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Dealing with High-Intensity Rainfall Events

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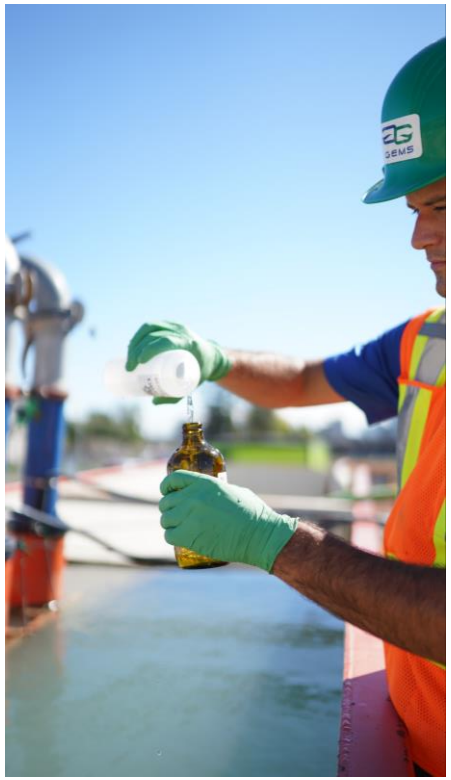
Presentation Outline

- High-intensity rainfall events and frequency
  - Recent history, climate data
- Occurrences and results of high-intensity rainfall events
  - Flooding, wash-outs, fish, ecology etc.
- Implications to a Site
  - Permit compliance, Spills Action Centre
- Management
  - Contingency, Response Time



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High-Intensity Rainfall vs. Rainfall Accumulation

Peter Ward, founder of Hydrological Service America describes rainfall intensity as:

Rainfall intensity refers to the amount of rain that falls per hour.

Rainfall Accumulation refers to the overall amount of rain recorded in an extended period of time (e.g. 24-hour period).

High-Intensity Rainfall Events (2013-2017)

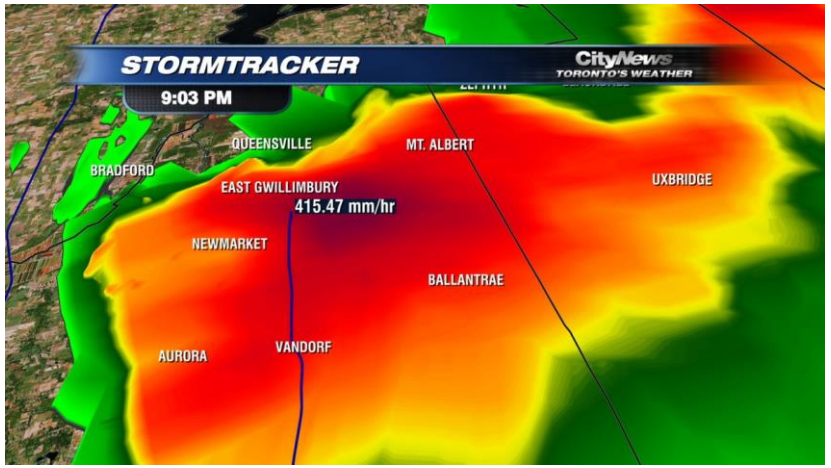
Dec 22, 2013

May 25, 2017

July 8, 2013

July 27, 2014 (77 mm event)

July 8, 2016



April 2017 - wettest April on record that saw Lake Ontario rise 44 cm. 44.6 mm of rain hit Toronto, breaking a 64-year old record for that day

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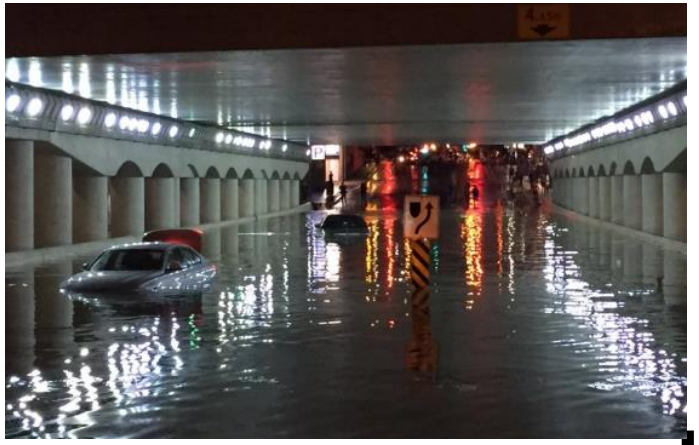
High-Intensity Rainfall Events (August 2018)



Aug 18, 2018

August 21, 2018

August 21st saw 42 mm of rain fall north of the city, and 60 mm of rain over two days. The same system dumped between 20-40 mm over a 4 hour period closer to Lake Ontario.

Aug 7, 2018

On August 7th, a thunderstorm produced 72 millimeters of rain over Toronto, with 51 millimeters falling in just one hour.
Two men were trapped in an elevator in Toronto.

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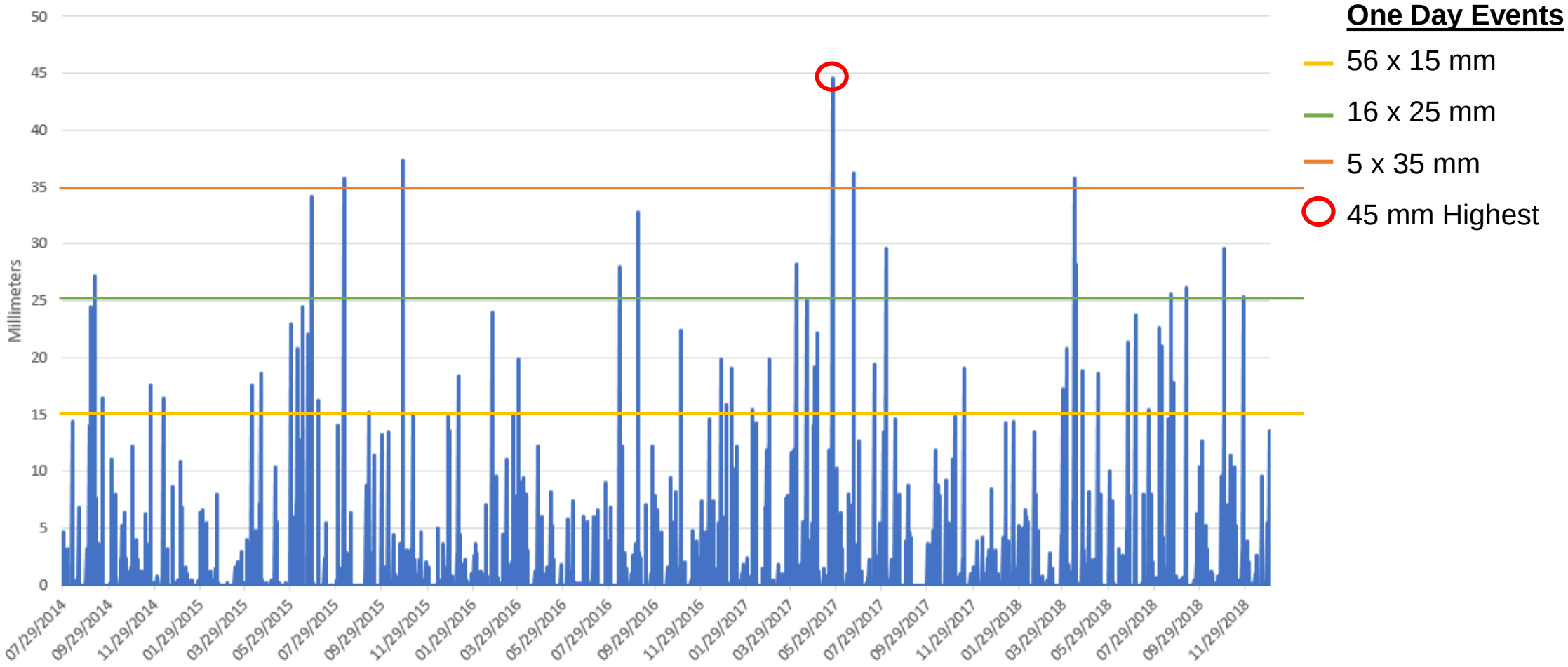
Total Precipitation July 2014 – Dec 2018 (Pearson)



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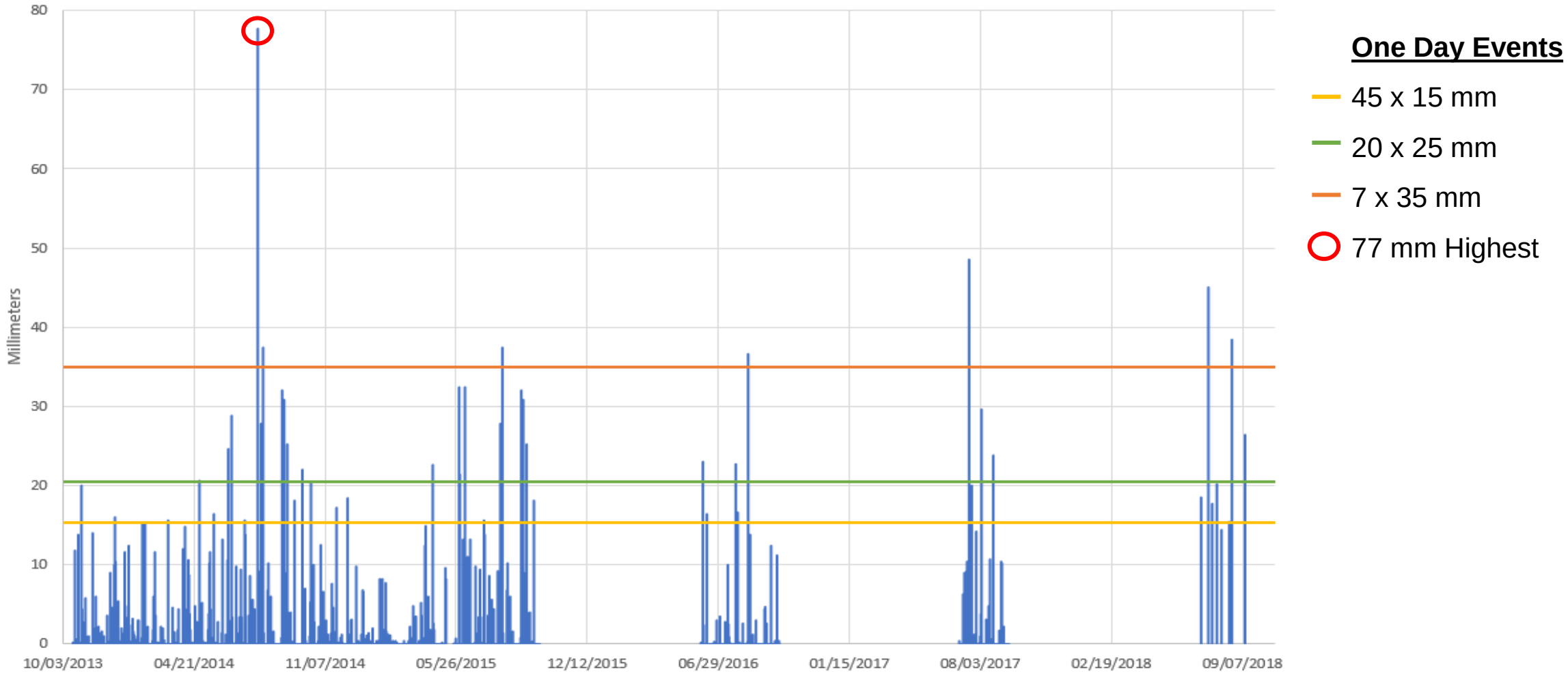
Total Precipitation Oct 2013 – Sept 2018 (Buttonville)



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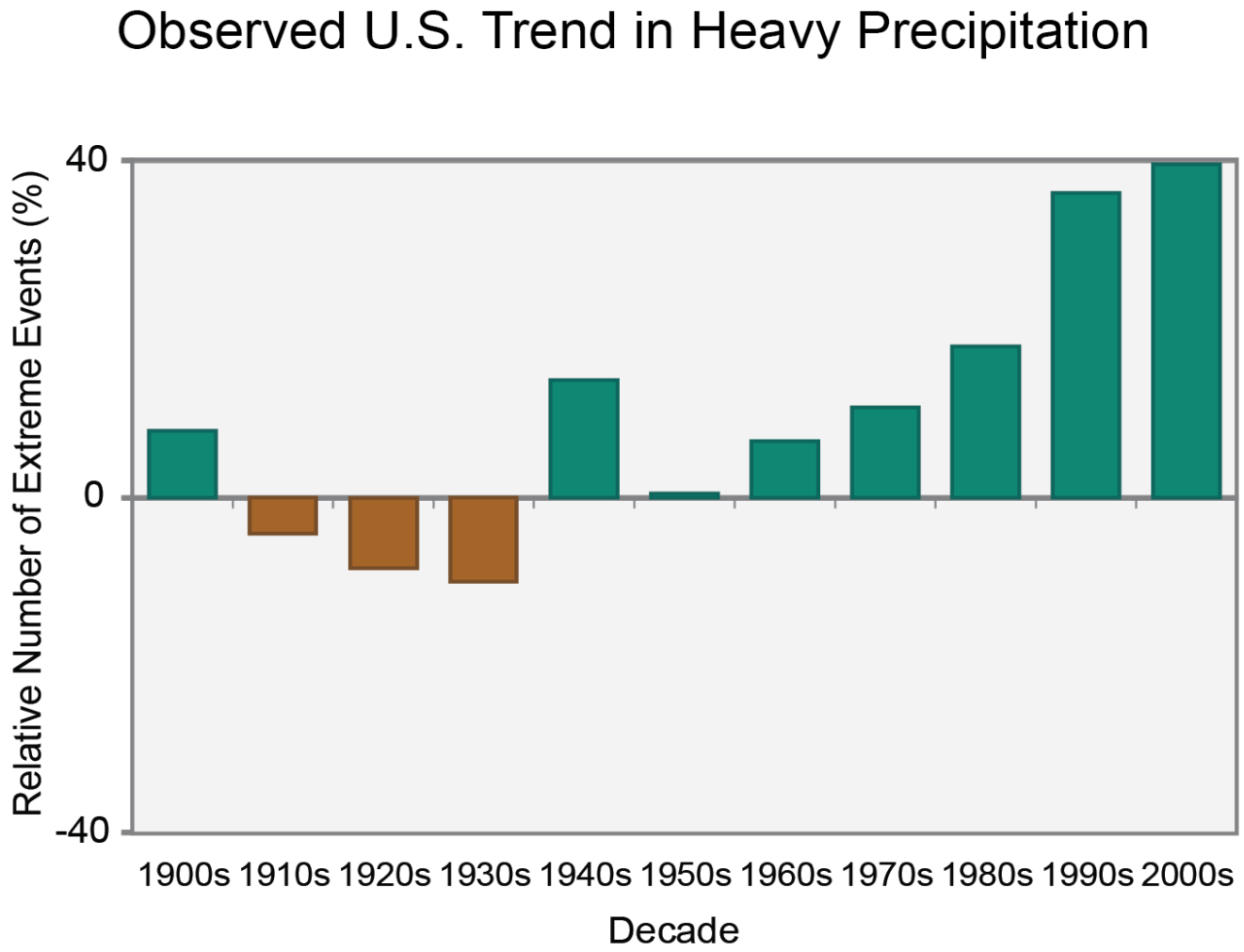
U.S. Global Change Research Program



Occurrences - Flooding

- Flooding is the most common outcome of a high-intensity rainfall.

- What are the repercussions of flooding?

Occurrences – Chocolate Milk/Wash-outs

- Washing out of established ESC measures leading to a discharge to the natural environment (a spill)

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Occurrences – Overflows

- High-intensity rain events result in overflows from combined sewers, when treatment plants are overwhelmed, releasing flows into waterways after partial or no treatment.
- Data provided by the federal government shows in 2017, municipalities reported 215 billion litres of raw sewage were spilled or leaked without being treated. Over the last five years, the total amount is in excess of one trillion litres.
- City of Toronto currently undergoing $3-billion, multi-stage project to build overflow pipes to store excess water during storms until the treatment system can handle the additional water.
- But it will be 10 years before the first phase is expected to start operating, and as long as 25 years before the entire project is complete.

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Occurrences – Ecological Impacts

- The extra sediment impacts ecology by adding non native sediments / soil into natural features, which can add invasive seed banks or smother roots/vegetation.
- Terrestrial plants and Wetlands can be flooded and stressed if they are not prone to flooding events.

Occurrences – Fish

- Overtopping of in-water controls isolating work areas from fish habitat.
- High intensity rain falls add sediment which impacts fish that feed based on sight (i.e. redside dace), adds sediment into spawning beds, sticks to gills etc.

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Permit Compliance

- Environment Canada
  - Fish - Redside dace permit requires ESC measures, as per the permit. Redside Dace is federally listed fish, therefore Environment Canada may be on-site.
- Conservation Authority
  - Do you have specific ESC measures in your permit?
  - The CA may be involved with spills/clean-up/restoration
- Ministry of the Environment, Conservation and Parks
  - Does your PTTW cover a high-intensity rain event?
  - Does your ECA have requirements during a rain event?
- Region or City Discharge Permits
  - Do you have a discharge agreement in place? Is it to the storm sewer? Can you discharge during a rain event? Can you store water on-site? Will you have to haul water off-site?

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Permit Compliance – Contingency Planning

- Having permits in-place isn't enough because the question is when, not if, a high intensity rainfall event is going to happen
- A contingency plan is required: what to think about when contingency planning (i.e. distance to natural features such as wetlands and watercourses).
- Who is monitoring the weather and who needs to be notified?
- Is there a notification or communication plan in place?

Contingency

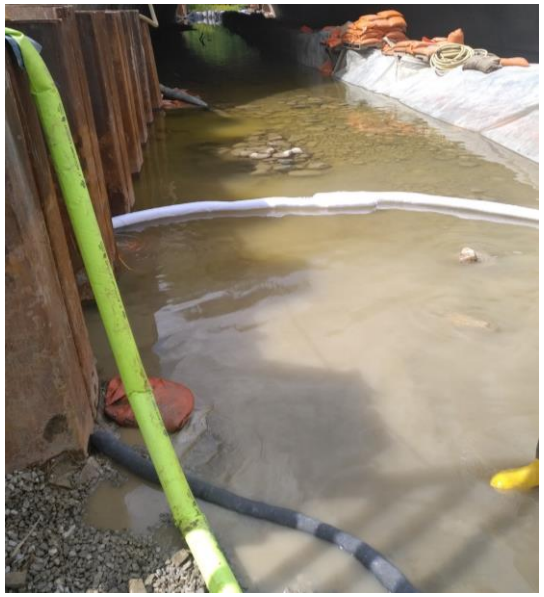
- Do you have additional storage on site to deal with a significant rain event?
- Is this a pond, berm, tank etc?
- If not, make sure equipment is removed from the excavation before forecasted rain (end of work day)

Contingency

- Erosion and Sediment Control Inspections and Materials (on site!)
- Daily water quality sampling, weekly to monthly laboratory analysis
- Groundwater level monitoring, erosion monitoring, flow monitoring, dust/noise/vibration monitoring (real-time data)
- Submission of results and/or progress reports at specified time intervals
- Back-up pumps, generators, ESC controls on site, spill kits

Response Time

- Response time is key to initiate contingency plan
- Keep regulators informed and updated of results and any changes where applicable
- Is it a spill? Will I get in trouble for calling in a spill?
- Can repairs be done now or is access an issue? What kind of repairs, remediation and/or restoration do I need to do? Do I have the permits to do so?



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Conclusions

- High-intensity rainfall events are becoming more frequent;
- Day-to-day ESC measures probably won't stand up to the volume of water you'll be dealing with;
- You will have to notify regulators that you're not in compliance and let them know what you're doing to mitigate the situation;
- Think about what monitoring requirements are involved with respect to ecological impacts (i.e. baseline studies and impacts); and
- Ensure permitting process is properly followed and the commitments of your permit are being taken care of. This is an integral piece of your team.

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Thank you!

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