Update: Environmental Impact Studies and Permit

Hampton Creek Wetland Areas, City of Portage, Michigan

November 19, 2019

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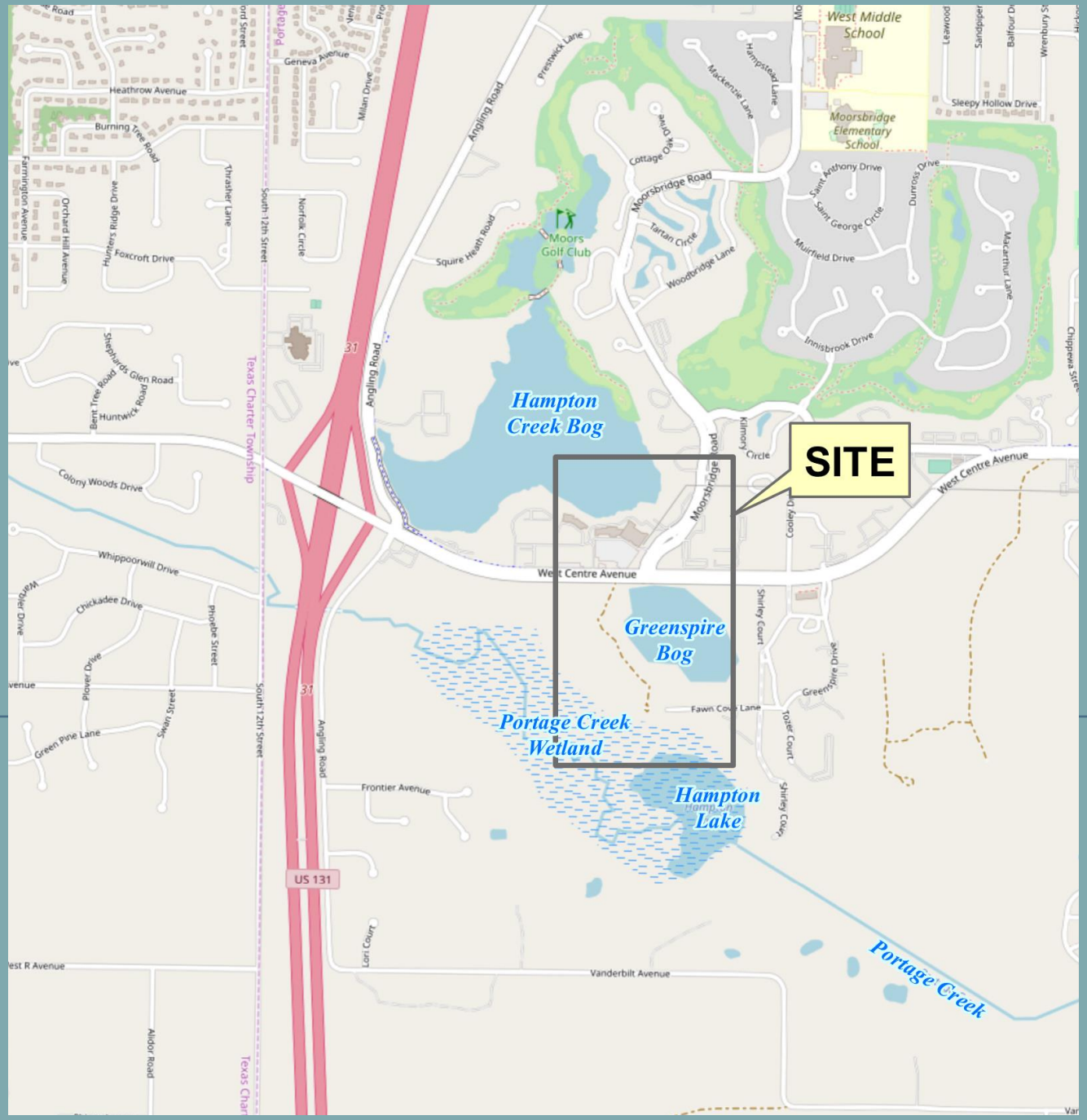
Engineers | Architects | Scientists | Constructors



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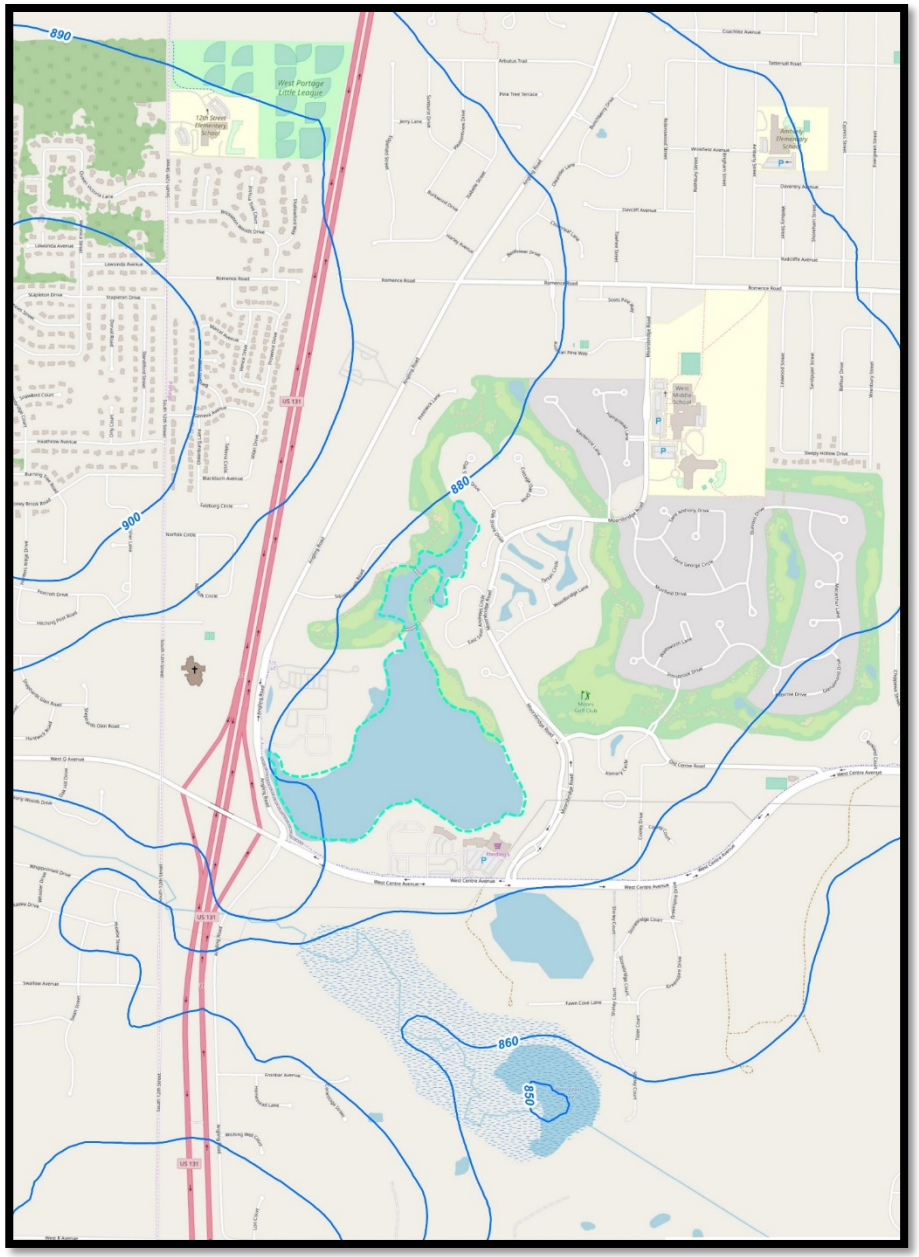
Initial Investigation

- **Hydrogeologic study**
- **Initial design concept**
- **EGLE pre-application meeting**




Hampton Creek Bog
W-Q Ave
Angling Rd
W Centre Ave
Moorsbridge Rd
Kilmory Cir
Old Centre Rd
Cooley Dr
Greenspire Bog
Stonebridge Ct
S 12th St
Greenspire Dr
Fawn Cove Ln
Portage Creek Wetlands
131
Tozer Ct
Shirley Ct
Portage Creek
Hampton Lake
Frontier Ave
Homestead Ln
Hampton Lake
Google Earth

EGLE Pre-application Meeting

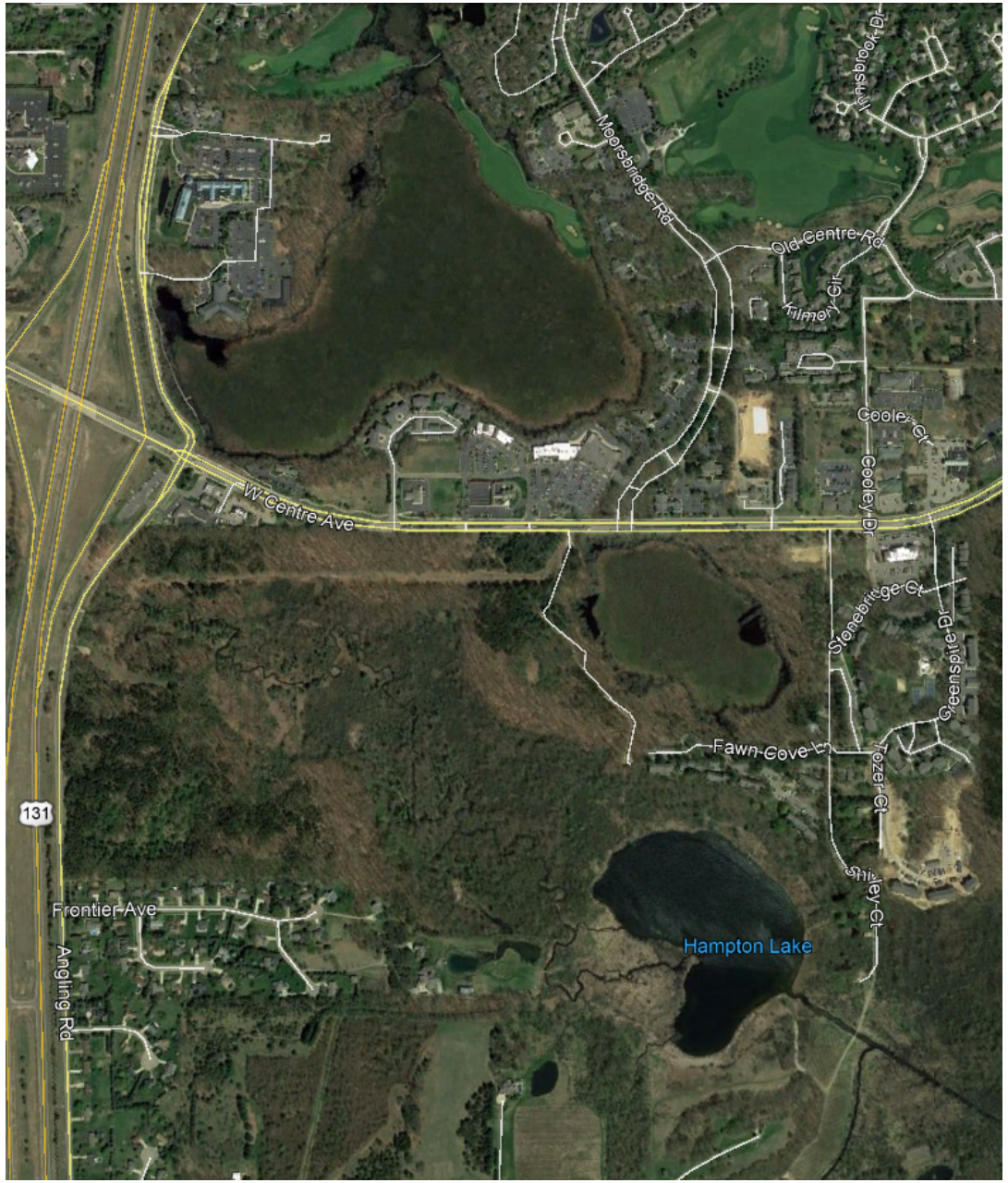
- **Onsite meeting: April 18, 2019**
- **Response letter issued: June 24, 2019**
- **Follow-up meeting: June 26, 2019**

EGLE's Conclusions

- **Joint Permit is required**
- **Extensive site evaluation, modeling, and alternative analysis is required**
- **Primary concerns**
  - water quality
  - natural features
  - sensitive receptors (wetlands, Portage Creek, and Hampton Lake)
- **Need MDNR authorization for work in Gourdneck State Game Area**

Investigations

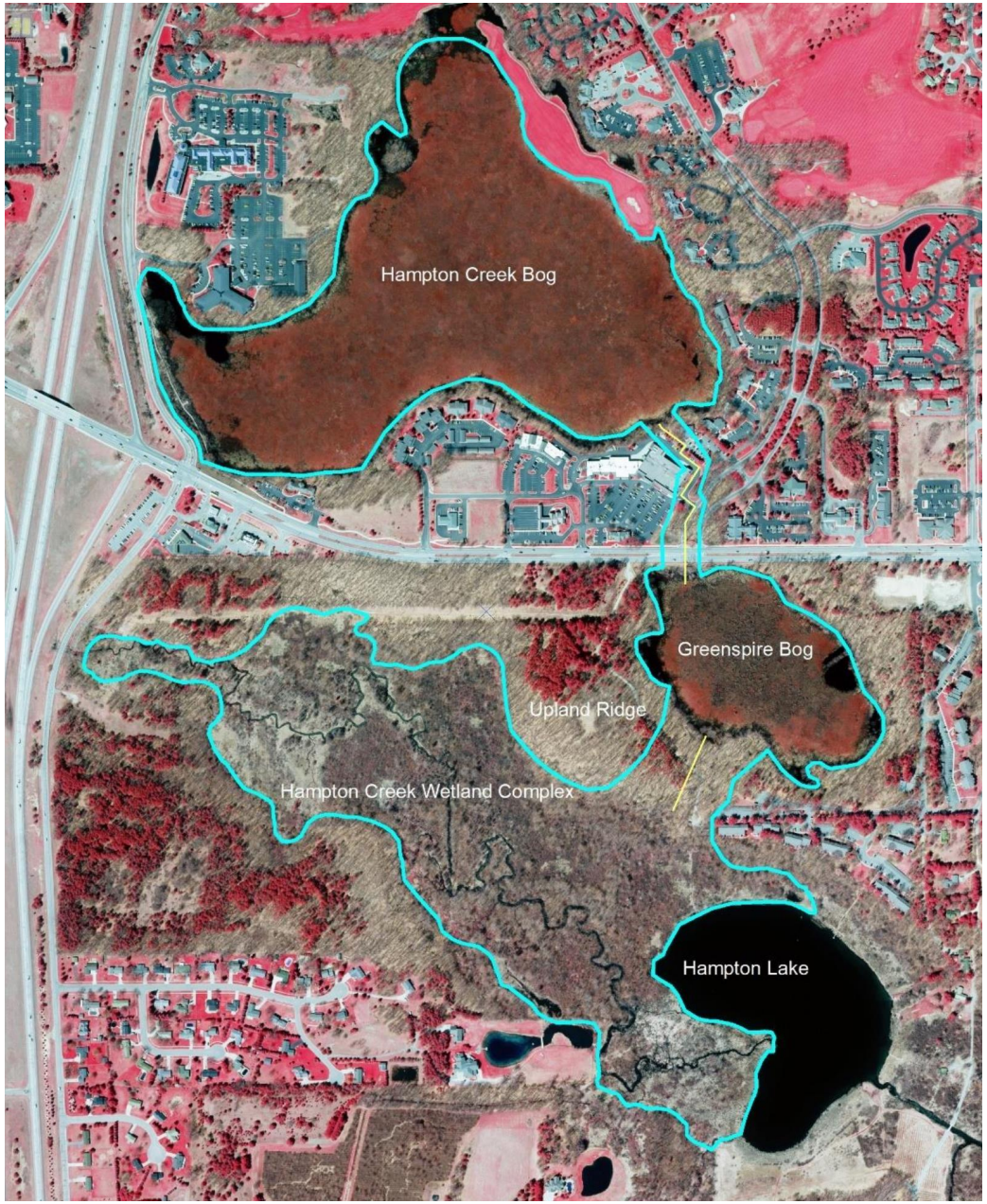
- **Wetland delineation**
- **Natural features survey (MNFI)**
- **Water chemistry evaluation**
- **Stream stability assessment**
- **Hydrologic/hydraulic analysis**



Wetland Delineation

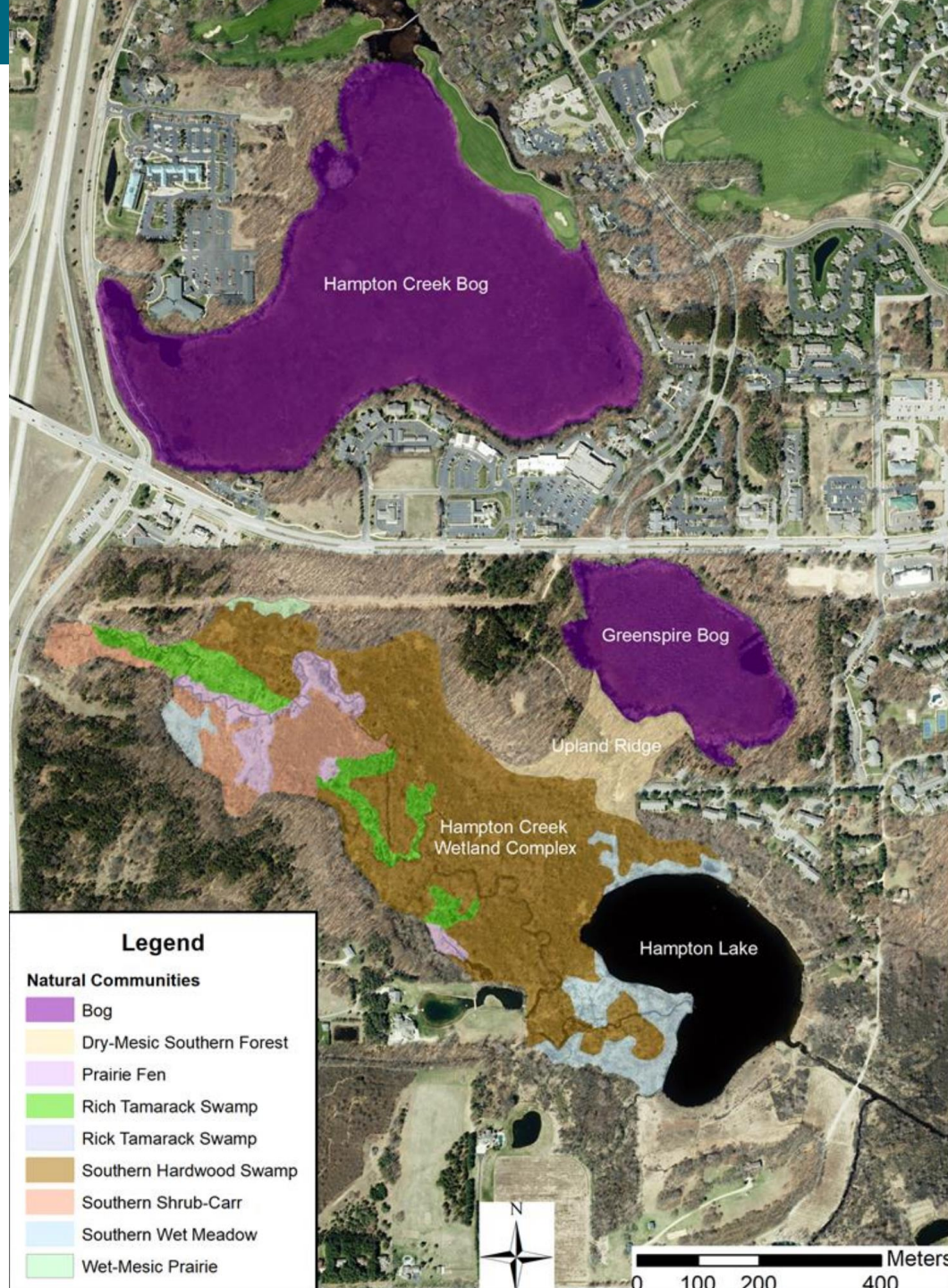
Natural Features Survey

- **Plant community survey**
- **Invasive species inventory**
- **Threatened and endangered species evaluation**
- **Evaluation of potential project impacts**



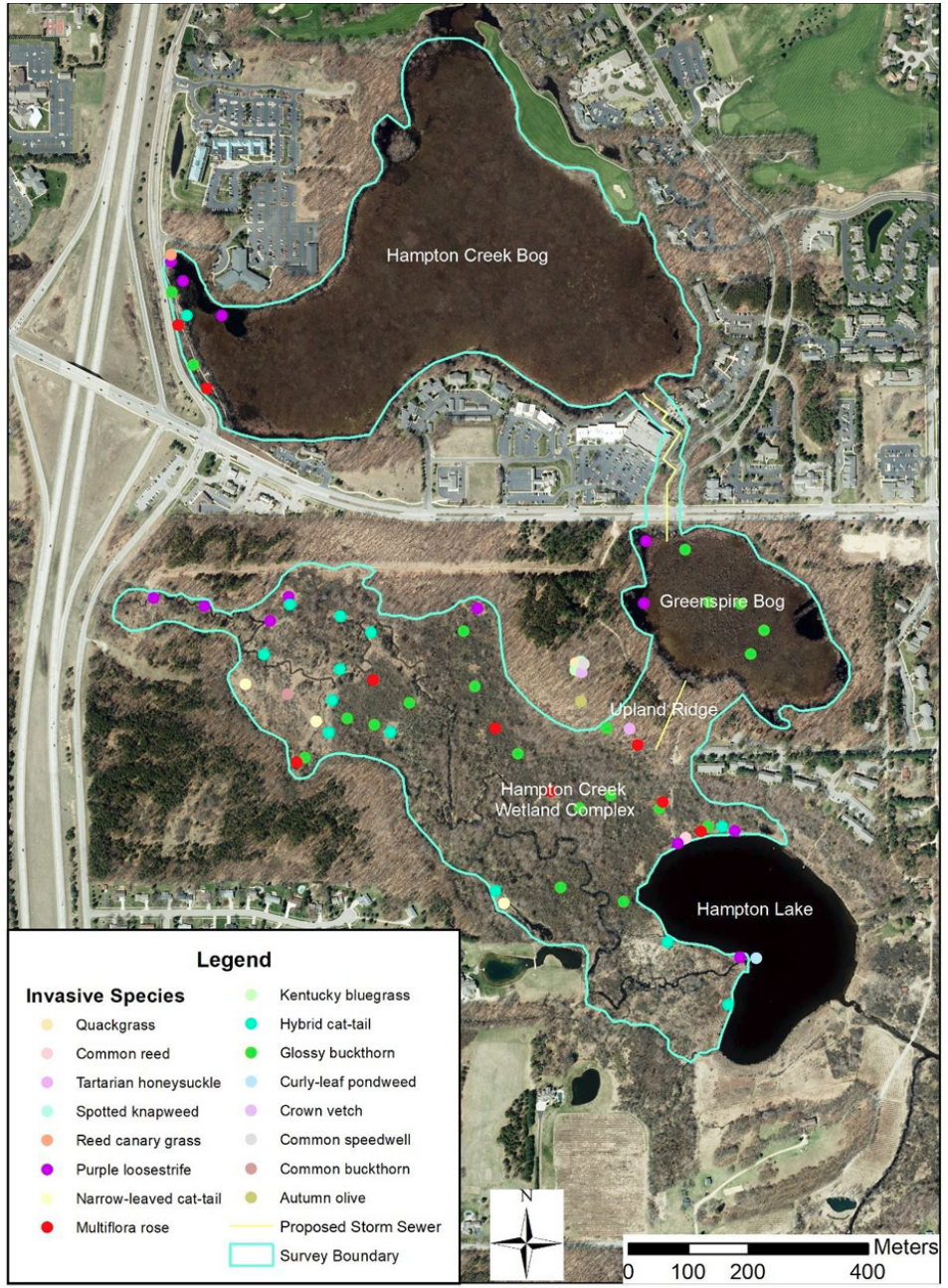
Natural Features Survey

Plant community map



Invasive Species

- **Hampton Creek Bog is relatively free of invasive species**
- **Portage Creek wetland complex contains extensive stands of invasive species.**



Threatened and Endangered Species

- **Five rare species observed (none near project area)**
- **Spring surveys to confirm:**
  - 3 plant species
  - 6 animal species (turtles, snakes, and a frog)
- **Concern about impact of stormwater on habitat**

Water Chemistry Evaluation

- pH
- N: ammonium, nitrate, nitrate
- Total Phosphorus
- Total Suspended Solids
- Temperature
- Dissolved Oxygen
- Specific conductance
- Chlorophyll

Surface Water Samples

- Hampton Creek Bog: 6 samples
- Greenspire Bog: 4 samples
- Portage Creek wetland: 3 samples
- Portage Creek: 3 samples
- Hampton Lake: 3 samples

Summary of pH Data

- Hampton Creek Bog: pH 5.8 - 6.4
- Greenspire Bog: 4.2 - 6.1
- Portage Creek wetland: 6.4 - 7.0
- Portage Creek: 8.0
- Hampton Lake: 8.2 - 8.3

Summary of Water Temperatures

- Surface water temperatures - 18.8° to 24.4° Celsius
- Warmest water - Hampton Lake
- Coolest water - Hampton Creek bog
- Portage Creek - similar to bogs

Summary of Nitrogen Data

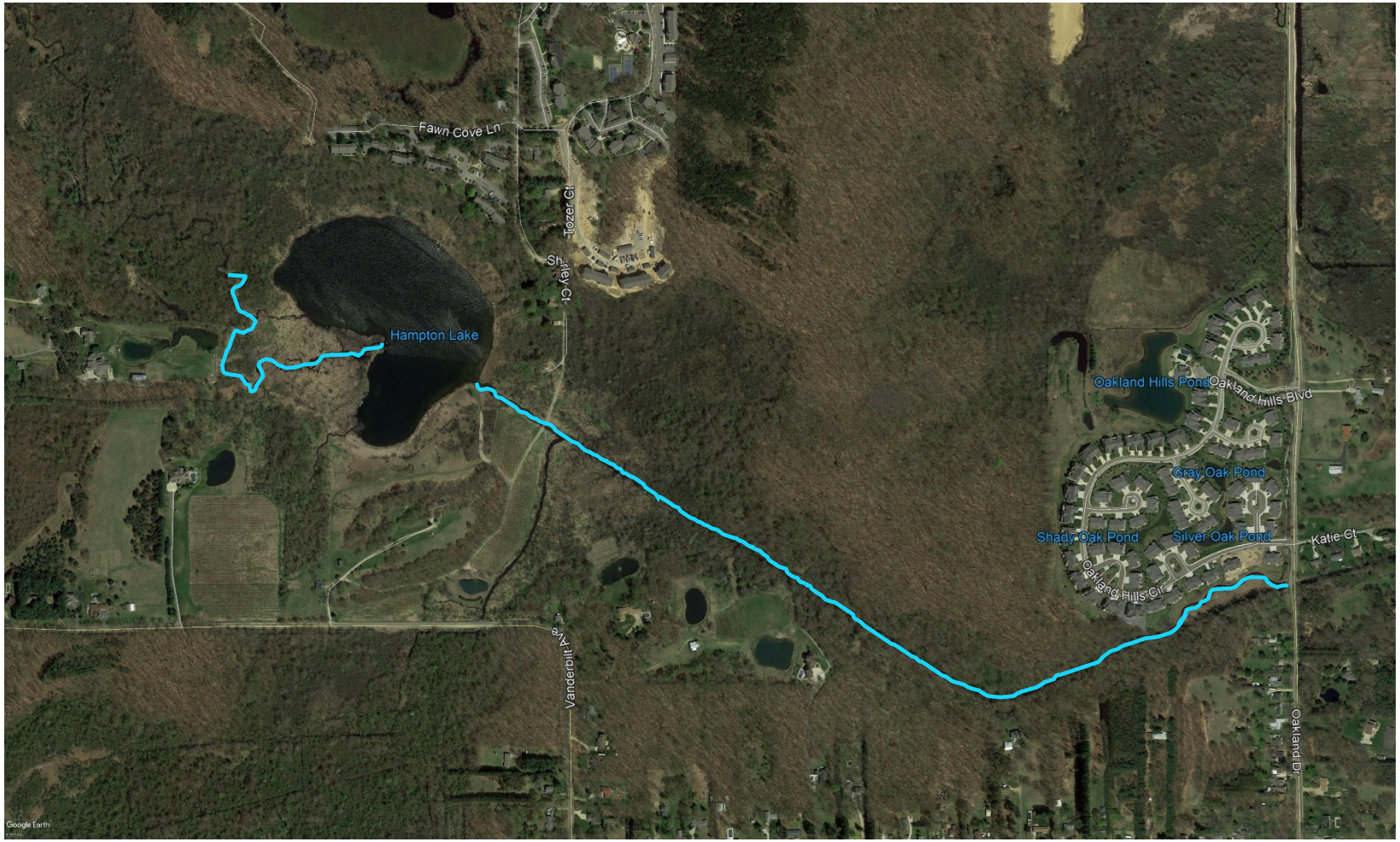
- Ammonia nitrogen concentrations exceeded EGLE criteria in:
  - Hampton Creek Bog (4 locations)
  - Greenspire Bog (2 locations)
  - Portage Creek Wetland (3 locations)
- No detectable concentrations of ammonia nitrogen in:
  - Hampton Lake (3 locations)
  - Portage Creek (3 locations)

Summary of TSS and Phosphorus Data

- Total phosphorus concentrations correlated directly with TSS levels in all the water samples.
- Hampton Creek Bog water samples had low TSS, turbidity and phosphorus.
- Portage Creek Wetland water samples had high TSS, turbidity and phosphorus.

Stream Stability Assessment

- Geomorphic assessment
- Stream bank stability
- Sediment transport

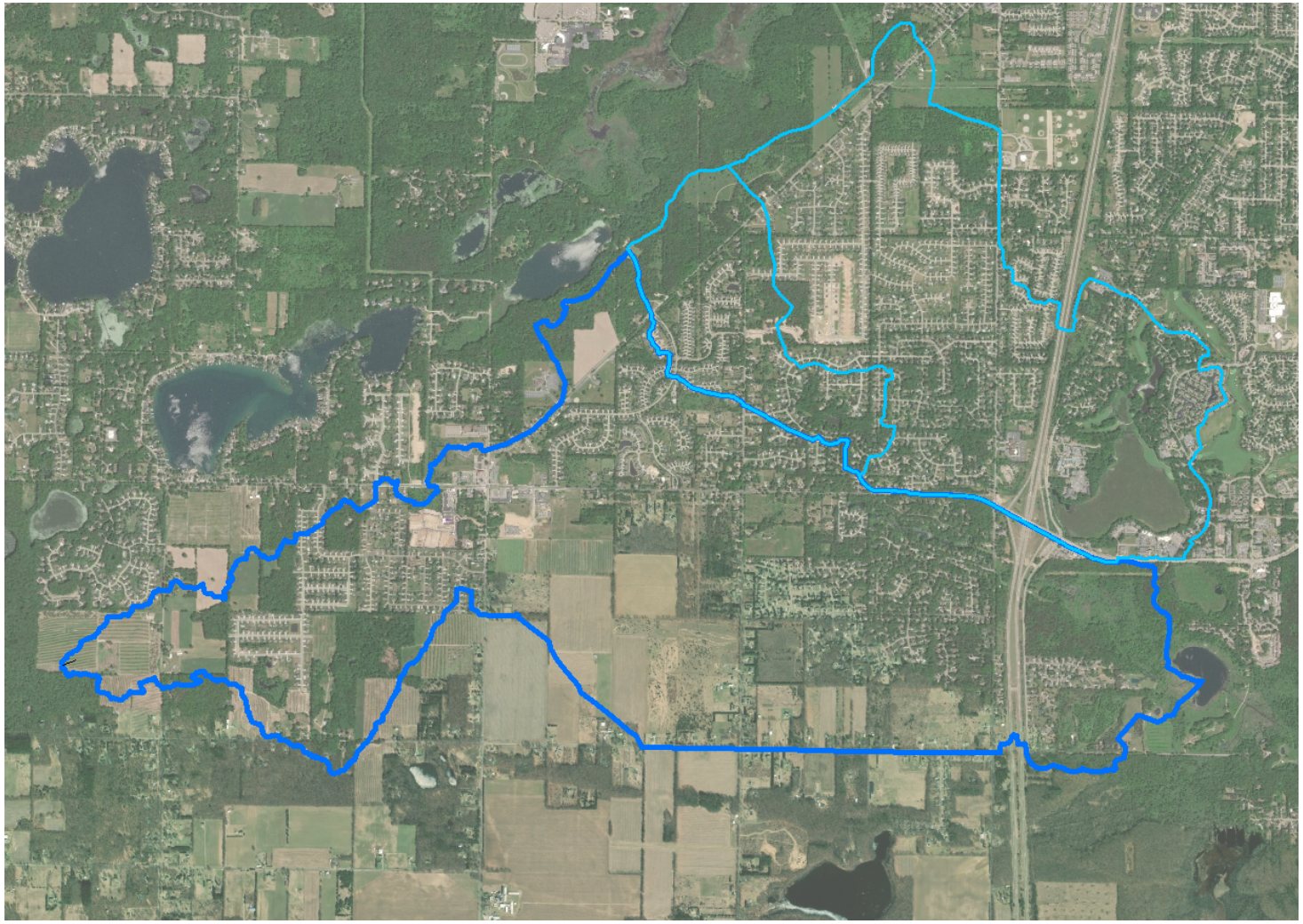


Stream Stability Assessment

Portage Creek stream channel: High functioning and stable

Hydraulic Evaluation

- **Hydrologic evaluation**
  - Topographic map
  - Verify depression areas
- **Hydraulic model**

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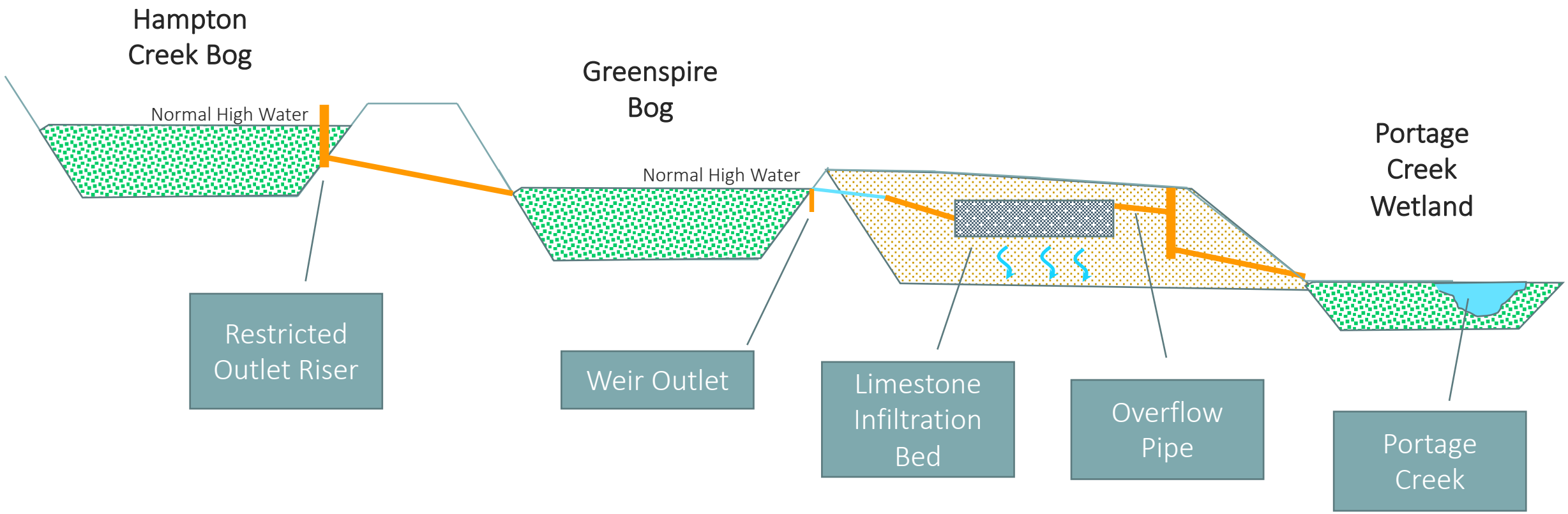
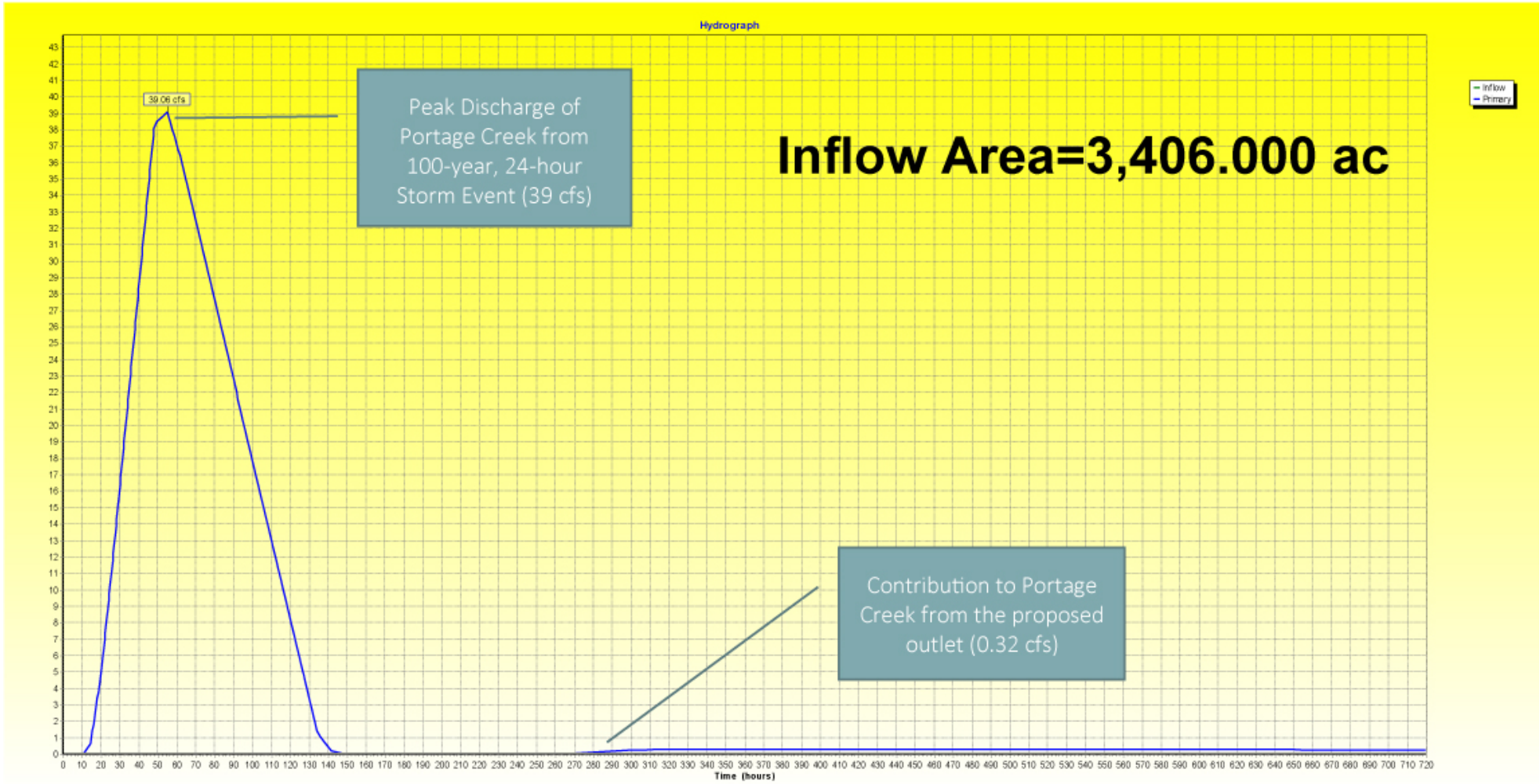
Proposed Stormwater Outlet



Hydraulic Evaluation

Figure 3. Portage Creek Composite Hydrograph, 100-year, 24-hour Storm Event



Remaining Work

- **Meet with regulatory agencies to review findings and obtain input**
- **Preliminary engineering design**
- **Joint permit application**

Design Challenges

- **Managing pH**
  - Bog pH = 4.2 - 6.4
  - Portage Creek wetland = 6.4 - 7.0
  - Portage Creek = 8.0
  - Hampton Lake = 8.2
- **Strategy: Infiltration through Limestone Bed**

Design Challenges

- **Potential impact on wetland and stream hydraulic regimes**
  - Strategies
    - Hampton Creek Bog - restricted outlet at historic high water elevation
    - In the Greenspire Bog - outlet at the historic high water elevation
    - Limestone infiltration bed
    - Overflow to Portage Creek wetlands (50-year event and greater)

Design Challenges

- **Impact on rare and protected natural features**
  - Strategies
    - Minimize ground disturbance due to construction
    - Implement Best Management Practices
    - Minimize impacts on wetland hydrology through infiltration
    - Pretreat stormwater through infiltration via limestone bed

Design Strategies

- **Limestone infiltration bed**
  - Limits direct discharge of stormwater to the Portage Creek wetland
    - Overflow - 50-year storm event or greater
    - Minimize and delay discharge to Portage Creek
  - Neutralizes high pH water