

Technical Memo 2

DRAFT

SUBJECT: Evaluation of Water Chemistry and Physical Parameters
Hampton Creek Wetland Areas
City of Portage, Kalamazoo County, Michigan

DATE: November 15, 2019

PROJECT NO.: 181663

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Introduction

This technical memo has been prepared to summarize the evaluation of surface water chemistry and physical parameters conducted at the Hampton Creek Wetland Areas, Portage, Michigan (subject property). The area of investigation includes Hampton Creek Bog, Greenspire Bog, Portage Creek and associated wetlands, and Hampton Lake (see Figure 1 - Location Map). The purpose of the investigation was to characterize surface water throughout the area of investigation and to identify significant differences in water chemistry between the bogs, wetland, creek, and lake.

Background

On December 19, 2018, Fishbeck visited the Hampton Creek Bog to collect surface water samples. A total of three surface water samples were collected (SW-01 through SW-03). SW-01 was located along the eastern shore of the northern portion of the bog (i.e., open water area). SW-02 was collected along the southern portion of the bog immediately north of Harding's Supermarket. SW-03 was collected in an open water area of the bog, located in the southwestern portion, adjacent to Angling Road, north of West Centre Avenue. The approximate surface water sample locations are shown on Figure 2. The samples were collected for laboratory analysis of *E. coli*, nitrate nitrogen, nitrite nitrogen, ammonia nitrogen, and total phosphorous. The samples were placed in an ice-filled cooler and transported under chain-of-custody (COC) protocol to Pace Analytical Services in Grand Rapids, Michigan, for the analysis.

A summary of the analytical laboratory data is provided in Table 1. Ammonia nitrogen was detected in one of the three sampling locations (SW-02) at a concentration exceeding the Part 31, Rule 57 Final Chronic Value of 0.029 milligrams per liter (mg/L). Nitrate and nitrite nitrogen were less than the laboratory reporting limits in all three samples. Phosphorous was detected in all three samples at concentrations ranging from 0.10 mg/L and 0.50 mg/L. *E. coli* was detected in all three samples at concentrations ranging from 36.9 to 122.4 colony forming units per 100 milliliters (CFU/100 mL). Total coliforms were detected in all three samples at concentrations ranging from 143 to 260.3 CFU/100 mL.

The State of Michigan's water quality standard for *E. coli* is the maximum allowable concentration of *E. coli* in surface water for total body contact during May 1 and October 31, and for partial body contact all year long. The maximum allowable daily total body contact during the warm season is 300 CFU/100 mL. The maximum partial body contact limit year-round is 1,000 CFU/100 mL. The concentration of *E. coli* observed in December was below this limit.

The details regarding the December 2018 sampling event were provided in a draft report submitted to the City of Portage, entitled *Phase I Hydrogeologic Evaluation Hampton Creek Wetland Area*, dated March 6, 2019.

Evaluation of Water Chemistry and Physical Parameters

Follow-up sampling was conducted by Fishbeck at the subject property on August 14, 2019. Sampling included collection of surface water samples from each of the identified wetlands and water features, as indicated in Figure 2. The weather was partly cloudy with temperatures between 70 and 80 degrees Fahrenheit. A total of 16 surface water samples were collected (SW-04 through SW-19). The locations are described below:

Hampton Creek Bog: A total of three samples (SW-04, SW-05, and SW-06) were collected. The samples were collected within the perimeter moat near the proposed outlet structure. Due to the shallow water, the samples were collected using a dipper cup with pole.

Greenspire Bog: A total of four samples (SW-07, SW-08, SW-09, and SW-10) were collected. The samples were collected within the perimeter moat near the proposed outlet and outfall structures and between the structures. Due to the shallow water, the samples were collected using a dipper cup with pole except for location SW-10, which was accessed using a canoe. The surface water samples were collected directly into laboratory-supplied bottles.

Portage Creek Wetland: A total of three samples (SW-11, SW-12, and SW-13) were collected from the wetland. The locations were evenly spaced along a transect from the inlet to Portage Creek. The sample locations were accessed on foot. Due to the shallow water, the samples were collected using a dipper cup with pole.

Portage Creek: A total of three samples (SW-17, SW-18, and SW-19) were collected. One sample was collected directly downgradient of the proposed outfall, and additional samples were collected approximately 200 feet upstream and downstream of the first sample. The creek was accessed on foot and the surface water samples were collected directly into laboratory-supplied bottles.

Hampton Lake: A total of three samples (SW-14, SW-15, and SW-16) were collected. Two of the samples were collected near the inlets from Portage Creek and one was collected from the central portion of the lake. A canoe was used to access the sample locations. The surface water samples were collected directly into laboratory-supplied bottles. A Secchi disk was also used to measure the transparency of the water at the three lake sampling locations.

Water samples were placed in an ice-filled cooler and transported following COC procedures to Pace Analytical Services in Grand Rapids, Michigan, for laboratory analysis of total suspended solids (TSS), nitrate nitrogen, nitrite nitrogen, ammonia nitrogen, and total phosphorous.

Two YSI meters were used to record field parameters of the water samples. The field parameters measured during sampling included pH, turbidity, temperature, reduction-oxidation (Eh), dissolved oxygen, specific conductance, and chlorophyll.

Discussion of Results

The Secchi disk results are discussed below.

- At SW-14, the lake depth was measured to be 8.5 feet, and was transparent to a depth of 5.5 feet below the surface of the lake.
- At SW-15, the lake depth was measured to be 6.0 feet, and was transparent to a depth of 5.3 feet below the surface of the lake.
- At SW-16, the lake depth was measured to be 18.5 feet, and was transparent to a depth of 4.0 feet below the surface of the lake.

A summary of the analytical laboratory data and field measurements are provided in Table 1 and are discussed below.

- pH values measured in the field during sampling consisted of the following:
 - Hampton Creek Bog – pH 5.8 to 6.4 standard units (S.U.).
 - Greenspire Bog - 4.2 to 6.1 S.U.
 - Portage Creek Wetland - 6.4 to 7.0 S.U.
 - Portage Creek - 8.0 S.U. (for all three locations).
 - Hampton Lake - 8.2 to 8.3 S.U.

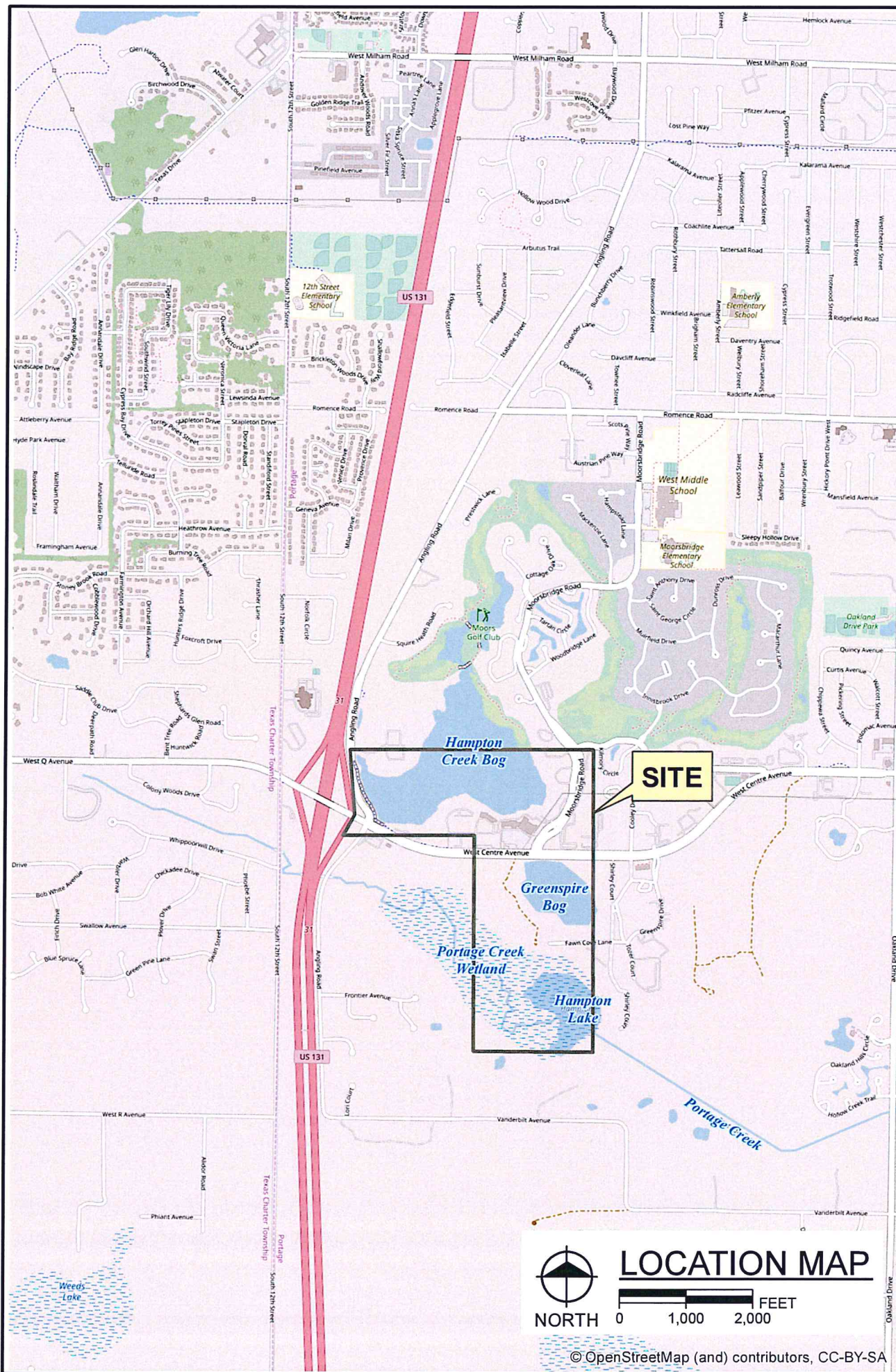
The data confirm surface water in the bogs is acidic, while surface water in the Portage Creek Wetland is slightly acidic to neutral, and Portage Creek and Hampton Lake are alkaline.

- Surface water temperature measured in the field during August 2019 sampling ranged from 18.8 to 24.4, with the warmest water found in Hampton Lake and the coolest water in Hampton Creek Bog. Portage Creek water temperatures were similar to those measured in the two bogs.
- Chlorophyll values ranged between 0.00027 and 0.36134 mg/L.
- Ammonia Nitrogen was detected in eight of the sixteen sampling locations (SW-04, SW-05, SW-06, SW-09, SW-10, SW-11, SW-12, and SW-13).
 - Ammonia nitrogen was detected at eight locations at a concentration that exceeds the Part 31, Rule 57 Final Chronic Value of 0.029 milligrams per liter (mg/L), as well as the Part 31, Rule 57 Aquatic Maximum Value of 0.16 mg/L, and the Part 31, Rule 57 Final Acute Value of 0.32 mg/L.
 - These exceedances were observed in the Hampton Creek Bog (four locations), Greenspire Bog (two locations), and Portage Creek Wetland (three locations).
 - Hampton Lake and Portage Creek water samples did not contain detectable concentrations of ammonia nitrogen.
- Nitrate nitrogen was detected in the samples collected from SW-14, SW-15, SW-16, SW-17, SW-18, and SW-19.
 - The nitrate nitrogen concentrations were all below the Part 31, Rule 57 Drinking Water HNV criteria.

- Nitrite nitrogen was detected in the water samples collected from SW-05, SW-06, SW-08, SW-09, SW-10, SW-14, SW-15, and SW-16.
 - The nitrite nitrogen concentrations ranged from 0.012 to 0.049 mg/L.
- TSS were detected above method detection limits in each of the samples except for SW-19.
 - The TSS concentrations ranged from 8 mg/L to 27,700 mg/L.
 - The highest TSS concentrations were detected in the three Portage Creek Wetland samples and one Greenspire Bog sample. These samples also had high turbidity.
 - Field notes indicate the Portage Creek Wetland samples were collected in surface water 0.1 to 0.3 feet deep. Water samples were black and contained visible organic matter. Likewise, sample SW-10 (in Greenspire Bog) was collected in 0.4 foot of surface water and the sample was dark brown with thick organic matter.
- Phosphorous was detected in each of the samples except for SW-14, SW-15, SW-16, SW-17, and SW-19.
 - The phosphorous concentrations ranged from 0.11 mg/L and 42.1 mg/L.
 - Total phosphorus concentrations correlated directly with TSS levels in all the water samples. This suggests organic matter was a primary source of total phosphorus. Consequently, the presence of suspended solids in these water samples biased the data.

The laboratory report is provided in Attachment 1.

Figures



fishbeck

Engineers | Architects | Scientists | Constructors

Hard copy is intended to be 8.5"x11" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

City of Portage Kalamazoo County, Michigan Hampton Creek Wetland Area Surface Water Evaluation

PROJECT NO.
181663

FIGURE NO.
1



NORTH

LOCATION MAP

0 1,000 2,000 FEET

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Tables

