is an appeals process available for homeowners who disagree with the appraisal value of the property.

Before the homeowner can receive funds from the sale, funds received and not used to repair the home from FEMA's Individual Assistance or flood insurance will be deducted. Homeowners are strongly encouraged to keep all receipts for repairs they have made to ensure accuracy of deductions.

If the homeowner still owes a mortgage on the home, the balance due will be deducted and paid to the lienholder. After required payment(s) have been made, the structure is then demolished and the land is deeded to the local government with its use restricted to open space. The land must remain open in perpetuity.

Projects that are not approved because of limited funding are kept on file in the event that funding becomes available in the future.

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