



Vanasse Hangen Brustlin, Inc.

Two Columbus Center
4500 Main Street, Suite 400
Virginia Beach, Virginia 23462
Telephone 757 490 0132
Fax 757 490 0136

Memorandum

To: File
Date: February 15th, 2013
Project No.: 31311.62
From: John D. Hines, P.E.
Re: Old Dominion University
Campus Master Plan
Sea Level Rise Narrative

Sea Level Rise Existing Conditions Assessment

Background:

The following documents informed the narrative and associated figures:

- Report of the Virginia Institute of Marine Science (VIMS) – Recurrent Flooding Study for Tidewater Virginia (SJR 76, 2012)
- Old Dominion University – Climate Change and Sea Level Rise Initiative, February 21, 2012 – PowerPoint from City of Norfolk website.
- Preliminary City Wide Coastal Flooding Mitigation Concept Evaluation and Master Plan Development – City of Norfolk Public Works (Consultant – FUGRO Atlantic).
- VA Construction and Professional Services Manual 2012 Edition (CPSM)
- City of Norfolk GIS data, circa 2009 (LIDAR contours)

Sea Level Rise: The effect of thermal expansion (as ocean water warms, it expands), land based ice melting and movement of water in the ocean causing the tidal elevations to increase in relation to a land based datum.

Subsidence: The motion of a surface (usually, the Earth's surface) as it shifts downward relative to a datum such as sea-level.

Constraints for buildings situated within 100-year flood zones:

Per the CPSM Chapter 4, section 4.7, and further defined by Executive Memorandum 2-97, State Building Construction in the Floodplain must provide (unless granted a variance by the director of DEB):

1. Reasonable or economically justified alternatives must not exist
2. The lowest floor elevation is elevated, or flood proofed, two feet above base 100-yr flood elevation
3. Reasonable access during flood events is demonstrated (i.e. typically a flood proof pathway must be created from the building to adjacent lands above the 100-yr flood for safe passage)

Having an understanding of climate change impacts for the purposes of master planning long term development is paramount. Many studies have been done on Sea Level rise in the world and in the United States. Documentation of data available for both Sea Level Rise and Subsidence cannot be denied. Hampton Roads is subject to both of these constraints for development.

While data is still being processed and refined, it is obvious that the risk of flooding in low lying areas of Hampton Roads is increasing. Specifically, the City of Norfolk is anticipated to see some of the worst flooding due to Sea Level Rise due to its adjacency to tidal waters of the Chesapeake Bay. Old Dominion University is situated between two tidal rivers, the Lafayette River and the Eastern Branch of the Elizabeth River. In order to address future flooding concerns on campus, and minimize risk of flooding, we have prepared a list of action items for the plan:

Assessment:

For the purposes of this assessment, *Figure 2: Current Floodplain Map* illustrates the formal FEMA Flood Maps, with a 100-year storm elevation of 7.6' (NAVD 1988 Vertical Datum).

Figure 3: Projected Future 100-YR Floodplain Map shows the effects of Sea Level Rise on Old Dominion University within the next 25 to 50 years. The anticipated 100-yr flood elevation will rise by roughly 1.5' (to elevation 9.1' on NAVD 1988 Vertical Datum). All areas of campus will be impacted representing approximately 25 percent of the main campus.

Figure 4: Project Future Floodplain Map shows the ground elevation at 2.0' above the existing 100-YR floodplain elevation (to elevation 9.6' on NAVD 1988 Vertical Datum). All areas of campus will be impacted representing approximately 40% of the main campus.

It is anticipated that unless major federal, state and/or municipal projects are undertaken to reduce the impact of sea level rising, the impact to campus will continue to worsen, according to the VIMS study.

Key Issues:

1. Approximately 25% of the main campus is predicted to be within a rising 100-year flood plain within the next 25-50 years. Development restrictions should be imposed in these areas.
2. Continue to support local, regional and federal comprehensive planning efforts now to mitigate impacts over the next 25-50 years.
3. Identify low lying areas prone to flooding both currently, and with projected flood increases due to Sea Level Rise and Subsidence.
4. Future design guidelines for the campus must address plans and structures that will be adaptable to varying scenarios of flood impacts in the future.
5. Long term developments (i.e. Major Buildings, Sports Complexes, and Infrastructure) should be sited outside of the projected 2050 flood plain area to the extent possible and should include appropriate mitigations for future intrusion of the flood plain into the campus. These mitigation measures should include raising the finish floor elevation and adjacent ground, developing buildings over ground floor parking structures, raising bulkheads where feasible and using some recreational areas as flood confinement areas. Other mitigation techniques will be investigated prior to finalization of the Plan.

Legend

APPROXIMATE LIMITS OF
OLD DOMINION UNIVERSITY PROPERTY

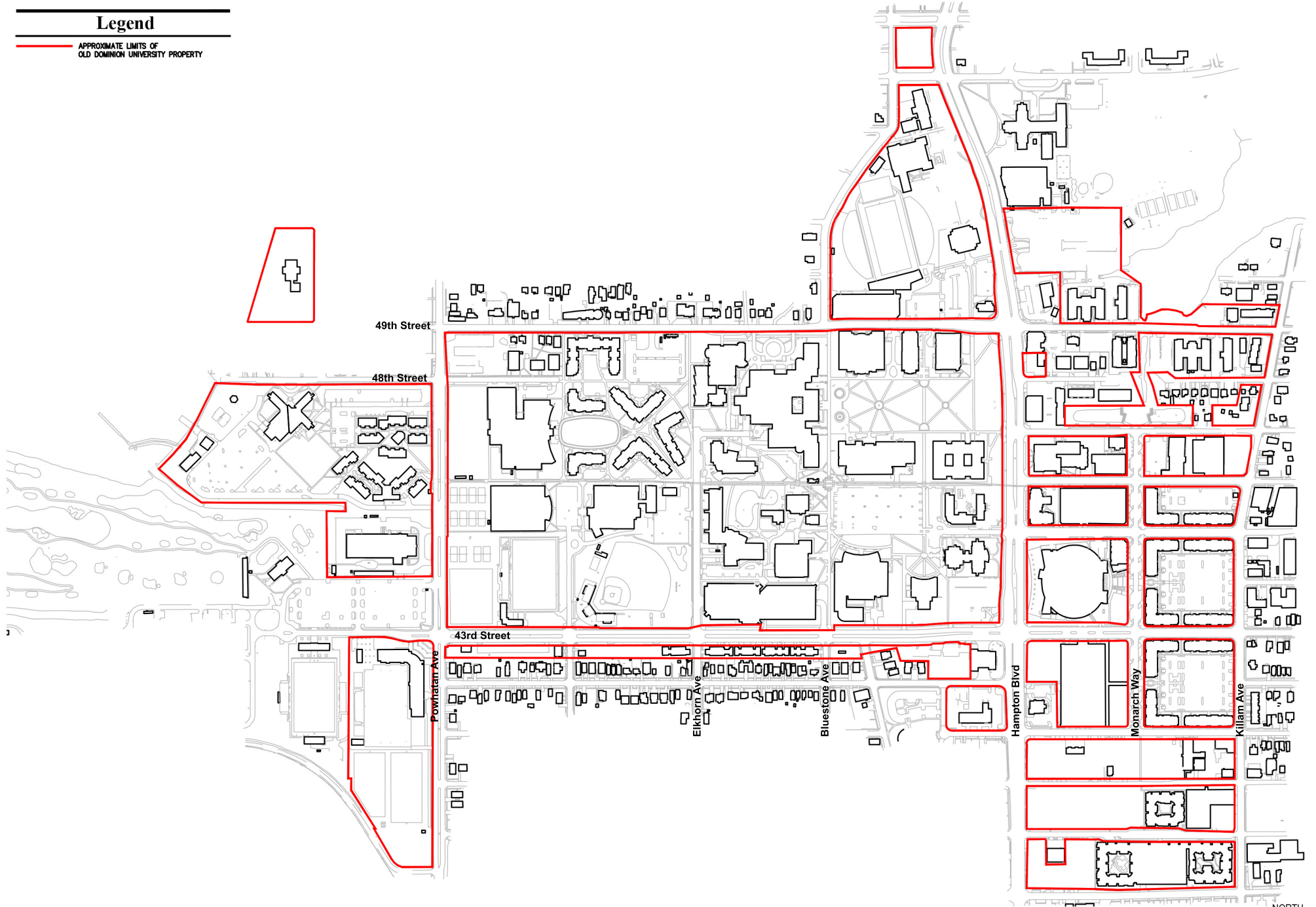
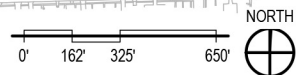


Figure 1
Overall Campus Map



Legend

CURRENT 100 YEAR FLOODPLAIN ELEV=7.6

Note

CONTOURS SHOWN PER 2009 CITY OF NORFOLK GIS TOPO (LIDAR) ELEVATIONS ARE BASED ON NAVD 1988

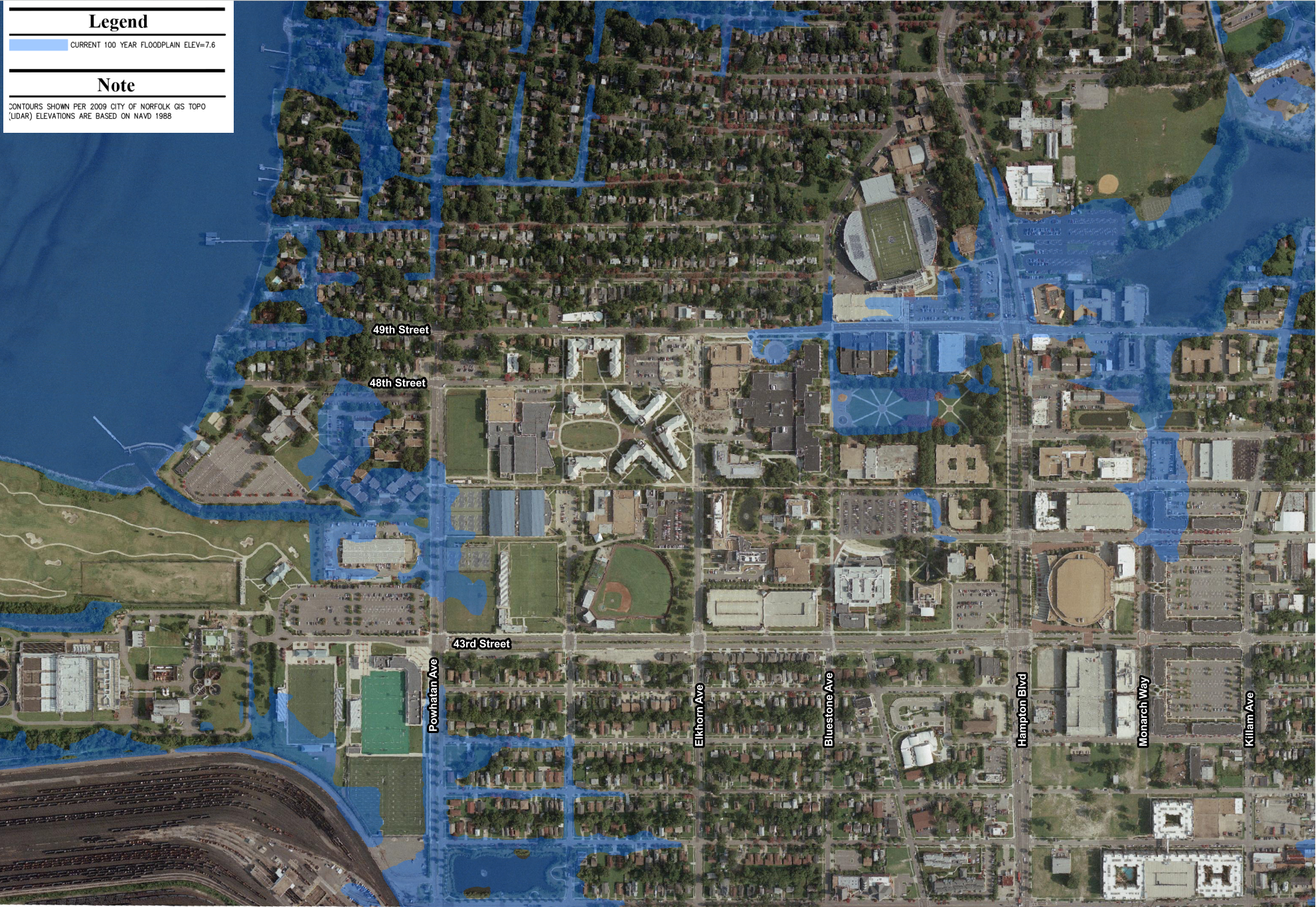
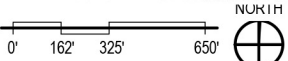


Figure 2
Current 100 Year Floodplain Map
(Elev 7.6')



Legend

PROJECTED FUTURE 100 YEAR FLOODPLAIN
DUE TO SEA LEVEL RISE ELEV=9.1

Note

CONTOURS SHOWN PER 2009 CITY OF NORFOLK GIS TOPO
(LIDAR) ELEVATIONS ARE BASED ON NAVD 1988

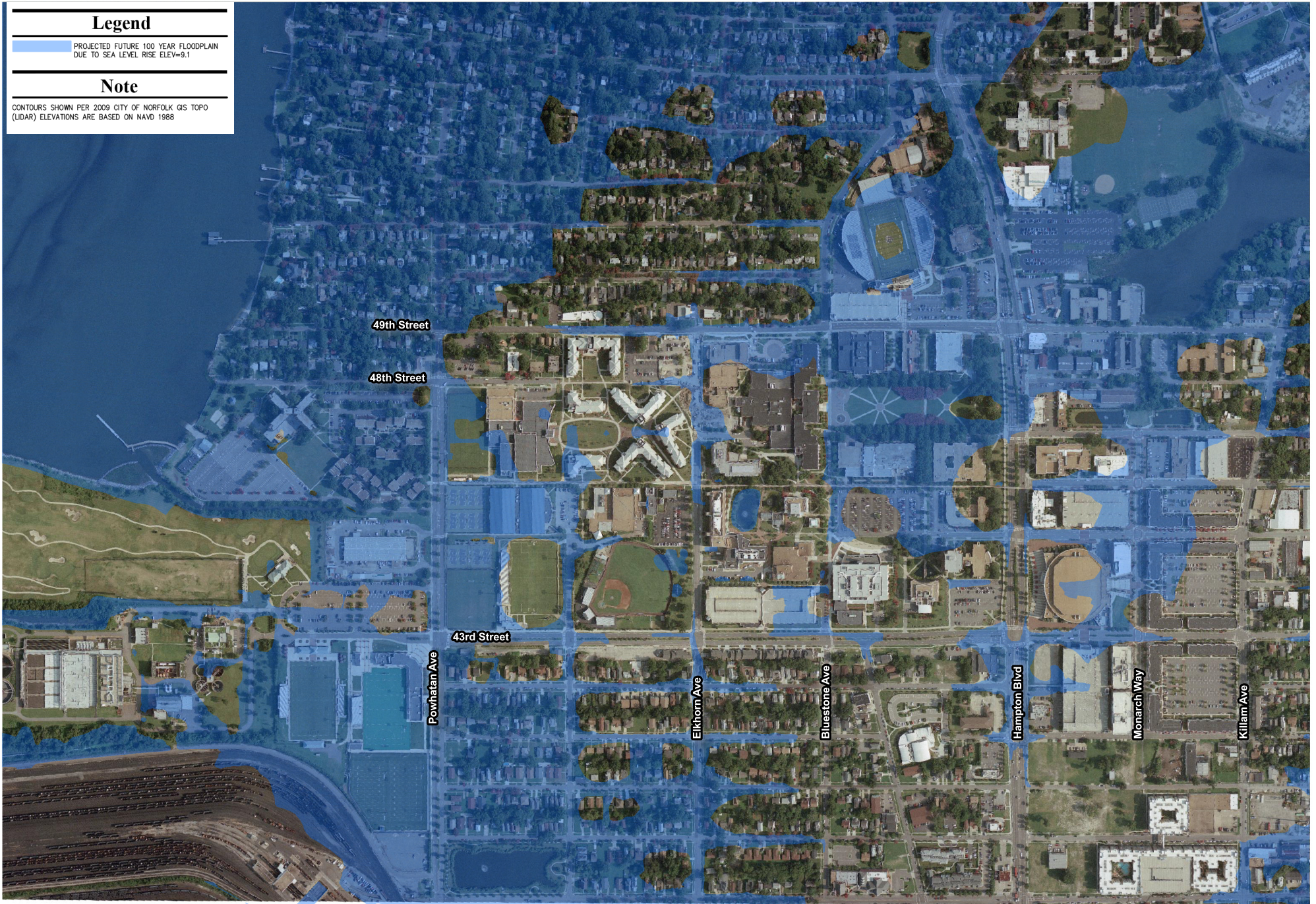


Figure 3
Projected Future 100 Year Floodplain Map
(1.5' Sea Level Rise Elev 9.1)

Legend

2 FEET ABOVE CURRENT 100 YEAR FLOODPLAIN ELEV=9.6

Note

CONTOURS SHOWN PER 2009 CITY OF NORFOLK GIS TOPO (LIDAR) ELEVATIONS ARE BASED ON NAVD 1968

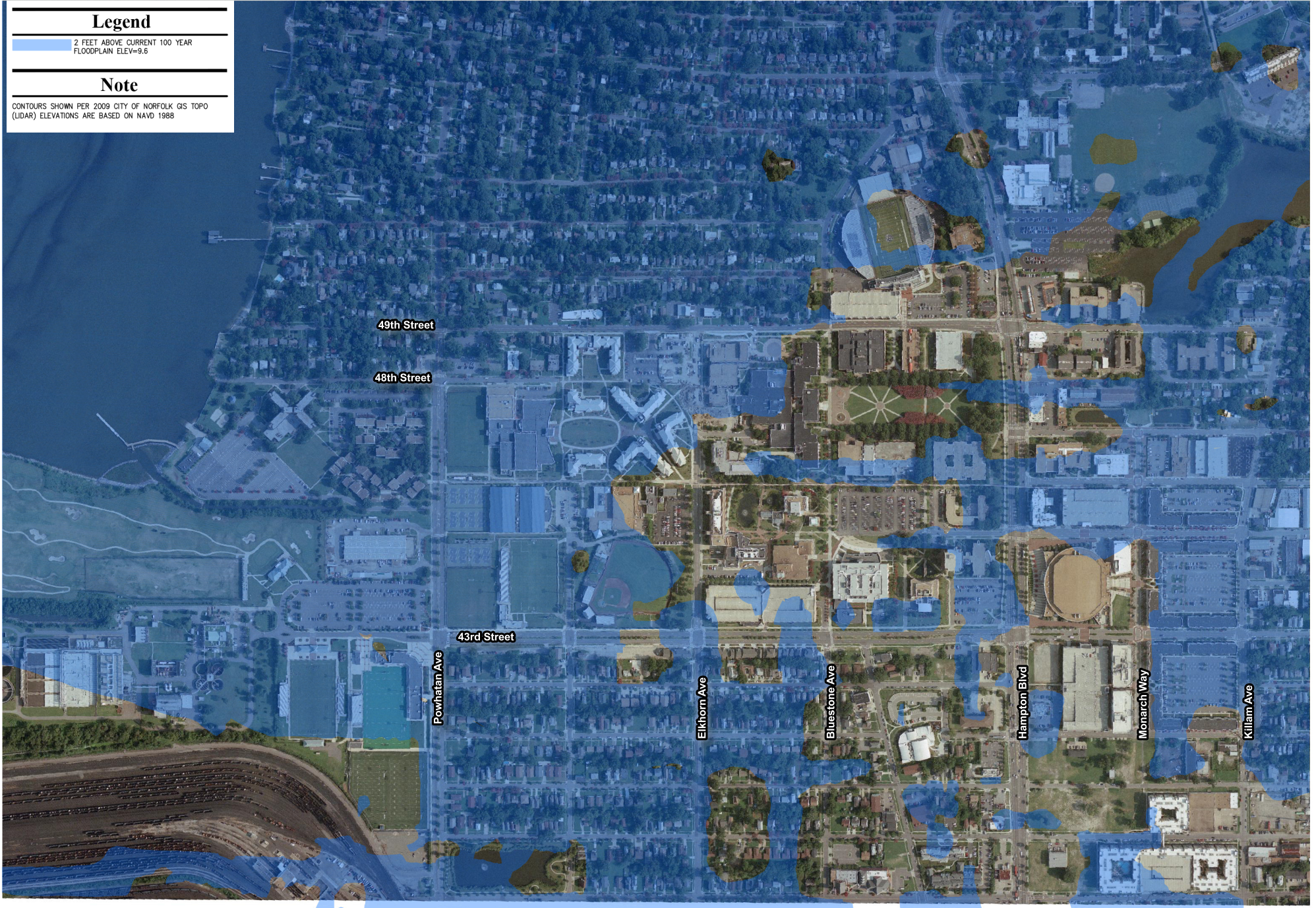


Figure 4
Projected Future 100 Year Floodplain Map
(2.0' Above Current Floodplain Elev 9.6)

