

Disclaimer: This map is intended for illustrative purposes only. Figure is to be read in conjunction with the Niagara Peninsula Source Protection Area Assessment Report. Please refer to report text for digital mapping sources.

All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West.

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**Legend**

- International Boundary
- Major Highways
- Highways
- Roads
- Watercourse
- Ponds, Reservoirs, Lakes
- Lower Tier Municipality
- Upper Tier Municipality
- Niagara Peninsula Source Water Protection Area

- EC Inactive Precipitation and Climate Station
  - RON Inactive Climate Station
  - RON Inactive Precipitation Station
  - EC Active Climate Station
  - EC Active Precipitation and Climate Station
  - RON Active Climate Station
  - RON Active Precipitation Station
  - OWN Active Precipitation and Climate Station
  - NPCA Active Snow Survey Station
  - MOE Active Climate Station
- Note: Environment Canada stations within 10 km of SWPA shown. Inactive Environment Canada stations have at least 15 years of data. Climate monitoring stations may include temperature, wind velocity, humidity and solar radiation.



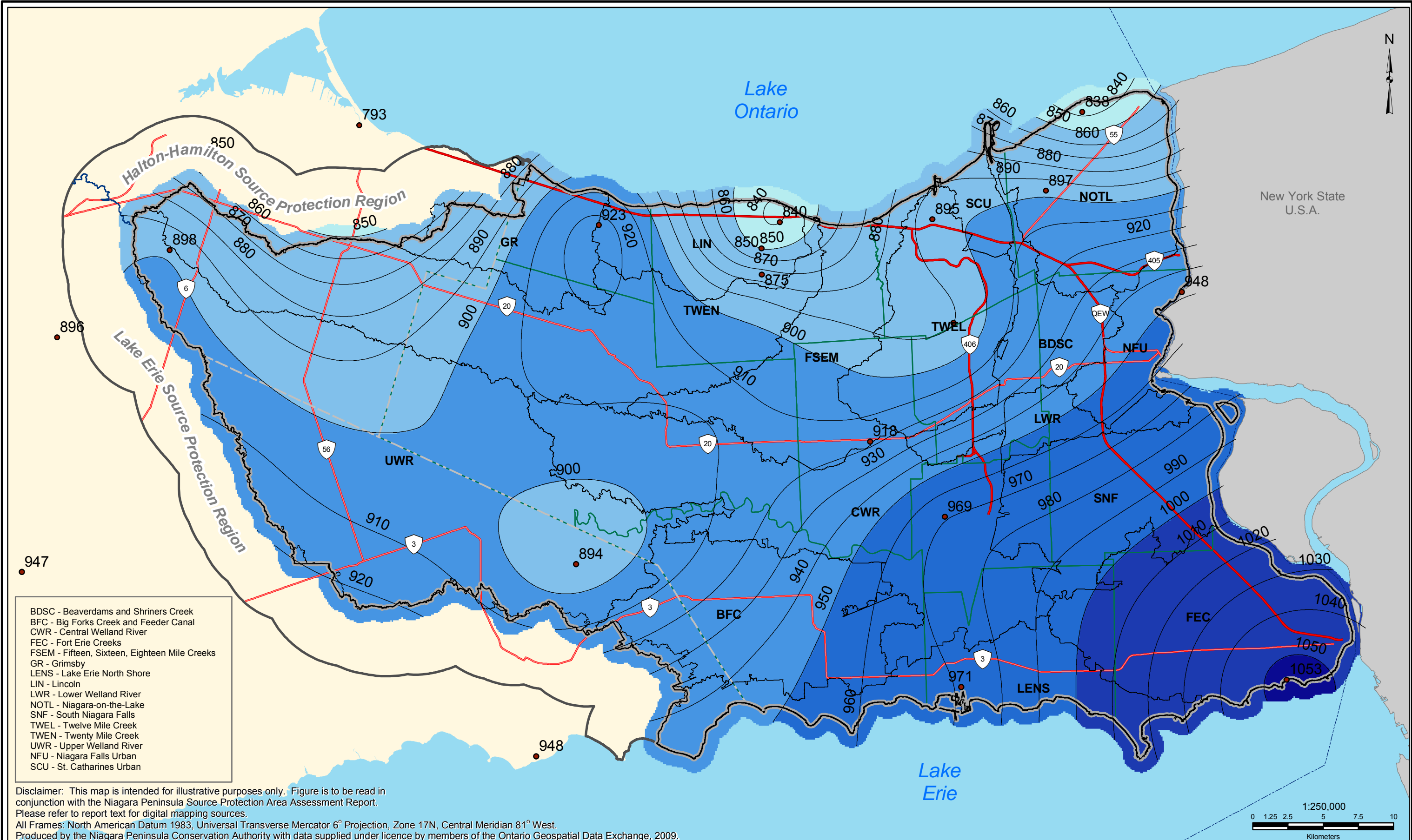
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*Figure 3.1: Weather Monitoring Stations*

Thursday, July 14, 2011



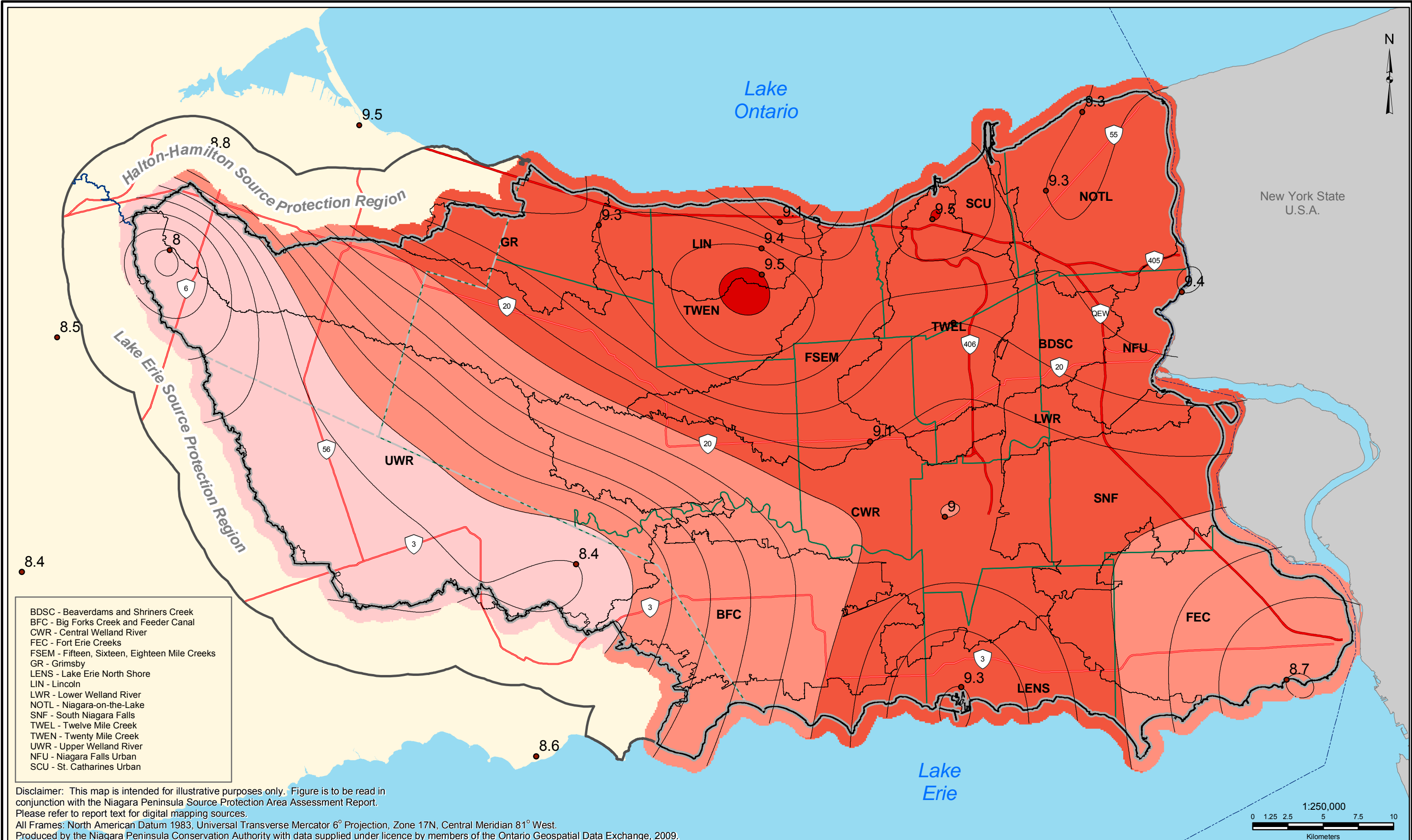












**Legend**

--- International Boundary	Ponds, Reservoirs, Lakes	Lower Tier Municipality
Major Highways	Extended Context Area	Upper Tier Municipality
Highways	Source Water Protection Area	0.1 ° C Isoline
Watercourse	NPCA Watershed Planning Areas	Station Mean (°C)

8.0 - 10.0 C°, 0.5 C° interval

Notes: 1991 - 2005 mean  
Contours interpolated using spline

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Figure 3.4: Mean Annual Temperature

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**Legend**

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- Niagara Peninsula Source Water Protection Area
- Lower Tier Municipality
- Upper Tier Municipality

- NPCA Gauges - Active
- Water Survey Canada Gauges - Active
- Water Survey Canada Gauges - Inactive

Additional stations exist, preliminary information is listed below:  
St. Lawrence Seaway management Corporation operates two water level stations on the Welland Canal  
Ontario Power Generation measures flows coming from the Decew Falls Power Generating Station  
The City of St.Catharines also measures water level at the Martindale Pond and flows at the Heywood Power Generating Station

- Gauged Areas

\*Please note that surface water gauges record water levels and that flows are not measured but are calculated by correlation to derived stage-discharge relationships. The Twelve and Four Mile Creek gauges have been operational for less than two years and their flow curves are still under development. Black Creek at Stevensville was formerly a Water Survey Canada station prior to being reactivated by the NPCA for flood forecasting purposes, however due to backwater effects from power generation along the Niagara River, stage is only of interest at this gauge.

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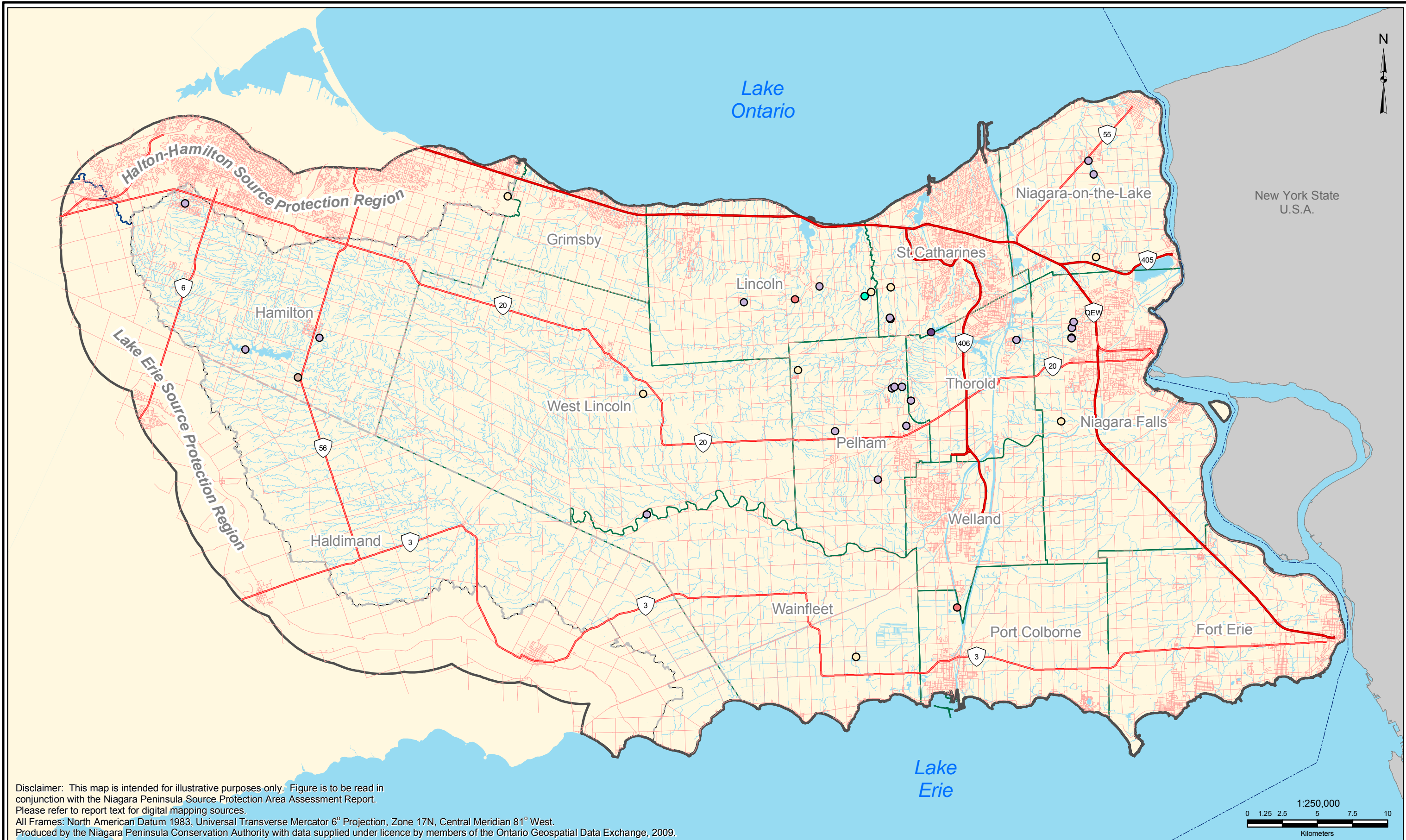
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**Figure 3.7: Surface Water Gauges**

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Legend		Structure Type	
--- International Boundary	Watercourse	Concrete	Gabion baskets, steel sheets
Major Highways	Ponds, Reservoirs, Lakes	Earth and Rock filled dam	Steel Sheet Piling
Highways	Niagara Peninsula Source Water Protection Area	Earthfill embankment	Timber and steel sheet piling
Roads	Lower Tier Municipality		
	Upper Tier Municipality		

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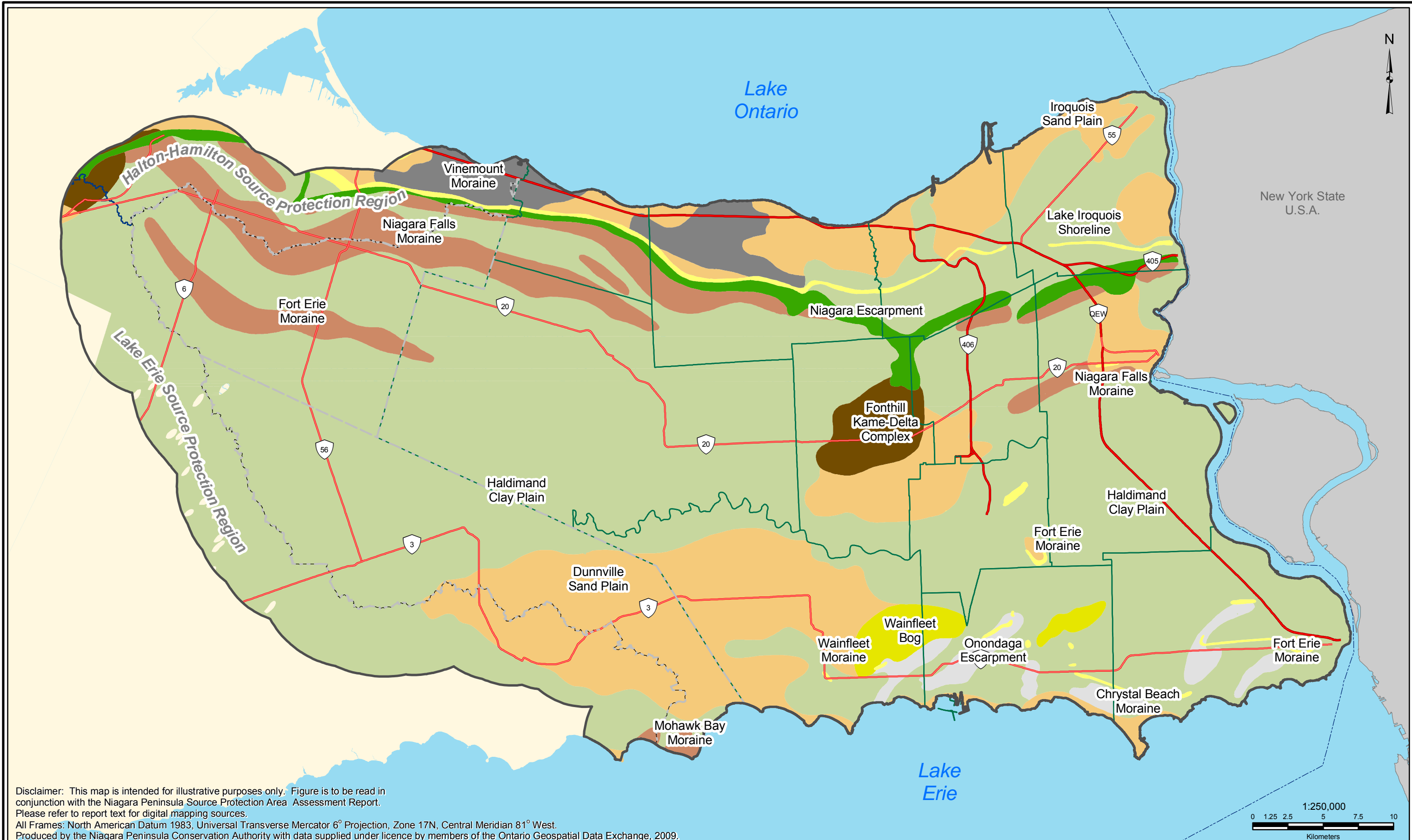
*Figure 3.8: Surface Water Control Structures*

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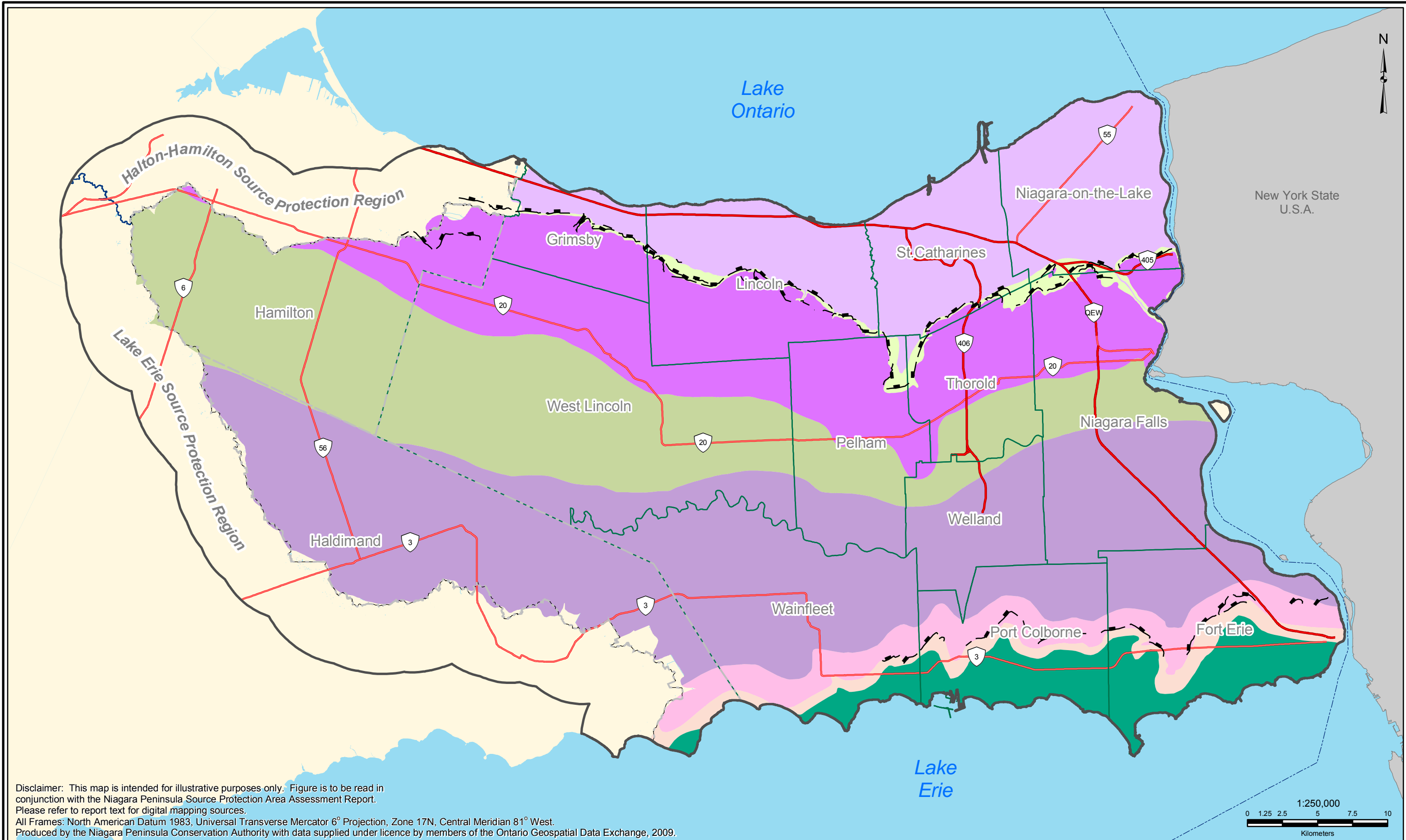
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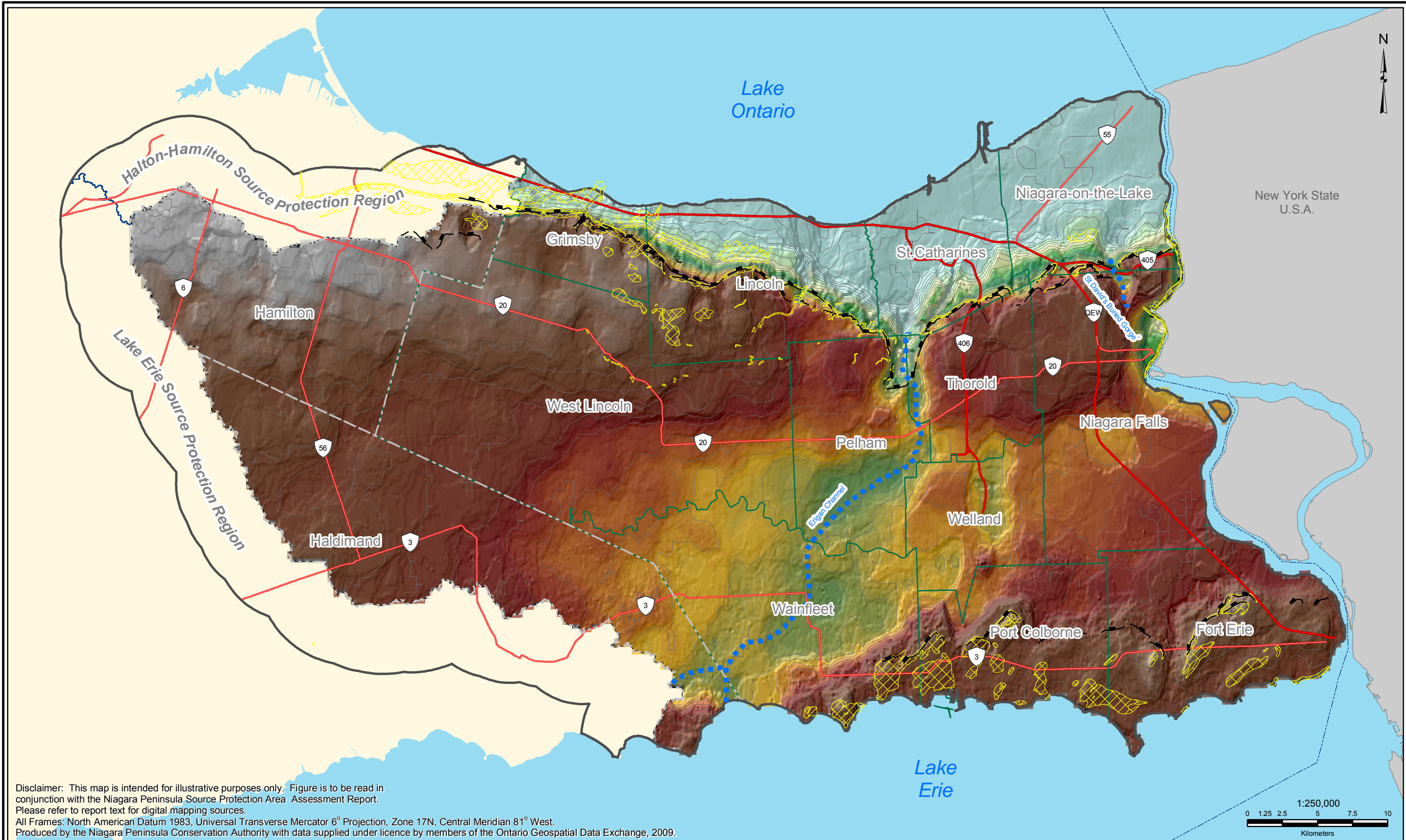


<b>Legend</b> --- International Boundary    ~ Watercourse --- Major Highways    Ponds, Reservoirs, Lakes --- Highways    Extended Context Area --- Roads    Niagara Peninsula Source Water Protection Area		Lower Tier Municipality Upper Tier Municipality		Beaches and Shorecliffs Escarpment Clay Plain Sand Plain Till Moraine		Kame Moraine Peat and Muck Limestone Plain Shale Plain Water					<b>NPSPA Assessment Report</b>	
									<i>Figure 3.9: Physiography</i>			
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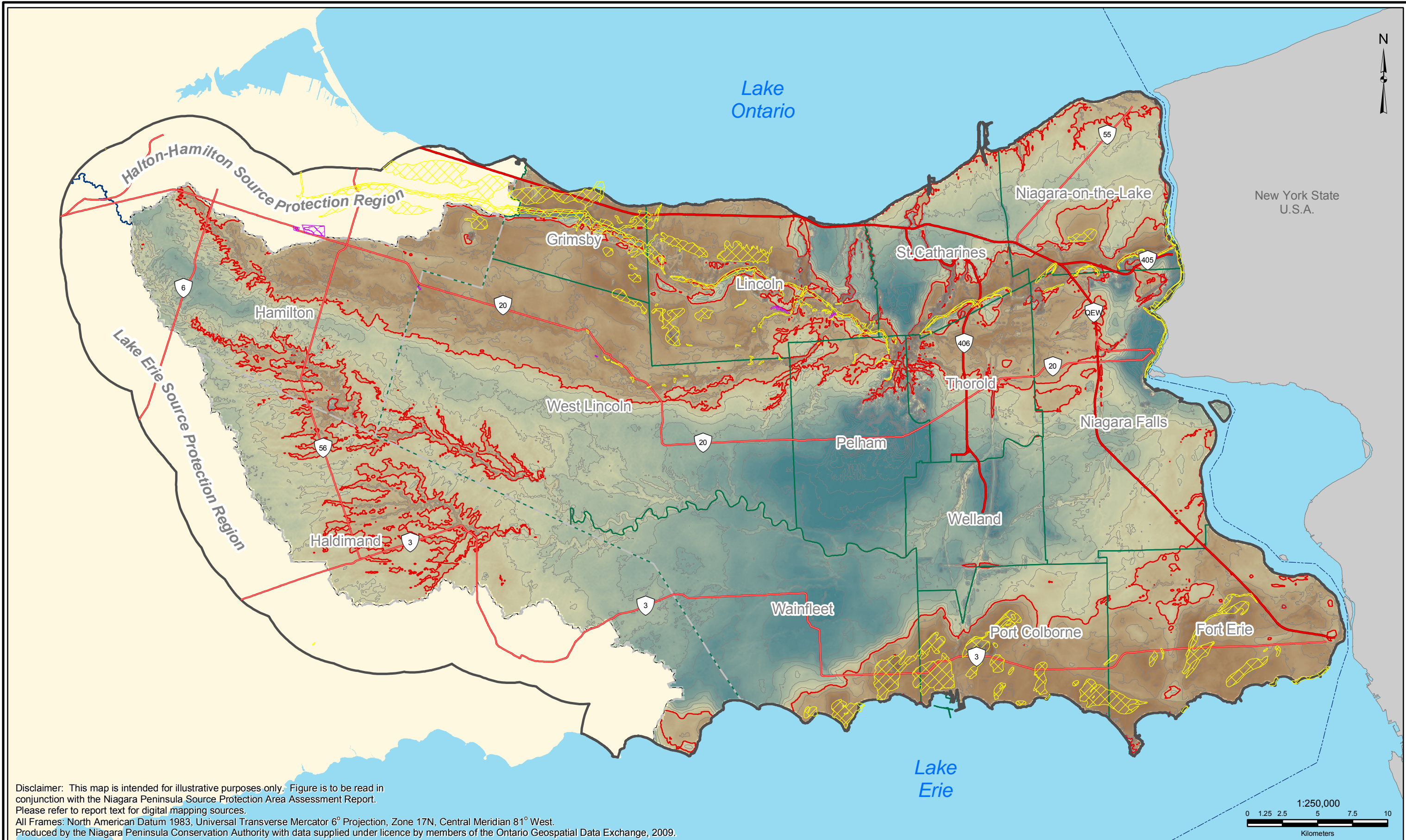
<b>Legend</b> --- International Boundary    ~ Watercourse --- Major Highways    Ponds, Reservoirs, Lakes --- Highways    Extended Context Area --- Roads    Niagara Peninsula Source Water Protection Area		Lower Tier Municipality Upper Tier Municipality Escarpment		<b>Bedrock Geology</b> Bertie Formation Bois Blanc Formation Clinton - Cataract Group Onondaga Formation		Guelph Formation Lockport Group Queenston Formation Salina Formation					<b>NPSA Assessment Report</b>	
									<i>Figure 3.10: Bedrock Geology</i>			
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<b>Legend</b> --- International Boundary     Extended Context Area --- Major Highways     Niagara Peninsula Source Water Protection Area --- Highways     Lower Tier Municipality --- Roads     Upper Tier Municipality		Bedrock Outcrop Escarpment 5 m Contours Bedrock Valleys		<b>Bedrock topography (m) above sea level</b> High : 220 Low : 48 Note: 'Bedrock Outcrop' denotes areas where there is less than 1m of overburden. The bedrock topography depicted in the St. David's Buried Gorge area may not be accurately represented due to a lack of well data. Previous interpretations indicate the gorge cuts approximately 60 to 130 m into the bedrock.						<b>NPSPA Assessment Report</b> Figure 3.11: Bedrock Topography	
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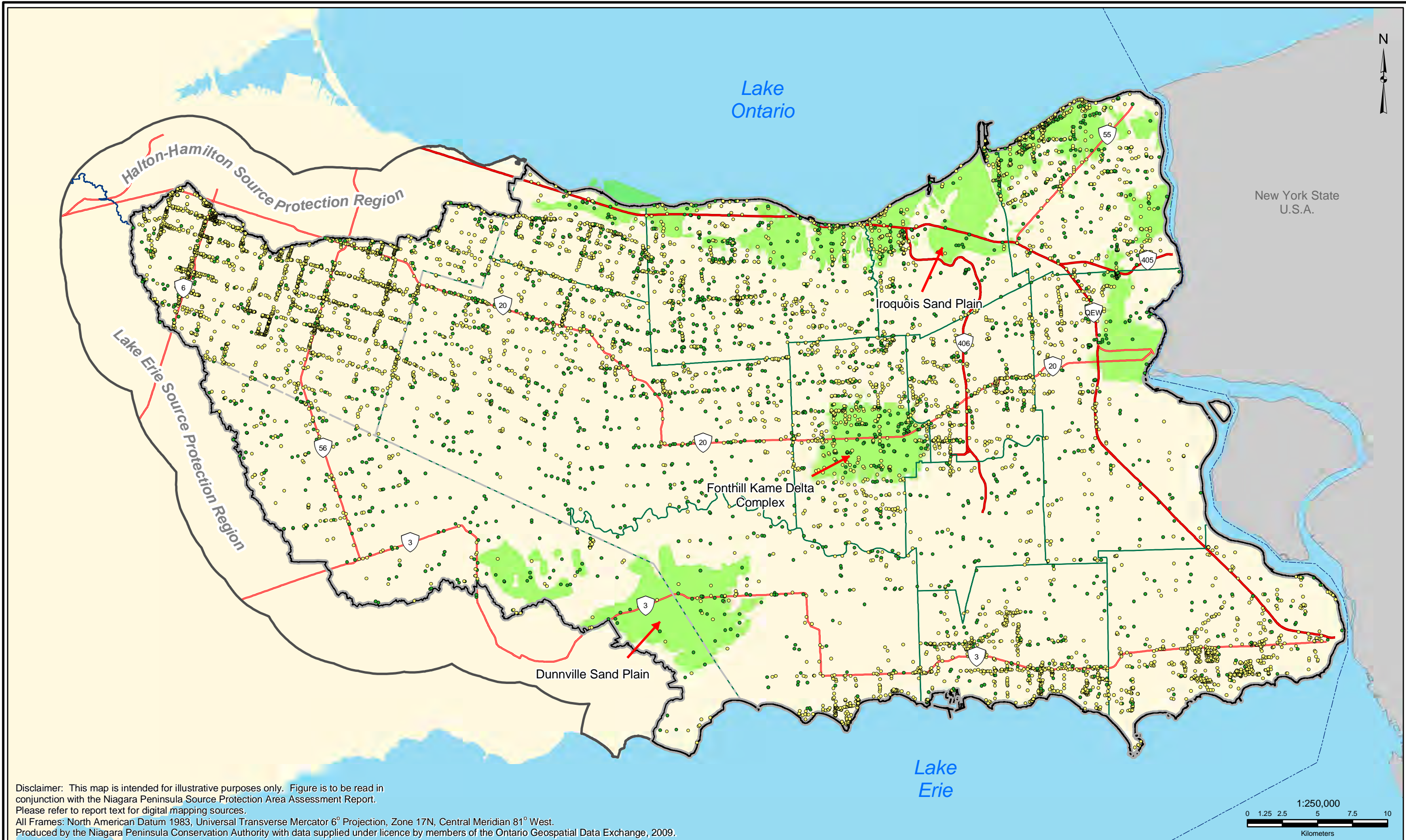


<b>Legend</b> --- International Boundary Major Highways Highways Roads Extended Context Area Niagara Peninsula Source Water Protection Area Lower Tier Municipality Upper Tier Municipality Bedrock Outcrop Contour 5m Interval 15 m Thickness Karst		Overburden thickness (m) above sea level High : 106.9 Low : 0.0 * Bedrock outcrop denotes areas where there is less than 1m of overburden			<b>NPSA Assessment Report</b> <b>Figure 3.12: Overburden Thickness</b> Thursday, July 14, 2011 
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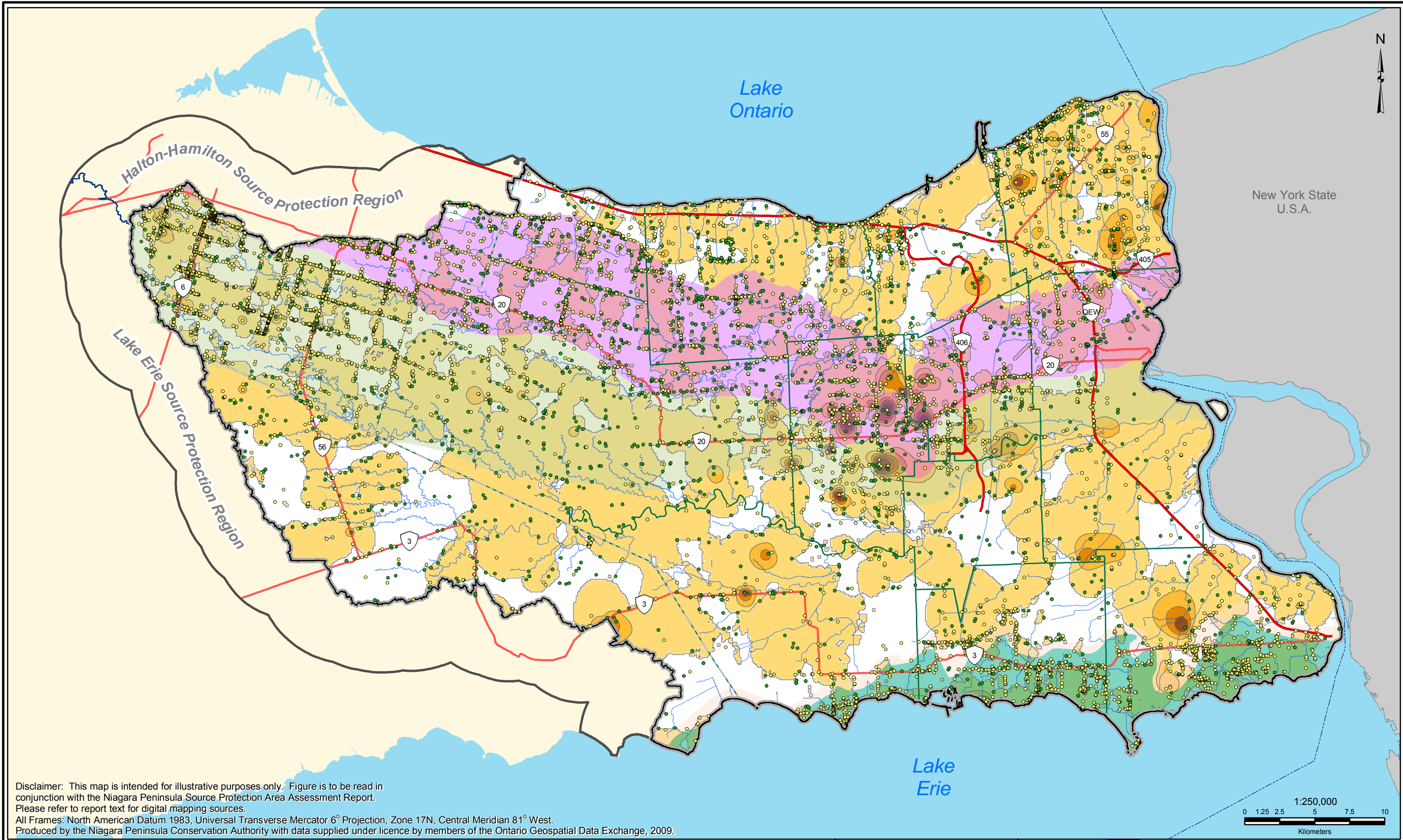












**Legend**

- International Boundary
- Major Highways
- Highways
- Watercourse
- Ponds, Reservoirs, Lakes
- Extended Context Area
- Source Water Protection Area
- Contour 5 m
- Lower Tier Municipality
- Upper Tier Municipality
- Other Water Wells
- Water Supply Wells

**Bedrock Water Supply Aquifers**

- Bois Blanc Formation
- Onondaga Formation
- Guelph Formation
- Lockport Formation

**Sand and Gravel Aquifer Thickness Above Bedrock (m)**

0	10.1 - 15
0.1 - 5	15.1 - 25
5.1 - 10	25.1 - 55

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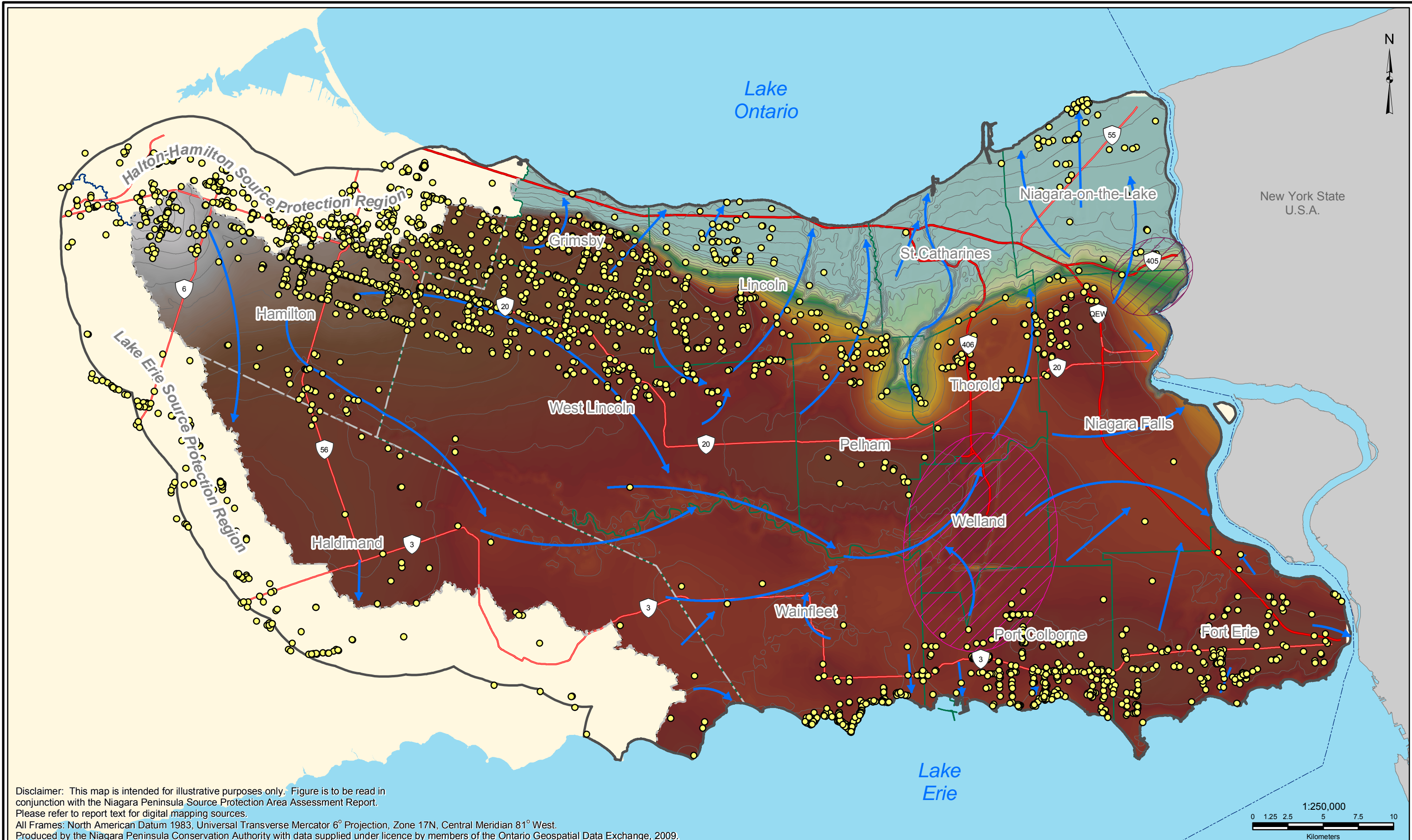
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Figure 3.15: NPSPA Area Contact-Zone and Prominent Bedrock Aquifers

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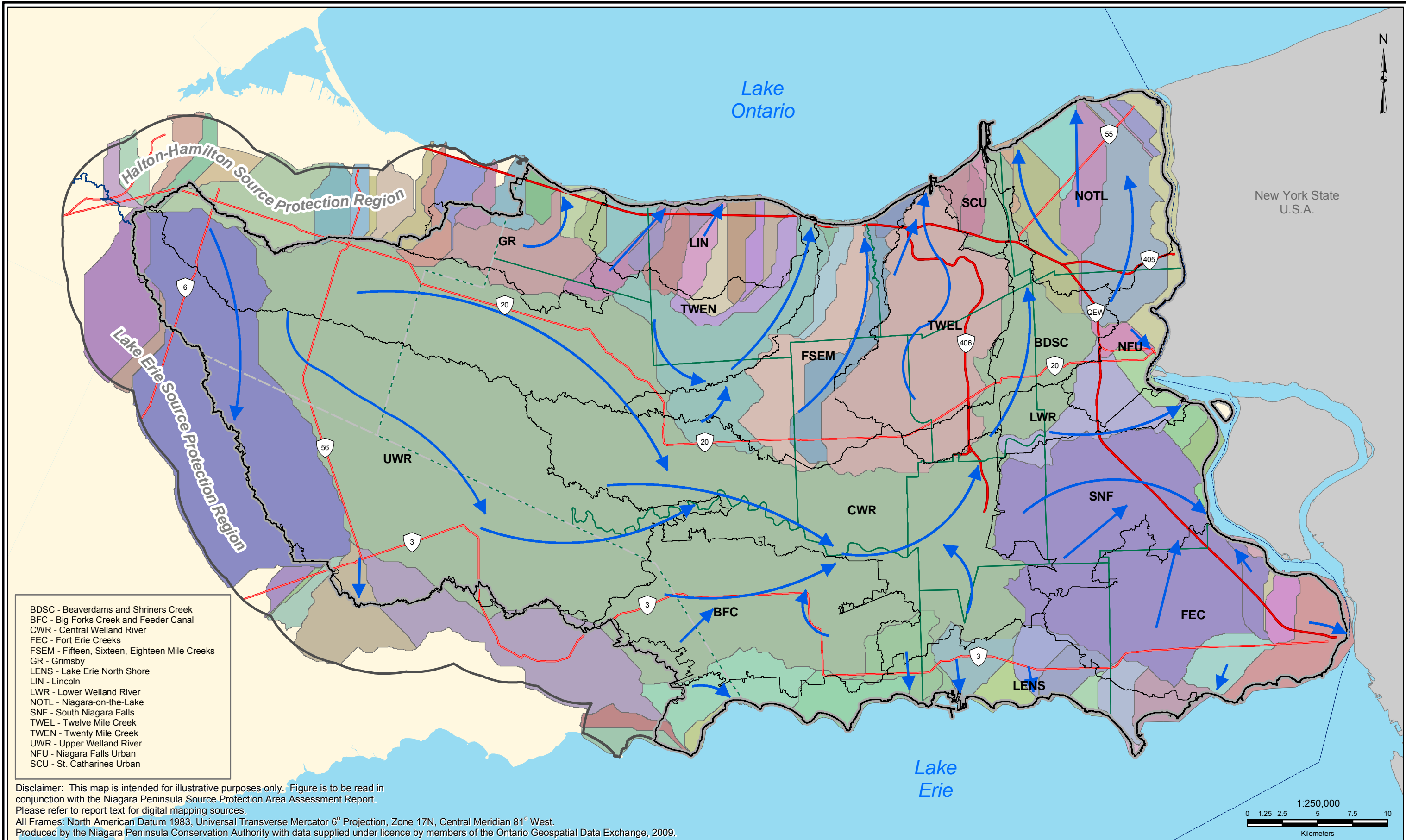
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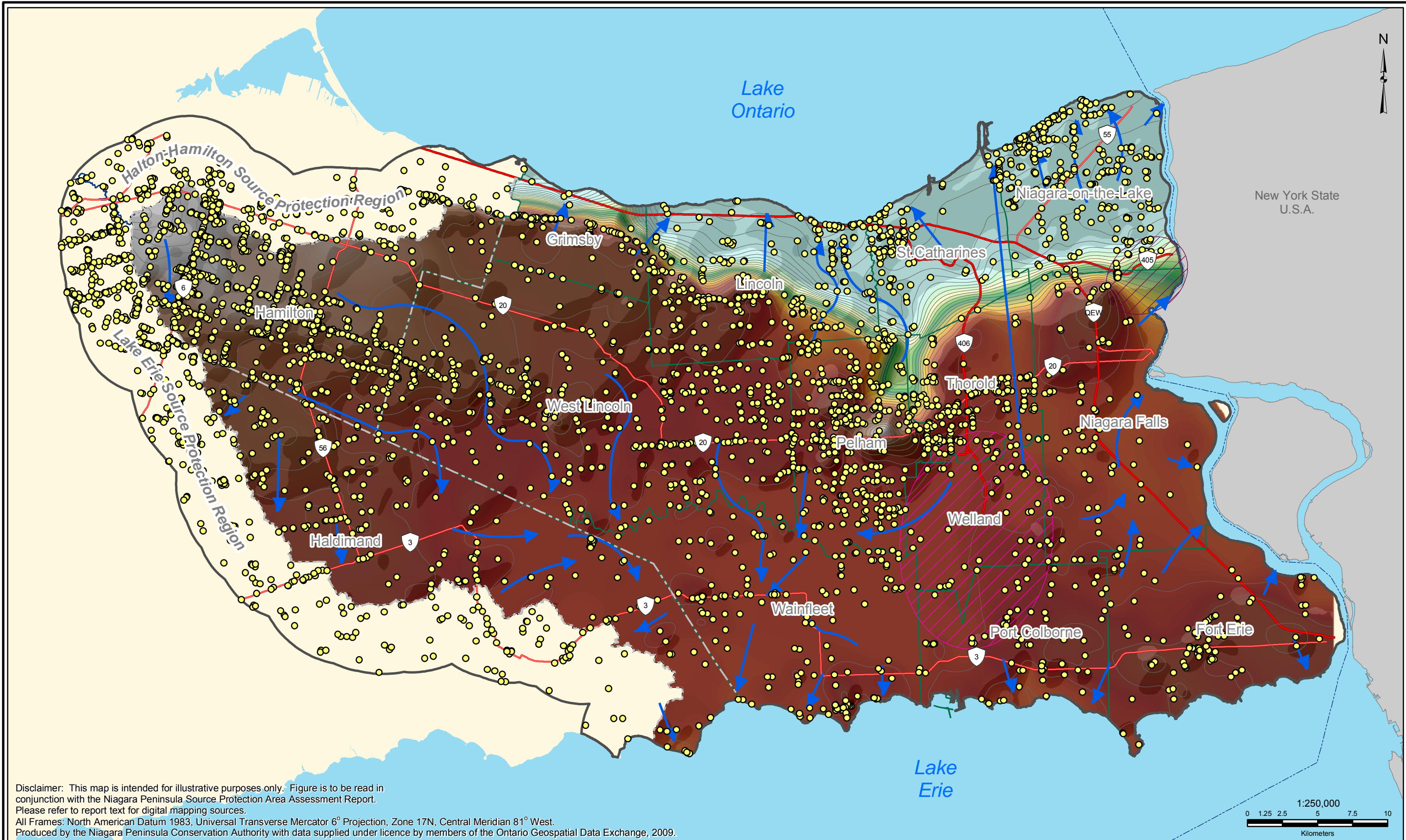


<b>Legend</b> --- International Boundary --- Major Highways --- Extended Context Area --- Niagara Peninsula Source Water Protection Area		Lower Tier Municipality Upper Tier Municipality Wells Used in Analysis Contour 5 m		Ground Water Flow Welland Canal Dewatering PGS Reservoir Area Elevation (m) above sea level High : 243.377 Low : 73.1598 <small>Elevation inaccurate due to radial outflow from power generating station reservoir (PGS)</small>					<b>NPSA Assessment Report</b>	
							<b>Figure 3-16: Water Table Elevations</b>			
									Thursday, July 14, 2011	



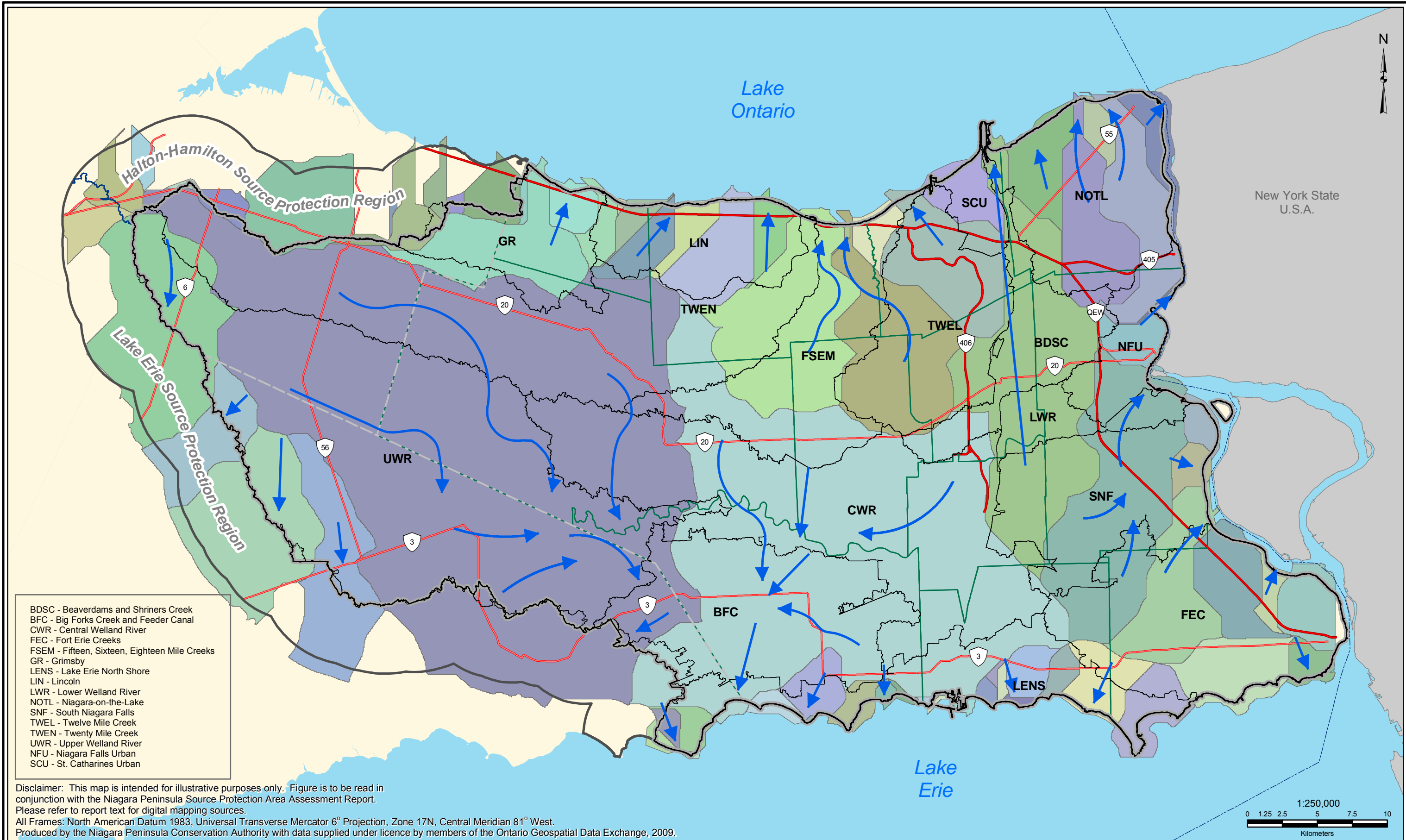




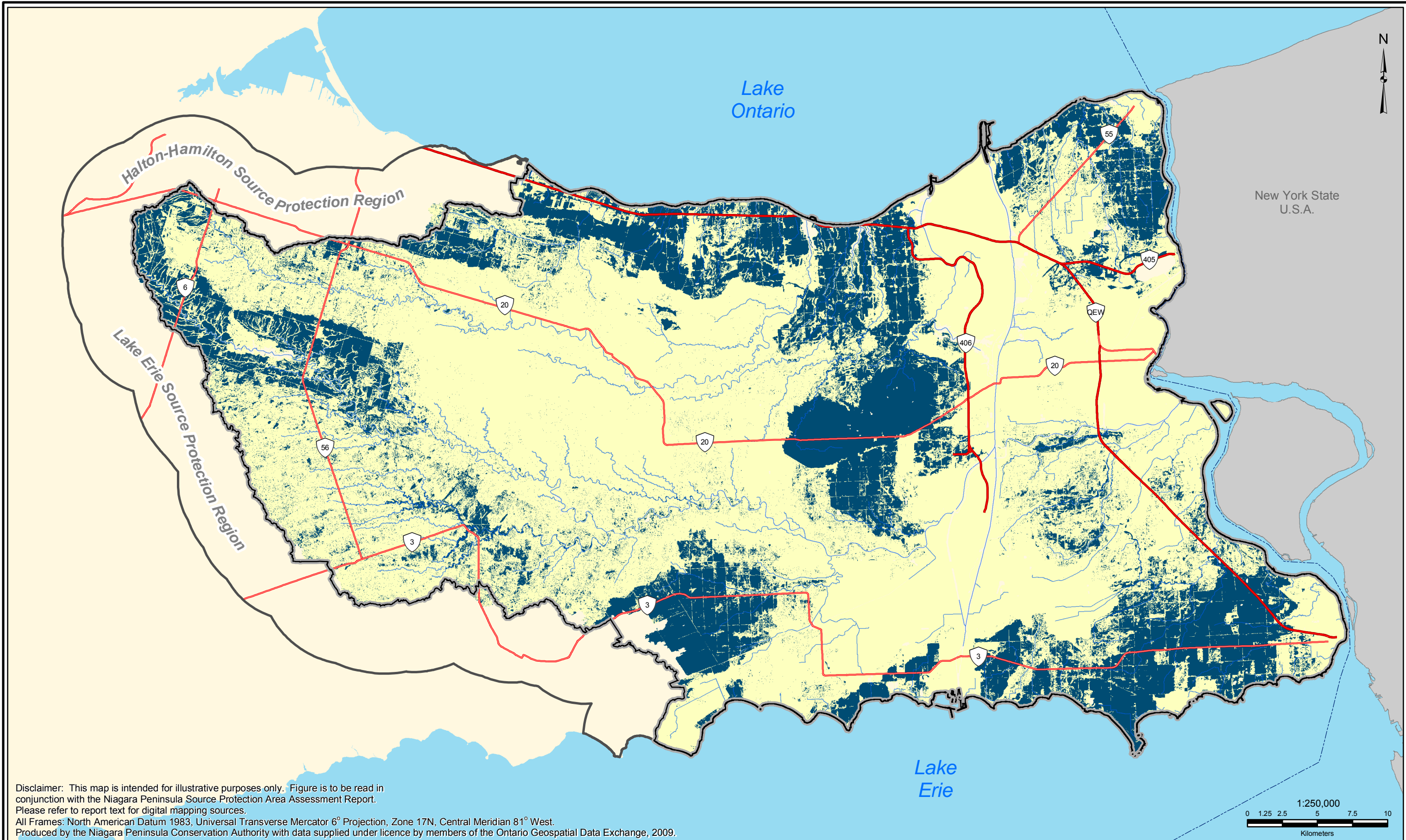


<b>Legend</b> --- International Boundary --- Major Highways --- Extended Context Area --- Niagara Peninsula Source Water Protection Area		Lower Tier Municipality Upper Tier Municipality Wells Used in Analysis Contour 5 m		Groundwater Flow Welland Canal Dewatering PGS Reservoir Area Elevation (m) above sea level High : 237.5 Low : 69.6 <small>*Elevation inaccurate due to radial outflow from power generating station reservoir (PGS)</small>				<b>NPSPA Assessment Report</b>	
							<b>Figure 3.18: Potentiometric Surface</b>		
								Thursday, July 14, 2011	









- Legend**
- International Boundary
  - Watercourse
  - Major Highways
  - Ponds, Reservoirs, Lakes
  - Highways
  - Extended Context Area
  - Source Water Protection Area
  - HMS Rivers
  - Non Modeled Areas

Annual groundwater recharge (mm/yr) 1991 - 2005

- ≤ 53
- > 53, Potential SGRAs



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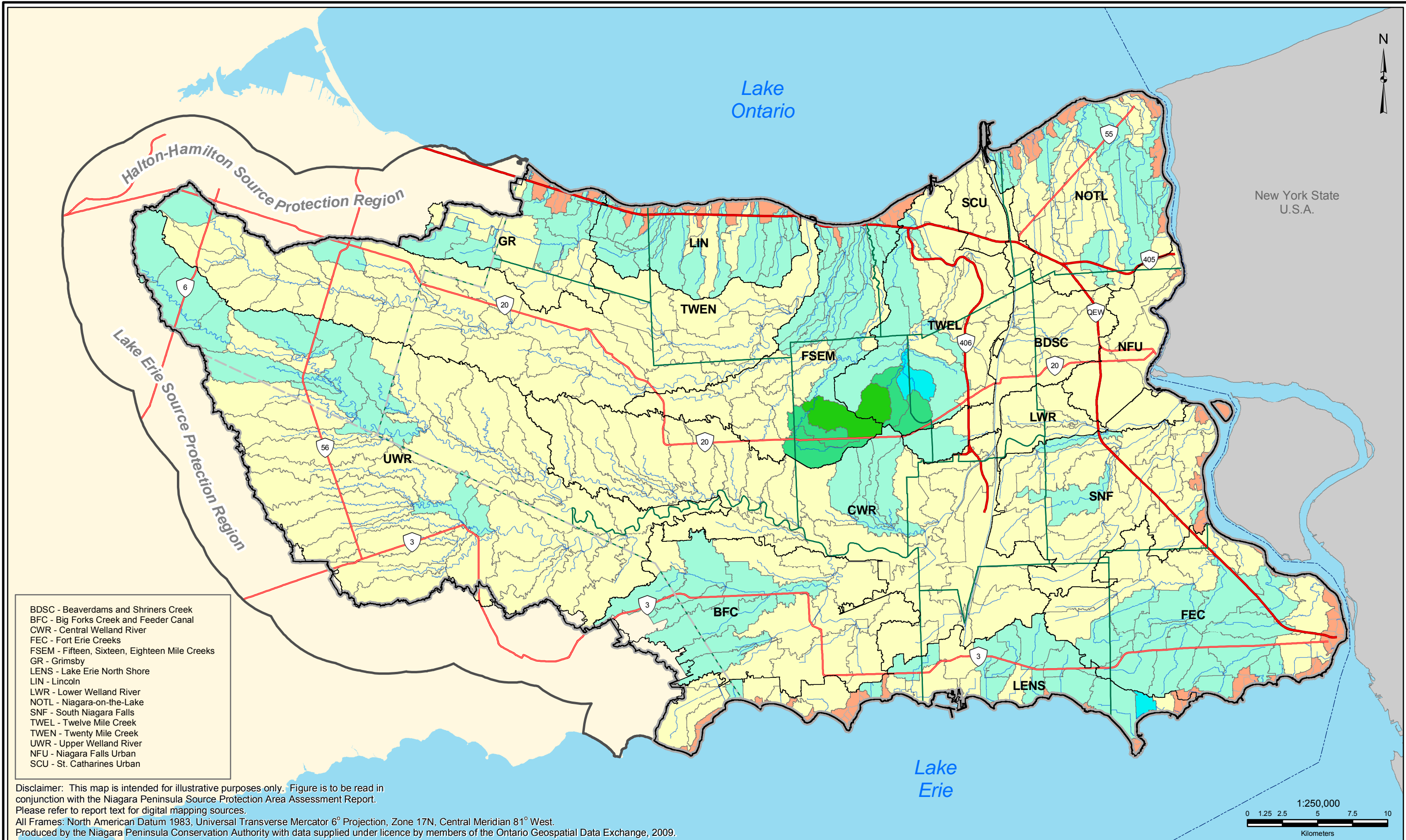
*Figure 3.20: Potential Groundwater Recharge Areas*



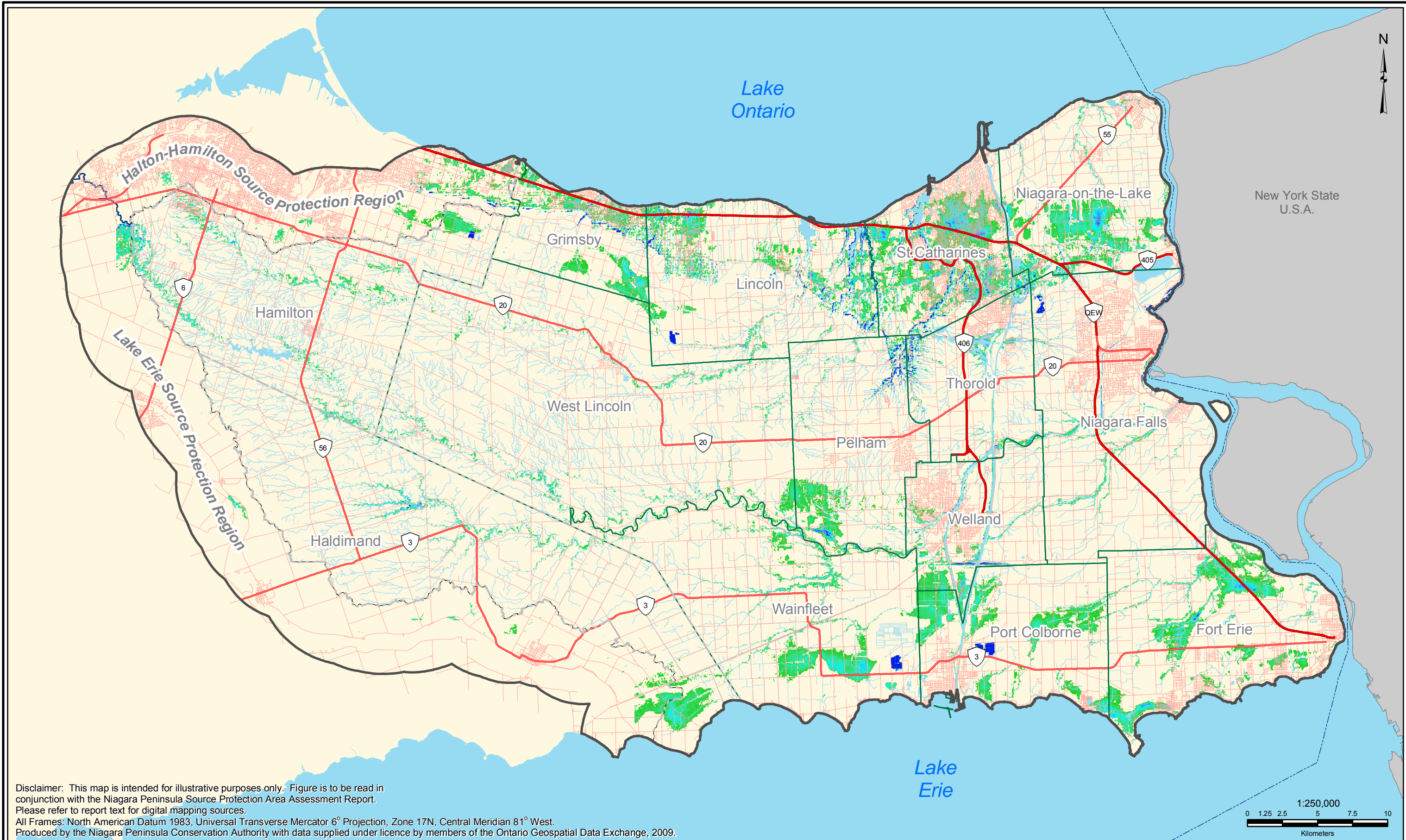
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**Legend**

--- International Boundary	Ponds, Reservoirs, Lakes	Niagara Peninsula Source Water Protection Area	<p>Height of water table above ground surface (m)</p> <p>High : 24.6</p> <p>Low : 0.0</p>
— Major Highways	Watercourse	Lower Tier Municipality	
— Highways	Extended Context Area	Upper Tier Municipality	
— Roads			

Note: Above ground heads north of the Niagara Escarpment (e.g. Grimsby Area) are generally considered anomalous

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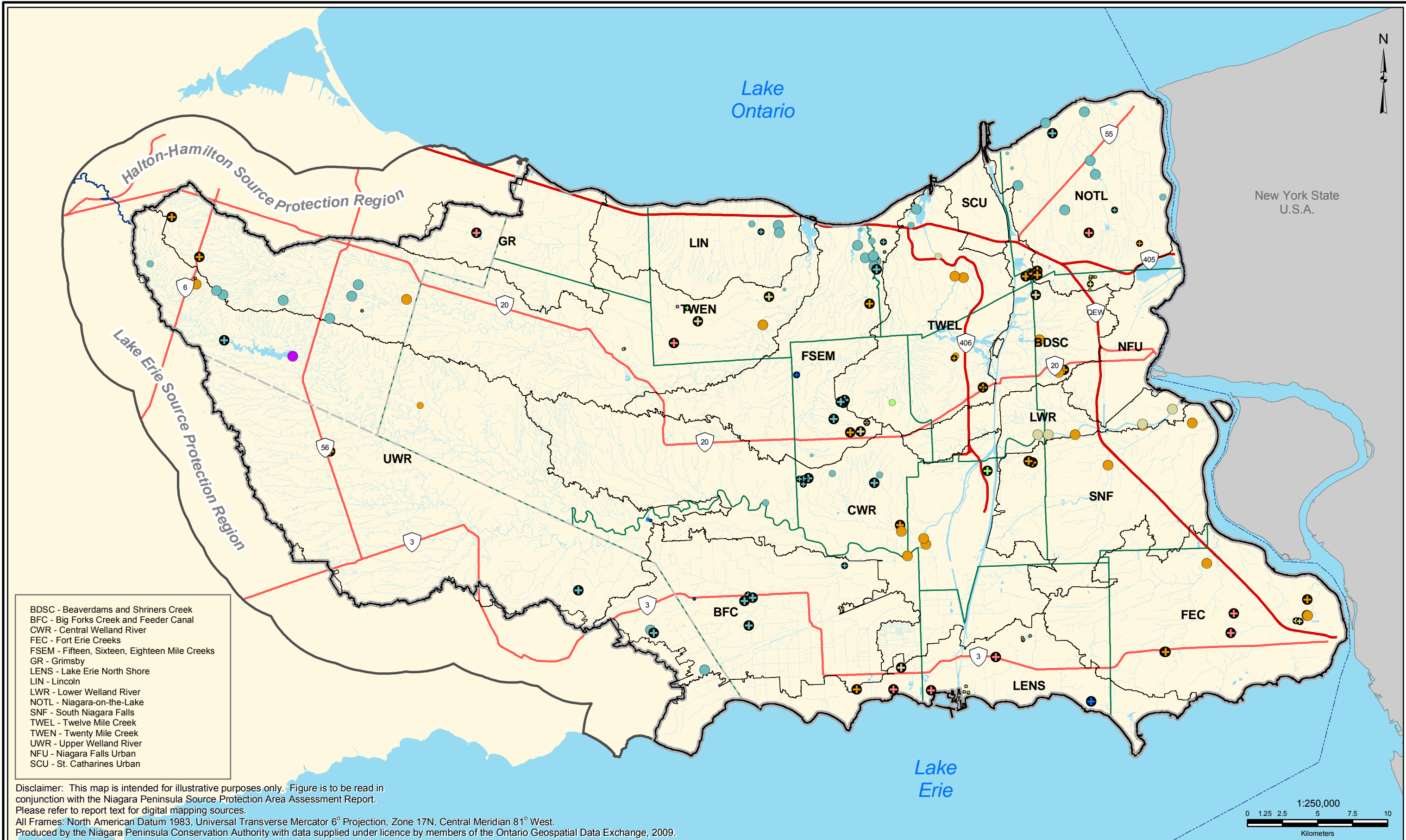
*Figure 3.22: Potential Groundwater Discharge Areas*

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**Legend**

- International Boundary
- Major Highways
- Extended Context Area
- Source Water Protection Area
- Lower Tier Municipality
- Upper Tier Municipality
- NPCA Watershed Planning Areas
- Watercourse

**Major Category**

- Agricultural
- Commercial
- Dewatering
- Industrial
- Institutional
- Miscellaneous
- Recreational
- Remediation
- Water Supply

**Source**

- Ground
- Surface

**Maximum Litres Per Day**

- ≤ 200 000
- 200 000 - 500 000
- ≥ 500 000

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Figure 3:23: Consumptive Permits to Take Water Sources

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