

Lake Erie Flooding Hazards & Preparedness Public Information Centre

Jason Gallagher, Fire Chief / Manager of Emergency Services

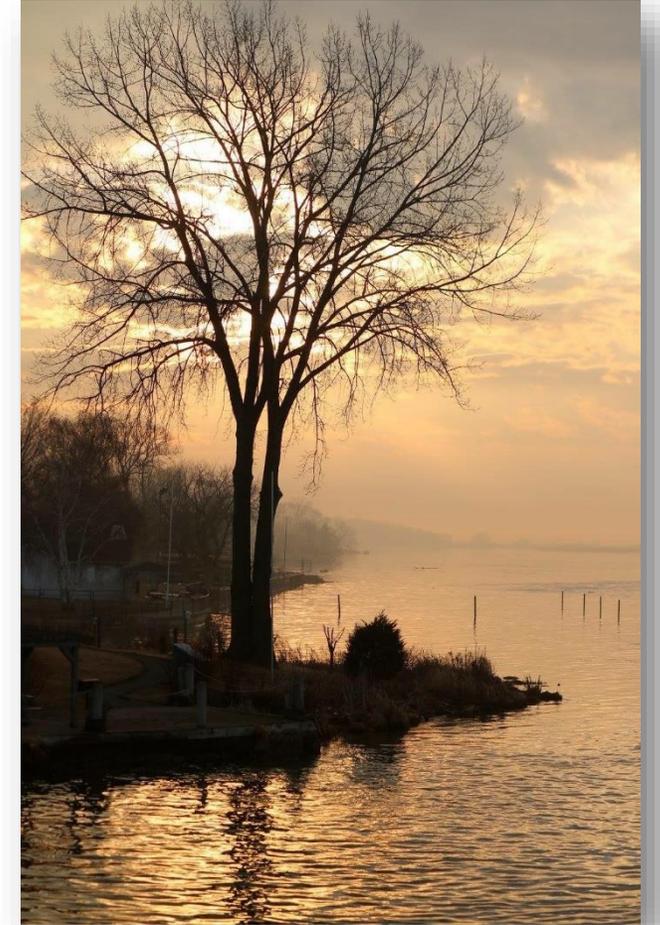
Scott Robertson, Senior Water Resources Engineer, GRCA

December 2, 2019



Presentation Overview

1. Lake Erie Characteristics
2. Types and Causes of Flooding
3. Roles and Responsibilities
4. Lake Erie Flood Hazard Zone Mapping
5. Coastal Hazard Mapping Project Update
6. Flood Preparation and Emergency Response
7. Staying Informed



Key Terminology

Static Levels

- long timeframes
- trends over decades, years, seasons

Storm Surge and Seiche

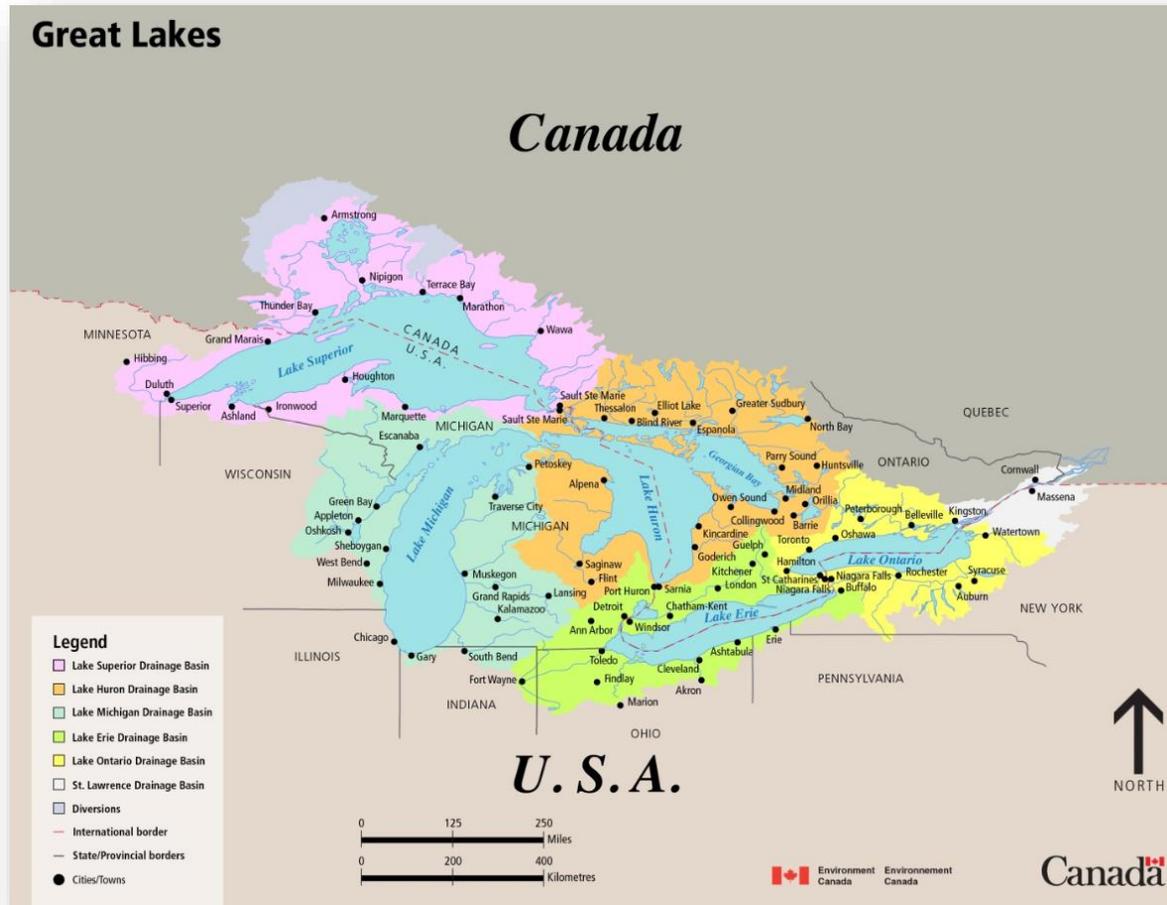
- short timeframe – hours

Waves

- very short timeframe – seconds



Great Lakes Drainage Area



- 766,000 km²
- 95 % of Lake Erie's water comes from the upper Great Lakes – Superior, Huron & Michigan
- Flow regulation on Great Lakes does not affect water levels in Lake Erie

Great Lakes System Profile

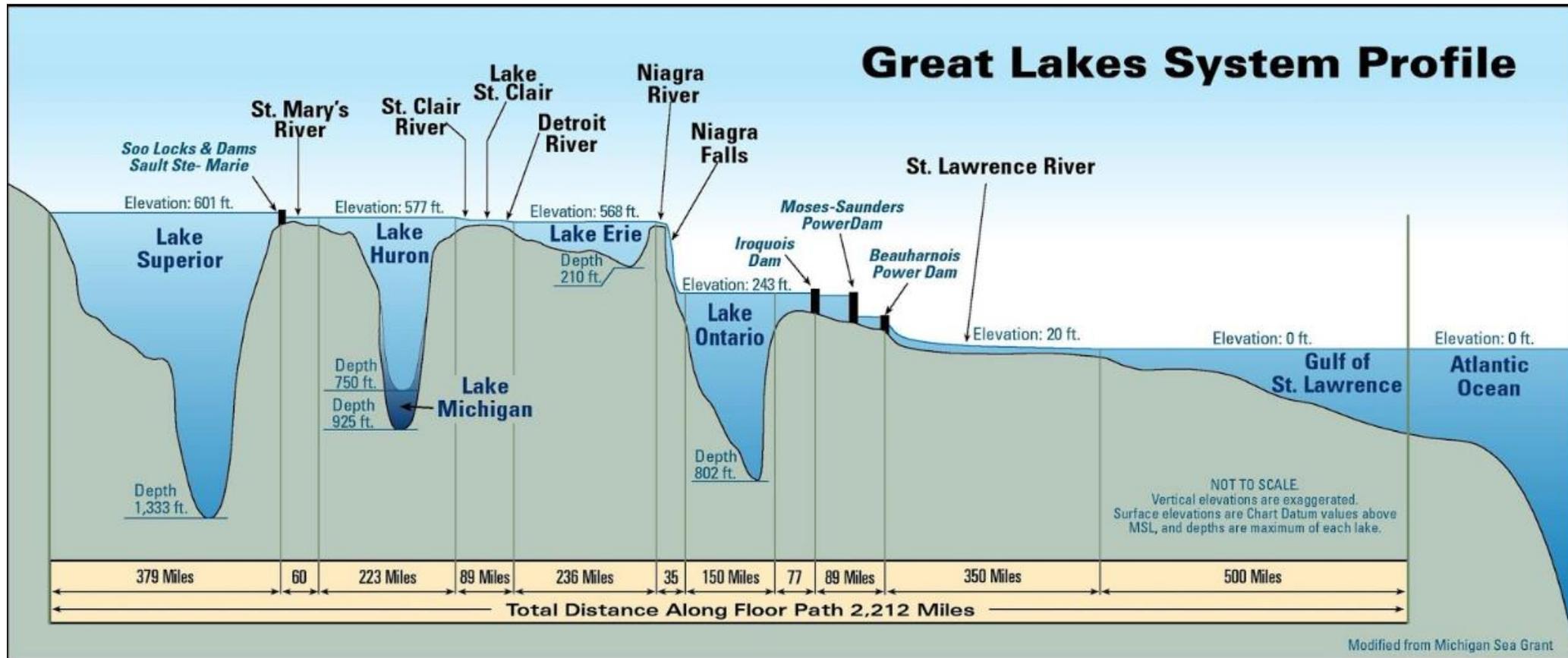
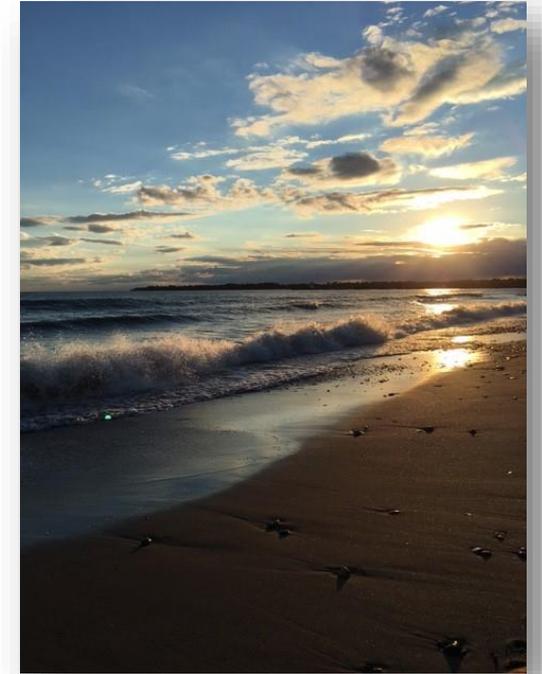


Image Source: Great Lakes Now – www.greatlakesnow.org.

Lake Erie Static or “Normal” Levels

Lake elevations are naturally impacted by:

- Weather across drainage catchment (e.g. Lake Superior, Huron and Michigan watersheds)
- Precipitation, temperature, ice cover
- Normal fluctuations are both seasonal and longer-term
- Unlike lower St. Lawrence / Lake Ontario, human influences are negligible - **Lake Erie is unregulated**



LAKE SUPERIOR MONTHLY MEAN LEVELS

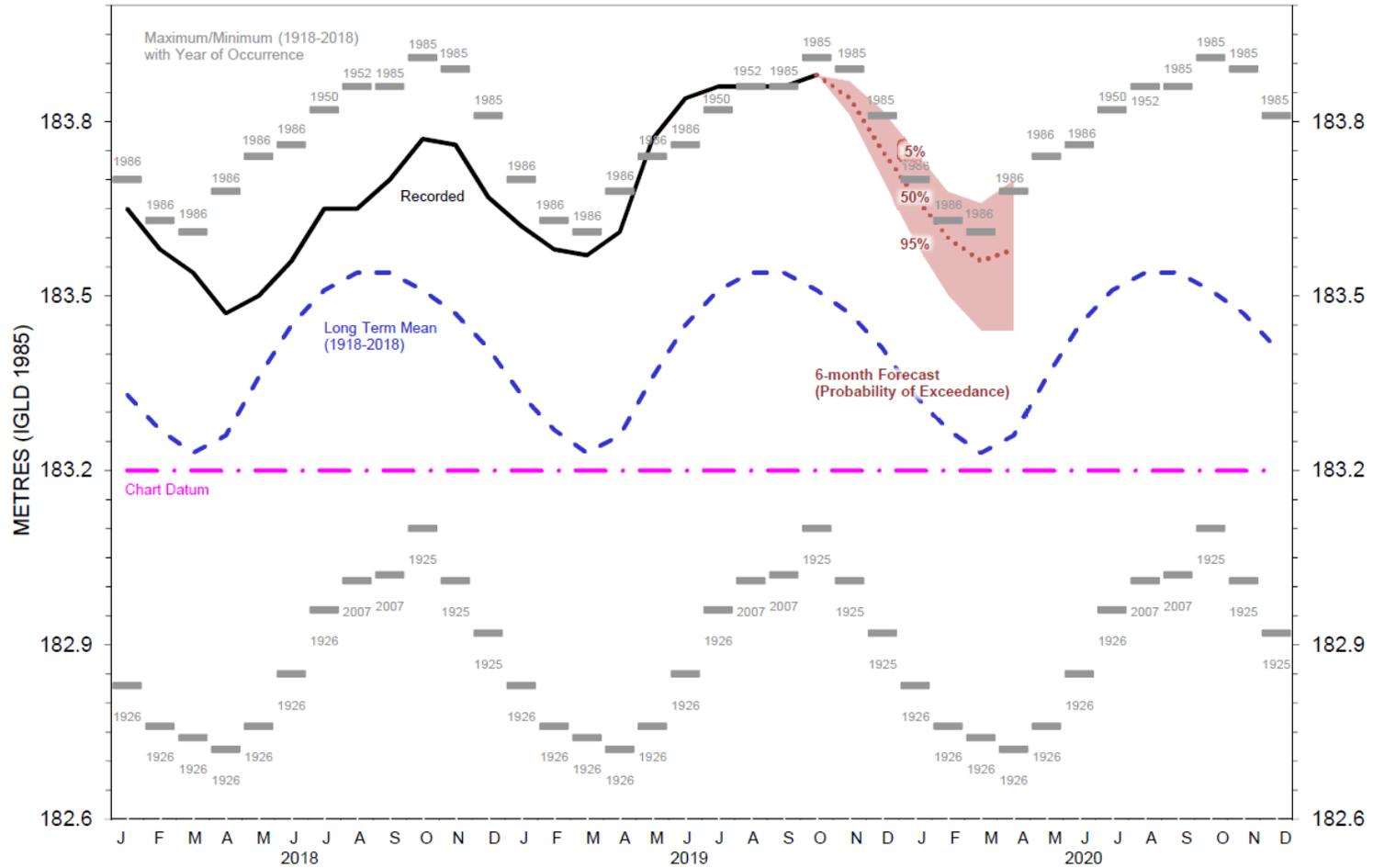


Chart Source:
Great Lakes – St. Lawrence Regulation Office, Environment and Climate Change Canada



LAKE MICHIGAN-HURON MONTHLY MEAN LEVELS

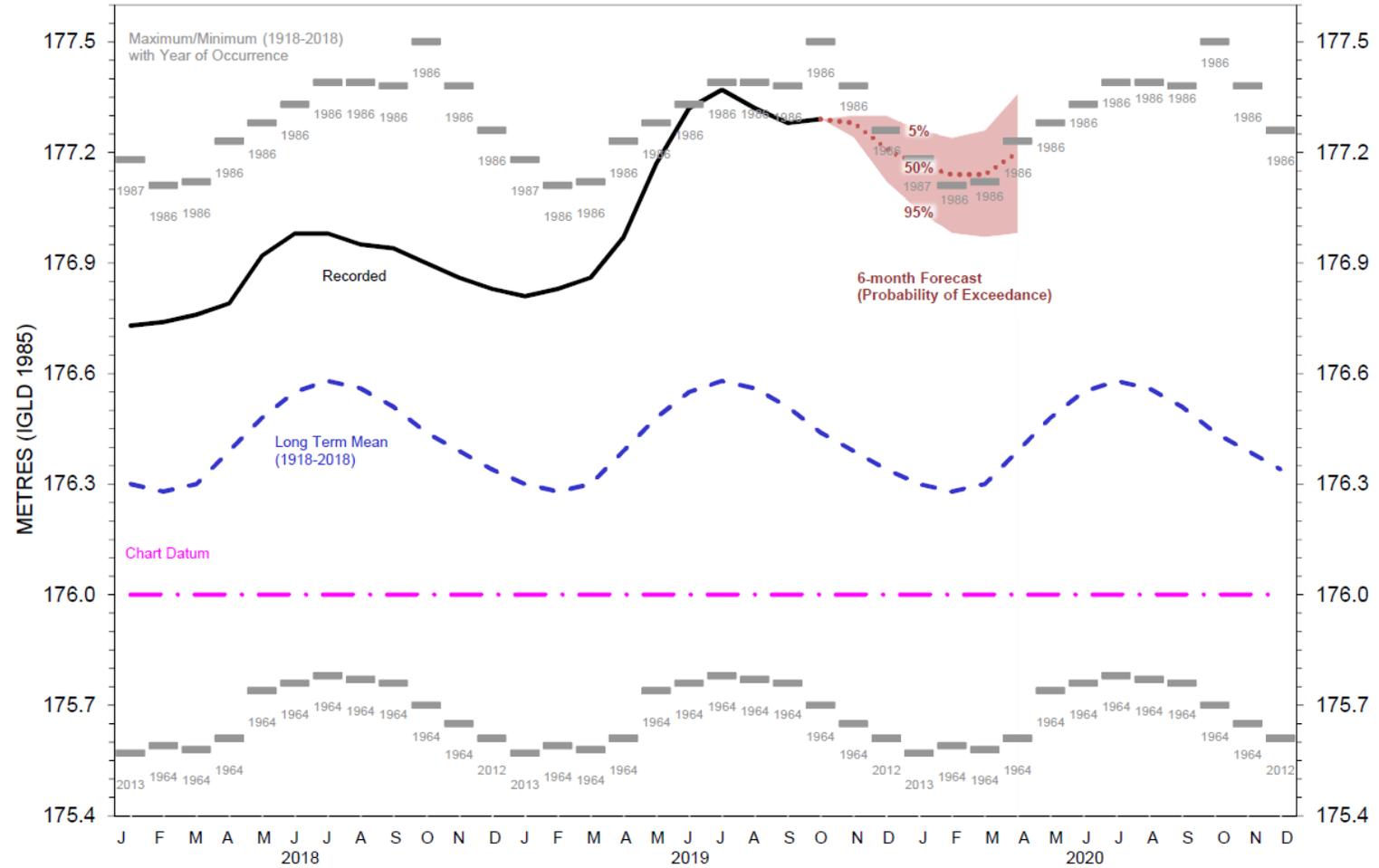


Chart Source:
Great Lakes – St. Lawrence
Regulation Office,
Environment and
Climate Change
Canada

LAKE ERIE MONTHLY MEAN LEVELS

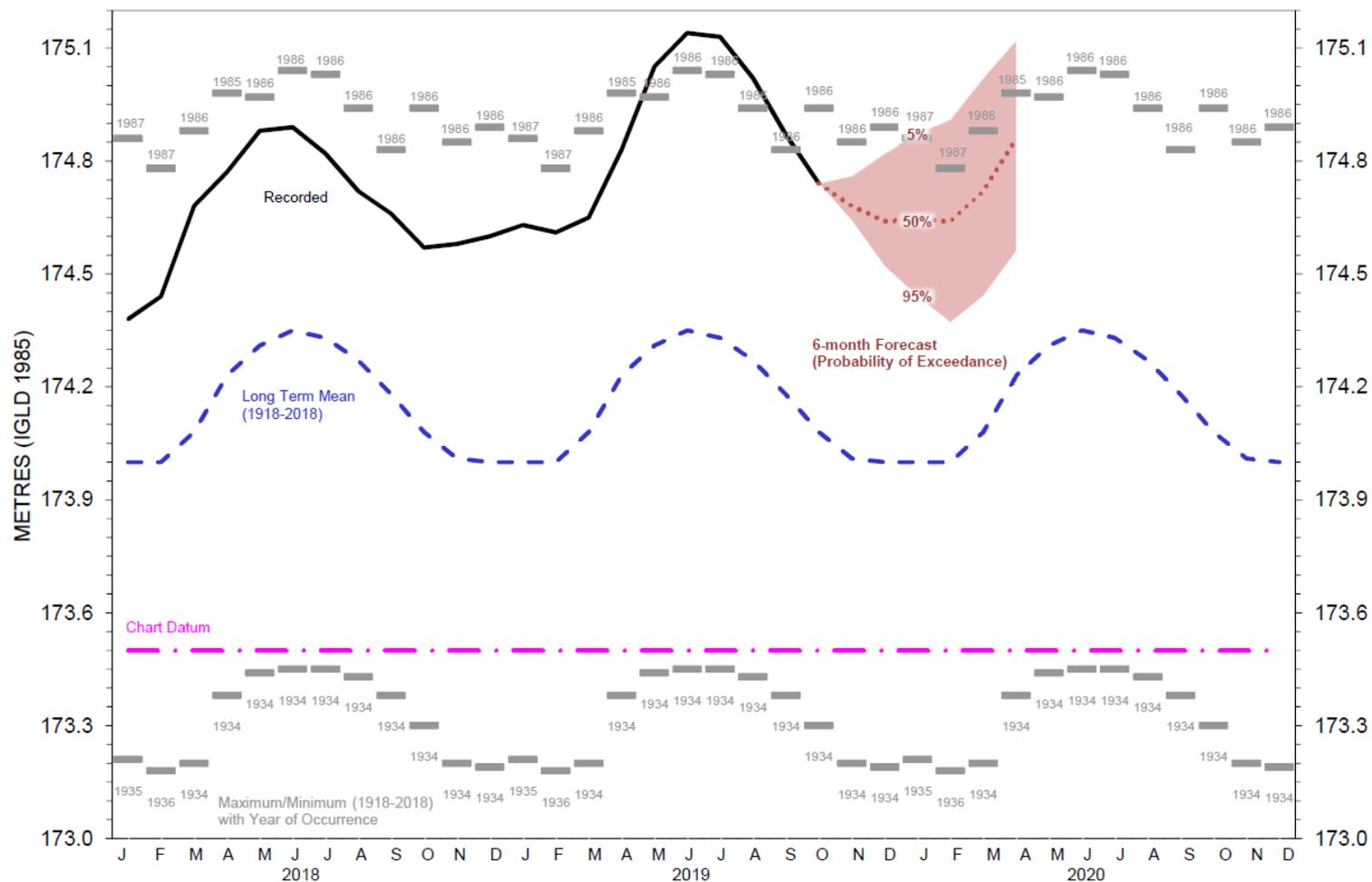
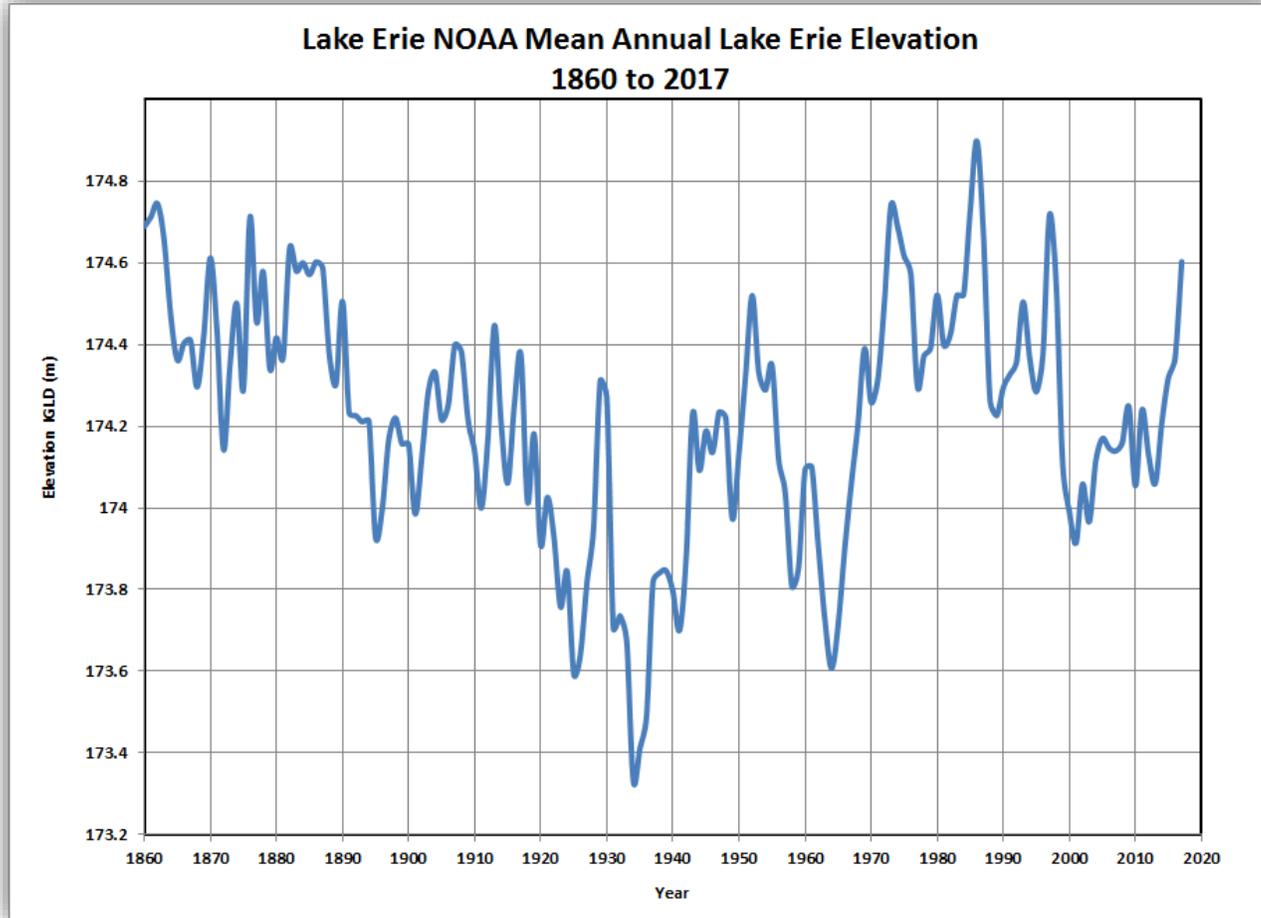


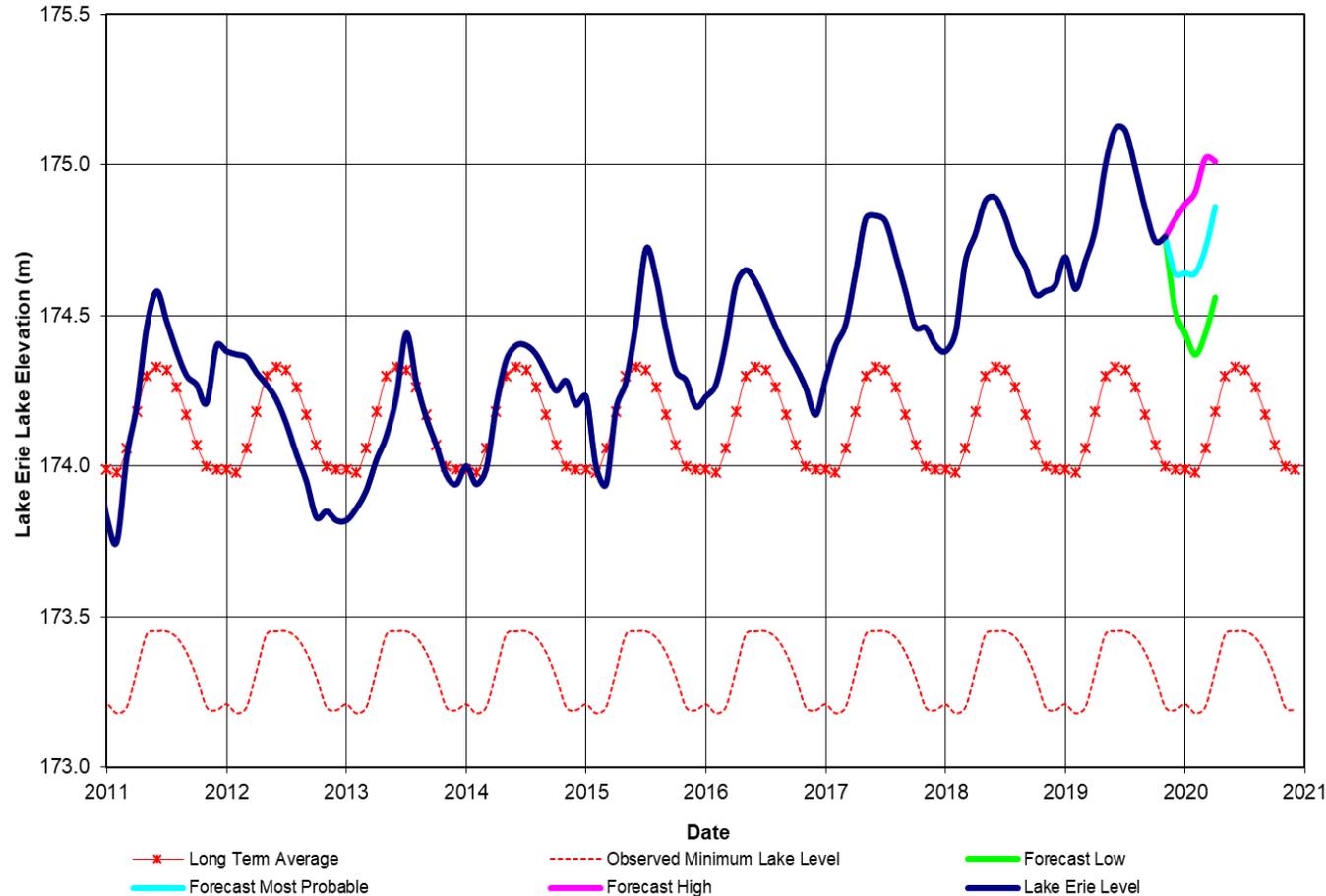
Chart Source:
Great Lakes – St. Lawrence
Regulation Office,
Environment and
Climate Change
Canada

Long-term Lake Level Cycles over Decades



- Significant low lake levels occurred in the 1930s and 1960s
- All-time low mean annual lake levels occurred in 1934
- High lake levels last occurred in the 1980s and 1990s
- All time high mean annual lake levels occurred in 1986
- Last cycle of high lake levels was 1997
- **High static lake levels increase risk of lake surge flooding**

Seasonal Nature of Lake Erie Levels



- Lake Erie levels typically peak in May/June annually
- Static lake levels are currently 174.6 m highest since 1997
- Spring runoff enters the Great Lakes causing levels to rise
- Less runoff typically occurs over the summer this combined with evaporation causes lake elevations to fall
- There is a time lag for runoff to the upper great lakes to reach Lake Erie

Flooding due to Static Lake Levels

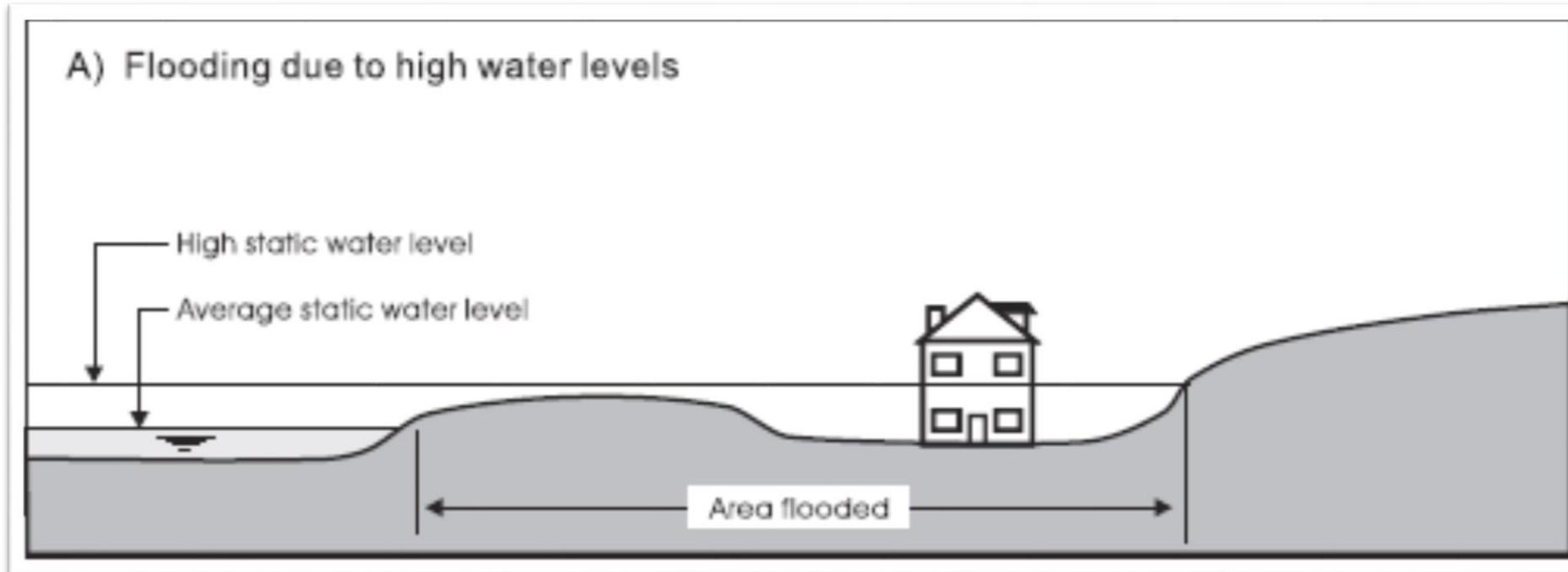


Image Source : Great Lakes – St. Lawrence River System and Large Inland Lakes, Technical Guides to flooding, erosion and dynamic beaches in support of Natural Hazards Policies 3.1 of the Provincial Policy Statement (1997) of the Planning Act (MNRF, 2001)

- Potential flooding of property due to fluctuations in static or “normal” lake levels with no exacerbating conditions
- Not often seen in Lake Erie, but experienced in 2017 & 2019 at Lake Ontario (e.g. Toronto’s Centre Island and the Bay of Quinte area)

Lake Erie Storm Surges and Seiches



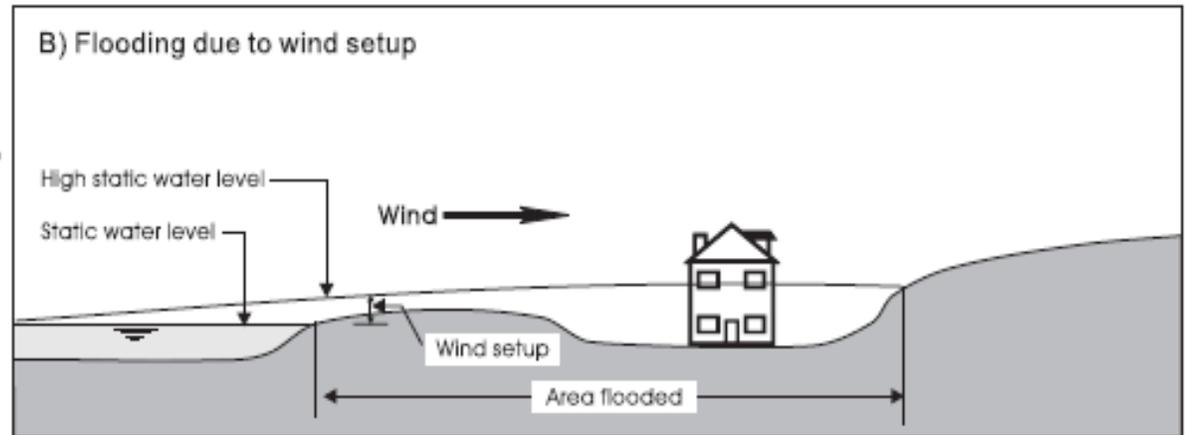
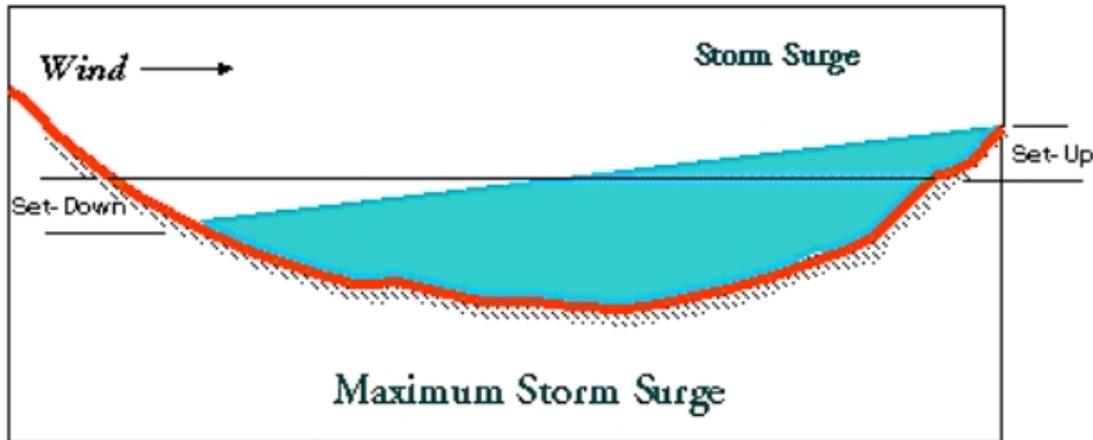
Flooding along Erie Shore Drive, May 2, 2017
(Photo Credit: Kathy Noble - Erieau Marina, www.blackburnnews.com)



Photo Credit: Great Lakes – St. Lawrence River System and Large Inland Lakes, Technical Guides to flooding, erosion and dynamic beaches in support of Natural Hazards Policies 3.1 of the Provincial Policy Statement (1997) of the Planning Act (MNRF, 2001)

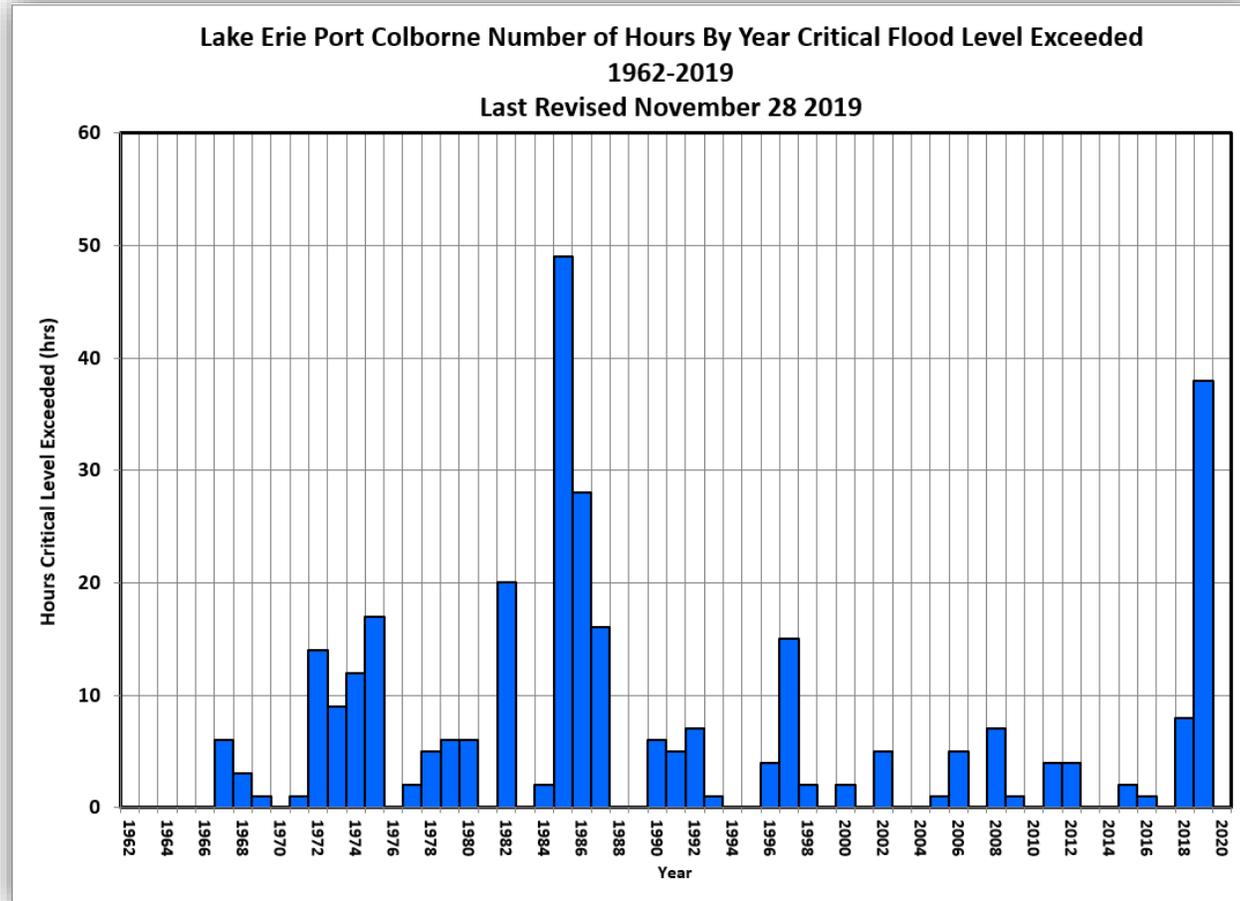
What are Surges and Seiches?

- Surges (a.k.a. wind setup) occur when winds, under specific combinations of velocity, direction, and durations physically push the water from one end of the lake to the other; water level differences of 4 m are often encountered on Lake Erie, occasionally 5 m
- For County coastal areas, surges typically result from 40+ km/hr southwest-to-south winds sustained for 4+ hours
- Seiches are the “sloshing” back and forth of water from end-to-end after a surge ends.



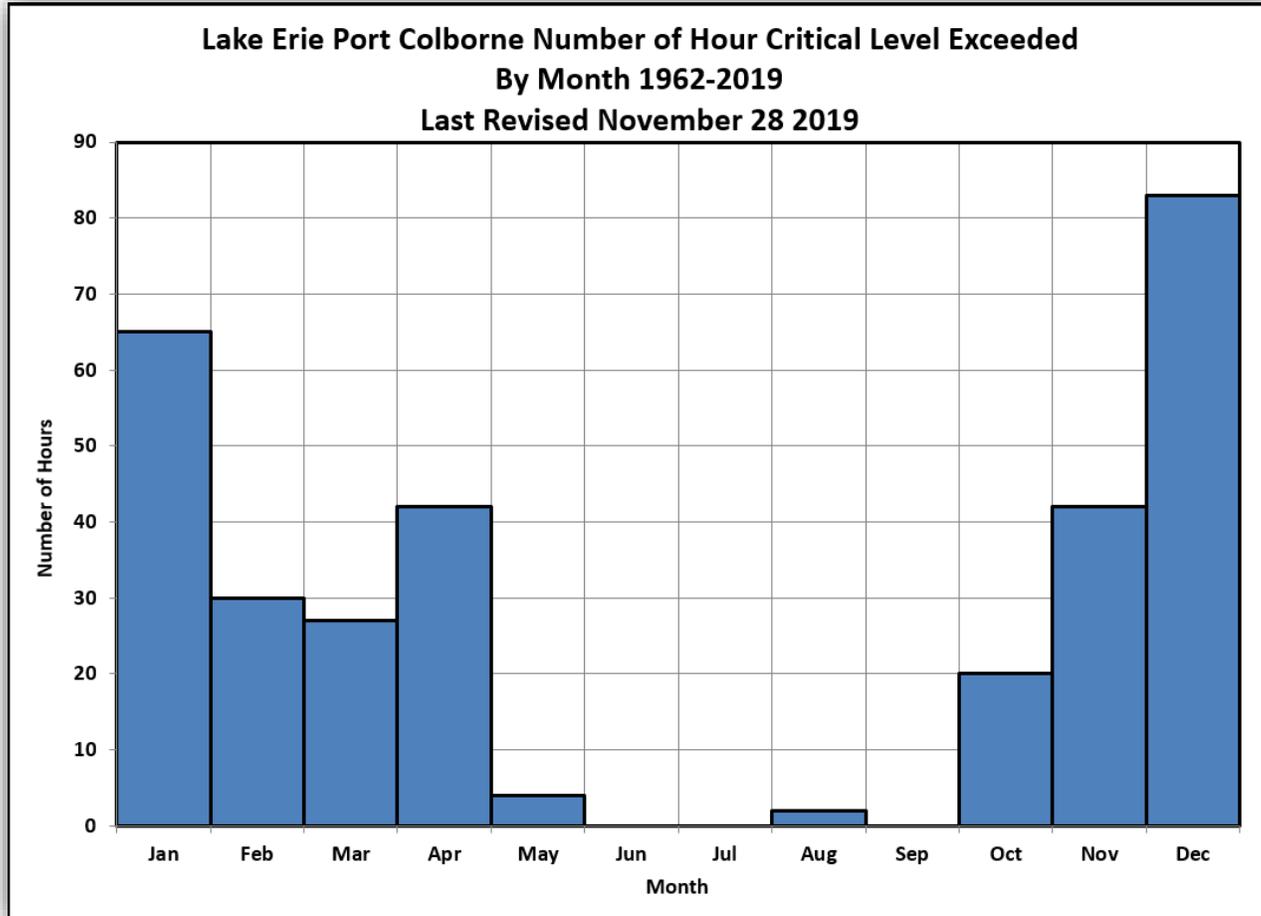
Images Source : Great Lakes – St. Lawrence River System and Large Inland Lakes, Technical Guides to flooding, erosion and dynamic beaches in support of Natural Hazards Policies 3.1 of the Provincial Policy Statement (1997) of the Planning Act (MNRF, 2001)

History of Past Lake Surge Events



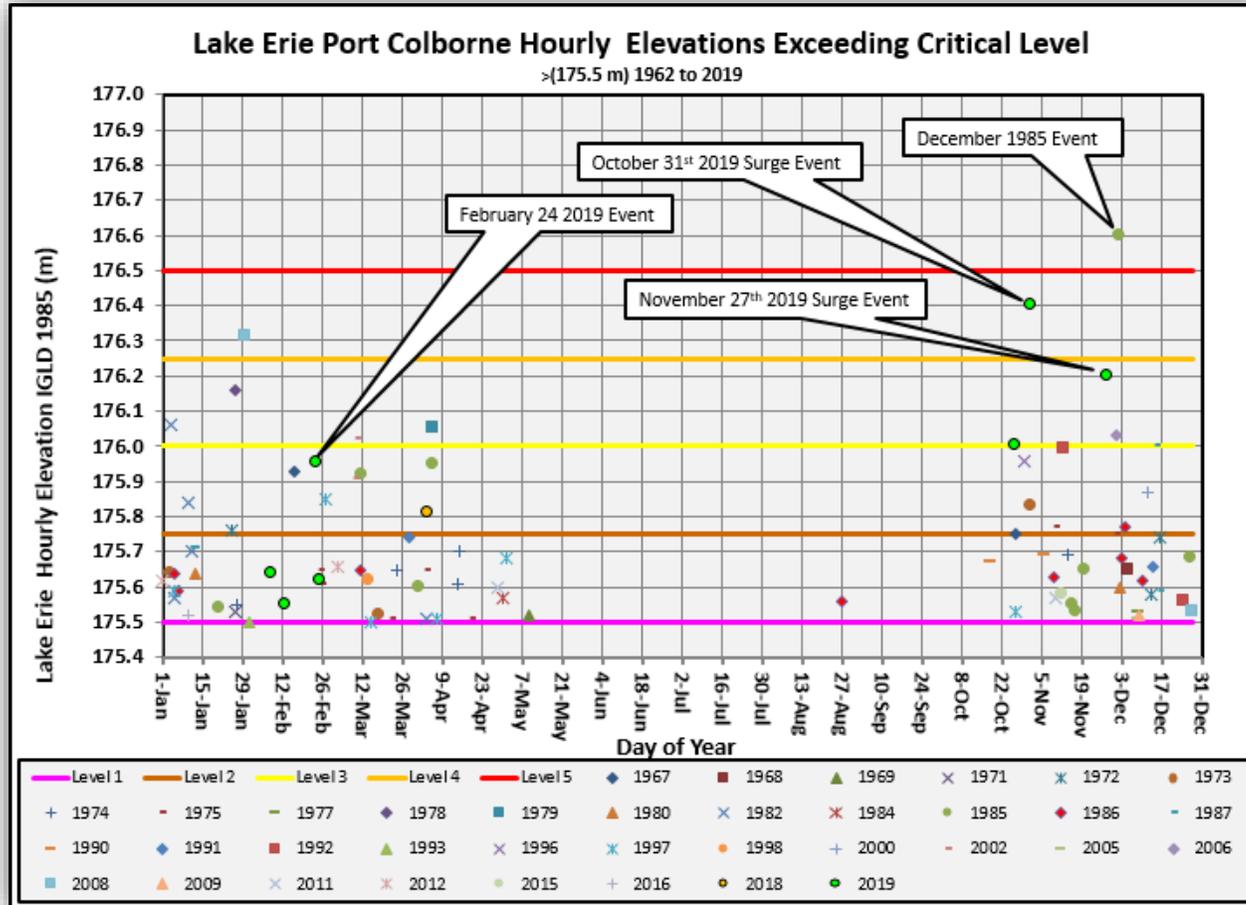
- High lake levels in 1985 resulted in several lake surge events
- Chart illustrates the number of hours the critical level was exceeded for each year
- Highest frequency of lake level surge events occurred in 1980s
- 2019 is the second-highest on record with a month remaining

Seasonal Nature of Lake Surge Events



- Higher risk of lake surges between November and April
- There is seasonal risk for lake surge events
- When air temperatures cool in the fall the risk of lake surge events increases
- December and January have had the highest number of lake surge events
- Most severe lake surges have occurred in December and January

Seasonal Nature and Height of Surges



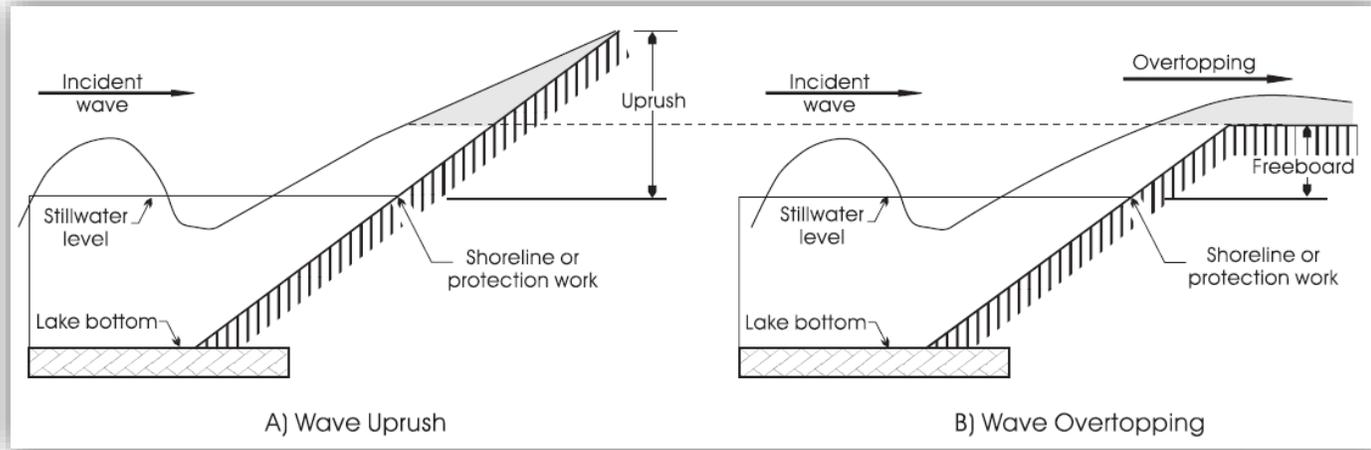
- Lake surge events can backup water over the Dunnville Dam
- Invert of Dunnville Dam is 175.77 m
- Chart summarizes Lake Erie surge events for the Port Colborne gauge by day of year
- The attached illustrates the severity of the lake surge and the time of year it occurred
- Highest lake surges occurred in December 1985 and January 2008

Lake Erie Waves and Wave Uprush

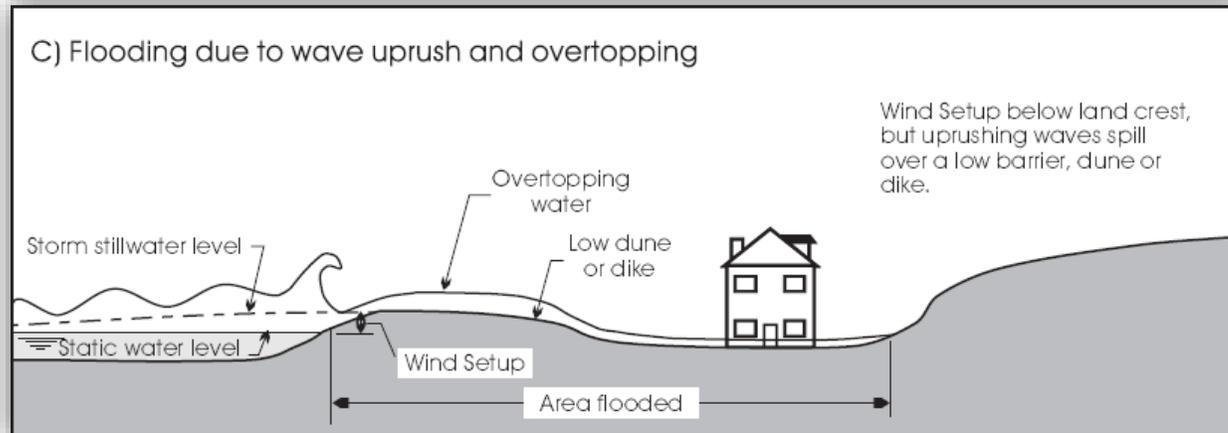


Photo credit: <http://erca.org/programs-services/flood-forecasting/>

Waves and Wave Uprush



- **Wave uprush** (a.k.a. wave run-up) is the vertical height above the stillwater level to which water, from an incident wave, will rush up onto a shoreline or shoreline protection work



Images Source : Great Lakes – St. Lawrence River System and Large Inland Lakes, Technical Guides to flooding, erosion and dynamic beaches in support of Natural Hazards Policies 3.1 of the Provincial Policy Statement (1997) of the Planning Act (MNR, 2001)

Ice and Winter Effects



Friend or
foe?



(Image Source - right:
Global News

Roles and Responsibilities

- Federal / Provincial
- Conservation Authorities
- County
- Individual Property Owners



Environment Canada Weather Forecasts

Alerts for: Dunnville - Caledonia - Haldimand

Warnings

2:19 PM EST Wednesday 27 November 2019

Wind warning in effect for:

- Dunnville - Caledonia - Haldimand

Southwesterly winds gusting to 100 km/h this afternoon and evening.

Very strong southwesterly winds gusting to 100 km/h will suddenly develop this afternoon as a sharp cold front blasts through. These damaging winds will persist into this evening before veering to the west and diminishing.

The highest wind gusts will be in exposed areas along the Lake Erie shore.

Power outages are possible.

Damage to buildings, such as to roof shingles and windows, may occur. High winds may toss loose objects or cause tree branches to break. Be prepared to adjust your driving with changing road conditions due to high winds.

Please continue to monitor alerts and forecasts issued by Environment Canada. To report severe weather, send an email to ONstorm@canada.ca or tweet reports using #ONStorm.

Typical Haldimand County EC Forecast - wind direction and speed can be a tip off to a potential lake surge event.

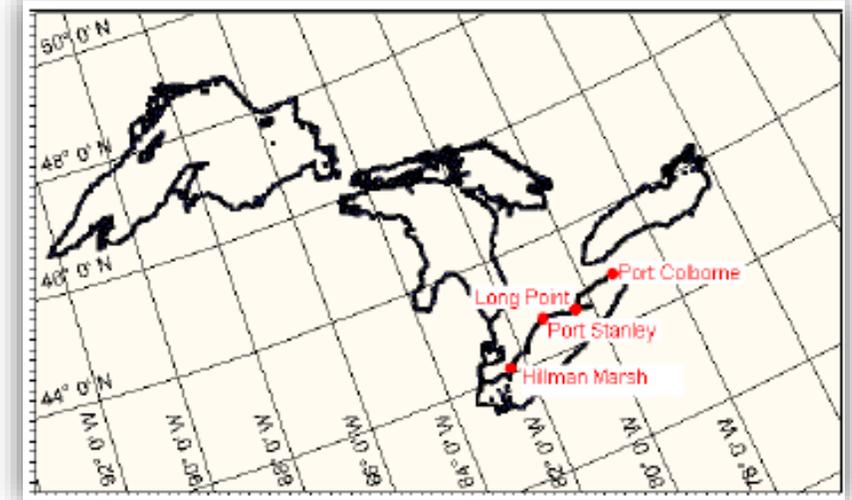


MNRF Lake Surge Forecasts

Summary of Run: 2019/11/27 05:32:06 AM(GMT)

Lake Erie Model Output Statistics

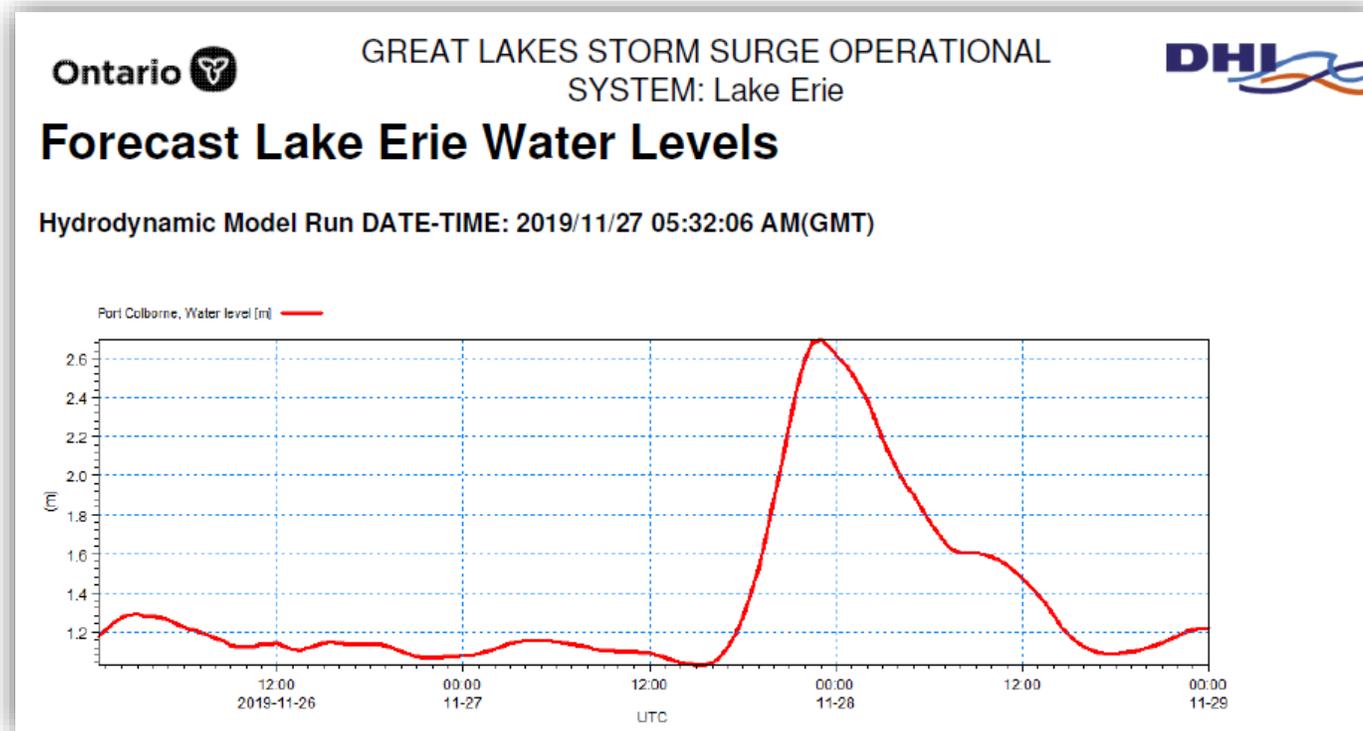
Station	Water level (m)			Wave height (m)			Wind speed (m/s)		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Port Colborne	1.03	2.70	1.36	0.06	1.86	0.58	1.68	17.83	7.55
Long Point	1.07	2.07	1.25	0.16	2.81	1.02	0.99	20.46	10.05
Port Stanley	1.01	1.58	1.19	0.09	2.42	0.84	3.27	20.56	10.57
Hillman Marsh	0.21	1.27	1.01	0.02	1.48	0.53	1.12	20.03	10.16



- MNRF Lake Surge Forecast Model produces forecasts for four locations
- MNRF issues Lake Erie surge warnings to CAs
- CAs review forecasts and determine if lake level warnings need to be issued to municipalities

Ontario Ministry of Natural Resources and Forestry (MNRF) runs a lake surge model twice daily.

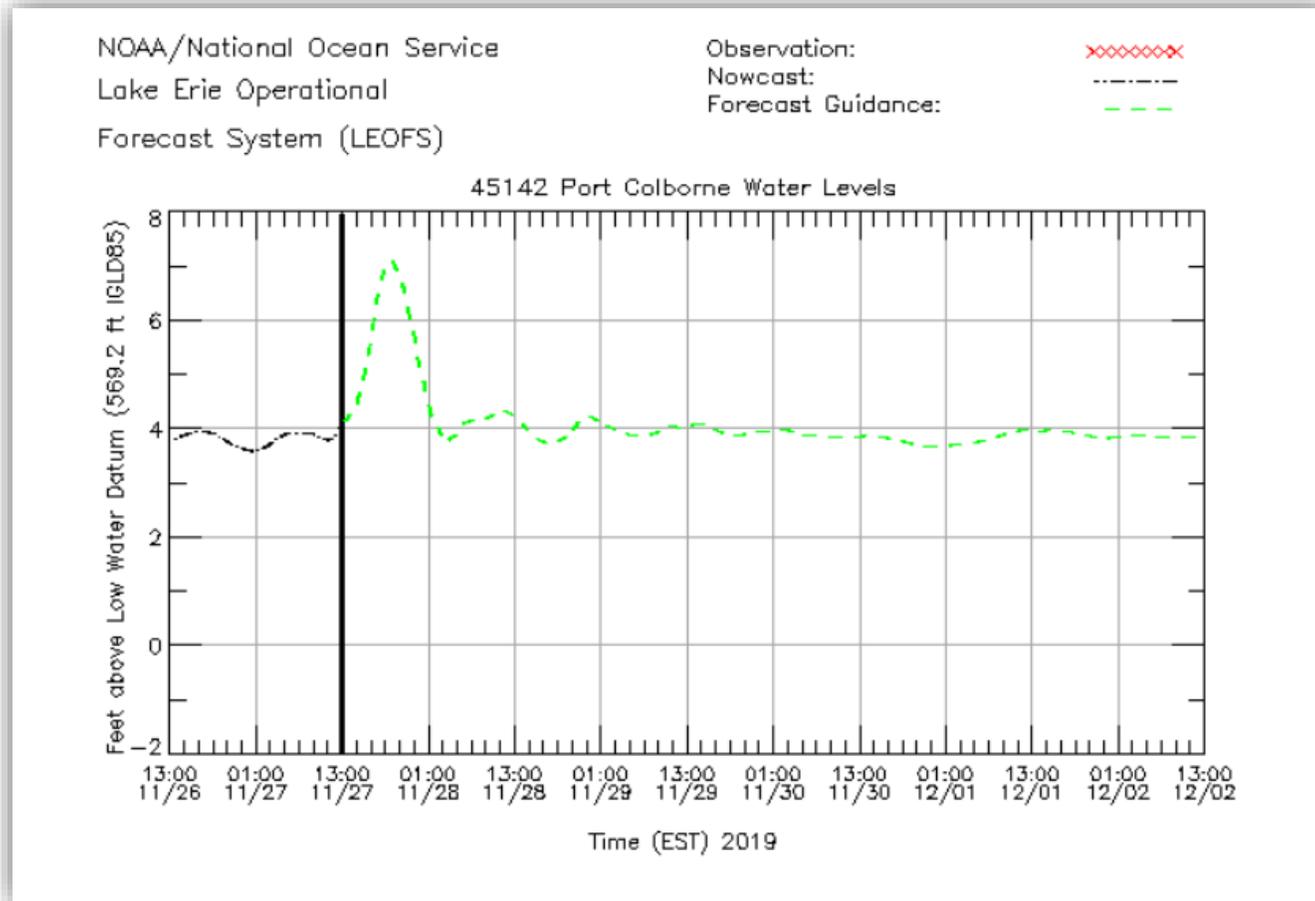
MNRF Lake Surge Forecasts



Surge forecasts provide approximately a two day outlook.

Level forecasts are relative to 173.5 m.

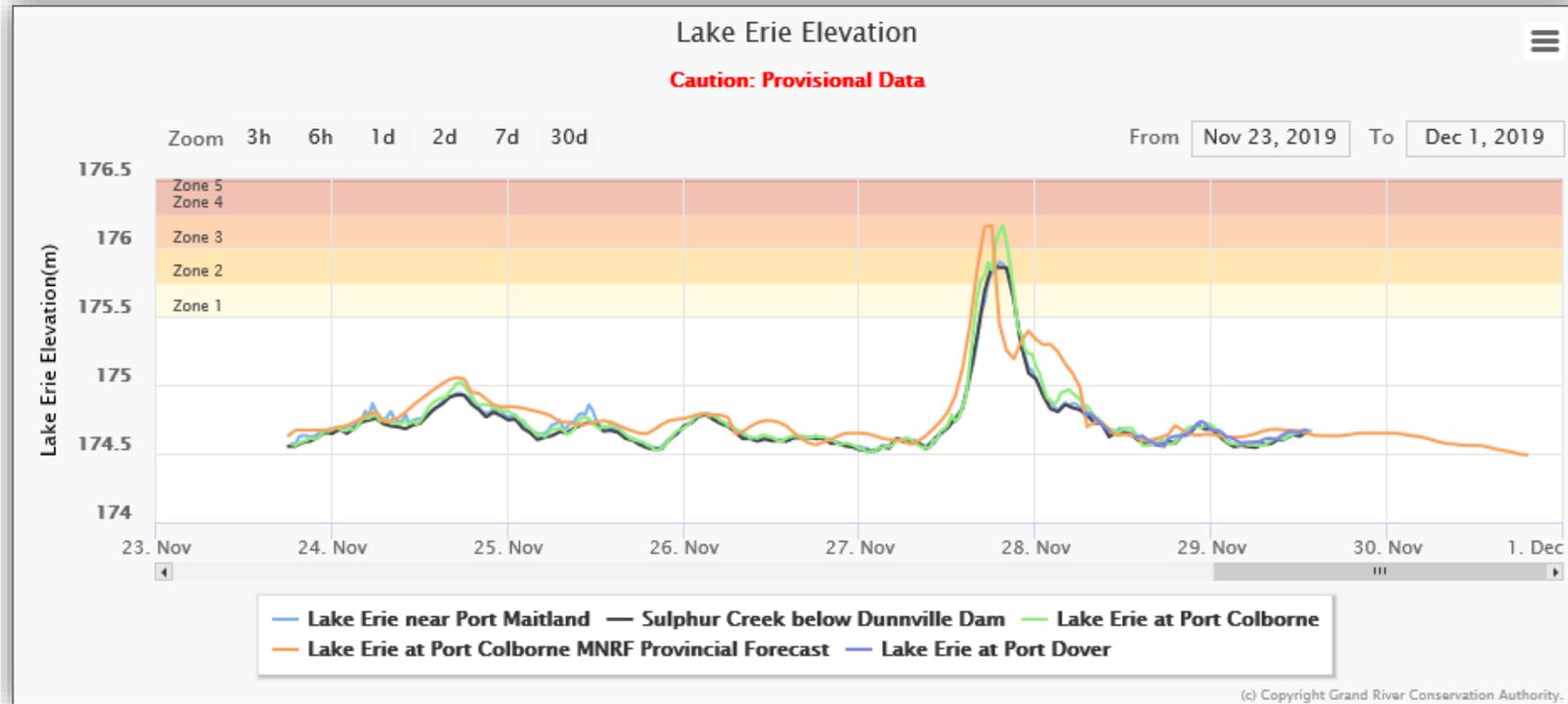
NOAA Lake Surge Forecasts



- Surge forecasts provide approximately a two day outlook
- Level forecasts are relative to 173.5 m
- This information is available on the National Oceanic and Atmospheric Administration (NOAA) website:

<https://tidesandcurrents.noaa.gov/ofs/leofs.html>

MNRF Lake Surge Model Forecast Levels



MNRF Lake Surge Model Forecast Levels at the Port Colborne gauge are available to the public on the GRCA website:

www.grandriver.ca/LakeErie

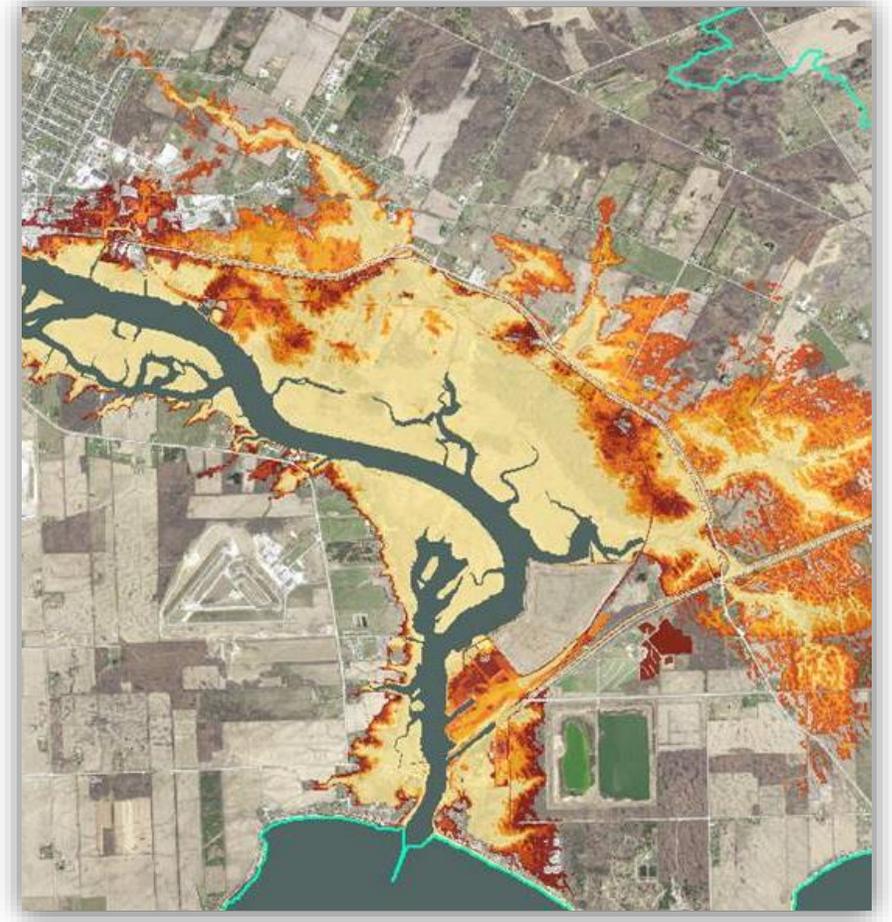
MNRF Lake Surge Forecast is updated twice daily at 1:00 a.m. and 1:00 p.m.

Flood zones are displayed dynamically as the flood zone thresholds are exceeded.



CAs' Role in Managing Floods

1. Monitor lake and weather conditions
2. Issue warning messages
3. Support emergency preparedness and response
4. Regulate development in hazard areas



County's Role in Managing Floods

Upon receipt of a Flood Message, County Officials:

1. Warn staff, affected citizens, businesses, and the general public in the forecast flood hazard area
2. Coordinate and enact Municipal Emergency Flood Response Plans
3. Monitor the flood situation and liaise with CA Flood Coordinators



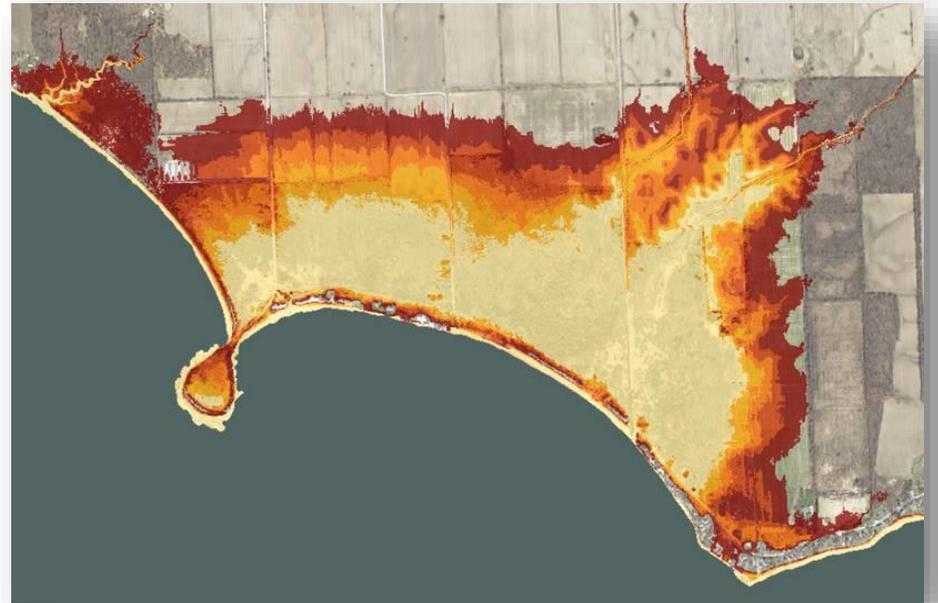
Property Owners' Role in Mitigating Risk



- Self-educate on hazards
- Acknowledge personal responsibility
- Maintain awareness of conditions
- Take steps before, during, and after flooding

Lake Erie Flood Zone Mapping

1. Enables more accurate warning and response
2. Improves efficiency of limited resources
3. Improves individual property owners' understanding of risk
4. Supports emergency planning, preparedness and response

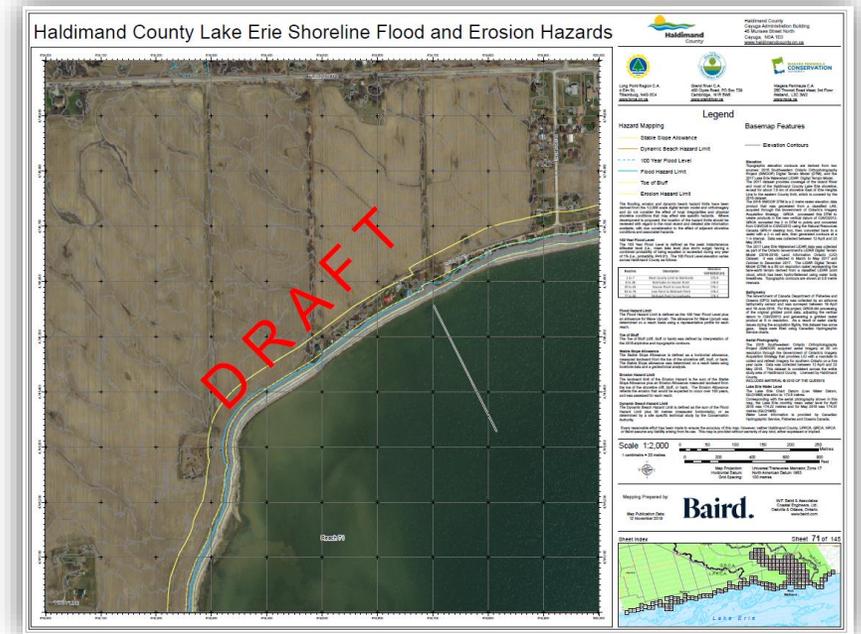


To find out if your property is vulnerable to flooding, use the Lake Erie Flood Zone Property Lookup tool at:

www.haldimandcounty.ca/floods

Shoreline Hazard Mapping Project Update

- Mapping of areas at risk of flooding, erosion, dynamic beaches
- Supports implementation of County Official Plan policies and CA regulation of development
- Update draws on new water level, topographic, bathymetric, photographic data
- New mapping to be adopted in 2020



For more information:

www.haldimandcounty.ca/lake-erie-shoreline-hazard-mapping-and-risk-assessment-study



Flood Preparation & Response

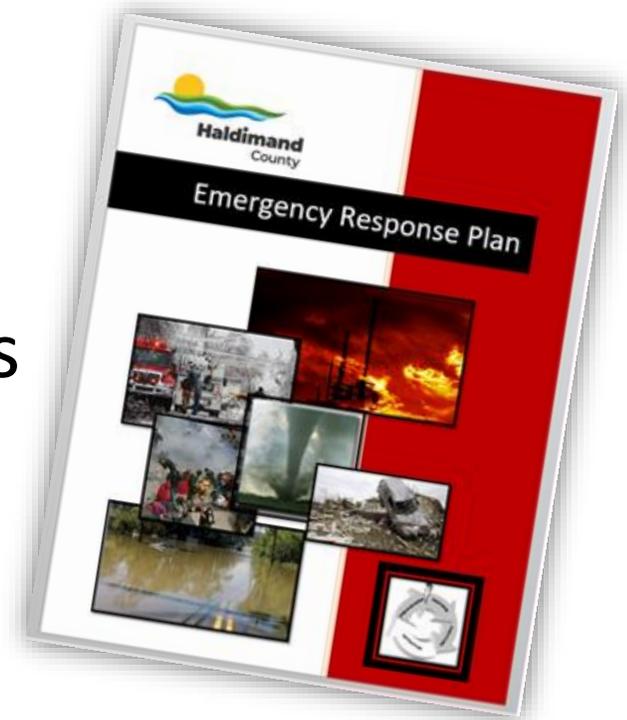
- Emergency Services relies on CAs for water level data, flood messages
- Information provided by CAs is used to inform Emergency Services preparations and response actions
 - Constant communication between Emergency Services, CAs, and County Public Works Operations before, during and after a flood event



NIAGARA PENINSULA
CONSERVATION
AUTHORITY

Haldimand County Emergency Plan

- Haldimand County has a comprehensive Emergency Plan that was re-vamped in 2019
- Highly detailed plan with many components covering a wide variety of potential emergencies
- Staff across all departments have roles in an emergency; simulation exercises occur yearly with participation from multiple agencies



What to do BEFORE a flood

While there are limits to what can be done to prevent flooding, there are steps that property owners can take to manage the risks floods pose to people and properties.

- Know where your property is located in relation to the Lake Erie flood zones (www.haldimandcounty.ca/floods)
- Prepare an Emergency Plan that can be initiated quickly should you need to evacuate during a flood emergency
- Have a 72-hour Emergency Kit that includes essentials your family may need
- Visit haldimandcounty.ca/emergency-preparedness for information on how to prepare a Family Plan and 72-hour Emergency Kit.



What to do BEFORE a flood

- Consider installing a sump pump and backflow preventer in basement floor drains, and consider having a portable generator and pump available in the event of a power outage
- Move important items away from areas that may be subject to flooding
- Consult your electricity and fuel suppliers (oil, natural gas, propane) for instructions on how to safely shut down and protect furnaces and other equipment, and the steps that need to be taken after a flood before restarting equipment
- In the winter months, drain pipes and shut off water supply to help prevent pipes from freezing
- Consider installing storm shutters
- Speak with your property insurer about insurance options



What to do DURING a flood

- Watch for Lake Erie flood warnings and advisories on television, radio ([92.9 The Grand FM](#)), social media & websites including Haldimand County's and the Conservation Authorities' websites
- Follow Haldimand County on [Twitter](#) and [Facebook](#) for important flood-related messages
- Follow the instructions of emergency response officials, such as police, fire and municipal staff
- Make sure your sump pump is working
- Follow the instructions from your utility supplier (gas, electrical, propane, etc.) to safely shut down and protect furnaces and other appliances



What to do DURING a flood



- Prepare to evacuate if necessary. Collect necessary items such as cash, medication, important papers, identification and change of clothes. Consider evacuating your residence if streets in your neighborhood are flooded. Emergency vehicles (ambulance, police cars, etc.) may not be able to get to your home.
- Resist the urge to tour flooded areas. You may be putting your own life at risk and could interfere with the work of emergency responders.
- Ensure your pets are not left alone during a flood by taking them to a kennel or leaving them with family and friends.
- If a road has been closed, obey the signs and take alternate routes. It is an offense to drive on a closed road and could void your insurance.

What to do AFTER a flood

- Do not return home until authorities advise it is safe. Check the Haldimand County website or Twitter/Facebook page for specific instructions and post-flood updates.
- Report broken or downed utility lines. If you see a downed power line caused by a storm or flood event, maintain a distance of 10 metres or more and report it to Hydro One at [1-800-434-1235](tel:1-800-434-1235).
- Consult your insurer about steps to take if your property is flooded. Take photos of damage and keep track of receipts.
- Exercise caution when re-entering your home. If the main power switch was not turned off prior to flooding, do not re-enter your home until a qualified electrician has determined it is safe to do so.
- If your main electrical panel was under water, it must be cleaned, dried and tested by a qualified electrician to determine if it is safe. Do not use flooded appliances, electrical outlets, switch boxes or fuse breaker panels until they have been checked by the power company.

What to do AFTER a flood

- If natural gas lines were under water, contact your gas supplier before resuming service. If natural gas appliances were under water, have them checked by an approved heating, ventilation and air conditioning contractor.
- If your well has been affected by flood waters, it is recommended that you boil your water for at least one minute at a rolling boil, or purchase water from a safe source. Before resuming normal use of the well, have the water tested for possible bacteria and pollutants. Water sample bottles can be picked up at any Haldimand-Norfolk Health Unit office; the HNHU will test well water free of charge.



Key contacts

Public Road, sewer, water, park or facility emergencies

- Monday to Friday, 8:30am to 4:30pm – [905-318-5932](tel:905-318-5932) or haldimandcounty.ca/report
- After hours – [1-888-849-7345](tel:1-888-849-7345)

Downed power lines & power outages

- If you see a downed power line, report it to both 911 and Hydro One at [1-800-434-1235](tel:1-800-434-1235)
- If you are experiencing a power outage, call Hydro One's 24/7 outage hotline at [1-800-434-1235](tel:1-800-434-1235)
- Hydro One's live outage map at stormcentre.hydroone.com includes restoration time information

**Call 911 if
you feel your
safety is at
risk.**

Staying connected

There are several things you can do to stay informed before, during & after a flood event in Haldimand County:

- Visit Haldimand County's website & social media feeds: haldimandcounty.ca, Twitter @HaldimandCounty, and Facebook (Haldimand County). **The most up-to-date information will be posted on these channels.**
- **Monitor the media.** Flood messages are distributed to area TV stations, radio stations and newspapers for broadcast and publication. **92.9 The Grand FM is Haldimand County's official emergency information broadcast partner.**
- **Follow your conservation authority** on social media or check for flood messages & water level information on their websites.

