



North Beach

Church Point

Chubb Lake

Shore Drive

Thoroughgood



LAKE BRADFORD/CHUBB LAKE DRAINAGE STUDY

November 2021 | CIP 7-053 (100229)



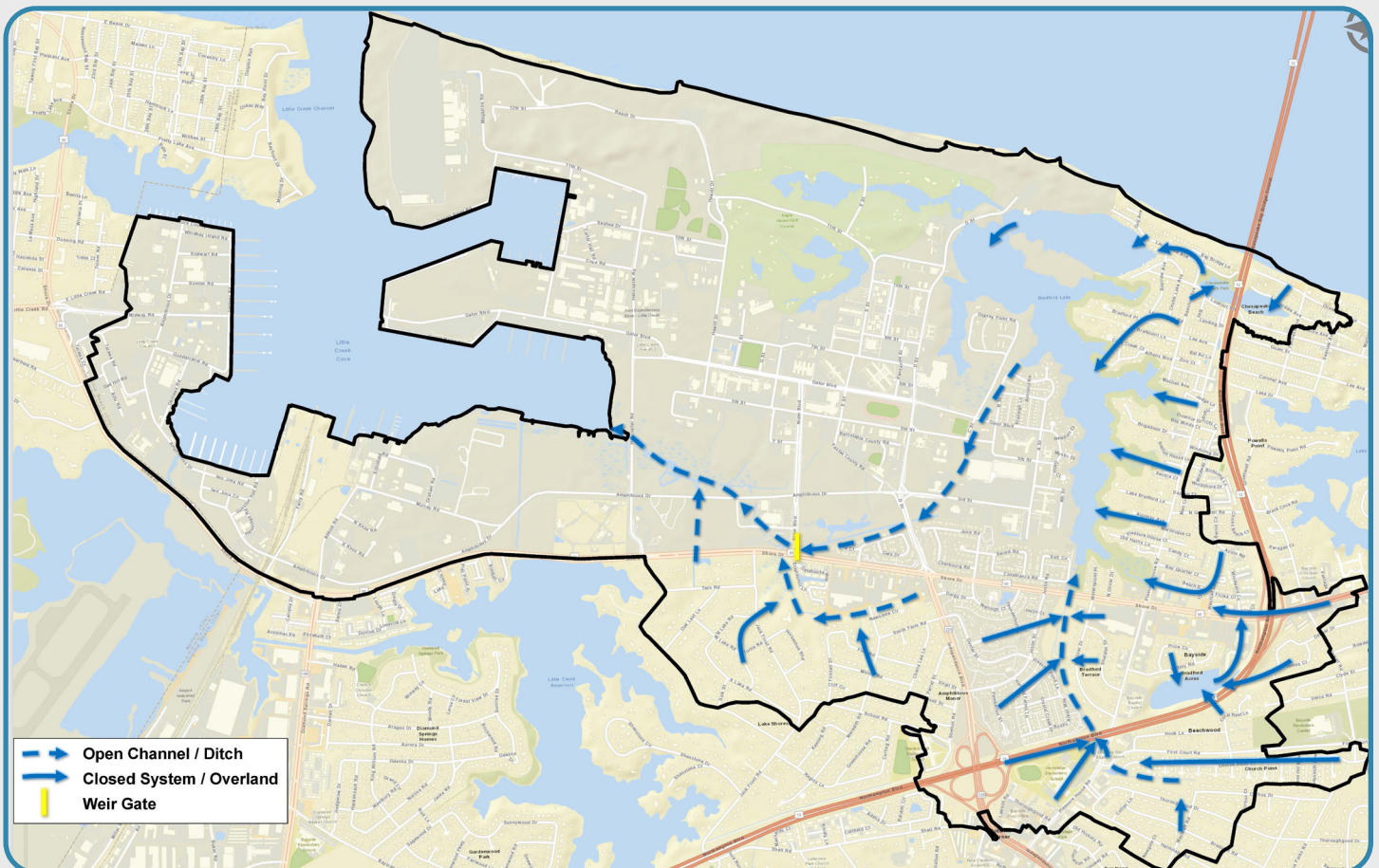
The Lake Bradford/Chubb Lake Drainage Improvements Project is a multi-phase program, initiated after Hurricane Matthew (2016), to mitigate flooding that occurs with moderate to heavy rainfall and tidal events.

Lake Bradford and Chubb Lake are located within the northwest part of Virginia Beach adjacent to Joint Expeditionary Base (JEB) Little Creek and Chesapeake Beach. Stormwater conveyance systems within the watershed drain to these lakes. From there, water enters a channel leading to Little Creek Cove west of JEB Little Creek. Located along this channel is a “weir gate”, used to maintain the water level in Lake Bradford and Chubb Lake.

Flooding in the program area is caused by both tidal influence and undersized conveyance systems.

If a moderate rain event occurs during high tide, Lake Bradford/Chubb Lake does not have enough storage capacity to accommodate both the tidal influx and the excess stormwater. Stormwater conveyance systems throughout the watershed are also lacking capacity, and frequent flooding is a significant issue within many neighborhoods, as well as along several major roadways.

An integrated systematic approach will be used to mitigate flooding. Since flow traveling through the conveyance system is cumulative, the upstream and downstream impacts of several alternatives needed to be evaluated before drainage improvement recommendations could be determined.



Drainage from the upstream areas in the watershed drain to Lake Bradford and Chubb Lake. Lake Bradford/Chubb Lake then drains through a channel located on JEB Little Creek, and ultimately drains to Little Creek Cove. A “weir gate” is located along the channel just upstream of Nider Boulevard.

Who operates the weir gate?

- The “weir gate” is operated by JEB LC personnel.
- The City of Virginia Beach Public Works Operations and JEB LC coordinate the operation of the “weir gate” to maintain the water levels of Lake Bradford and Chubb Lake.
- The City of Virginia Public Works Operations also coordinate with JEB LC to drawdown the water level of the lakes ahead of major storm events.

What are the benefits of the “weir gate”?

- The closed position blocks all tidal impacts, up to elevation 4.36 feet (NAVD88) - the top of the “weir gate” in the closed position, from affecting Lake Bradford/Chubb Lake and the upstream drainage area. Blocking the tidal impacts provides storage in Lake Bradford and Chubb Lake.

- Prior to major storm events, the “weir gate” can be operated in the open position to draw down the water levels of Lake Bradford and Chubb Lake to increase the storage capacity of the lakes.

How is the “weir gate” operated?

- Generally, the “weir gate” is in the closed position.
- The operation includes specific elevations when the “weir gate” is opened and closed.
- The “weir gate” has a sensor located in Lake Bradford/Chubb Lake that controls its operation. The “weir gate” is opened once the water level sensor reads an elevation of 4.06 feet (NAVD88) and the gate is closed once water level sensor reads an elevation of 3.46 feet (NAVD88).
- Ahead of significant storm events, the “weir gate” will be opened to draw down the water levels of Lake Bradford and Chubb Lake.



EXISTING “WEIR GATE” – CLOSED POSITION

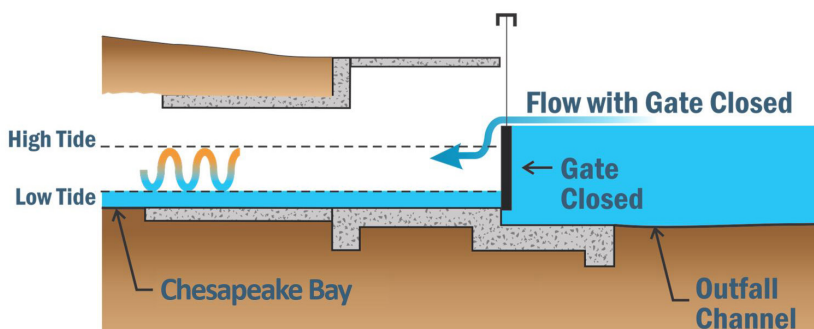
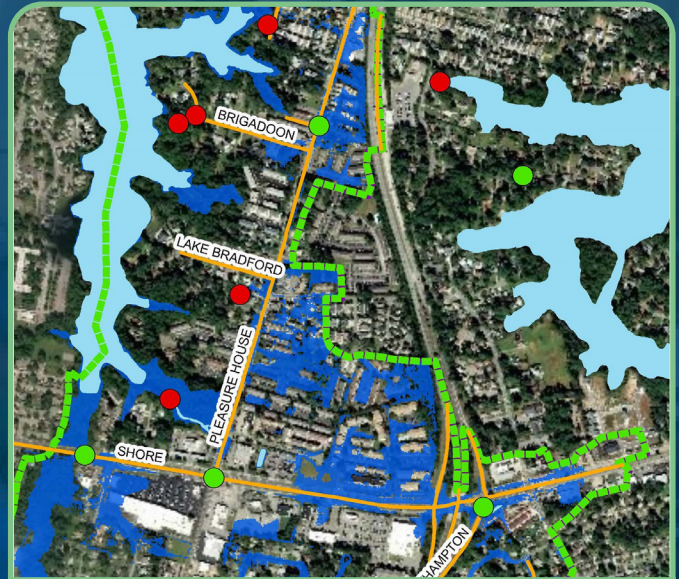


FIGURE: When the “weir gate” is in the closed position, Lake Bradford/Chubb Lake outfalls by flowing over the top of the gate. This position blocks tidal impacts, up to elevation 4.36 feet, from affecting Lake Bradford/Chubb Lake and the upstream drainage area.

CHALLENGES

- Low elevations
- Aging infrastructure
- Lack of stormwater storage
- Tidally influenced
- Current watershed outfall located on military base
- Increased frequency and severity of storm events



Flooding Map

Dots represent reported flooding

POTENTIAL SOLUTIONS

- Increasing the conveyance capacity of stormwater pipes
- Managing tidal influence
- Additional stormwater storage
- Construction of stormwater pumping stations



Typical Stormwater Pump Station



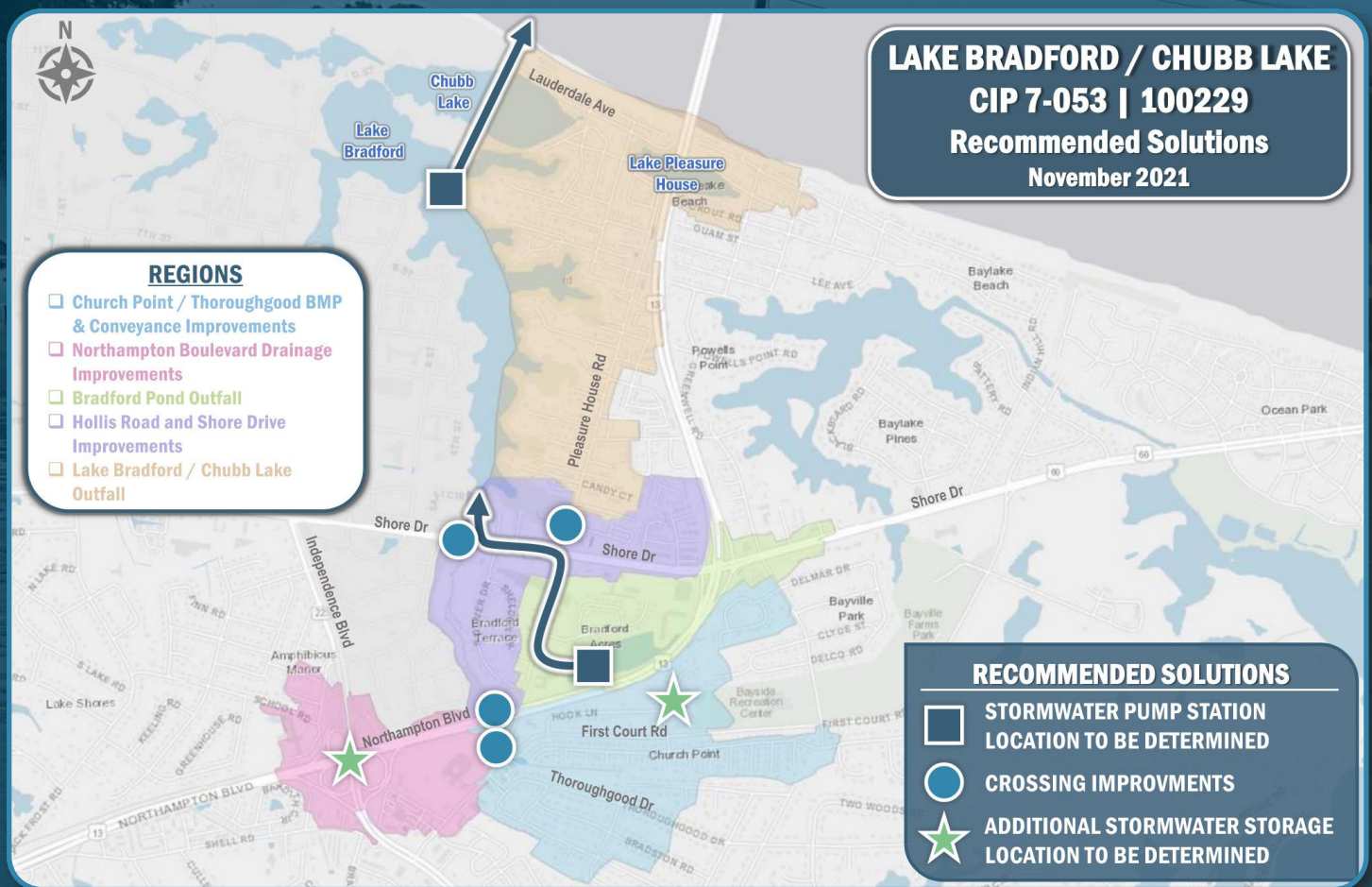
Typical Stormwater Pond

An extensive engineering analysis was conducted to develop recommended solutions to mitigate the flooding of structures and streets within the program area.

Structural, property, and roadway flooding has been reported within the neighborhoods of the program area. Additionally, Northampton Boulevard, Pleasure House Road, and Shore Drive are three major arterial roadways located within the program area impacted by flooding. These roadways provide access to numerous neighborhoods, Joint Expeditionary Base Little Creek - Fort Story, the

Chesapeake Bay Bridge Tunnel, and provide an east-west vehicle connection between the northern areas of Norfolk and Virginia Beach.

The extensive engineering analysis identified several recommended solutions utilizing the rainfall values and tidal elevations in accordance with the requirements of the Public Works Design Standards Manual (PWDSM). Potential solutions include but are not limited to, a combination of stormwater pump stations, tide gates, culverts, stormwater ponds, channels, and additional storm drains throughout the watershed.



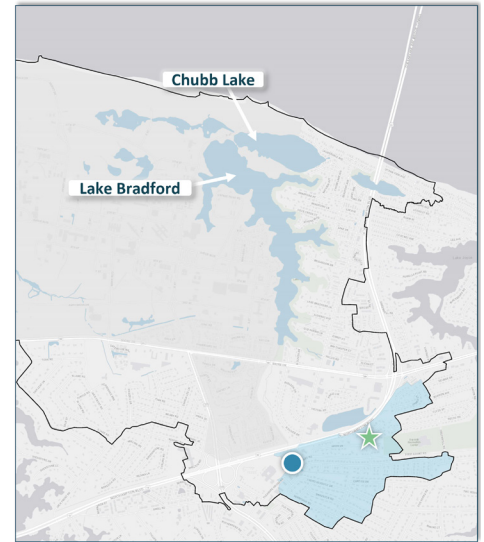
RECOMMENDED SOLUTIONS INCLUDE:

- Four major roadway crossings
- Two pump stations
- 47 acre-feet of stormwater storage
- One tide gate
- Additional storm drain inlets and pipes

Each project will be an incremental benefit to the program area. The goals and objectives of this program require the construction of all recommended improvements. As a whole, the construction of the recommended improvements mitigate simulated flooding of 93 structures and over 12,000 linear feet of roadway.

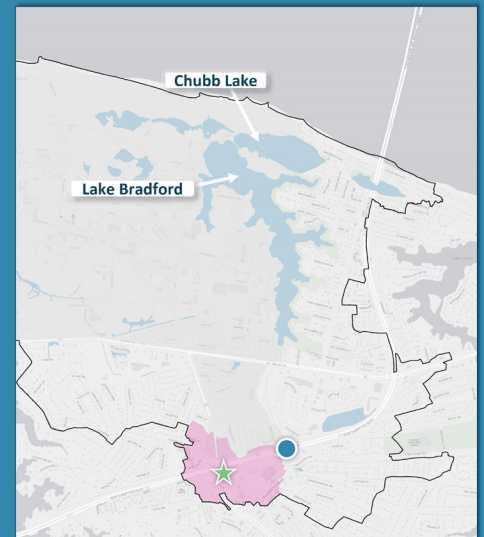
CHURCH POINT / THOROUGHGOOD BMP AND CONVEYANCE IMPROVEMENTS

- Additional stormwater storage (location to be determined)
- Pleasure House Road crossing improvement
- Additional storm drain inlets and pipes
- * The recommended solution will not be constructed until the recommended downstream Lake Bradford pump station is operational



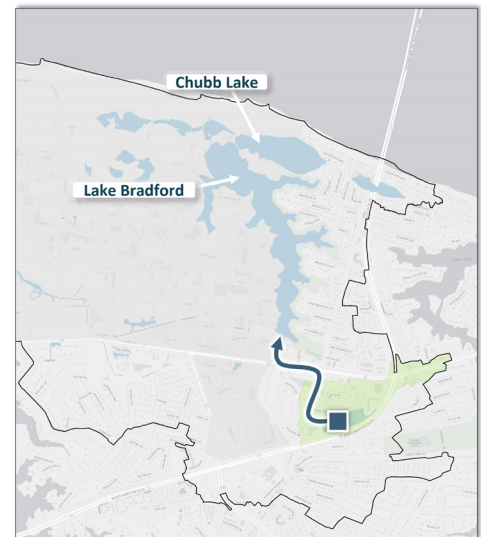
NORTHAMPTON BOULEVARD DRAINAGE IMPROVEMENTS

- Additional stormwater storage (location to be determined)
- Northampton Boulevard crossing improvement
- Additional storm drain inlets and pipes
- * The recommended solution will not be constructed until the recommended downstream Lake Bradford/Chubb Lake pump station is operational



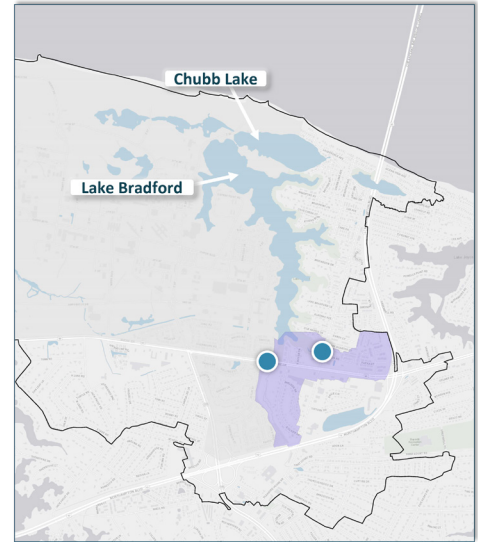
BRADFORD POND OUTFALL

- Stormwater pump station for Bradford Acres pond (location to be determined)
- Force main discharge to Lake Bradford/Chubb Lake
- Additional storm drain inlets and pipes
- * The recommended solution will not be constructed until the recommended downstream Lake Bradford/Chubb Lake pump station is operational



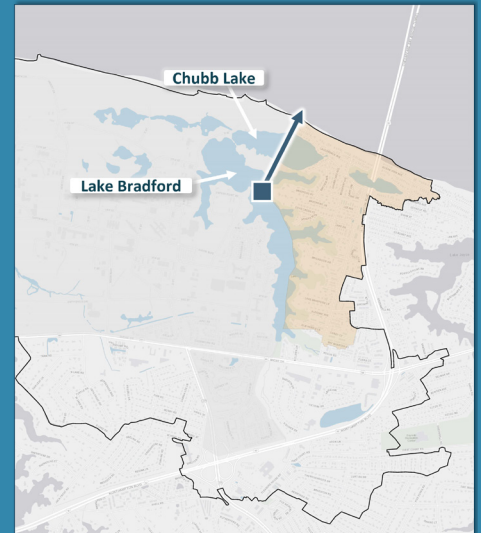
HOLLIS ROAD AND SHORE DRIVE IMPROVEMENTS

- Shore Drive storm pipe crossing improvement
 - Pleasure House Road storm pipe crossing improvement
 - Hollis Road storm drain improvements
 - Additional storm drain inlets and pipes
- * The recommended solution will not be constructed until the recommended downstream Lake Bradford pump station is operational



LAKE BRADFORD / CHUBB LAKE OUTFALL

- Stormwater pump station for Lake Bradford/Chubb Lake (location to be determined)
- Force main outfall to the Chesapeake Bay
- Stormwater pump station must be operational before upstream projects can be constructed



NOTES:



CONTACT INFORMATION

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Project Manager

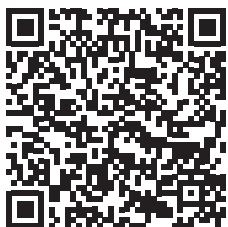
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Please complete the online survey available on the project website by scanning the QR code or visiting the following web address:

www.vbgov.com/LakeBradford