# Fermilab Water Systems

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Community Advisory Board meeting

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Water at Fermilab

- **Domestic Water System**
  - Provides potable water from Warrenville for people on site, including guest houses
- **Surface Water Ponds**
  - Serve as reservoirs for Industrial Cooling Water
  - Used for storm water retention
  - Fish habitat
- **Creeks**
  - Surface water leaves site
- **Industrial Cooling Water System**
  - Fire Protection
  - Heat Exchanger and HVAC Cooling
- **Low-Conductivity Water Systems**
  - Closed system for cooling of equipment such as magnets and power supplies
- **Sanitary Sewer System**
  - Discharge of waste water (to treatment facilities in Batavia and Warrenville)

connected
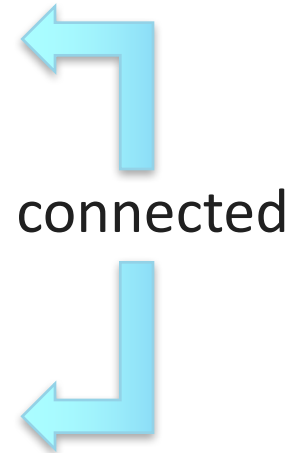
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Water sources for Fermilab

- Domestic water
  - From Warrenville (well water)
  - 4.3 million cubic feet (32.164 million Gallons)
- Precipitation
  - About 6.6 billion gallons per year
- Dewatering of NuMI/MINOS underground halls
  - About 150 gallons per minute, or 0.08 billion gallons per year
  - Low levels of tritium (see previous presentations)
- Fox River
  - Backup if water in cooling ponds gets too low
    2005 ~165 million gallons, 2016 ~ 5 million gallons
- Deep well on site
  - Backup if water in cooling ponds gets too low
  - 2005 ~ 41 million gallons, 2015 ~ 1 million gallons

Domestic Water System – Potable water

Domestic water system (continued)

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Surface Water

Overview
-6,800 Acres Mixed Land Use
-2,000 Acres Row Crop Agriculture
-2,000 Acres Restored Natural Ecosystems
-Interconnected Industrial Cooling Water System
-Reservoir Lakes, Cooling Ponds and Distribution Pipe
-Three Watersheds
-Headwaters to Two Creeks
-Straddle Two Counties

Operations
-Water for cooling
-Recirculating pond &pipe system
-250 million gallon system capacity
-24 miles of pipe

Water Sources
-Precipitation
-NuMI/MINOS underground area
-Fox River (supplemental)
-Deep well (supplemental)
-Excess water released from outfalls

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Surface Water (continued)

Closer look at cooling ponds near Main Injector ring

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Surface Water (Cont.)

Fermilab has many man-made cooling ponds. Robert Wilson, the physicist who envisioned and built Fermilab, didn't want the lab to look like an industrial complex with huge air towers, so he used the available space to provide necessary cooling by natural evaporation. This water is what we call Industrial Cooling Water (ICW).

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Surface Water Tributary Watersheds

Surface Water Uses

- Our use of this water has little affect on the environment or the animals and fish that live around and in the ponds. The exception being that the pond water is a few degrees warmer than normal. In the winter the ponds seldom freeze over, which is why Canadian Geese often take a long stop here on their flight south.

- This ICW is used in a heat exchange system where LCW from service buildings and accelerator tunnels, and office air conditioning systems meet, but never mix. A pond pump sends the ICW to the places it's needed and then returns it to the pond. CUB controls and monitors much of this process.

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Surface water management (Storm water)
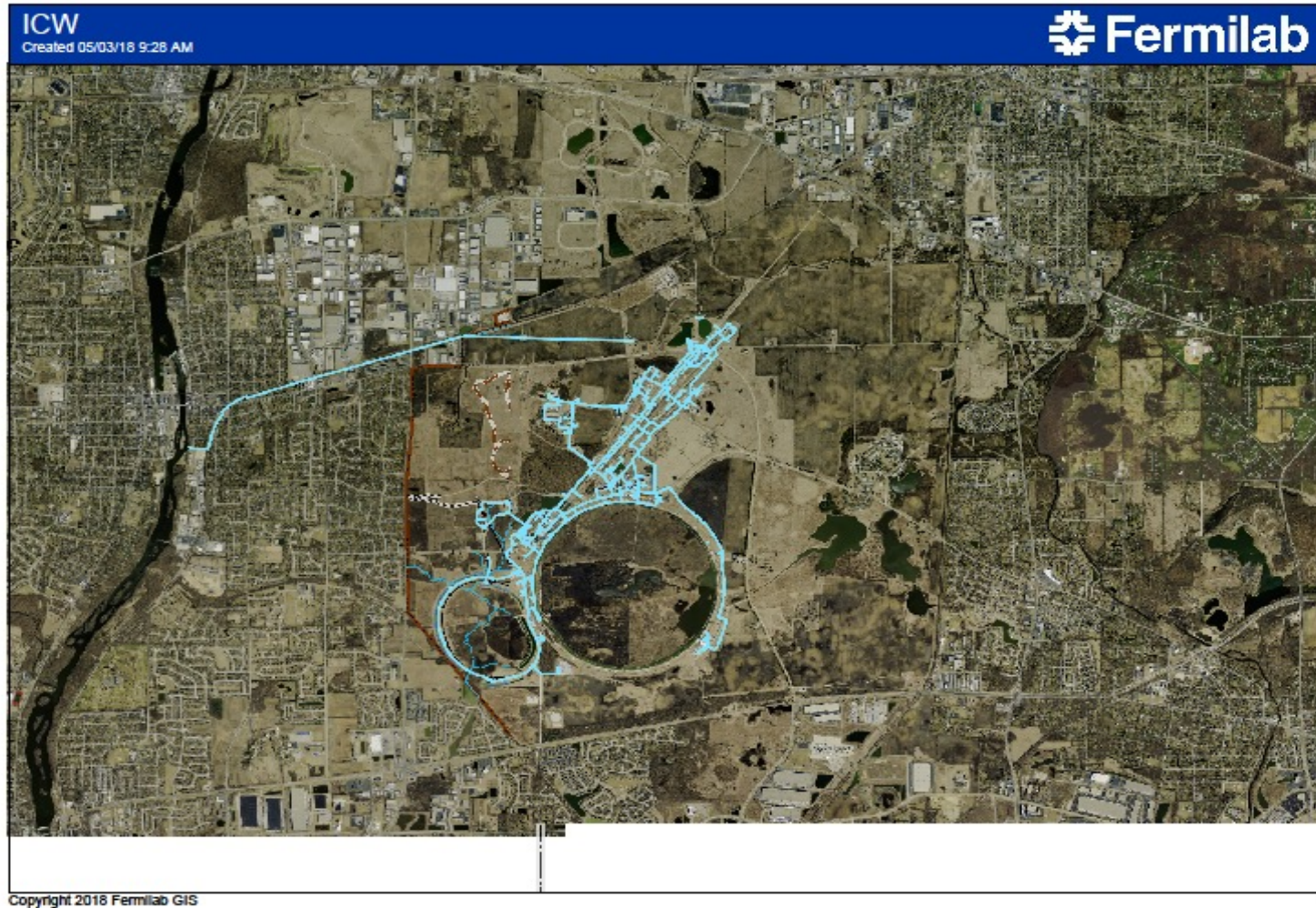

Culvert replacements under Batavia Road

Booster Pond Flooding 2010

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# Surface water management (continued)

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Industrial Cooling Water System

Industrial cooling water system (continued)

OVERVIEW:

-Surface Water Ponds on North side of Site

-Make-up Sources

-Rain/Snowmelt/Well Water

-Water treatment necessary to prevent equipment damage. Done in accordance with environmental regulations and governmental permitting.

-Water treatment of:

   -Algae

   -Zebra mussels

-Chlorination

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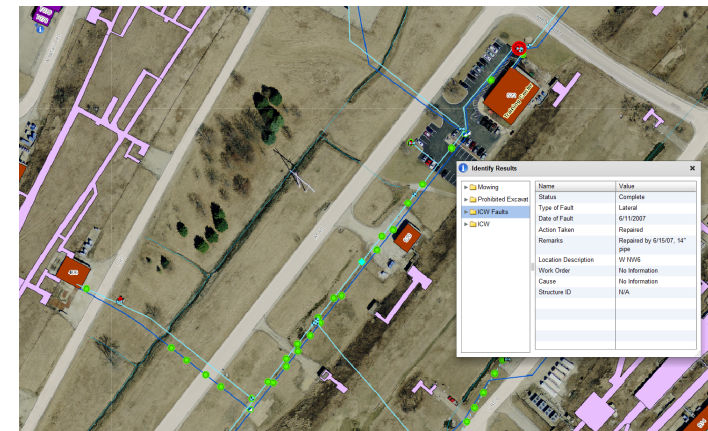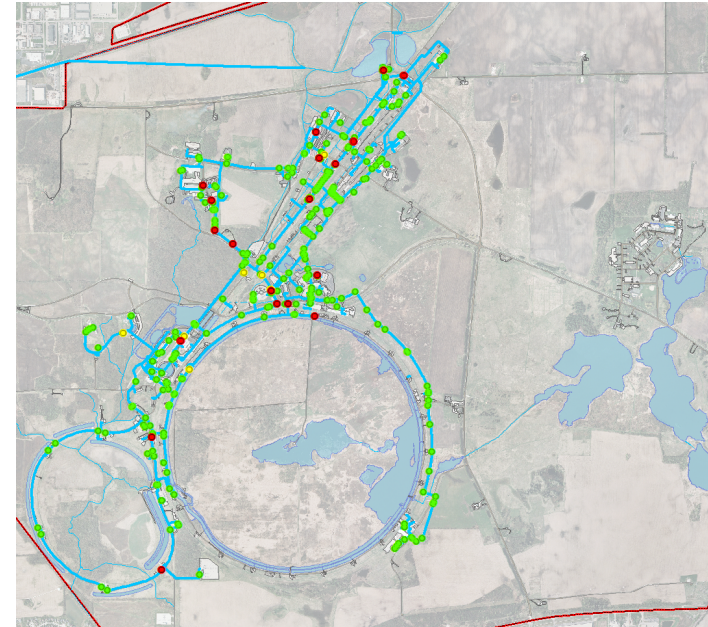
Use of surface water as industrial cooling water (ICW)

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Water for Cooling Systems at our Central Utility Building

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Low Conductivity Water Systems

The LCW system uses de-ionized water whose resistivity is greater than 10 MΩ, much greater than that of untreated water of the order of 102 to 103 Ω. The high resistivity of the cooling fluid renders a good thermal conductivity with a good electric insulation so as to prevent adverse effects like ground fault and other electrical interference.

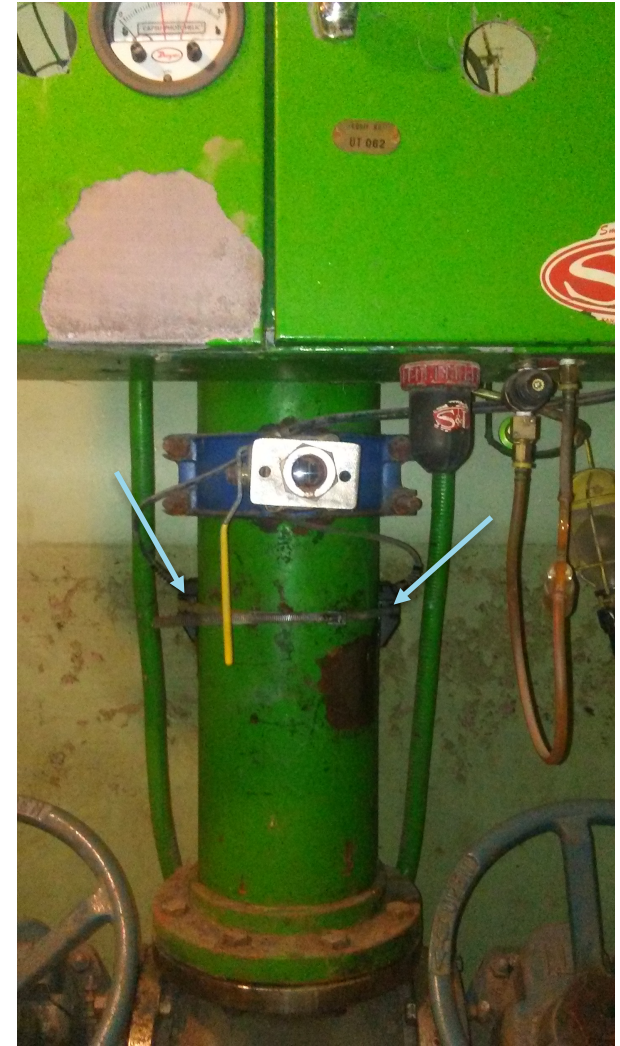**Fermilab**

Low-Conductivity Water Systems

Site Sanitary Sewer System
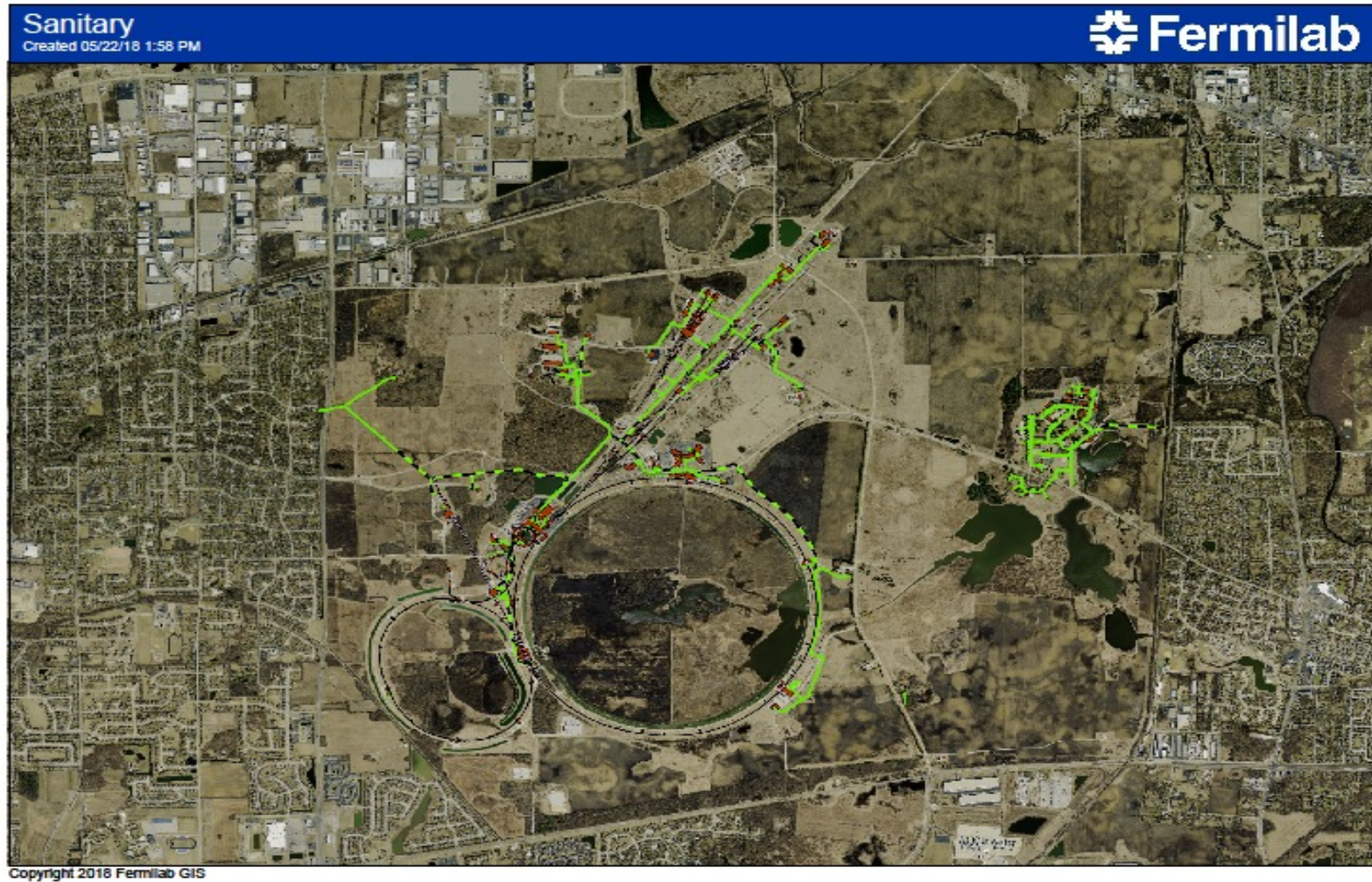
Warrenville Sanitary Sewer Metering

- Warrenville receives sanitary discharge from the village only.
- Warrenville owns and maintains the Sewer meter located in the Village (and the Domestic Water Meter)
- Meter Readings are compared to a downstream flume-type meter off-site
- Both sewer and domestic water meters are slated for replacement by Warrenville this year

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Batavia Sanitary Sewer Metering

- Batavia receives sanitary discharge from the remainder of the lab.
- Fermilab owns and maintains the Sewer meter located in the main sanitary lift station and provides Batavia with monthly readings
- Meter Readings are compared to a downstream flume-type and velocity meter just prior to leaving the site
- Flume and velocity meters need additional engineering to be beneficial

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