2021 Water and Wastewater Servicing Plan Update

Tuesday, May 9, 2023

BluePlan ENGINEERING

Niagara Region

2021 Master Servicing Plan Update (MSPU)

> ***The 2021 Master Plan Update will identify and develop a long-term water and wastewater servicing strategy and capital forecast to ensure level of service for existing and future residents and businesses. This will support future growth in the community to 2051 and consider potential impacts beyond 2051.***

With an updated planning horizon to 2051, the 2016 Master Servicing Plan needs to be updated to determine how the Region's water and wastewater infrastructure will establish a cost effective infrastructure program that meets the service needs of existing and future users, meets regulatory and legislative requirements, supports growth in a sustainable and responsible manner, and addresses the priority areas of climate change, energy management, infrastructure optimization, system security, and resiliency.

Niagara Region has completed several updates to the Water and Wastewater Master Plan (MSPUs). The most recent 2016 MSPU, completed in 2017, looked at servicing planned growth to year 2041.

Planning and Servicing Context

- Master Servicing Plan Update (MSPU) based on addressing growth to the year 2051 planning horizon with strategic consideration for potential build out requirements
- MSPU focused on municipally serviced systems (excluding Wainfleet)
- Population and Employment Forecasts based on Region led process:
  - 2051 Region Population – **694,000 people**
  - 2051 Region Employment – **272,000 jobs**

Supporting MSPU Policies:

- Reserve capacity
- Resiliency, reliability, security
- Climate change and energy use
- Operational flexibility
- Wet weather management
- Environmental protection and Guideline F-5-5

2021 MSPU Key Updates

- Design Criteria Analysis
  - Water per capita reduced from 300 Lpcd to 248 Lpcd equivalent (17% reduction)
  - Wastewater per capita reduced from 275 Lpcd to 267 Lpcd equivalent (3% reduction)
  - Wastewater extraneous flow adjusted from 0.286 L/s/ha to 0.286 L/s/ha for new growth areas only and 0.4 L/s target for existing areas
- Cost Estimating Enhancements
  - Base unit costs indexed by 4% per year from 2016 MSPU
  - Property costs updated based on current market conditions
  - Utilize recent studies for detailed estimates (SNF)
  - Utilize perspective from construction projects in Niagara and other Regions
  - Update project components (Internal project costs, Odour control, Facility impacts, …)

Wet Weather Flow Reduction Program

- Strategic identification of wet weather flow reduction opportunities based on historical flow monitoring and modelling
- The Region currently, and will continue to implement a funded program to deliver projects in collaboration with the Local Area Municipalities to address wet weather flow reduction
- Projects can range from:
  - Flow monitoring
  - Hydraulic analysis
  - System testing (inspections, condition assessments)
  - Sewer separation
  - Sewer rehabilitation
  - Infrastructure upgrades (new sewers)
  - Private disconnections
- Implementation of this program can free up capacity in the system to support growth as well as improve the current level of service and environmental protection in the area

2021 MSPU Servicing Strategy Impacts

- Additional growth out to year 2051
- Increased Storage requirements
- Additional Regional Transmission Main requirements
- Increased Wet Weather Program
- Region-wide projects (odour control, ECA, flow monitoring/data)
- SNF program updated costs
- Increase in cost estimates for some projects previously identified in 2016 MSPU
- Additional new projects to service growth areas and 2051 capacity requirements

Water Growth Related Capital Program

Development Charges Program

	2022 - 2031	2032 - 2041	2042 - 2051	Total
Water Treatment Plants	$73,904,000	-	-	$73,904,000
Water Pumping Stations	$40,339,000	-	$1,716,000	$42,055,000
Water Storage Facilities	$141,903,000	-	$44,226,000	$186,129,000
Water Linear	$196,522,000	$118,346,000	$26,169,000	$341,037,000
Water Other	$8,592,000	$1,802,000	$1,290,000	$11,684,000
Additional Studies	$1,750,000	$1,750,000	$1,750,000	$5,250,000
Total	**$463,010,000**	**$121,898,000**	**$75,151,000**	**$660,059,000**

100% Sustainability / Benefit to Existing Program

	2022 - 2031	2032 - 2041	2042 - 2051	Total
Water Treatment Plants	$160,000,000	-	-	$160,000,000
Water Storage Facilities	$100,000	-	-	$100,000
Total	**$160,100,000**	**$0**	**$0**	**$160,100,000**

100% Post 2051 Program

	2022 - 2031	2032 - 2041	2042 - 2051	Post 2051	Total
Water Storage Facilities	-	-	-	$69,960,000	$69,960,000
Total	**-**	**-**	**-**	**$69,960,000**	**$69,960,000**

Total Growth Related Program

	2022 - 2031	2032 - 2041	2042 - 2051	Post 2051	Total
Total	**$623,110,000**	**$121,898,000**	**$75,151,000**	**$69,960,000**	**$890,119,000**

Wastewater Growth Related Capital Program

Development Charges Program

	2022 - 2031	2032 - 2041	2042 - 2051	Total
WW Treatment Plants	$208,275,000	$123,895,000	$0	$332,170,000
WW Pumping Stations	$158,574,000	$38,674,000	$0	$197,248,000
WW Linear	$292,800,000	$95,105,000	$0	$387,905,000
Wet Weather Program	$75,000,000	$75,000,000	$75,000,000	$225,000,000
WW Other	$34,500,000	$37,656,000	$34,000,000	$106,156,000
Additional Studies	$17,250,000	$1,750,000	$1,750,000	$20,750,000
Total	**$786,399,000**	**$372,080,000**	**$110,750,000**	**$1,269,229,000**

100% Sustainability / Benefit to Existing Program

	2022 - 2031	2032 - 2041	2042 - 2051	Total
WW Treatment Plants	-	$200,000,000	-	$200,000,000
WW Pumping Stations	$4,189,000	-	-	$4,189,000
Total	**$4,189,000**	**$200,000,000**	**$0**	**$204,189,000**

100% Post 2051 Program

			Post 2051	Total
Total	**-**	**-**	**$0**	**$0**

Total Growth Related Program

	2022 - 2031	2032 - 2041	2042 - 2051	Post 2051	Total
Total	**$790,588,000**	**$572,080,000**	**$110,750,000**	**$0**	**$1,473,418,000**

Integrated Program with Sustainability Initiatives

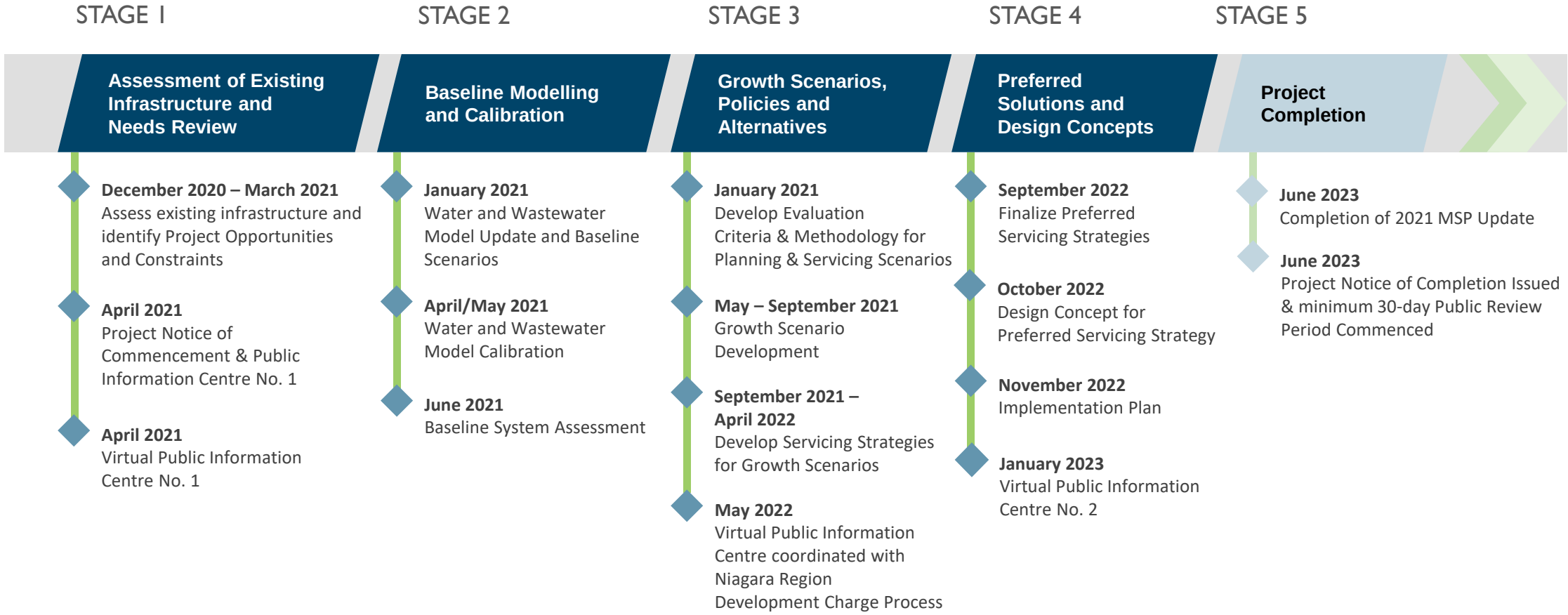
- It is essential that the existing infrastructure is maintained with good condition and performance in order to support servicing growth
- The sustainability and state-of-good-repair program is essential and is a capital program over and above the growth-related MSPU program
- The Sustainability Program was reviewed and resulted in:
  - Elimination of duplicate projects
  - Alignment of the timing for both growth and sustainability needs where appropriate
  - Focus on the next 10 year program

	DC Program Growth-Related Projects (2022 – 2031)	2021 MSPU 100% Sustainability/BTE Projects (2022 – 2031)	Additional Sustainability Projects (2022-2031)	Potential Integrated 10-Year Program (2022 – 2031)
Water	$463,010,000	$160,100,000	$487,237,000	**$1,110,347,000**
Wastewater	$786,399,000	$4,189,000	$1,048,099,500	**$1,838,687,500**
Total	**$1,249,409,000**	**$164,289,000**	**$1,535,336,500**	**$2,949,034,500**

Key Considerations

- Servicing strategies based on maintaining appropriate levels of service throughout the systems
- Investment is needed to support operations, maintenance, staff and other resources
- With new growth-related projects will come resourcing requirements to deliver the program
- The development community must similarly commit to appropriate levels of service and construction practices to support the capacity goals for growth
- Many projects in the MSPU will require future studies to refine the recommendations and address Class EA requirements. For some projects, Class EA studies are already underway and will update the strategies (i.e. Queenston WWTP).
- Expanded urban areas will require development of servicing strategies, extension of local servicing, and new local infrastructure (in some cases including local wastewater pumping stations)
- MSPU cost estimates represent conceptual level estimating. We continue to see significant fluctuations in project costs related to volatile market conditions, supply chain issues, and other variables. It is difficult to predict future costs, however, best available information has been used under the MSPU.

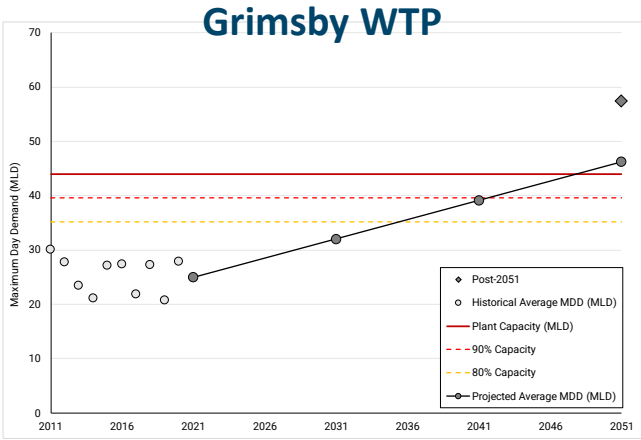
MSPU Process Overview

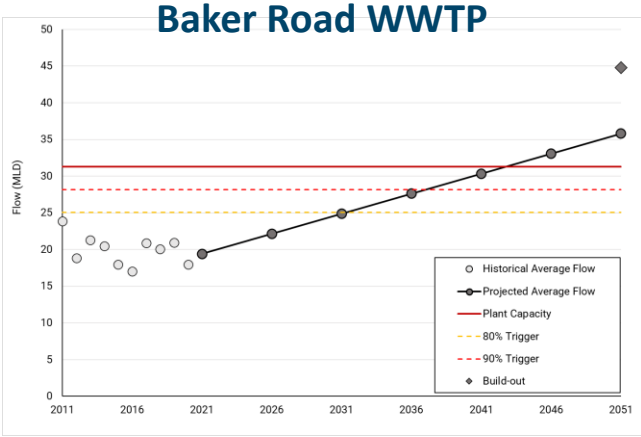


Regional Servicing Strategies by Service Area (for reference)

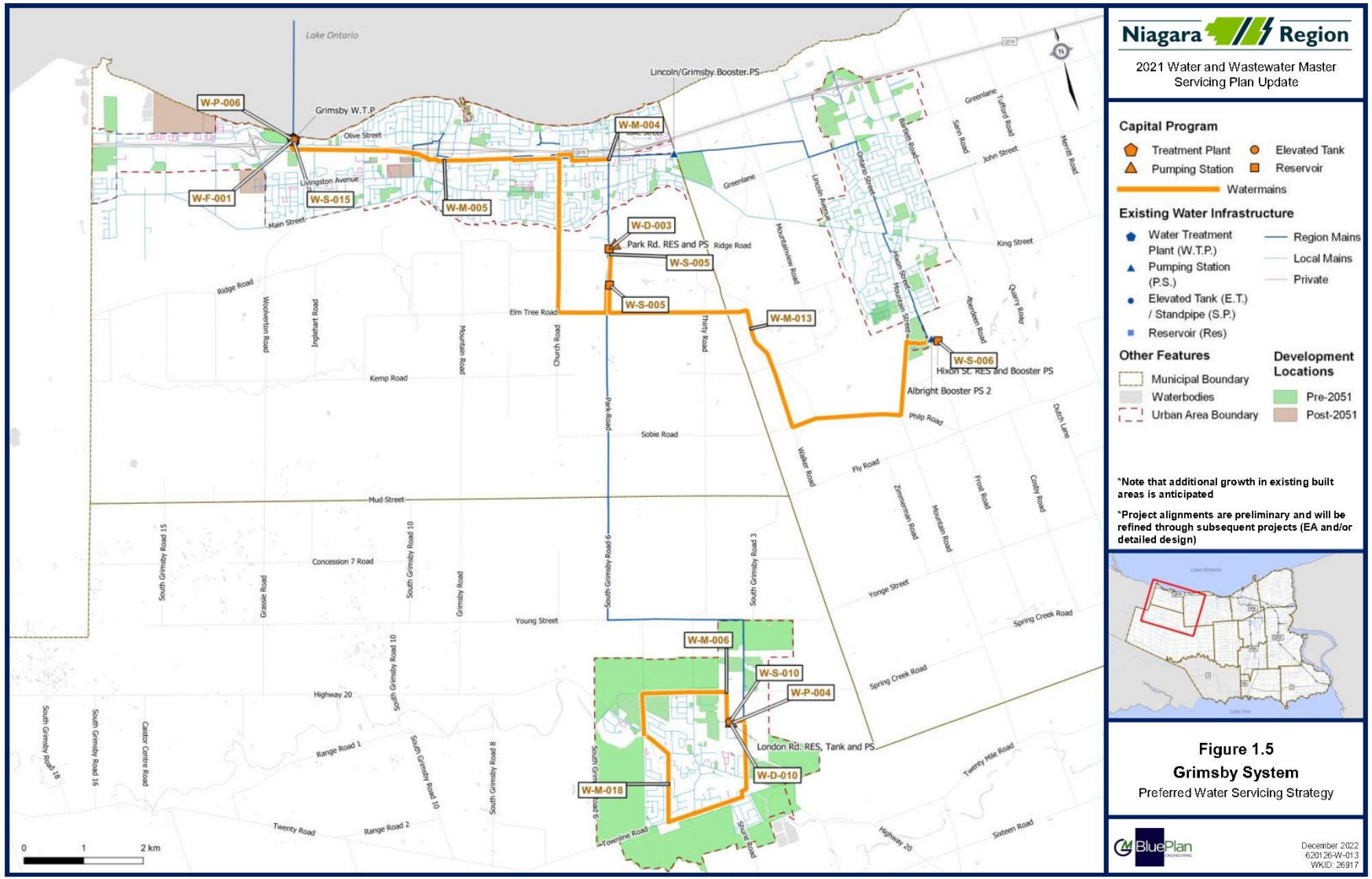
Grimsby / Lincoln / West Lincoln

- Significant growth projected in Smithville, Beamsville and Vineland
- Continued growth in Grimsby with intensification and corridor development
- Water and wastewater treatment plants require expansion
- Water system feeds and looping required to support growth for Smithville and Beamsville and security of supply / resiliency
- Vineland supply via Decew (St. Catharines)
- Additional water storage required
- Hixon Reservoir expansion is needed post-2051 to support growth
- Significant wastewater pumping station and forcemain work required for additional capacity
- Wastewater system capacity also achieved through strategic wet weather flow reduction programs





Grimsby / Lincoln / West Lincoln – Water Strategy



Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

Capital Program

- Treatment Plant
- Elevated Tank
- Pumping Station
- Reservoir
- Watermains

Existing Water Infrastructure

- Water Treatment Plant (W.T.P.)
- Pumping Station (P.S.)
- Elevated Tank (E.T.) / Standpipe (S.P.)
- Reservoir (Res)
- Region Mains
- Local Mains
- Private

Other Features

- Municipal Boundary
- Waterbodies
- Urban Area Boundary

Development Locations

- Pre-2051
- Post-2051

*Note that additional growth in existing built areas is anticipated

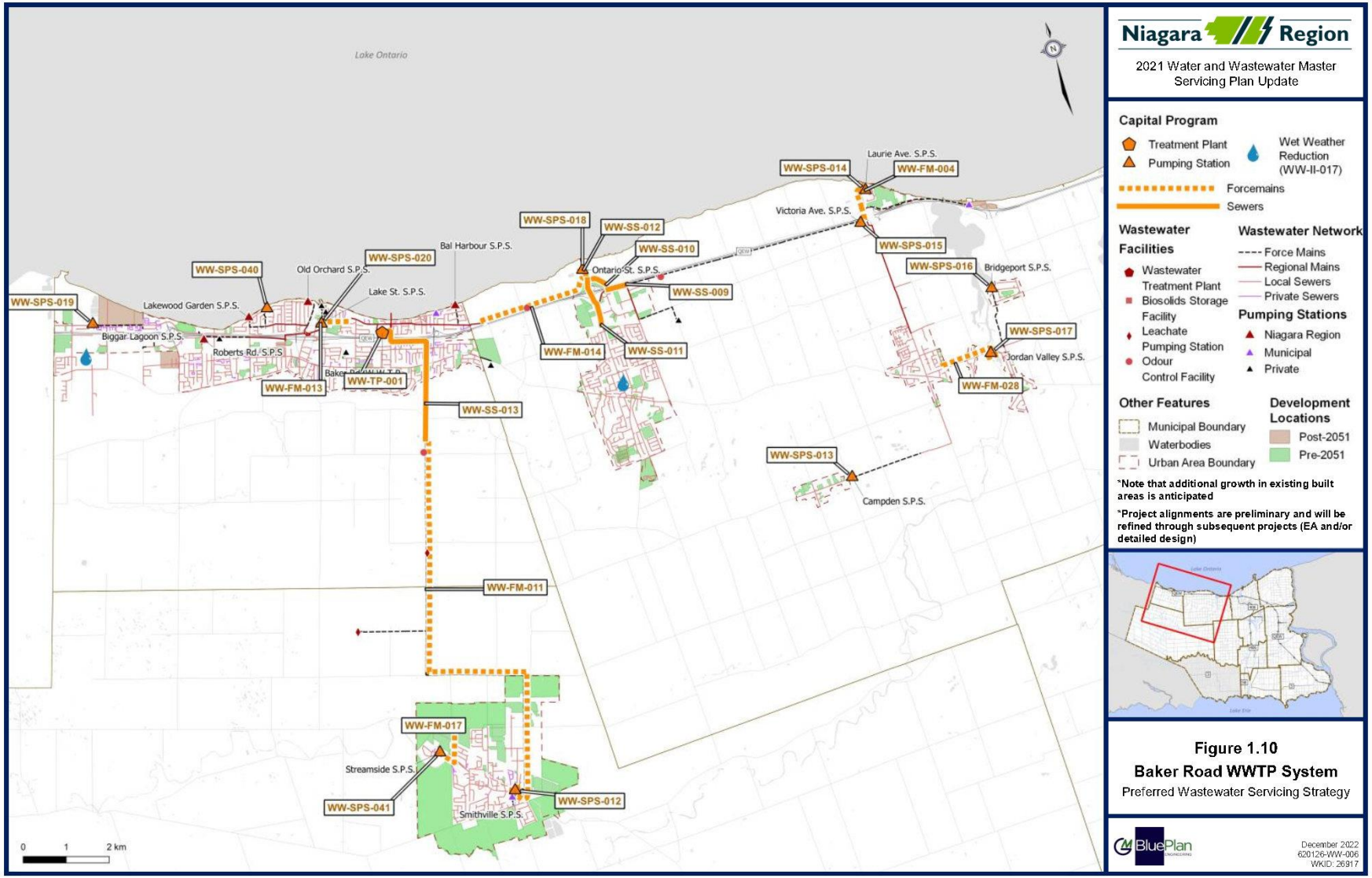
*Project alignments are preliminary and will be refined through subsequent projects (EA and/or detailed design)

Figure 1.5
Grimsby System
Preferred Water Servicing Strategy

BluePlan

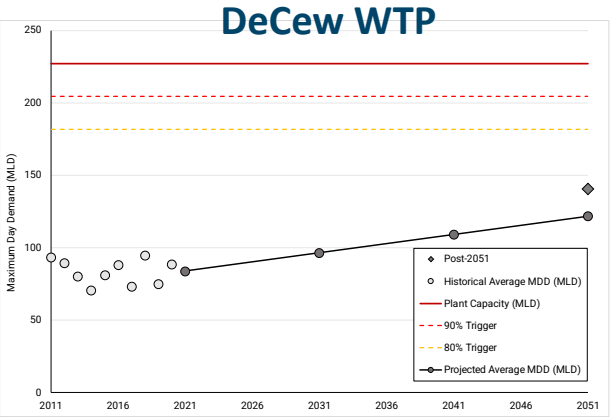
December 2022
620126-W-013
WKID: 26917

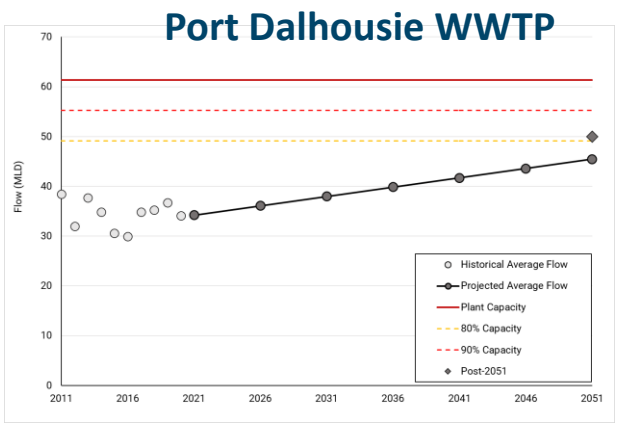
Grimsby / Lincoln / West Lincoln – Wastewater Strategy

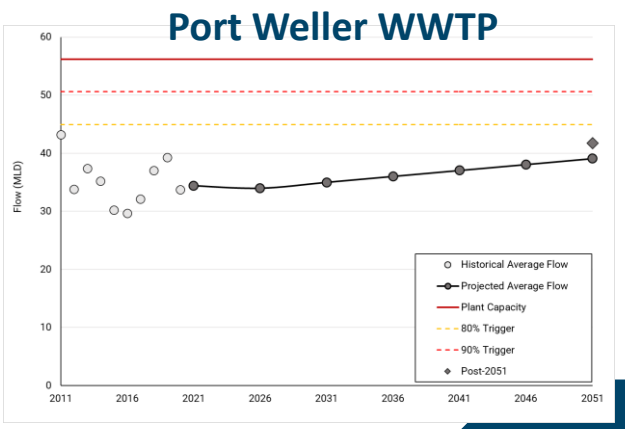


St. Catharines

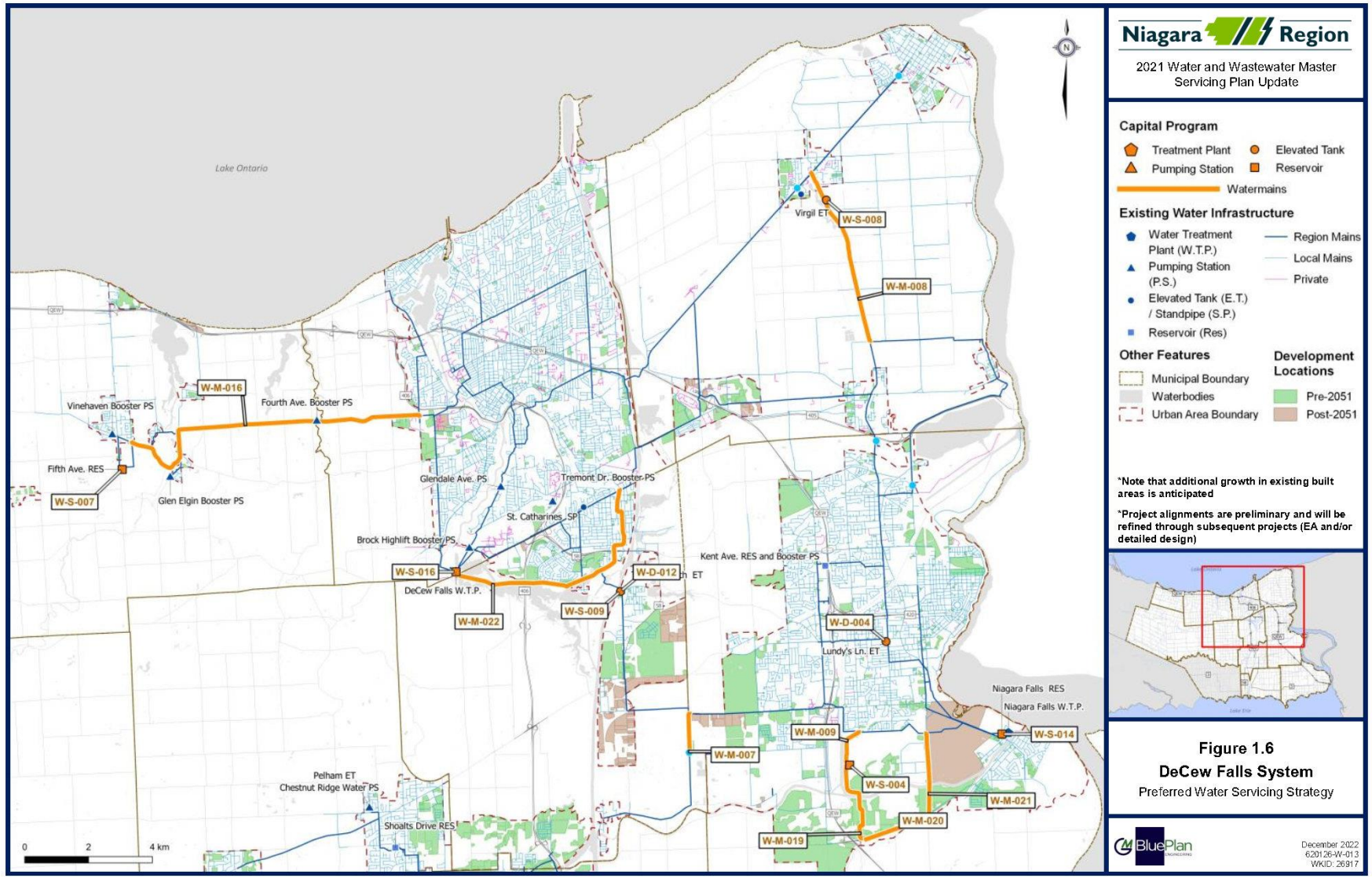
- Continued intensification across St. Catharines
- Water and wastewater treatment plants have sufficient capacity
- Water distribution system requires additional capacity to support growth flows from Decew WTP and to service Vineland
- Decew WTP reservoir expansion is required post-2051 to support growth
- Some wastewater pumping station upgrades to support growth
- Wastewater system capacity achieved through strategic wet weather flow reduction programs



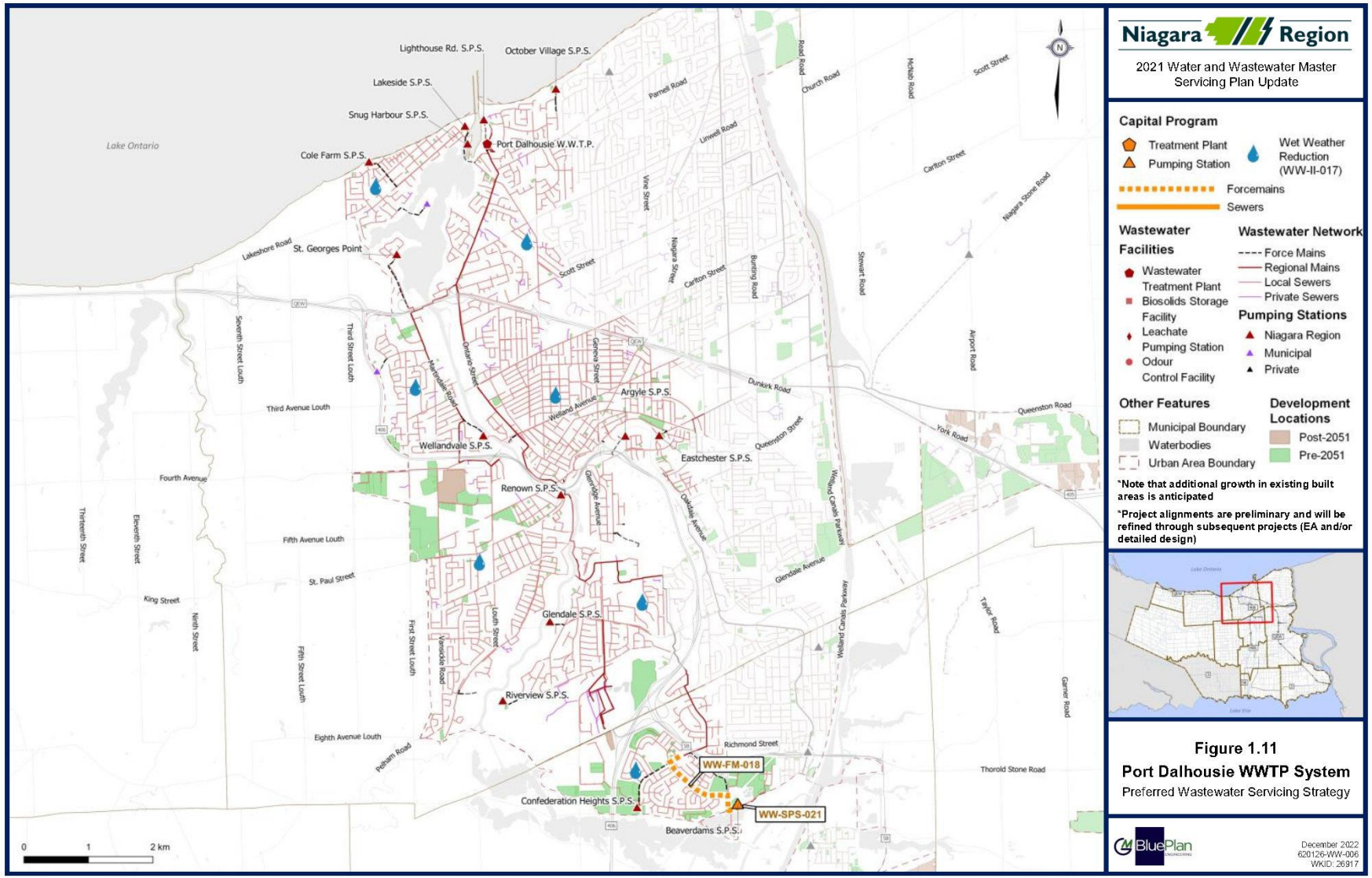




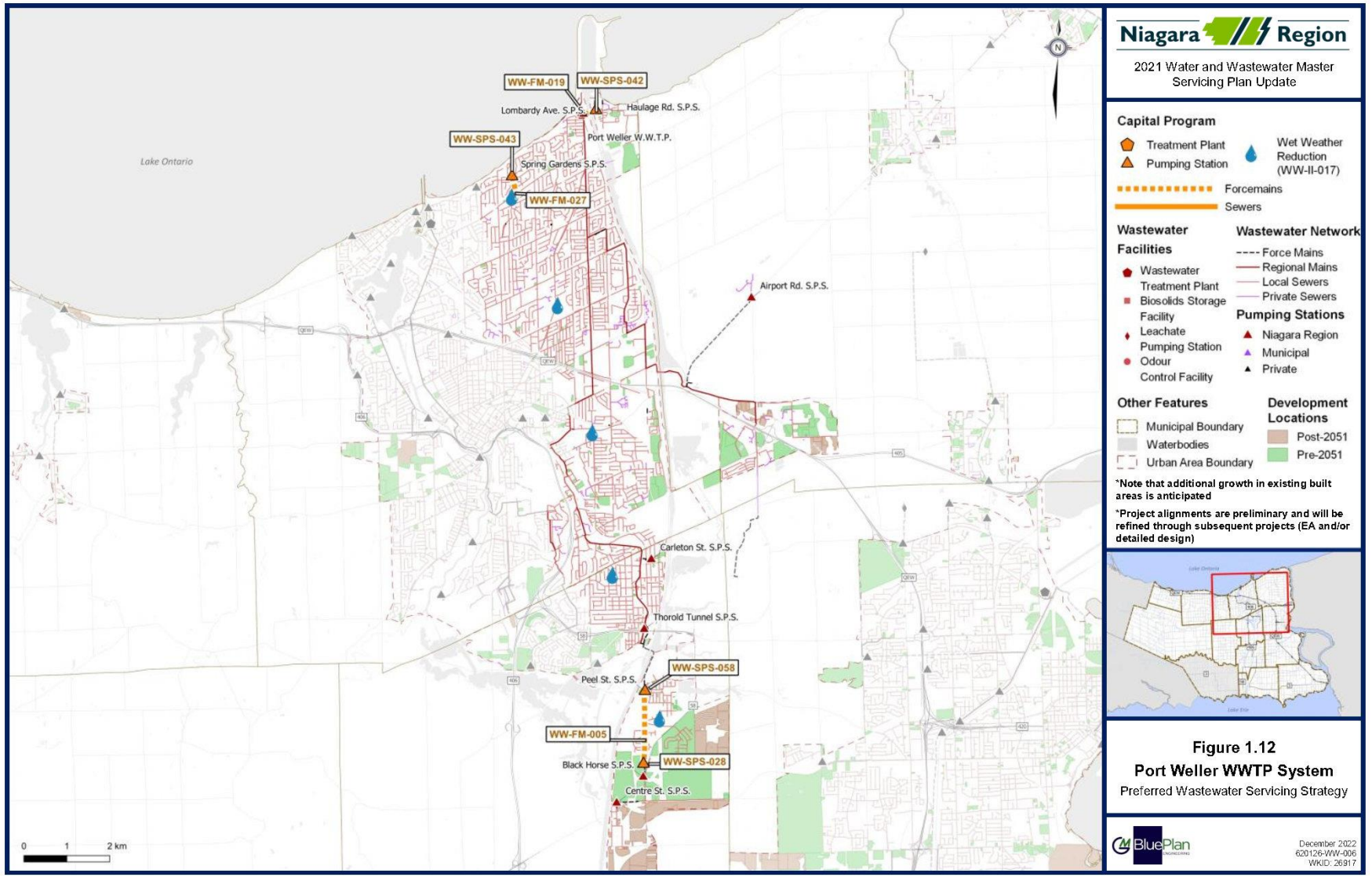
St. Catharines – Water Strategy



St. Catharines (Port Dalhousie) – Wastewater Strategy



St. Catharines (Port Weller) – WWTP Wastewater Strategy



Niagara Falls / NOTL / Thorold

Niagara Falls

- Significant growth across City with large portion in South Niagara Falls
- Water storage and distribution system trunk looping required to support growth
- Niagara Falls WTP Reservoir expansion is required post-2051 to support growth
- Wastewater strategy based on completed South Niagara Falls Wastewater Solutions Class EA
- Several wastewater pumping station upgrades to support growth
- Long term servicing strategy to connect Chippawa to the new SNF WWTP
- Wastewater system capacity also achieved through strategic wet weather flow reduction programs

Figure 1. Stanley Ave WWTP Flow Projections

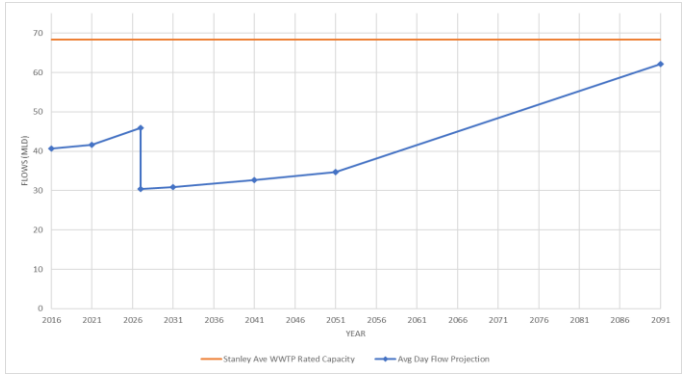
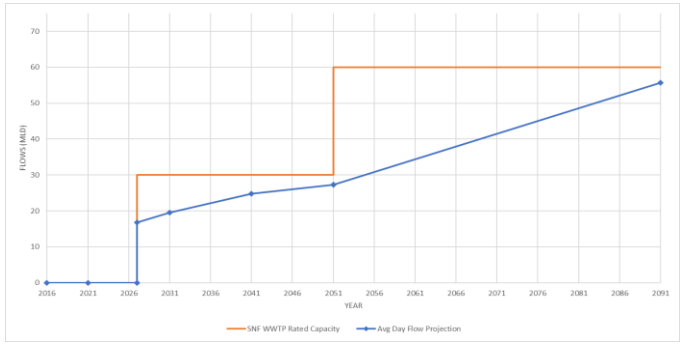
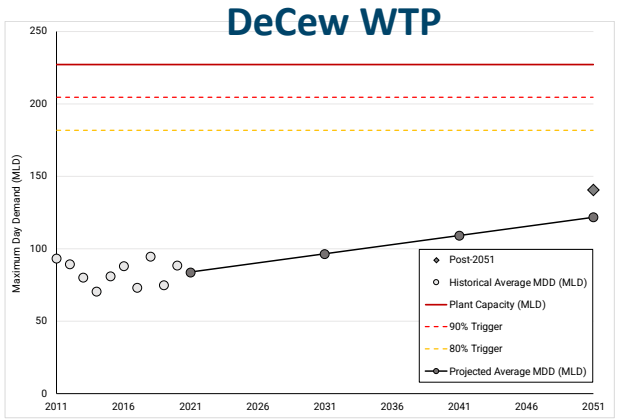
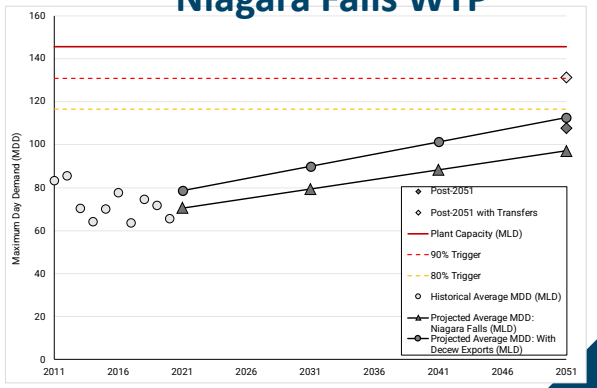


Figure 2. SNF WWTP Flow Projections



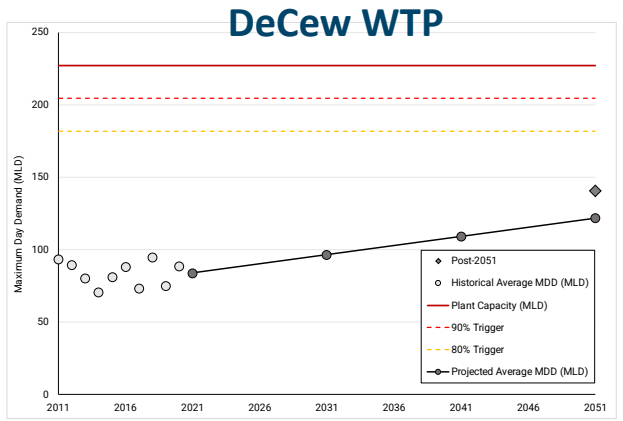


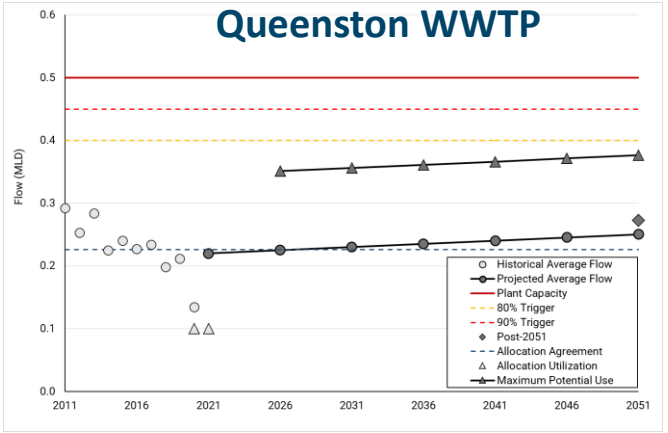


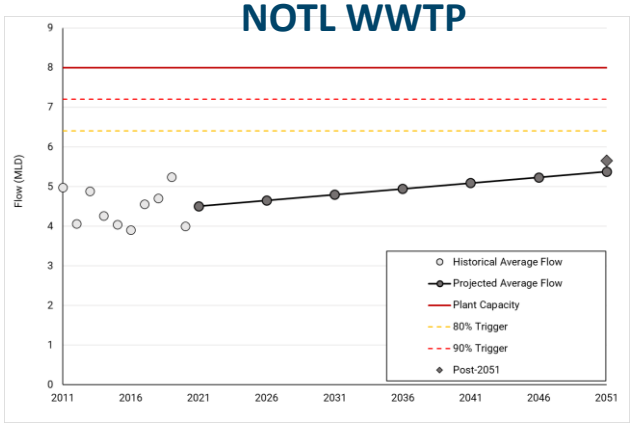
Niagara Falls / NOTL / Thorold

NOTL / Queenston

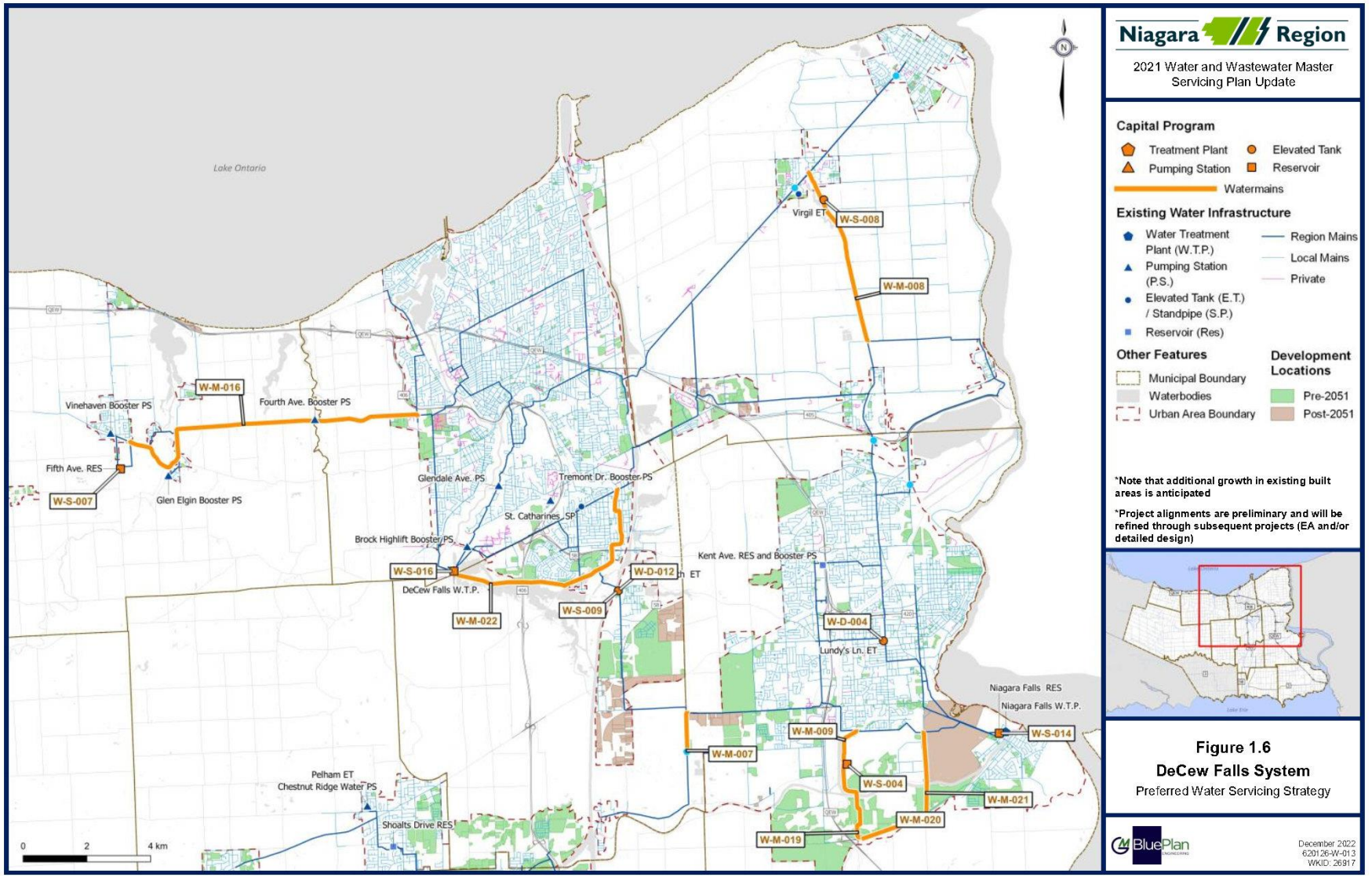
- Infill growth projected in urban centres
- Additional water storage and distribution trunk looping required to support growth
- Wastewater pumping station upgrades required to support growth
- Queenston wastewater strategy currently reflects the DC program and will be updated based on the ongoing Class EA study



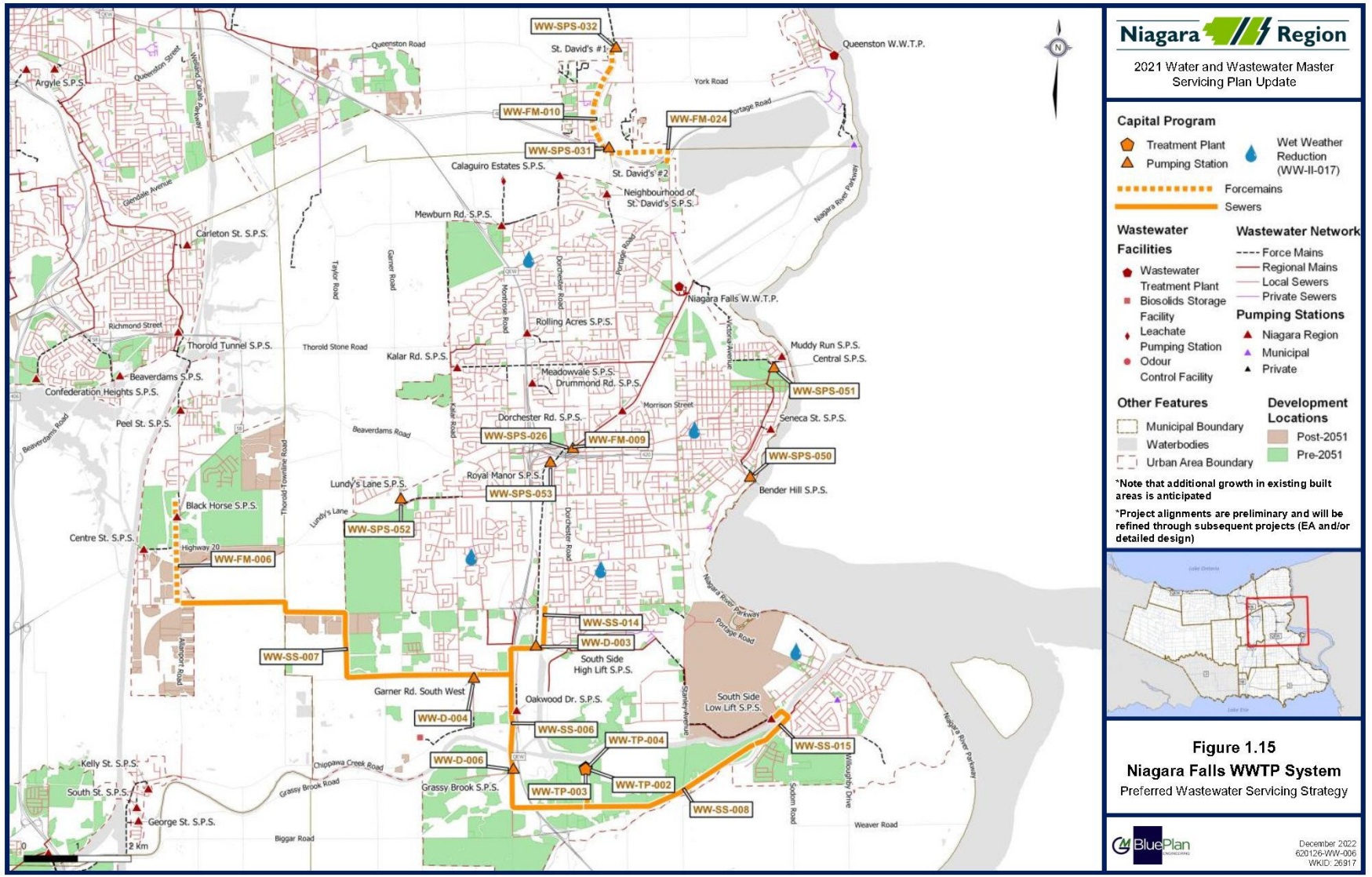




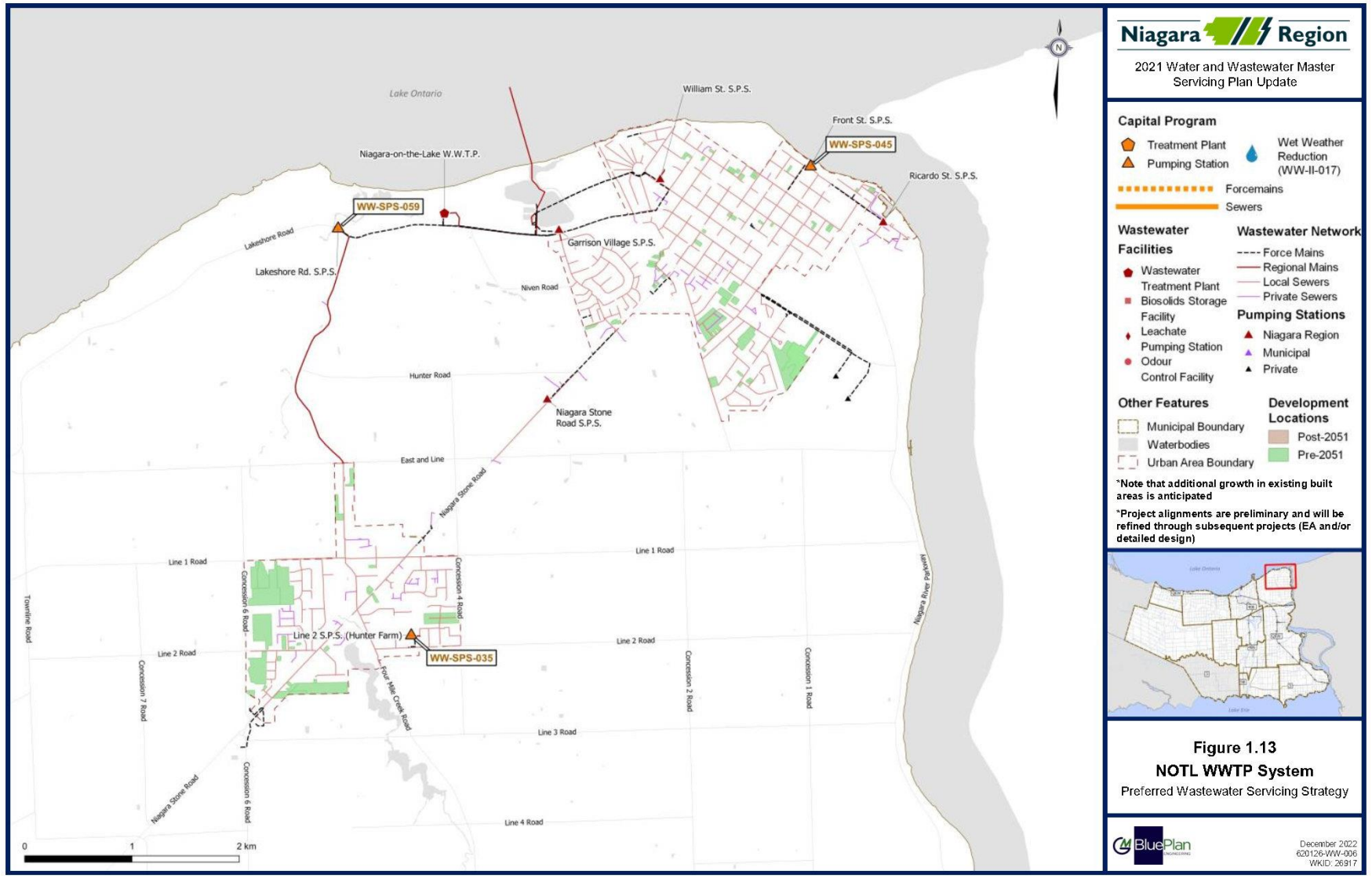
Niagara Falls / NOTL / Thorold – Water Strategy



Niagara Falls / NOTL / Thorold – Wastewater Strategy

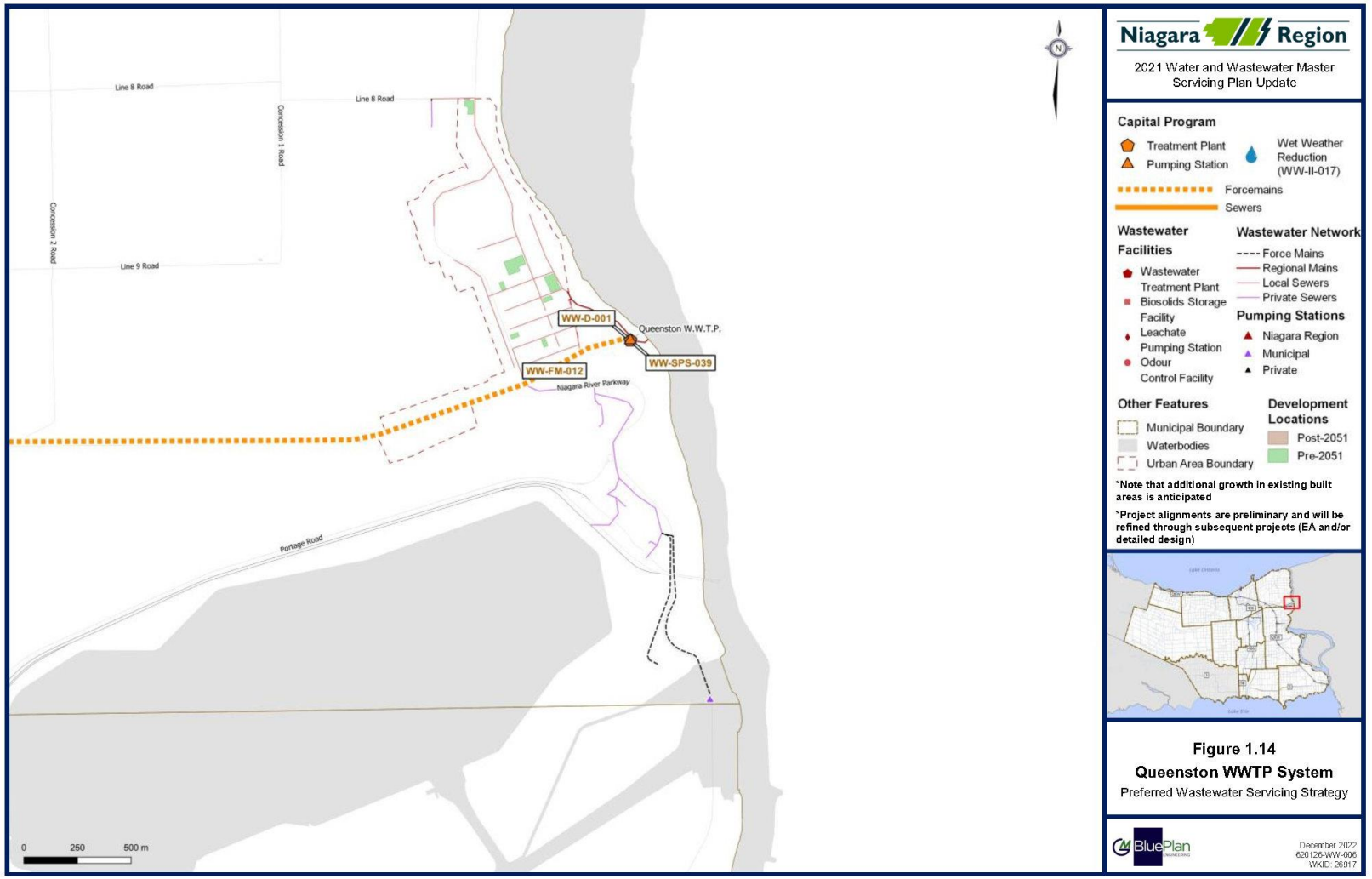


Niagara Falls / NOTL / Thorold – Wastewater Strategy



Niagara Falls / NOTL / Thorold – Wastewater Strategy

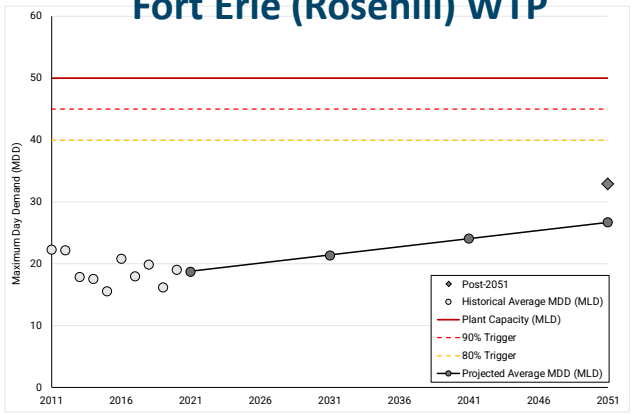
The proposed works or a more suitable recommended option from the ongoing Queenston – St. David's Wastewater Servicing Strategy EA are to prevail over the 2021 MSPU recommendations for the Queenston wastewater system, when the Queenston EA study results are approved and filed in 2023



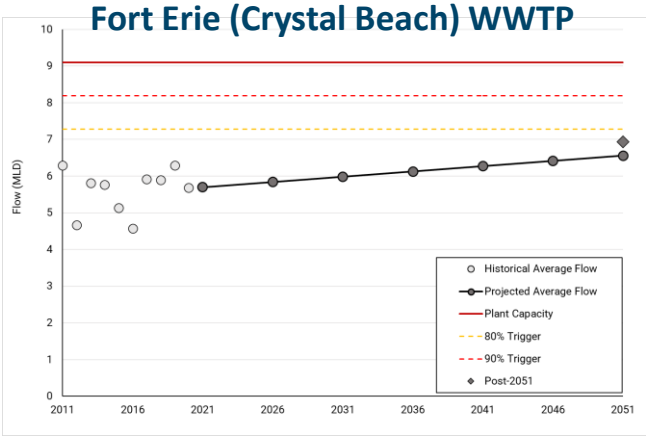
Fort Erie

- Continued infill growth in the urban centres
- Potential greenfield growth in new Fort Erie urban expansion areas
- Water treatment capacity sufficient
- Some trunk water system upgrades required for growth
- Some wastewater pumping station upgrades required for growth capacity
- Wastewater system capacity also achieved through strategic wet weather flow reduction programs

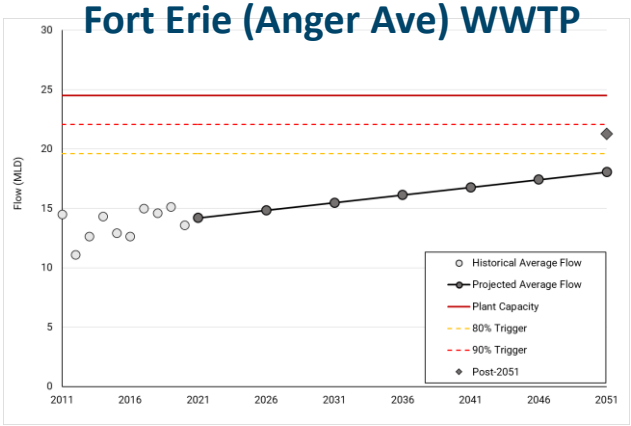
Fort Erie (Rosehill) WTP



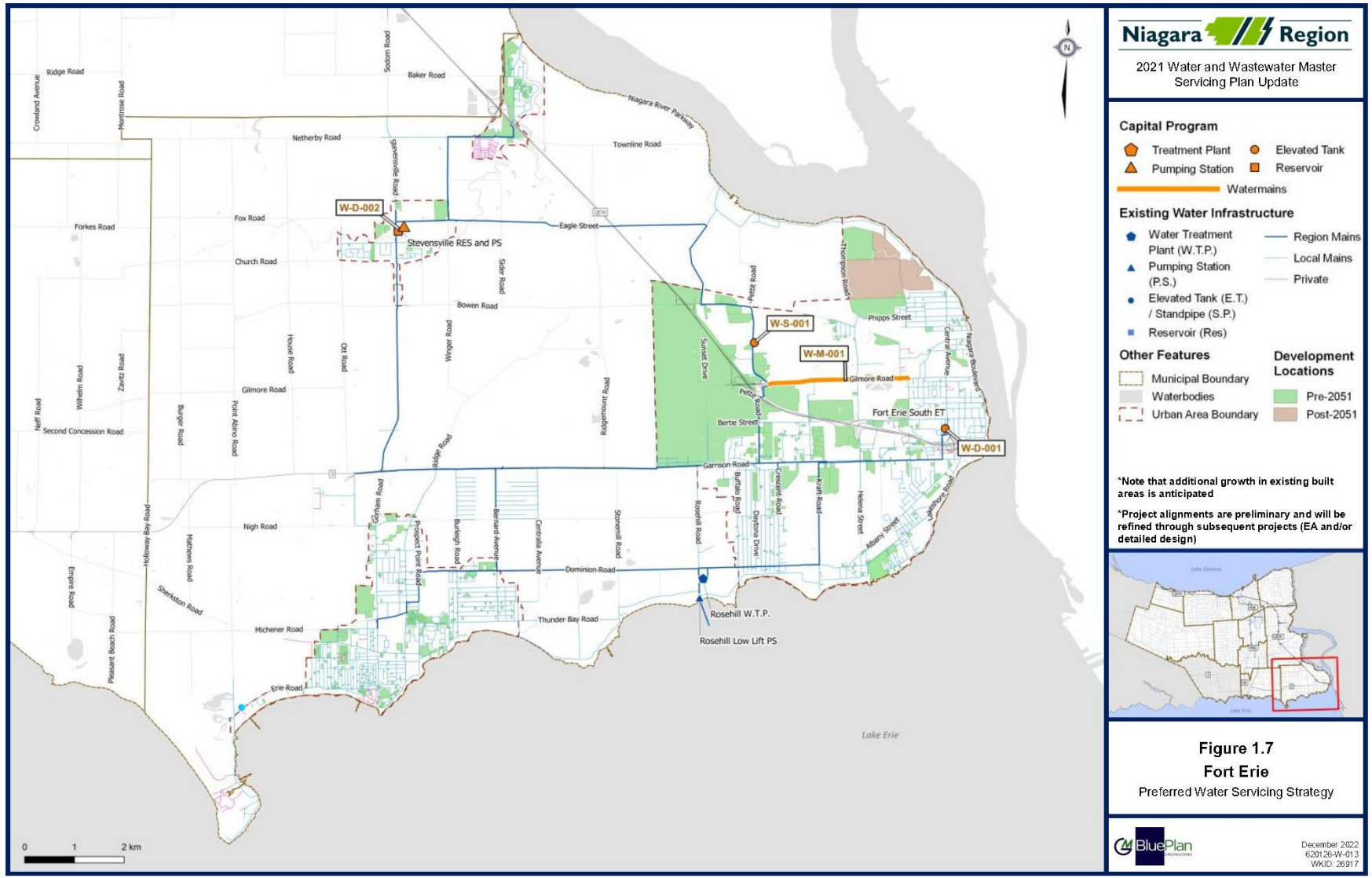
Fort Erie (Crystal Beach) WWTP



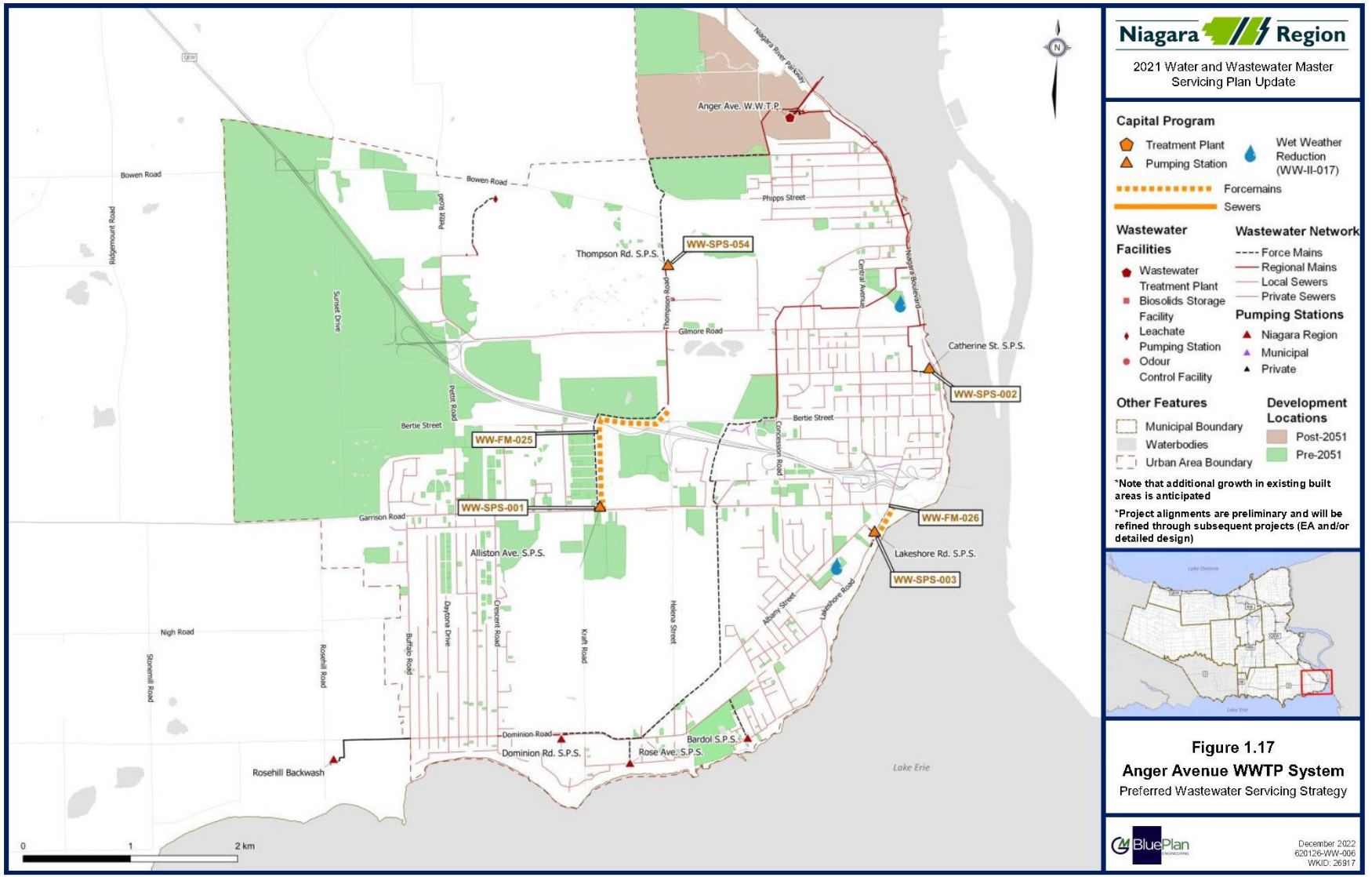
Fort Erie (Anger Ave) WWTP



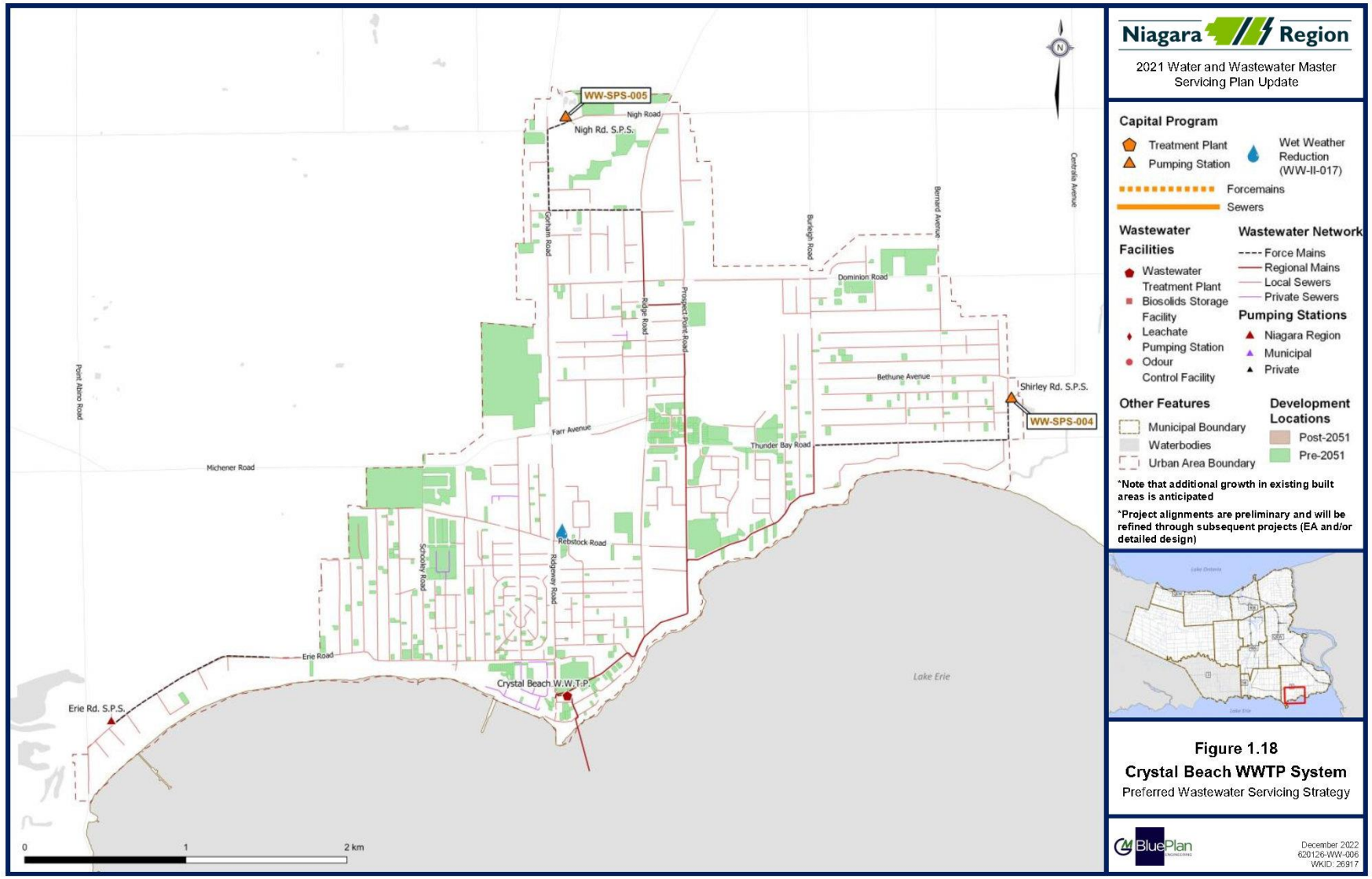
Fort Erie – Water Strategy



Fort Erie (Anger Ave) – Wastewater Strategy

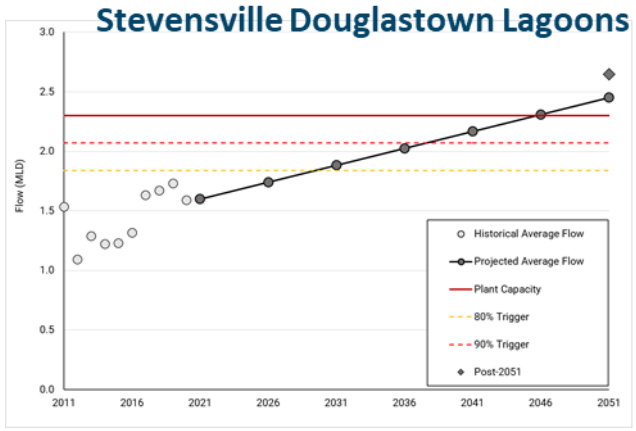


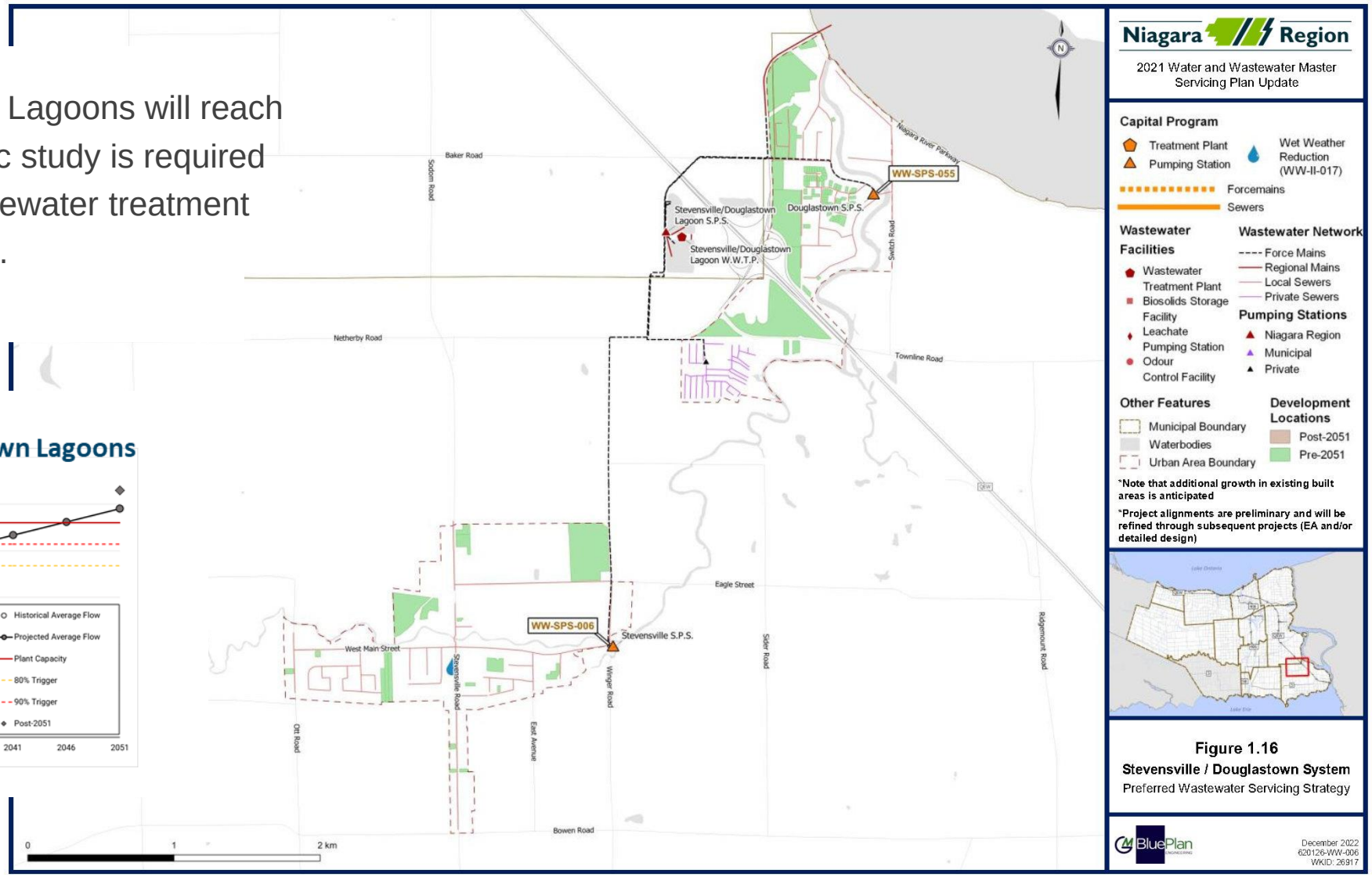
Fort Erie (Crystal Beach) – Wastewater Strategy



Stevensville Douglastown – Wastewater Strategy

Stevensville Douglastown Lagoons will reach capacity. Broader strategic study is required to determine optimal wastewater treatment solution for all of Fort Erie.





Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

Capital Program

- Treatment Plant
- Pumping Station
- Wet Weather Reduction (WW-II-017)
- Forcemains
- Sewers

Wastewater Facilities

- Wastewater Treatment Plant
- Biosolids Storage Facility
- Leachate Pumping Station
- Odour Control Facility

Wastewater Network

- Force Mains
- Regional Mains
- Local Sewers
- Private Sewers

Pumping Stations

- Niagara Region
- Municipal
- Private

Other Features

- Municipal Boundary
- Waterbodies
- Urban Area Boundary

Development Locations

- Post-2051
- Pre-2051

*Note that additional growth in existing built areas is anticipated

*Project alignments are preliminary and will be refined through subsequent projects (EA and/or detailed design)

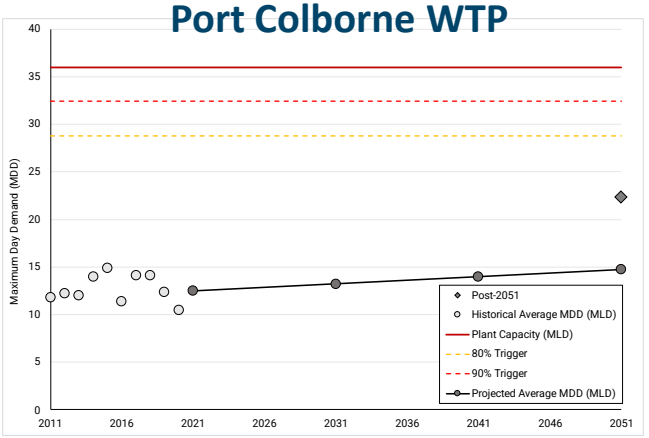
Figure 1.16
Stevensville / Douglastown System
Preferred Wastewater Servicing Strategy

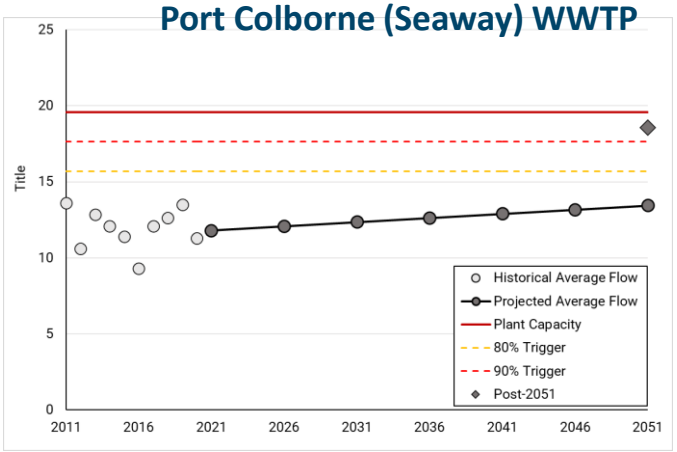
BluePlan

December 2022
620126-WW-006
WKID: 26917

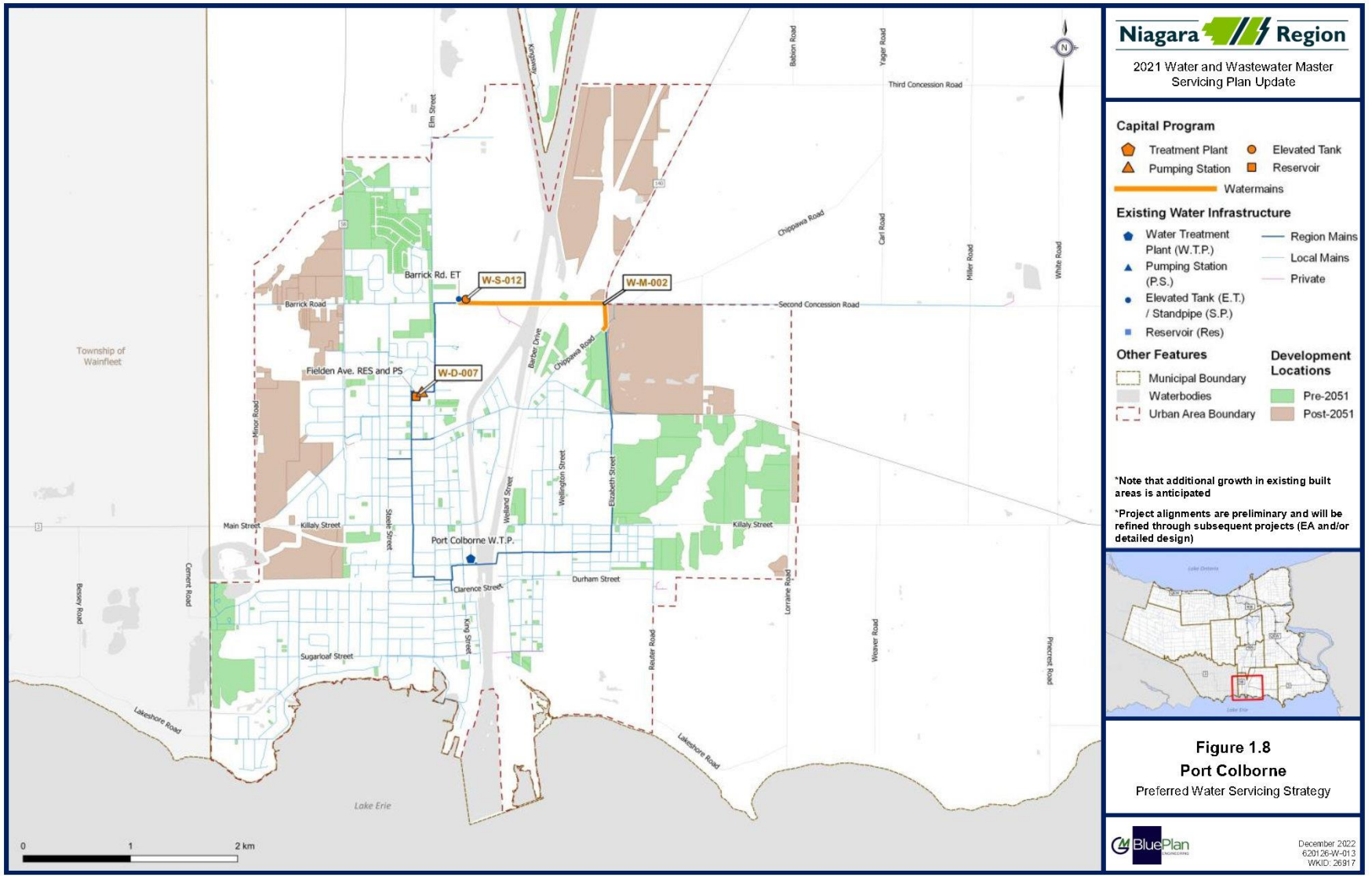
Port Colborne

- Infill and greenfield growth
- Water and wastewater treatment plants have sufficient capacity
- Trunk watermain recommended to increase flow and provide security of supply across the canal
- New elevated tank is required post-2051 to support growth
- Wastewater pumping station upgrades required for growth capacity
- Wastewater system capacity also achieved through strategic wet weather flow reduction programs
- Awareness of long-term growth potential

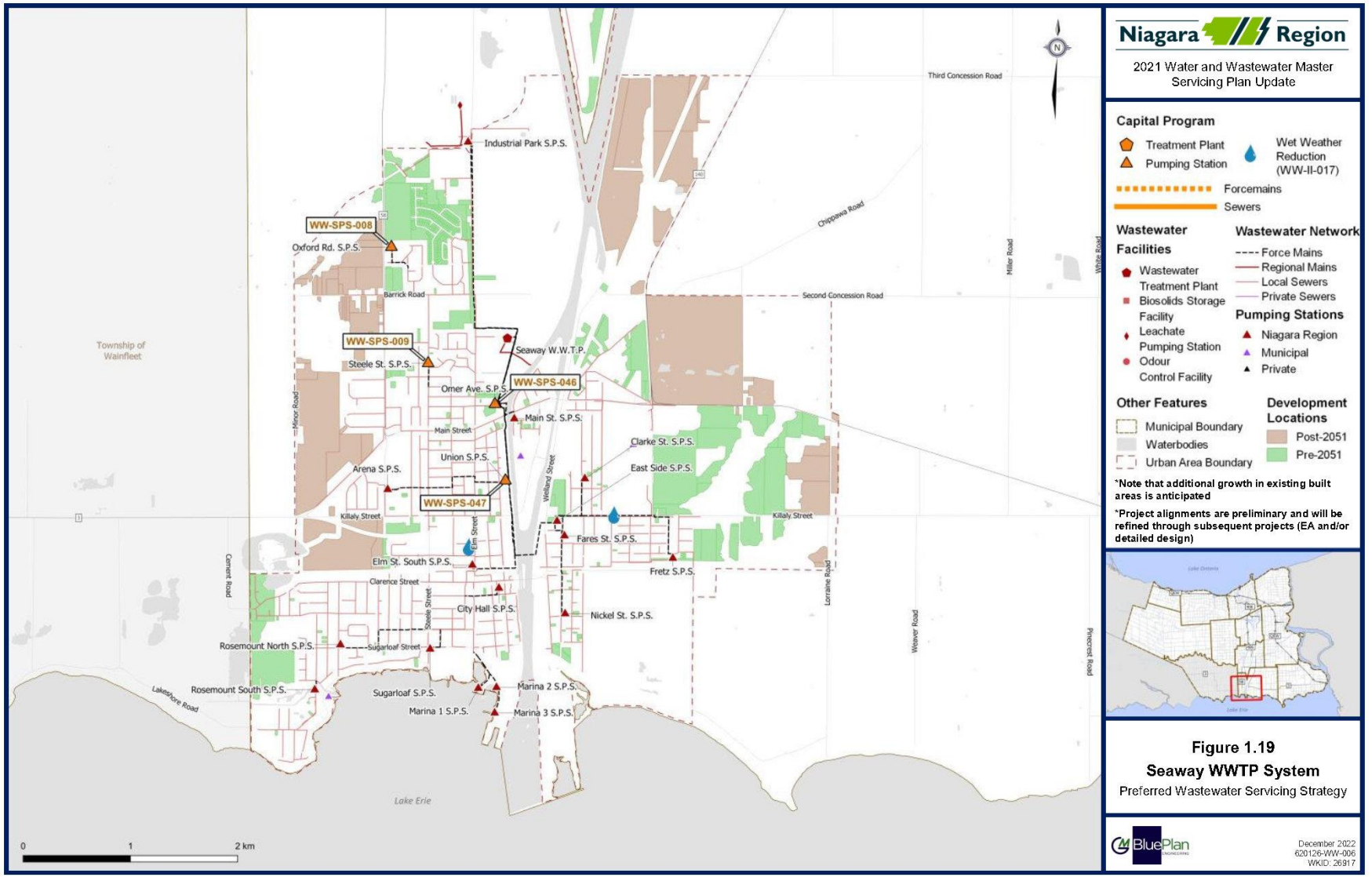




Port Colborne – Water Strategy

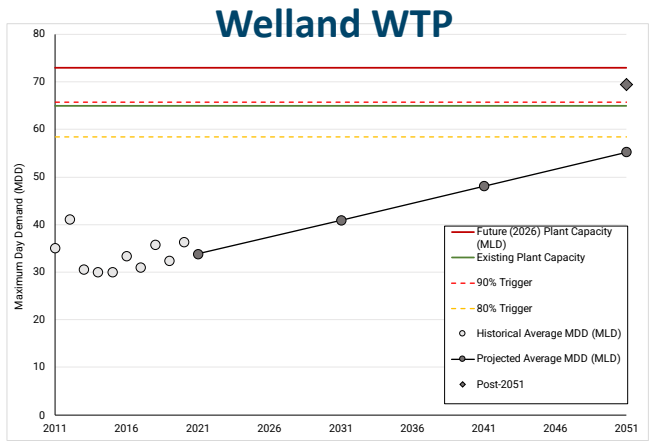


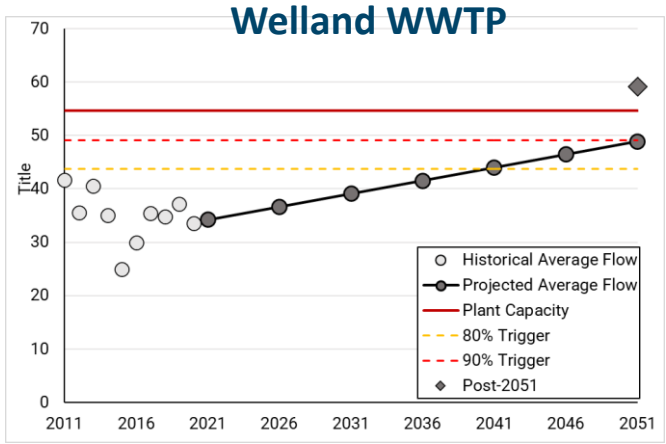
Port Colborne – Wastewater Strategy



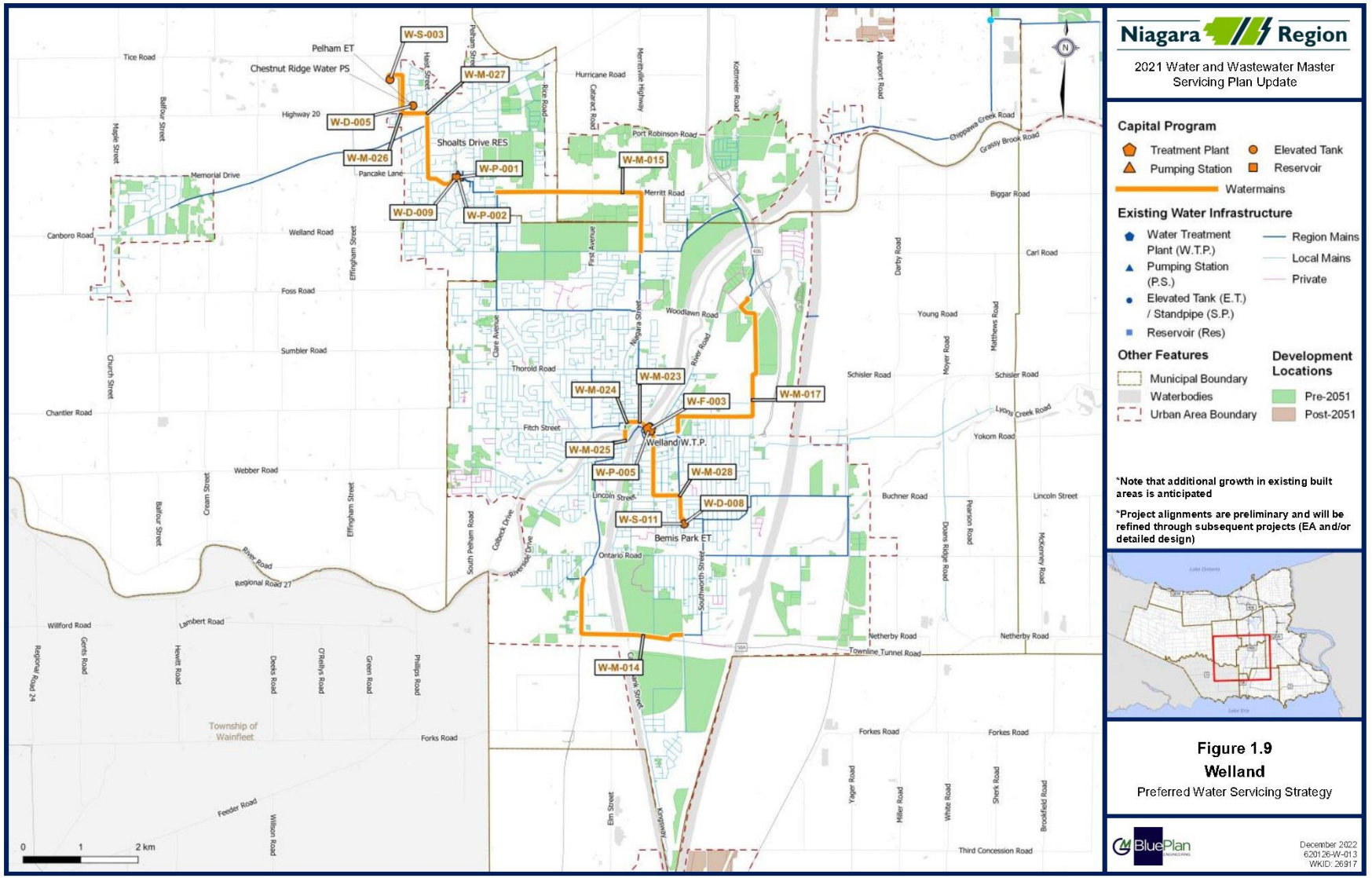
Welland / Pelham

- Infill and greenfield growth
- Water and wastewater treatment plants will require additional capacity for growth (WTP underway, WWTP future consideration)
- Additional storage and related trunk watermain and trunk watermain looping required to support growth
- Wastewater pumping station and forcemain upgrades required for growth capacity
- Wastewater system capacity achieved through strategic wet weather flow reduction programs

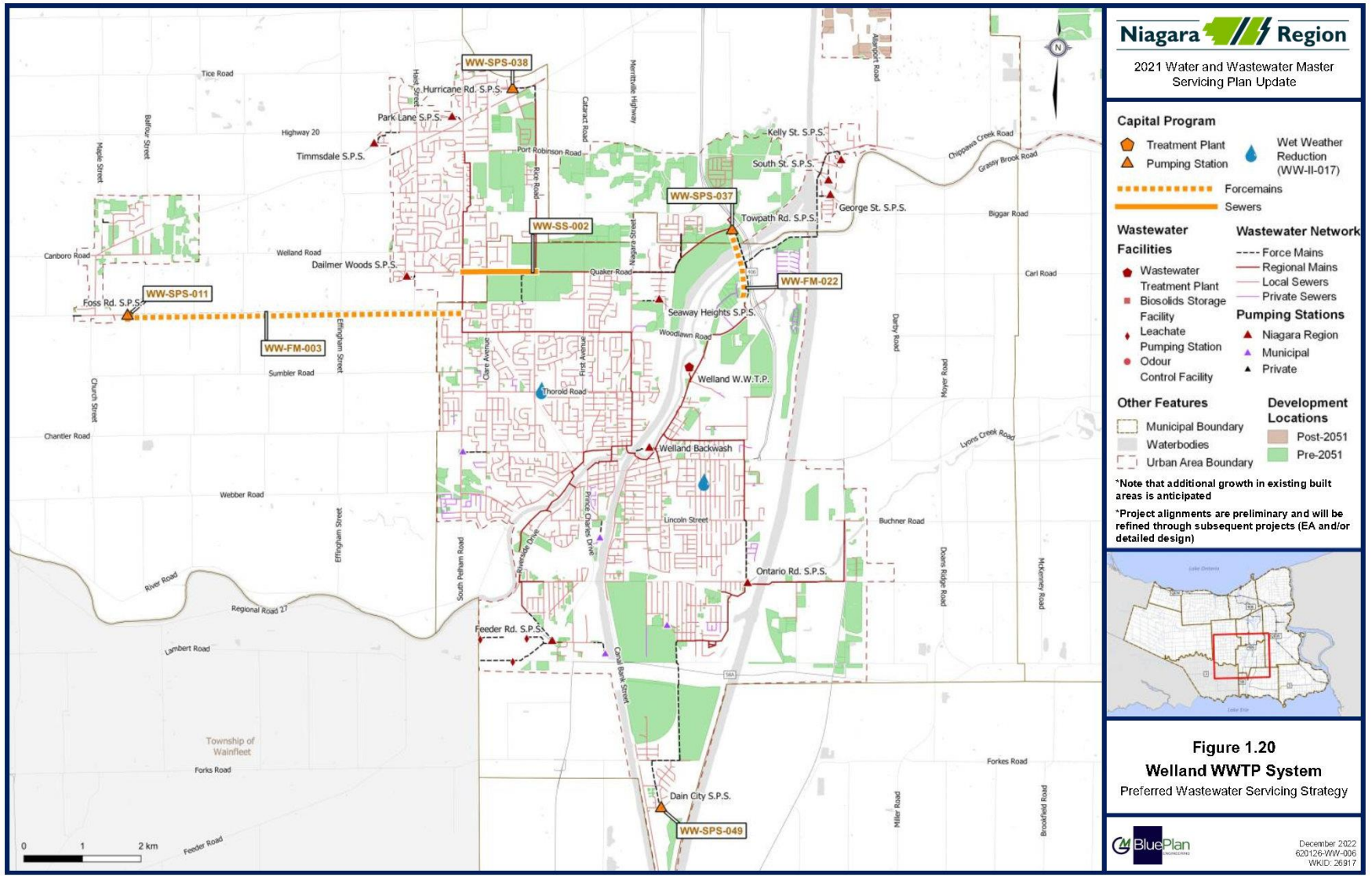




Welland / Pelham – Water Strategy



Welland / Pelham – Wastewater Strategy



Niagara Region

2021 Water and Wastewater Master Servicing Plan Update

Capital Program

- Treatment Plant
- Pumping Station
- Wet Weather Reduction (WW-II-017)
- Forcemains
- Sewers

Wastewater Facilities

- Wastewater Treatment Plant
- Biosolids Storage Facility
- Leachate Pumping Station
- Odour Control Facility

Wastewater Network

- Force Mains
- Regional Mains
- Local Sewers
- Private Sewers

Pumping Stations

- Niagara Region
- Municipal
- Private

Other Features

- Municipal Boundary
- Waterbodies
- Urban Area Boundary

Development Locations

- Post-2051
- Pre-2051

*Note that additional growth in existing built areas is anticipated

*Project alignments are preliminary and will be refined through subsequent projects (EA and/or detailed design)

Figure 1.20
Welland WWTP System
Preferred Wastewater Servicing Strategy

BluePlan

December 2022
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