# Windsor Woods Drainage Project Thalia Creek Tide Gate
CIP 7-028

Windsor Woods is a neighborhood located in what was once the undeveloped headwaters of the Lynnhaven River. According to aerial photos from 1949, the area was originally forest surrounded by farmland. Much of the area has relatively low elevations and lies within FEMA's 100-year floodplain. The infrastructure is approximately 50 years old and storm drain standards were not as stringent and pipe sizes were not as large as the current construction standards. To relieve wide-spread flooding problems, this area needs pumping improvements, tidal protection, additional stormwater storage capacity and extensive storm drain improvements. The proposed Thalia Creek Tide Gate is one of many infrastructure projects planned for the Windsor Woods area to mitigate flooding.
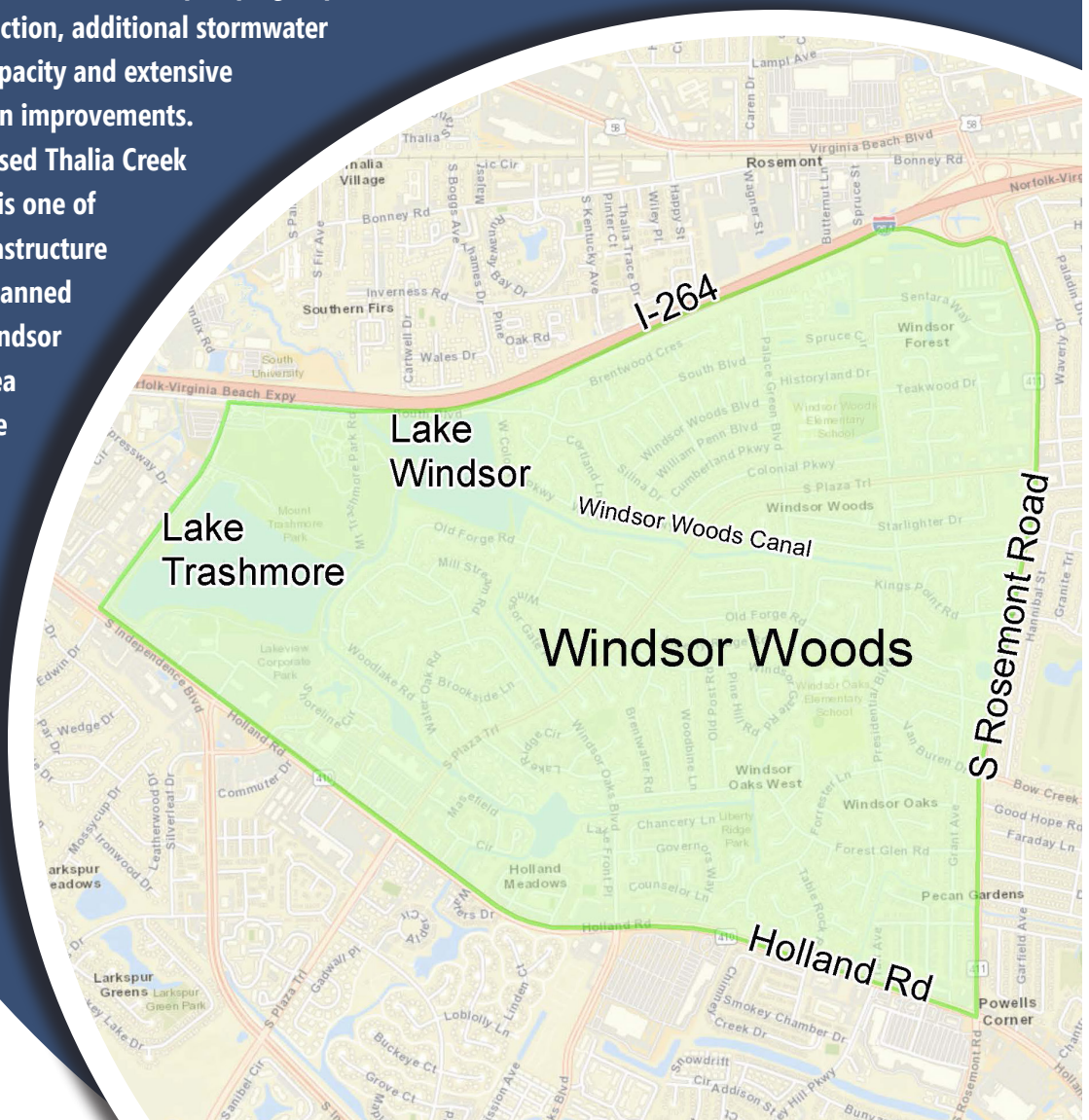
Beginning with the FY18 budget, the City Council approved initial funding to develop a multi-year program to mitigate flooding in Windsor Woods. The first phase is the engineering analysis to develop the specific program of flood mitigation measures. This will identify the needed improvements, the cost of those improvements, a plan that spells out what needs to be implemented, what each phase will be, and what environmental permitting is required. The preliminary analysis has identified some potential solutions to include:

- Addition and replacement of stormwater pipes with larger pipes to improve flow
- Construction of tide **gates** and barriers to minimize tidal flooding
- Construction of a stormwater pumping station
- Additional lake storage capacity

One important initial project is constructing a tide gate across Thalia Creek to block high tides during significant storm events.

Lake Windsor is influenced by
the incoming tide and stormwater runoff

Why is a tide gate needed?
Significant issues in the Windsor Woods service area include:
- Low elevations
- Stormwater pipes that are too small for current standards
- **High tides resulting in significant reduction of storage in Lake Windsor**
- Intense storm events have resulted in more frequent flooding and increased property damage

Significant portions of Windsor Woods are within FEMA's 100-year floodplain. Additional storage is needed to capture stormwater runoff. A tide gate on Thalia Creek is important because it will block incoming tides and provide for storage of stormwater behind the tide gate. Figure 2 illustrates the water level at low tide (green) and the water level at high tide caused by the incoming tide (red).

When it rains in the Windsor Woods neighborhood, the rain enters the stormwater pipes and flows into Lake Windsor. The water level in Lake Windsor rises (see Figure 3) and the resulting rise in the water elevation contributes to flooding. Blocking the incoming tide and eliminating the tide influence creates storage capacity in Lake Windsor (see Figure 4).

How will the gate be operated?
The tide gate will normally be open and so the natural ebb and flow (rise and fall) of the tide in Thalia Creek and in Lake Windsor will not be altered. When significant rains are anticipated (hurricanes, nor'easters, etc.), **the tide gate will close at low tide**. When tidal flow reverses and moves inland (i.e. at high tide), tidal water inflow into Thalia Creek is blocked by the closed gate. This retains the available storage in the lake (see Figure 4).

What are the benefits of the gate?
- The closed gate will block the incoming tidal water inflow into Thalia Creek and therefore into Lake Windsor; the Lake Windsor elevation is lower than it would normally be at high tide, as shown in Figure 4. This lower elevation provides storage capacity for incoming stormwater flows due to a rain event.
- In addition to the tide gate, interim pumping will be installed to lower the elevation of Lake Windsor after the tide gates are closed to increase storage capacity.
- During a rainstorm event, pumping will continue so that water captured and stored in Lake Windsor will be pumped downstream into Thalia Creek.

When the tide gate is closed and blocking the incoming high tide, will the closed gate (blocked tide) cause flooding down-stream along Thalia Creek?
The closing of the gate will not cause flooding downstream along Thalia Creek. The rise and fall of the tides is caused by the combined effects of the gravitational forces exerted by the moon and the sun, and the rotation of Earth. The Earth rotates through two tidal changes every day and coastal areas such as Virginia Beach experience two high and two low **tides** every day.

Closing the tide gate does not change the elevation (height) of the downstream tide levels as those are controlled by the water level in the Chesapeake Bay and the Atlantic Ocean. So closing the gate will not increase water levels along Thalia Creek. If a stacked tide is occurring in the Lynnhaven River, the closed tide gate will not increase the stacked tide levels.
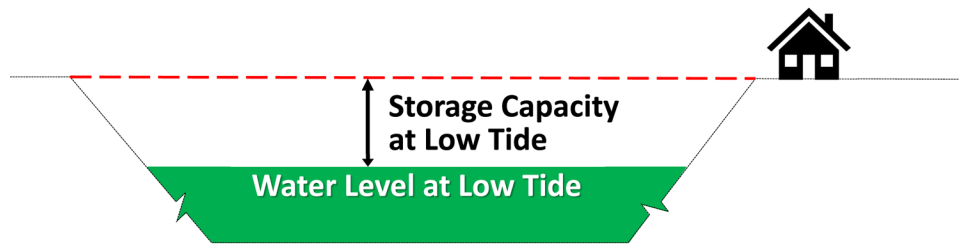
Lake Windsor Thalia Creek Tide Gate

Figure 1. The water level of Lake Windsor drops as the tide flows out (low tide conditions). Therefore at low tide, storage capacity is increased for stormwater flows due to a rain event.

Figure 2. At high tide (shown in red), the storage capacity in Lake Windsor is dramatically reduced.
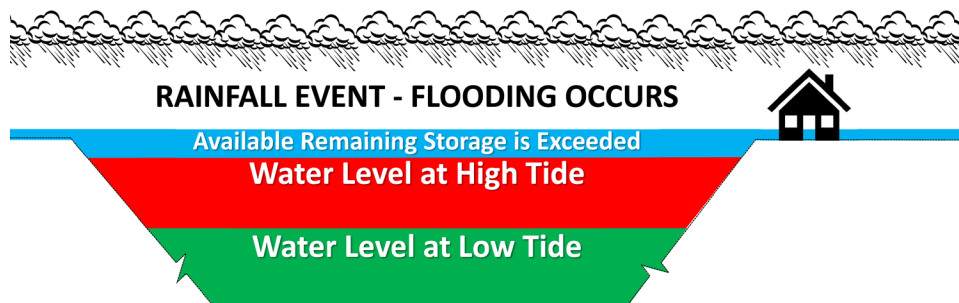

Figure 3. When it rains, stormwater flows into Lake Windsor. With limited or no storage available, the level of the lake rises and stormwater in the storm drain pipes has nowhere to go. That's when flooding occurs in the neighborhoods.

Figure 4. Storage capacity for stormwater (shown in blue) is available when the incoming tide is blocked. When the tide gate closed at low tide, the incoming tide is blocked and therefore storage capacity in Lake Windsor is available for stormwater flows.

Where is the proposed location of the tide gate?

The location of the tide gate is across Thalia Creek just south of I-264 on the City-owned Mount Trashmore Park property, as shown at right.

What are the dimensions of the tide gate?

The height is 12.5 feet. The length of the tide gate structure across Thalia Creek is 60 feet.

Proposed Tide Gate Location

Thalia Creek Tide Gate Rendering

Example of Interim Pumping Facilities, photo courtesy of Baker Corporation

FOR MORE INFORMATION, CONTACT:
Michael S. Bumbaco III, PE
Stormwater Project Manager
City of Virginia Beach
Department of Public Works
Municipal Center - Building 23
2473 North Landing Road, Room 139
Virginia Beach, VA 23456
Phone: 757-385-4131
Email: papww@vbgov.com
www.vbgov.com/windsor-woods