

## INTRODUCTION

In 1935, three ponds were excavated and constructed for a fish hatchery that fed Lake James. The ponds are located north of the Potawatomi Inn in the southwest corner of the park. The construction of the ponds included inlet piping, overflow piping, and control structures between the ponds. The ponds have two water sources, which include surface runoff from the north and a drainage area to the west of the ponds that are connected via a drainage pipe. However, the ponds do not retain water throughout the year. Currently, the ponds are unattractive with overgrown plants and trees.

The state park would like to restore these ponds to become functional ponds. The ponds will need to retain water throughout the year to support aquatic life. The water entering the pond will need to be monitored to ensure proper water qualities for aquatic life. The new pond design intends to restore the ponds close to the original use of a fish hatchery and provide benefit to the public. Two different pond designs are described herein.



## Scope of Work

The project's focus is redesigning the ponds to become functional ponds. Field work and lab testing was needed to get additional information about the ponds. A seasonal and permanent pond design was considered. A bridge and new landscaping will be included in the new designs.

## Field Work

Grubbing had to be completed before any field work could be started. Surveying, soil boring, water tracing, and water quality testing was completed during the project. A topographic survey was completed to generate a contour map in AutoCAD. The contour map allowed elevations and slopes to be determined. Soil borings were taken to further analyze the soil in the lab. Water tracing was done to determine the drainage area. Water quality testing was also performed at the site to ensure the water was adequate for aquatic life. After the water testing was completed, it was determined that the on-site water is safe for fish.



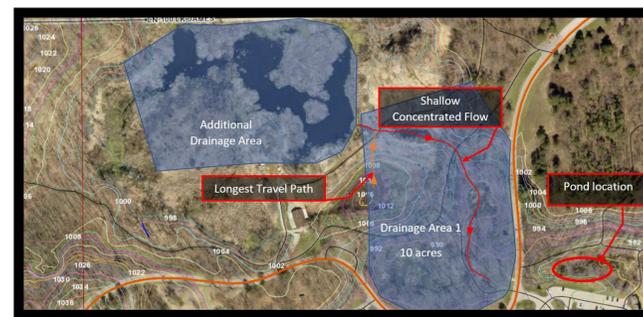
## Lab Testing

In order to get a better understanding of the soil types and quality of water present in the ponds, several tests were completed both in the field and in the lab. Water quality data was compared to the Fawn River Fish Hatchery in Orland, Indiana. All results were within the desirable range, and it was concluded that the ponds could support aquatic life if desired. After soil testing was completed, we determined that the bottom of the ponds consisted of lean clay, whereas the banks consisted of poorly graded sand.



## Hydraulic Analysis

An important aspect of the design was determining the amount of water getting to the ponds. The TR-55 method was used to estimate the amount of runoff to these ponds. It was determined that not enough runoff is flowing to the ponds for a permanent pond. A second water source would be needed for a permanent pond.



## Bridge Design

Pokagon would like to have a bridge in the middle of the two existing ponds. Prefabricated bridges were found on Fifthroom.com, and we decided to implement the Treated Pine Sunrise Bridge into the project.

This timber bridge will span 10 feet in length and would be an excellent location for event pictures at the park such as weddings, proms and field trips. Analysis of the bridge was completed using the National Design Specification for Wooden Structures and the LRFD Guide Specification for Design of Pedestrian Bridges to calculate the weight capacity of the bridge.



## Seasonal Pond Design

After surveying the pond areas and investigating the hydrology in the area, we determined that the ponds would not retain water for an extended period. However, in order to reduce the water flowing out of pond 2, we recommend a headwall installation to increase the water level in the ponds. We also recommend that the top 9-inch organic layer in the ponds be excavated and an additional 12 inches will be removed to prevent water from saturating the soil. To prevent erosion on the sides of the ponds, rip rap composed of 5"-9" stone will be necessary. The pedestrian bridge will be installed between ponds 1 and 2 for viewing purposes. Brush on the perimeter of the pond will be removed to improve visibility. Other vegetation will be added for aesthetic purposes around the ponds along with park benches for viewing. The client would like for the ponds to support aquatic life, so it was also a consideration while designing the seasonal and permanent ponds.

## Permanent Pond Design

A second option is to develop permanent ponds. Using the hydrology information gathered, we determined that it will likely be necessary to include a liner to the edge of the pond to prevent excess infiltration which would occur on the edge of the ponds. Also, a second water source would be required to maintain water within the ponds without any problems with the dry season. We also recommend replacement of the catch basin and piping leading from the inlet to pond 1. A headwall will be needed to reduce the flowrate out of pond 2 which will increase the water level in pond 1 and pond 2. Like the seasonal pond design, accommodations, such as rip rap, clearing, benches, a bridge and new vegetation is recommended for this permanent design as shown below.

