Caesar Creek Marina

Schematic Design Report

February 2013

SMITHGROUP JJR

OHIO DEPARTMENT OF NATURAL RESOURCES

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EXECUTIVE SUMMARY

This document presents the Schematic Design for a proposed marina, shoreline improvements and recreational enhancements at Caesar Creek State Park. It provides a brief summary of the project background, issues, and key influences which lead to the resulting design plan.

The Ohio Department of Natural Resources, through a public-private partnership, intends to develop a recreational marina at Caesar Creek. Studies completed in 2008 identified the preferred marina location and established a preliminary development program. Through recent efforts and in collaboration with a team lead by SmithGroupJJR, ODNR evaluated multiple concepts and continued the process of refining the vision for the new marina. This report is an interim step in this process and is based on public feedback and economic analyses.

From a big picture perspective, the Schematic Design for Caesar Creek Marina seeks to:

- Create a well-designed, attractive and sustainable marina that provides a range of economic, social, and ecological benefits;
- Use public investment as a tool to attract and encourage private investment that will help to maintain, manage, and construct the planned improvements; and
- Expand the range of recreational opportunities available and develop marina and park facilities that support a broad range of users.

As part of the schematic design process, extensive research on the existing site conditions was performed. Regulatory agencies were engaged in preliminary discussions to confirm the permitting process and help guide design decisions. ODNR engaged members of the community and key project stakeholders to gain feedback. The project costs are well defined and the process for implementing the vision embodied by the Schematic Design is clear. In 2015, ODNR and the Caesar Creek community intend to begin using the first phase of waterfront improvements.

Existing landscape character

Existing youth fishing pond

Existing shoreline condition

1.0 INTRODUCTION

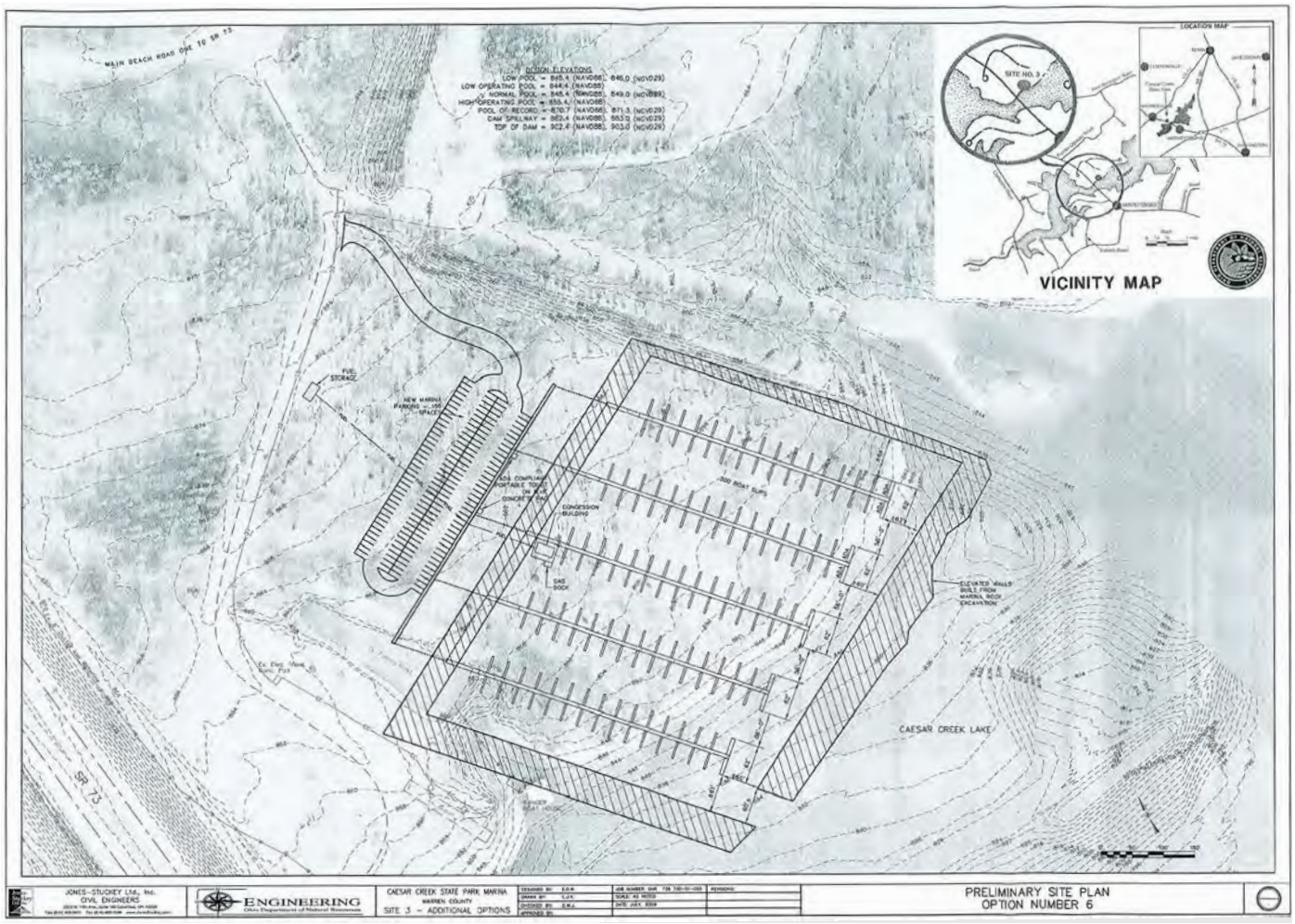
1.1 Project History and Background

In 1994, the United States Army Corps of Engineers (USACE) approved an overall master plan for Caesar Creek which included the development of a marina. The Ohio Department of Natural Resources (ODNR) sought to advance the initiative of developing a marina at Caesar Creek and hired Jones-Stuckey, Ltd. Through a series of studies completed between 2008 and 2010, five alternative marina sites, multiple marina sizes and numerous configurations were considered. From these alternatives, the preferred location for the new marina was selected and a preliminary development program for the marina was established.

1.2 The Planning Process

1.2.1 Initial Conceptual Plan

ODNR selected a site immediately north of Highway 73 as the home for the future marina. Multiple marina facility sizes and configurations were presented as part of the Jones-Stuckey studies (Option 6 below) and, in 2011, ODNR hired a team lead by SmithGroupJJR to further refine the vision for the new marina. The SmithGroupJJR Team, in collaboration with ODNR, revisited the previously developed concepts and created a refined development program. With the refined program established, the SmithGroupJJR Team began the process of preparing refined concepts to address some of the site's unique challenges, including significant water level fluctuations and a relatively shallow depth to bedrock.



Site Plan Option 6 (2009), Jones-Stuckey, Ltd.

1.2.2 Alternative Concepts

ODNR and the SmithGroupJJR Team explored three different concepts for creating a protected marina basin. Due to the extreme water level fluctuations within the reservoir, all concepts employed the use of floating attenuators versus fixed, rubblemound breakwaters to create suitable basin tranquility.

Alternative 1

Alternative 1 considers a marina basin excavated into the upland areas of the project site, similarly to what was proposed in many of the initial Jones-Stuckey solutions. This concept features a land-based marina administration building, relatively short horizontal distances between parking and the marina slips and two harbor entrances. ODNR eliminated this alternative due to high cost of marina basin excavation.

Alternative 2

Alternative 2 consists of a marina and land-based improvements along the existing shoreline. Two harbor entrances serve distinct areas of the marina. The western basin is a conventional marina, while the eastern basin supports development of rental cottages in the wooded uplands and provides transient dockage. A dry-stack storage building near the shoreline creates an additional revenue generating opportunity. Marina administration and support buildings are built on land. This solution was eliminated from further consideration due to concerns over the viability of the dry-stack facility and challenges associated with developing fixed, land-based buildings in flood-prone areas.

Alternative 3

Alternative 3 consists of a marina and associated land-based improvements placed along the existing shoreline. This alternative was the preferred solution as the floating marina buildings address water level fluctuations, preserve key existing features like the youth fishing pond, offer a dry-dock area with the potential to generate additional revenue and minimize harbor basin dredging costs.

1.2.3 Consensus Master Plan

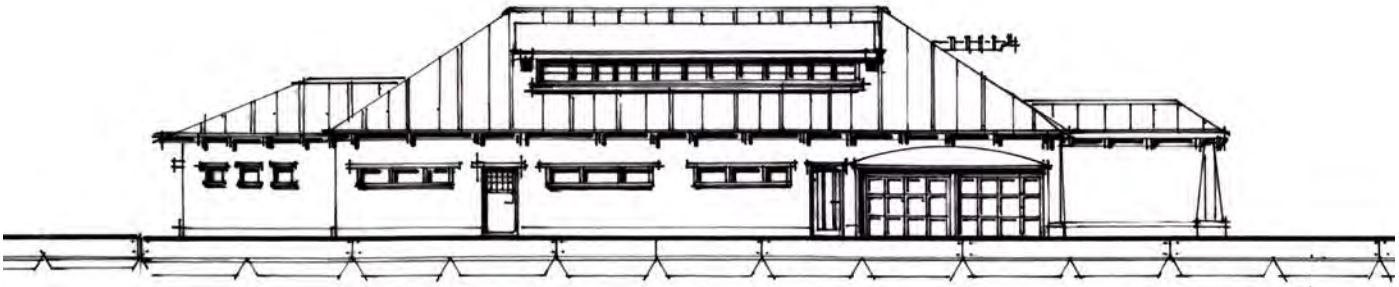
The Consensus Master Plan was developed based on preferences expressed through the alternative review process. It illustrates a cost effective solution that offers revenue-generating opportunities that can help support investment from a private partner, responds to the specific site challenges and integrates the marina and its upland facilities with other amenities currently available at Caesar Creek.

The Consensus Master Plan represented an important step in the overall design process and guided development of the Schematic Design. Key highlights of the Consensus Master Plan that inspired the Schematic Design include:

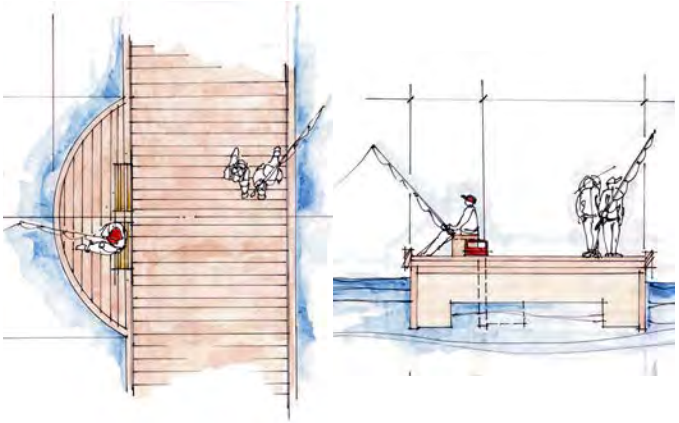
- Arcing floating attenuators with a central dock that creates two distinct basins that simplify phased implementation of the planned improvements;
- Public access to the attenuators for fishing purposes;
- Private partner revenue generating opportunities including floating cottages, a marina service area and dry dock facilities;
- Floating marina administration facilities;
- Preservation of the youth fishing pond;
- Interconnected trails that link the marina to the nearby beach;
- A system of naturalized drainage swales that collect and treat upland runoff prior to entering the lake; and
- Tandem sets of gangways connecting upland parking to the marina and the relocated patrol boat house.

ODNR presented the Consensus Master Plan to the public . The plan was well received and has helped bolster community support for implementation of the project.

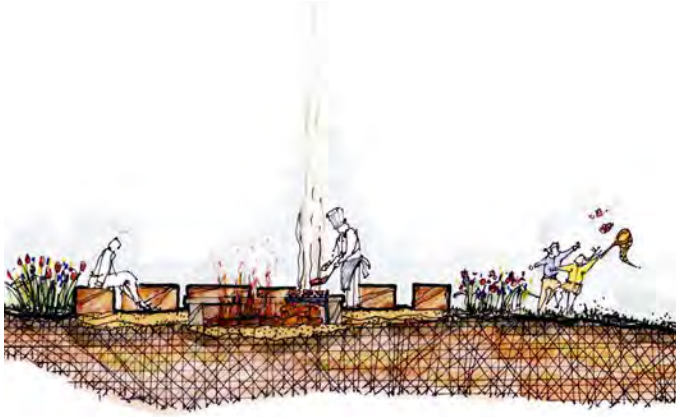
Consensus Master Plan



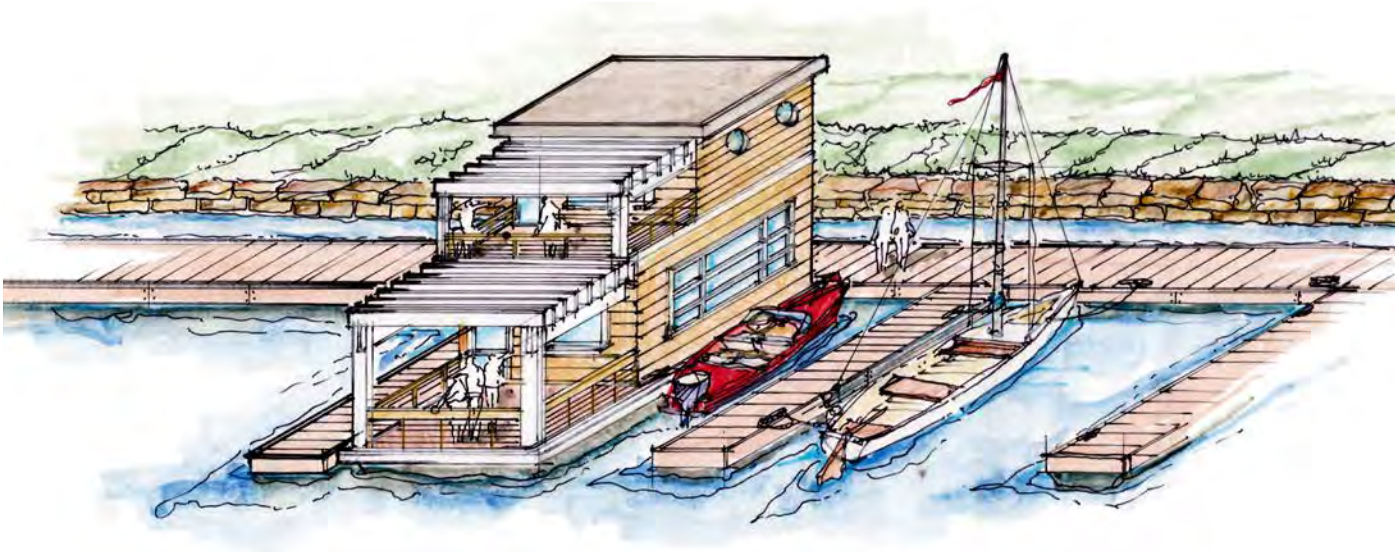
Example marina services building character



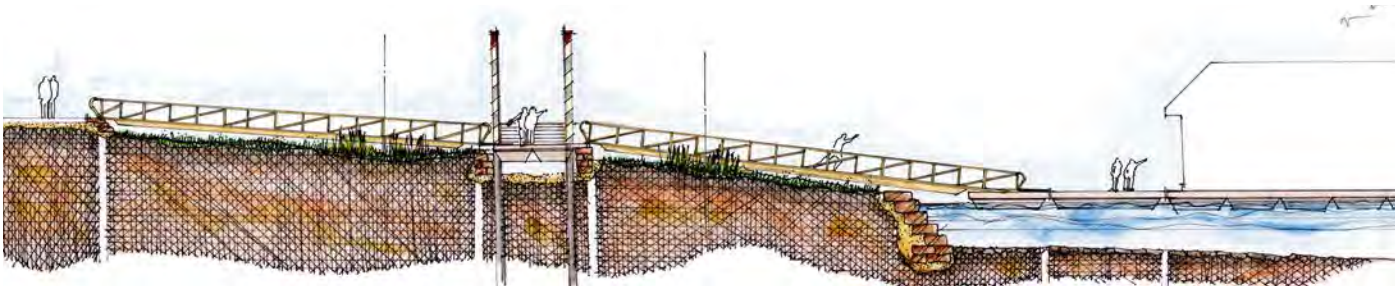
Accessible public fishing along attenuators



Example of a fire pit



Example of a floating cottage



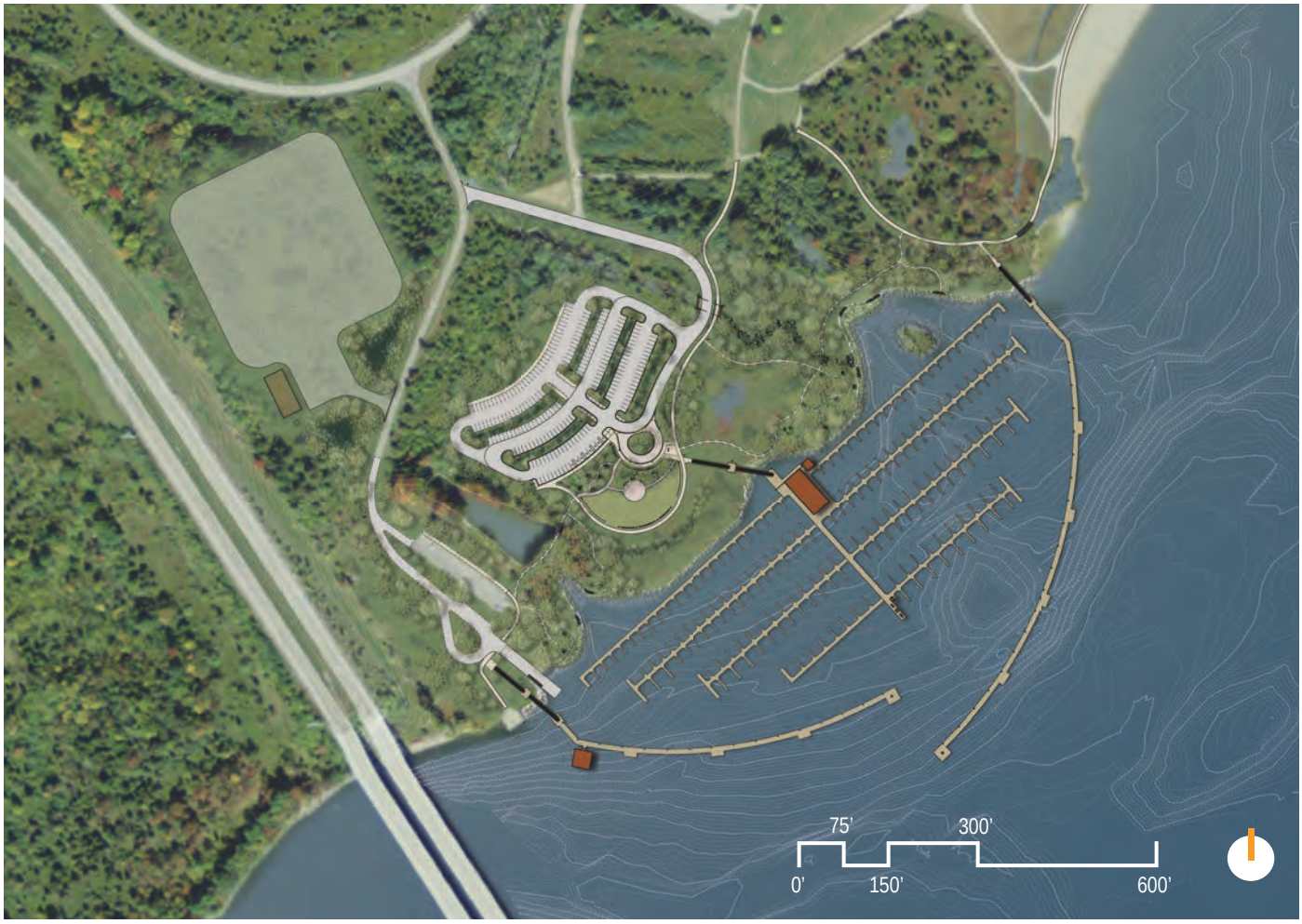
Section through gangways and pile-restrained floating platform connecting marina to upland improvements

1.3 Schematic Design Plan Overview

The Schematic Design Plan further refines the vision and solidifies the design program established by the Consensus Master Plan. It blends a recreational marina with the park-like amenities that will be enjoyed by boaters and non-boaters alike. A new waterfront plaza connects with nearby park facilities and overlooks the marina. Recreational boating opportunities and improved fishing are accessed via an interconnected trail network. Portions of the upland areas are reserved for private partner use to help generate revenue that helps support private investment. Ecological enhancements improve the function of the natural landscape, help treat stormwater runoff and expand aquatic and terrestrial habitat.

The Schematic Design Plan is a comprehensive vision that includes an initial phase that the state intends to construct, as well as facilities that are likely to be developed by the private investment partner. Future permit application materials, and the private partner solicitation, rely on the Schematic Design Plan as their foundation.

For further discussion on the Schematic Design Plan, please see Section 3 of this document.



Schematic Design Plan

2.0 SITE INVESTIGATIONS & ANALYSIS

2.1 Existing Features

Existing features at the project site include an accessible fishing platform, youth fishing pond and floating patrol boat house. Old STH 73 runs along the northern edge of the proposed marina and dead-ends into Caesar Creek Lake. Other internal drives provide access to the youth fishing pond, platform and floating patrol boat house. Sanitary sewer and water are not currently extended to the project site, but are in close proximity. Electric service does extend to the floating patrol boat house, but will be upgraded as marina improvements are built.

Existing accessible fishing platform

Old STH 73 dead-ending into Caesar Creek Reservoir

2.2 Topography & Bathymetry

Topographic and bathymetric survey data is referenced to state plan coordinates North American Datum of 1983 (NAD83) with a vertical datum based on the North American Vertical Datum of 1988 (NAVD88). The Ordinary High Water Mark for Caesar Creek Lake has been established as 848.25 feet.

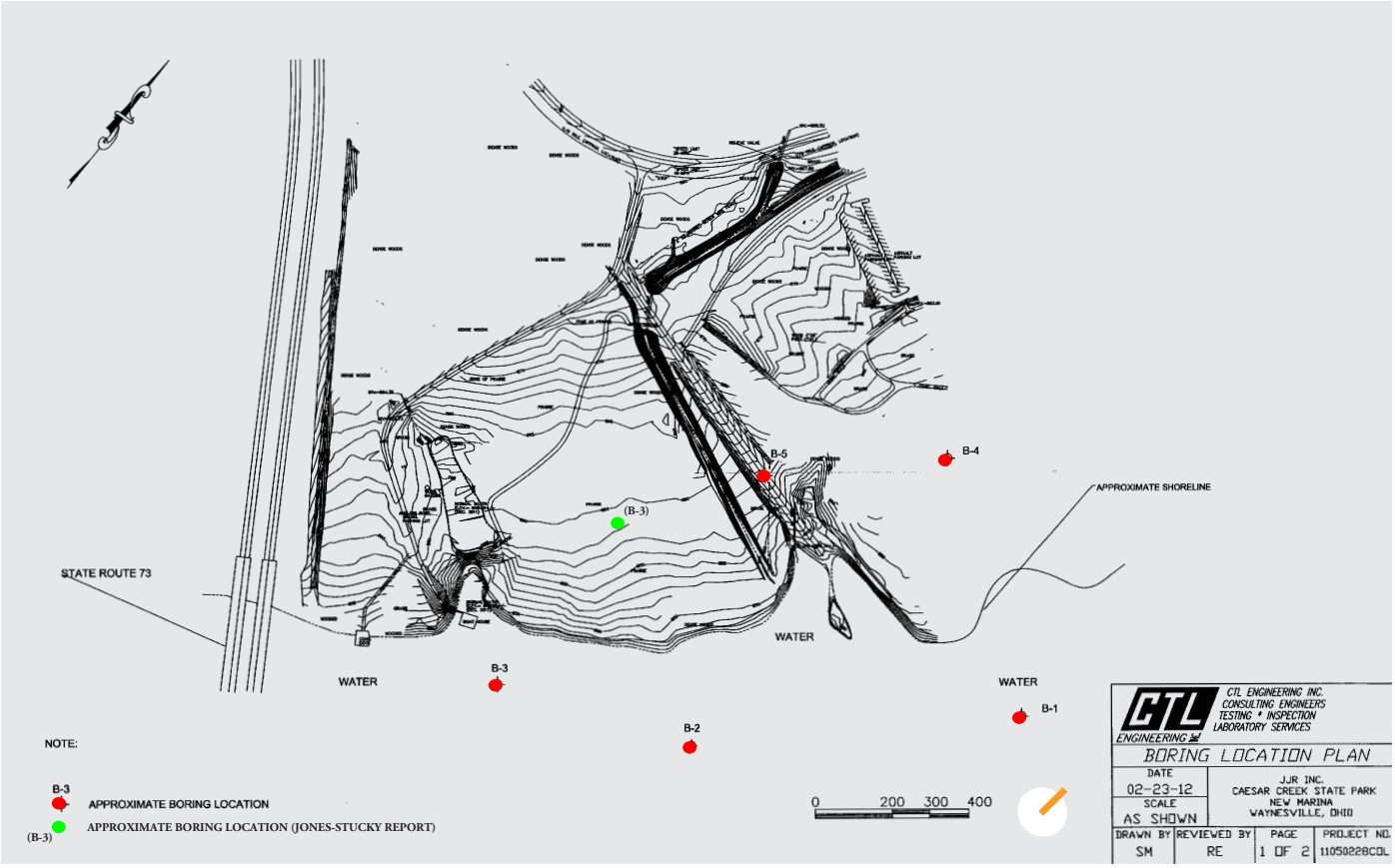
The landward topography for the project site was surveyed by WD Transportation, Inc. between December 2011 and February 2012. The bathymetric survey was conducted by SmithGroupJJR in November 2011.

2.3 Vegetation

Vegetation on the site is mainly upland grasses and deciduous forest. A tree survey was completed and indicated that the species include elm, box elder, cherry, locust, hackberry, and ash. A majority of the trees were White Ash and are likely to experience significant decline due to the Emerald Ash Borer. While the existing tree species are relatively common and in many instances non-native weed species, the focus of the preservation efforts is to avoid and minimize disturbance around large specimens wherever practical.

Of the species found on the site, five are considered to be favored by the Indiana bat, a state and federally endangered species. These five species include American Elm, Bitternut Hickory, Red Oak, Silver Maple and White Ash. Approximately 125 trees on the site are considered to be bat roosting species. Trees included are those that have exfoliating bark, crevices, and cavities in upland and/or riparian corridors. In accordance with state and federal regulations, bat favored trees can only be cut during the time frame of September 30 through April 1.

Typical upland landscape characteristics



Approximate boring location plan, CTL Engineering, Inc.

2.4 Geotechnical Assessment

A single boring completed as part of the Jones-Stuckey evaluation of alternative marina development sites offered limited information about the subsurface conditions. Initial supplemental investigations were completed using non-invasive, seismic refraction analysis due to potential concerns over the presence of archaeological artifacts. Upon completing a preliminary archeological survey and gaining the necessary clearances, five conventional soil borings were also performed.

In December 2011, Grumman Exploration, Inc. performed a seismic refraction survey of the project site to help characterize the unconsolidated overburden and shallow bedrock profile. The results suggest a layered geologic profile with gradual transitions between shallow soil, weathered rock and underlying bedrock. Deeper, more rippable rock appears to exist around the area of the existing youth fishing pond with shallower, less rippable material being more prevalent at the north end of the project site. In general, the depth of unweathered, consolidated bedrock was determined to be as little as 15 feet toward the northern end of the site and as great as 30 feet toward the southern end of the site. The results of the survey, while preliminary, were highly informative and became the basis for preparing alternative marina development concepts. Based on this analysis (and as later confirmed through borings), the decision was made to advance with a marina development concept that limited upland excavation to avoid costly earthwork and rock blasting.

Five test borings were drilled and cored as illustrated in the Boring Location Plan (above). Two of the borings were drilled on land (B-4 & B-5), with the remaining three being drilled from a barge floating within the lake. The field work was completed during January and February 2012 and the soil samples were classified in the field and laboratory tested to establish the Rock Quality Designation (RQD) and moisture content.

The corings generally indicate a relatively uniform lean clay with sand overburden across the project site. Below the overburden and for borings within the lake, limestone with interbedded layers of clay was encountered. It is believed that the clay was formerly shale and weathered to its current condition. Much of the recovered rock washed away during the coring operations and RQD values were very low, ranging from 0 to 12 percent. Borings within

B-4 core sample, CTL Engineering, Inc.

the upland areas exhibited bedrock described as shale or interbedded shale and limestone with RQD values ranging from 0 – 30 percent.

The results of the borings indicate that excavation of the soil overburden should be able to be accomplished using standard excavation equipment. However, mass excavation of the weathered shale is likely to require the use of high-powered equipment (i.e. excavator). Excavation of the interbedded limestone layers will be difficult and shallow excavations into the weathered bedrock or bedrock for foundations or utility trenches may need to be saw cut. Excavated shale material, which is considered poor quality rock because it will soften in the presence of water, is not suitable for reuse as fill. Excavated limestone is considered more durable and is deemed suitable for reuse.

The full geotechnical exploration report prepared by CTL Engineering, Inc. is on file. Please see this document for additional information.

2.5 Water Levels

The Army Corp of Engineers created Caesar Creek Lake in 1978 to assist with flood control in the Little Miami River watershed. In 2005, the lake reached its highest recorded water level of 870.55 (NAVD88) – well below the reservoir spillway elevation of 882.25 (NAVD88).

ODNR completed an analysis of the historic water level data and developed probability projections for a range of events (see chart on page 9). The projected water level for the 50-year return period is 871.15 (NAVD88) – slightly above the pool of record. The highest recorded pool level resulted from a series of small storm events that fell on frozen ground during the winter of 2005.

Normal summer pool for the lake is 848.25 (NAVD88). In the event of significant rainfall, lake elevations may rise for a period of time since the Corp is tasked to release specific amounts of water downstream daily. During the winter low operating pool is 845.25 (NAVD88).

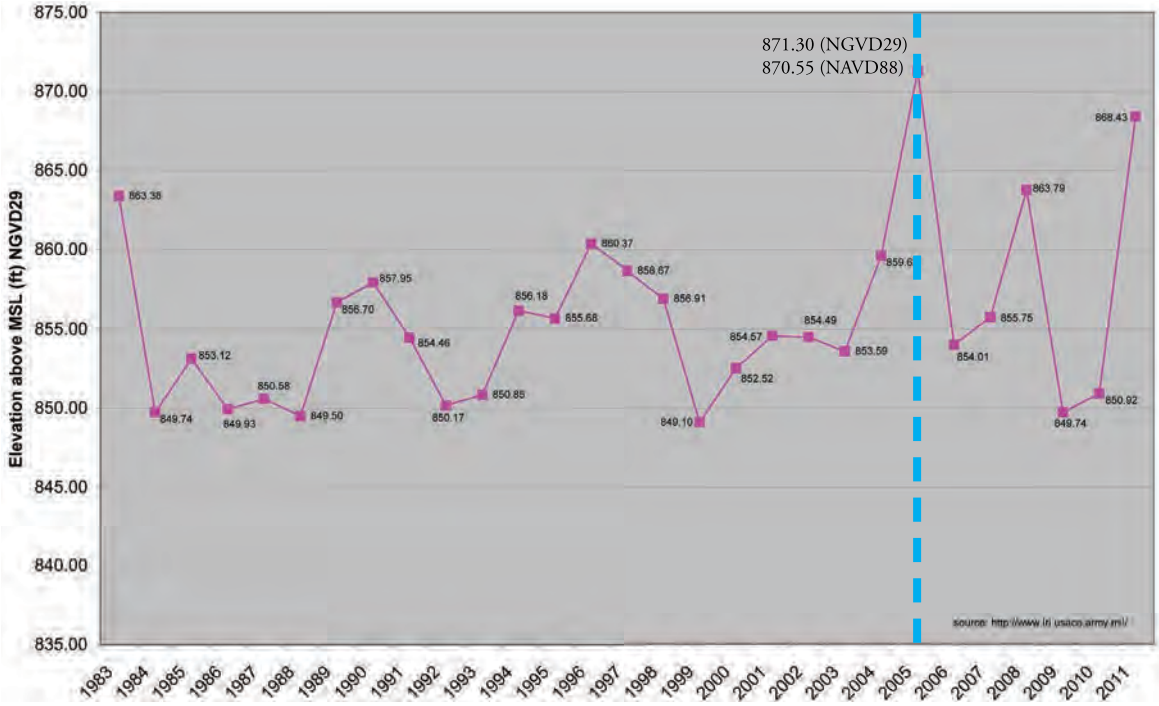
Based on an analysis of historic water levels, the elevation above which a majority of the site improvements should be developed was selected to be approximately 860.0 (NAVD88). There have been only two occasions where water levels have exceeded this threshold during the boating season.

Dredging of the marina basin is based on average low summer pool of 846.29 (NAVD88). To accommodate expected vessel sizes in this marina, it was determined that a minimum of 9-feet of dredging was required nearshore. Larger slips further into the basin that could expect to moor sailboats will be dredged a minimum of 10-feet to accommodate below water fixed-keels.

Basis of Design: A majority of land-based improvements shall be located at or above the 860.0 (NAVD88) elevation. Land-based structures should be designed to withstand flooding and require minimal maintenance and repair. The marina breakwaters (attenuators), dockage and anchorage will be designed to accommodate water levels at or below the 50-year return period of 871.15 (NAVD88) (2% annual chance of occurrence).

2.6 Wind and Wave Climate

The primary factor affecting the treatment and costs associated with harbor and shoreline protection is wave action. The size, force, and direction of waves is a function of lake levels, bathymetry, prevailing wind direction and the distance of open water over which waves may propagate (fetch). For recreational marinas, acceptable basin tranquility standards are to have less than one foot of wave height during the boating season and up to three feet during the non-boating season. While these standards are widely accepted, there is some latitude on exceeding these wave heights during infrequently storm events.



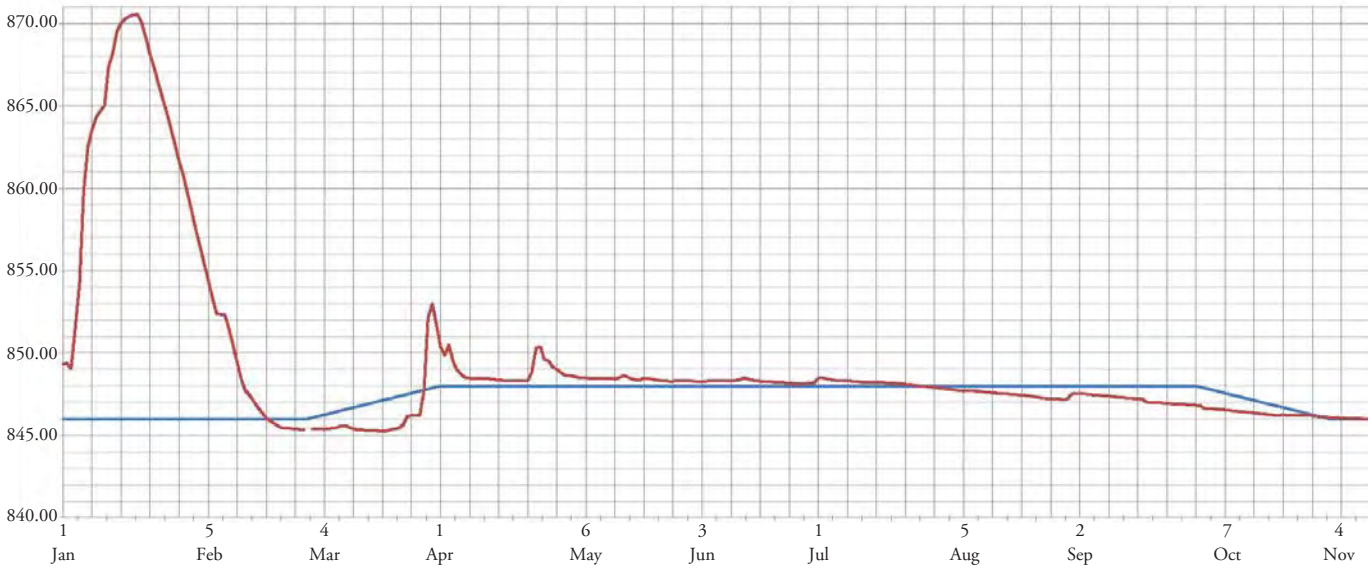
Caesar Creek peak pool elevations (1983 - 2011) - USACE

Expected Elevation ('88)	Return Period	Life of Project (years) 5	10	15	25	30	35	40	50	75	100
882.25	5000	0.10%	0.20%	0.30%	0.50%	0.60%	0.70%	0.80%	1.00%	1.50%	2.00%
882.25	1000	0.50%	1.00%	1.50%	2.50%	3.00%	3.40%	3.90%	4.90%	7.20%	9.50%
882.25	500	1.00%	2.00%	3.00%	4.90%	5.80%	6.80%	7.70%	9.50%	13.90%	18.10%
878.25	200	2.50%	4.90%	7.20%	11.80%	14.00%	16.10%	18.20%	22.20%	31.30%	39.40%
874.65	100	4.90%	9.60%	14.00%	22.20%	26.00%	29.70%	33.10%	39.50%	52.90%	63.40%
871.15	50	9.60%	18.30%	26.10%	39.70%	45.50%	50.70%	55.40%	63.60%	78.00%	86.70%
870.05	40	11.90%	22.40%	31.60%	46.90%	53.20%	58.80%	63.70%	71.80%	85.00%	92.00%
867.65	25	18.50%	33.50%	45.80%	64.00%	70.60%	76.00%	80.50%	87.00%	95.30%	98.30%
862.85	10	41.00%	65.10%	79.40%	92.80%	95.80%	97.50%	98.50%	99.50%	100.00%	100.00%
859.15	5	67.20%	89.30%	96.50%	99.60%	99.90%	100.00%	100.00%	100.00%	100.00%	100.00%
853.65	2	96.90%	99.90%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
846.35	1	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Probability that event of given Return Period will occur within Life of Project

Notes
1 Results calculated by performing a general frequency analysis of annual peak storage using HEC-SSP from the Corps of Engineers (COE).
2 Peak storage data derived from 29 years of daily elevation data (obtained from COE website) and elevation/storage table provided by the COE.
3 Consultation with USGS confirmed that analysis based on 29 years of record is not inappropriate and that general approach is valid.

Exceedance probabilities - ODNR



2005 Caesar Creek storm water level data (NAVD88)

Preliminary wind and wave climate data was evaluated for the project area. The analysis considered the wave direction, height and period for storm events ranging from the two-year to the 100-year return frequency. The 50-year event, capable of producing maximum wave heights of approximately two feet with up to 2.8 second wave periods out of the northeast, was selected as the basis of design for this project. Considering the design storm, water depths, water level fluctuations, cost and aesthetics, floating wave attenuators (breakwaters) will be used to achieve the desired level of basin tranquility necessary to support marina development.

Basis of Design: The wave height within the marina basin shall not exceed one-foot during the boating season and three-feet during the non-boating season for return periods greater than the 50-year (2% annual chance of occurrence) storm event.

2.8 Archeological Investigation

A Phase I archaeological survey was completed during March and April 2012 by Ohio Valley Archaeology, Inc. (OVAI). Shovel testing identified a total of fourteen previously unrecorded archaeological sites. Thirteen of the sites contained prehistoric scatters and isolated finds organized in a very diffuse, low-density pattern with few tools and very little to no fire cracked rock (FCR). One site contained both prehistoric and historic components, represented by 12 artifacts including two tools and a projectile point. The lack of FCR, coupled with the low density of tools across the site, suggests that the project site was host to short-term, ephemeral camps where few domestic activities occurred.

Based on the results of the Phase I work, OVAI indicated that none of the sites appear to have the potential to yield significant information that will improve the understanding of Ohio's prehistory. Nor are any of the sites considered eligible for inclusion into the National Register of Historic Places. Clearance of the proposed project area is recommended by OVAI The required documentation has been provided to the Ohio Historic Preservation Office for concurrence with OVAI's recommendation.

The full Phase I archeological investigation report is on file. Please see this document for additional information.

2.9 Waterways and Wetlands

A Preliminary Jurisdictional Waters Delineation (PJWD) was completed by CTL Engineering, Inc. in May, 2012. The purpose of the PJWD was to determine whether jurisdictional waters (wetlands and streams) of the US and/or State are present. The investigation identified a number of potentially jurisdictional elements within or near the project area as illustrated on page 11.

While the PJWD identifies potentially jurisdictional features, it requires review and concurrence by USACE and the State prior to being final. The USACE prefers to make jurisdictional determinations during the active growing season with jurisdictional determinations often taking as long as the formal Section 404 permit review process. Based on pre-meetings with USACE representatives, the jurisdictional determination will most likely occur prior to the growing season.

The Schematic Design Plan seeks to avoid and minimize impacts to potentially jurisdictional features identified as part of the PJWD. Therefore, and based on pre-application consultation with USACE and discussions with ODNR, it was decided that the jurisdictional determination would be accomplished as part of the Section 404 permit rather than being a separate process.

Figure 3 - Caesar Creek Marina Wetland Overview Map

Warren County, Ohio

Project #: 12510132COL, Date: 5-9-2012, by DNB and MEC
1:4,600 Scale, 2009 Aerial, Source: USDA

3.0 SCHEMATIC DESIGN PLAN

3.1 Guiding Principles

In a memorandum dated October 31, 2012, Ohio Department of Natural Resource Division of Watercraft and SmithGroupJJR, developed a set of project principles and metrics. These principles were intended to shape the project vision and inform the decision making process through the life of the project. Specific metrics were also developed to help gauge how successful the project was at achieving the core facets of sustainability in the areas of Ecology, Economics, Social Equality and the Human Spirit.

A. Ecology: Sustaining the ability of the landscape to perform ecological functions such as building soil, recharging and cleaning water, cycling nutrients, and enabling biological systems to remain diverse and productive.

1. Principles
   - Use naturalized approaches to treating and managing stormwater.
   - Expand riparian habitat opportunities through creative shoreline protection treatments.
   - Minimize site disturbance from utilities and other upland features.
   - Use the site's existing features to influence the design of the site improvements.
2. Metrics
   - Treat 90% of runoff from paved surfaces in small scale BMPs prior to entering the lake.
   - Develop at least one fish spawning area along the shoreline.
   - Use naturalized shoreline protection methods (not typical revetment) along 25% of the marina shoreline.

B. Economics: Encouraging reinvestment in the community and providing cost effective solutions that preserve or wisely use scarce resources.

1. Principles
   - Encourage private investment/partnership in development and maintenance of the marina facility.
   - Generate sufficient revenue to fully cover or exceed the required annual state (public) investment.
   - Minimize maintenance (costs and labor) for infrastructure and other improvements.
   - Minimize the impact of routine flooding on planned improvements.
   - Create an operational marina facility by Spring 2015.
2. Metrics
   - Successfully secure investment by a private partner to implement the South Harbor.
   - Provide a minimum of 130 slips as part of the first phase of marina development.
   - Have the private partner oversee management and maintenance of the marina facility within two years of the State's initial investment in development of the north harbor.

C. Social Equality: Providing equitable access to natural resources for the benefit of all humankind and preserving cultural connections between people and place.

1. Principles
   - Preserve existing and expand the range of recreational opportunities available to state park users. Promote use and visitation by a diverse range of users.
   - Maximize opportunities to connect the marina with existing recreational amenities (i.e. fishing pond, trails, beach, etc).
   - Provide service and access at water levels below EL 860 (NAVD 88) during the boating season and for a diverse range of user abilities (i.e. ADA, elderly, etc).
2. Metrics
   - Develop fully connected, universally accessible trails along the entire waterfront that link the fishing pond, marina and nearby swimming beach.
   - Provide one large group and two small group picnic and gathering areas in close proximity to the marina.
   - Provide public access to both floating attenuators for fishing.

D. Human Spirit: Inspiring a deeper, spiritual connection with nature.

1. Principles
    - Identify, enhance and protect viewsheds.
    - Create an aesthetically appealing recreational marina and arrival sequence.
    - Respect and celebrate the site's historic use.
    - Support safe, enjoyable water-based recreation.
2. Metrics
    - Minimize views of above-ground infrastructure and potential auto-trailer parking/service facilities.
    - Create at least one location suitable for interpretive signage discussing the site's history.

Using this series of principles and metrics, the project team was able to improve upon the vision established in the Consensus Master Plan to create the Schematic Design. Enhancements integrated into the Schematic Design Plans include:

- Reuse of old State Highway 73, reducing impervious surfaces and minimizing site disturbance;
- Greater preservation of existing trees, upland areas and wetlands;
- Maximizing the amount of leasable area that may be offered to a private partner/investor;
- Enhancing the marina arrival sequence by directing views and improving the aesthetic experience;
- Creation of new, and the enhancement and preservation of existing, ecological features;
- Expanding the variety of gathering spaces along the waterfront to create spaces for large and small group interaction, as well as places for quiet contemplation;
- Utilizing a naturalized stormwater treatment system to remove pollutants and improve water quality; and
- Preserving the existing fishing platform.

3.2 Marina Improvements

3.2.1 Attenuators

The Schematic Design Plan uses a floating attenuator to protect the proposed harbor. Submerged side skirts on each side of the attenuator extend approximately 2-3 feet below the water's surface to limit wave transmission. Beyond simply creating the desired basin tranquility, the attenuators will be accessible to the public for fishing. Navigation aids will be installed at the marina entrance and low-level lighting will be installed along the entire length of the attenuators.

Waves interrupted by a floating attenuator

3.2.2 Gangways

Installation of a single 80-foot long gangway with a minimum clear width of 5-feet complies with the Americans with Disabilities Act (ADA) requirements for providing access to a marina. Horizontal slopes on the gangway may exceed 1:12 if it cannot be achieved in one 80-foot run.

The Schematic Design identifies three gangway locations. The southwest attenuator and the floating docks will be accessed via dual sets of 80-foot long gangways. These paired gangways allow walkway slopes to meet accessible standards throughout the range of typical water levels experienced on Caesar Creek Lake. The transition between the paired 80-foot gangways will be accomplished using an intermediate pile-restrained, floating platform. The northern attenuator will be accessed via a single 100-foot long gangway. Again, this connection will meet ADA

requirements in all but the most extreme water levels. All gangways accessing the floating attenuators will be a minimum of 6-feet wide, while the paired gangways to the floating docks will be a minimum of 8-feet wide.

To achieve the desired character and mesh with other facilities in the state park, gangways serving the Caesar Creek Marina will be aluminum. Timber cladding and decking material may be used if the budget permits.

Aluminum gangway with wood cladding

3.2.3 Fuel & Sanitary Pump-Out System

Fueling and sanitary pump-out facilities will provide the marina operator with an additional source of revenue and support both season slip renters, as well as those who trailer in smaller vessels for day use.

Options for storing fuel at the marina are somewhat limited. Preliminary discussions with USACE indicate that fuel storage within upland areas would need to be +5-feet above the reservoir spillway elevation of 882.25 (NAVD88). Ballasted, underground storage tanks are a viable alternative, however, this approach is not preferred by regulatory agencies. Therefore, the Schematic Design calls for the use of floating fuel tanks placed near the floating administration building. The tanks are anticipated to hold between 2000-3000 gallons of gas.

To fill the floating tanks, a remote fill system has been located near the parking lot adjacent to the entry drive. An alarm system located on the tank, alerts the fuel delivery person when to stop the flow of fuel. Once stopped, the remaining fuel in the line will drain to the tanks, emptying the system.

A fuel dock with two dual dispensing units is shown at the end of the main headwalk near the marina entry channel. This dock would accommodate fueling of up to 4 boats at a time. A pre-fabricated fuel attendant building will be located at the end of the fuel dock housing spill containment equipment and a small office space for an attendant.

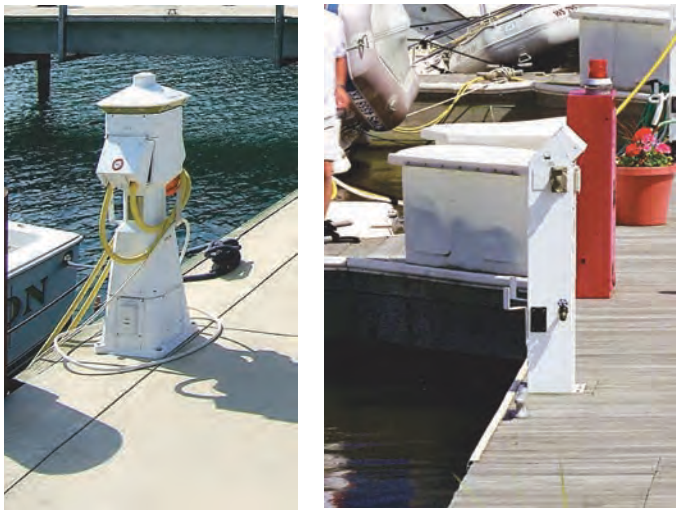
Immediately adjacent to the fuel dock is a sanitary pump-out with two hose stands. While a majority of the vessels using Caesar Creek may not have onboard restroom facilities due to their relatively small vessel size, the pump-outs will serve larger vessels that may dock at the marina.

3.2.4 Docks

The slips are organized in two marina basins split by a central headwalk. ODNR intends to develop the north basin, while the southern basin will be developed through a public-private partnership agreement. The Schematic Design Plan illustrates approximately 419 total wet berths ranging in size from 20 to 36 feet. Slips will be leased on a seasonal basis. A small number of slips may be set aside for transient boater use or to support a rental fleet of boats.

The floating docks surface will be either concrete pavers, Ipe or composite timber decking. Polyethylene-encapsulated floats will prevent the absorption of water and slow deterioration. Headpiers will be 8-feet wide, while finger piers will be either 3 or 4-feet wide depending on the slip length.

The central headwalk between the two marina basins is 12-feet wide. The surface treatment will match the option chosen for the floating docks and attenuators. Sides skirts similar to those found on the floating attenuator will be constructed on the main head pier to allow for planned implementation of the north marina basin.



Typical dockside utility centers

3.2.5 Dockside Utilities

Lighted dockside utility centers (DUCs) will be located in the center of each double-well berth. Electric and water service will be available at each slip 26-feet and greater in length. Slips without dockside utilities will have lighted bollards that match the DUCs to provide uniform and safe lighting conditions.

The electrical service available at each slip will vary to match typical demands based on vessel size. Smaller slips will have single 30 amp service, and larger slips will have either dual 30 amp or single 50 amp service.

3.2.6 Anchorage

Anchorage for the slips, attenuators and central headwalk will accommodate the water level fluctuation within the reservoir. Three options were considered, including chain and anchor, elastic mooring systems and piles.

- Chain and Anchor: Chain is connected from the docks to an anchor. This system uses the weight of the chain to help hold the docks in place. Due to the shallow near shore water depths, this system may be limited to being used on the floating attenuators.

- Elastic Systems: Elastic systems, such as SeaFlex, allow for the docks to change in response to the water level fluctuations. Anchors at the lakebed are connected to the elastic mooring system. Polyester braided rope connects from the elastic system to the floating docks. Docks are held in position with little horizontal movement because of constant tension. Due to the limited ability to pro-actively manage the system in response to water level changes, this is the recommended approach for anchoring the docks.

- Piles: Driven piles would extend approximately 30-40 feet above the operational water pool level. Telescoping piles would extend 10 feet above the docks, but can be much more expensive to install. Horizontal movement is controlled the most in this solution. Due to aesthetic concerns, pile were not seemed to be a viable option.

In both the chain and anchor and SeaFlex solutions, the mooring line are typically located and attached below the finger piers allowing vessels to move about the basin freely without encountering any hazards below the water. Regardless of the selected system, clearance between vessels and mooring lines need to be considered as detailed design is completed.

With each of these systems, there are options for the anchors.

- Concrete blocks are the most common anchoring solution consisting of a precast concrete block with imbedded hardware to attach chains.

- Stub piles are piles driven to a proper embedment depth and cut off at the lake bed. If stub piles can be embedded in at least 10-feet of overburden, this could be a viable solution.

- Helical anchors are essentially large screws driven into the lakebed. Sufficient depth is necessary to resist pull out forces.

The determination of the appropriate anchoring options will be made as the design advances. However, preliminary thoughts are that chain and anchor will be used for the attenuators and an elastic system will be used for the interior docks and central head pier.

3.2.7 Launch Ramp

Adjacent to the Highway 73 bridge is a new boat launch. While Caesar Creek currently offers a number of public boat launches, this private launch will be constructed at the discretion of the private development partner. If developed, the new launch will support the dry-dock facility that may be constructed in upland portions of the site.

Ohio Clean Marinas and Clean Boaters programs states that boats should be cleaned prior to and after use of water bodies to prevent the spread of aquatic invasives. If the private development partner chooses to build a launch ramp, a boat wash down area will be included as a part of the design.

3.2.8 Dry-Dock/Service

North of the existing drive that leads to the youth fishing pond is an area (Lease Zone A) reserved for use by the private partner. This area may be developed as a dry-dock and/or service area that can help generate additional revenue. Alternative uses of this area will be considered based on private partner preferences.

3.3 Shoreline & Environmental Improvements Overview

Within the boundaries of the marina is approximately 2000 linear feet of shoreline. This shoreline will be enhanced to create a diverse range of ecological systems that will differentiate the Caesar Creek facility from typical marinas.

During the boating season, water level fluctuations within Caesar Creek are relatively small. A natural shoreline scour line exists between elevation 848.0 and 849.0, with vegetative cover growing in the upland area above this point. These existing conditions suggest that a hardened shoreline edge is only needed above or below the existing scour line. The Schematic Design calls for diverse shoreline treatments that includes stacked stone to promote shoreline access and shallow submerged shelves that enhance fish spawning and support aquatic vegetation.

3.3.1 Revetment

A majority of the existing shoreline consists of brittle, shale-like limestone that tends to decompose and liquefy over time. The appearance of this material can be characterized as flat, angular and plate-like in shape. To integrate the marina into the surrounding environment, revetment stone will be a native limestone ranging in size from 100-300 pounds.

Stacked stone treatment adjacent to typical revetted edge

3.3.2 Stacked Treatment

To provide users the opportunity to interact with the water and access the shoreline, areas of stacked stone have been strategically located along the shoreline. These areas will provide informal seating zones for quite contemplation, picnicking, wildlife viewing and fishing adjacent to newly created spawning zones.

3.3.3 Spawning Beds

Fishing is a popular activity at Caesar Creek. It is known as one of the best crappie fishing lakes within the state. To help support spawning, enhance fishing opportunities and provide an attractive alternative shoreline treatment, two spawning beds are being constructed. The spawning beds target key sport fish species like crappie, largemouth bass and sunfish - all of which reproduce naturally in the lake.

To create target species habitat, the Schematic Design calls for the development of shelves that vary from two to eight feet in depth. Sunfish will use the shallowest areas, while bass and crappie will seek the mid to deep water zones. Various structures, including head-sized boulders, logs, cobble piles and cribs, will be installed in the beds to create beneficial habitat

Fish habitat and spawning beds

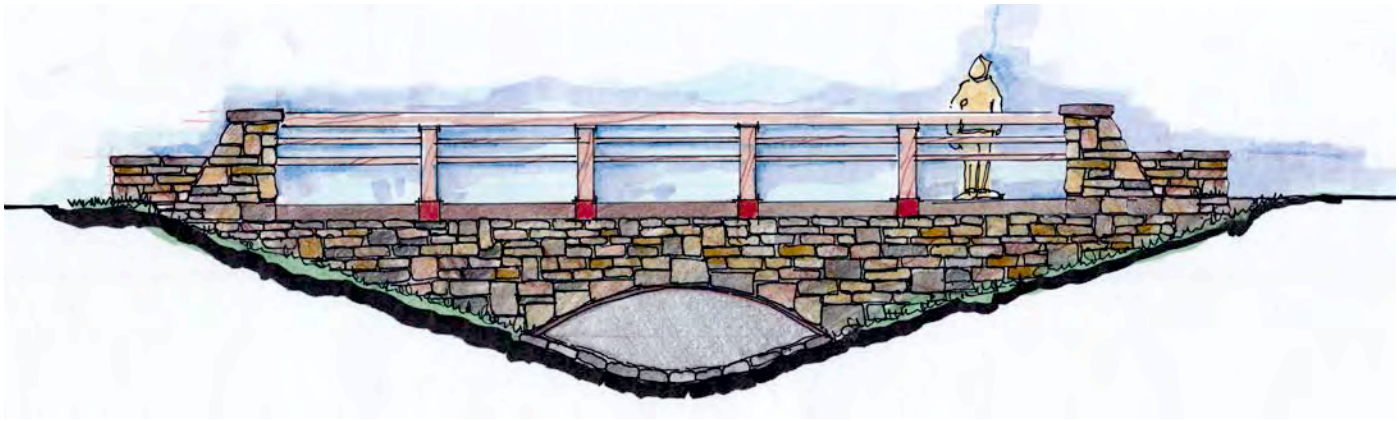
3.3.4 Stream Crossing & Corridor Enhancement

Along the new entry road (old State Highway 73) leading to the marina are two drainage corridors. One is a shallow drainage swale that conveys localized runoff to the lake. This swale will remain along the portion of the roadway that will be reused. As the road turns south toward the marina, the existing roadway will be removed and the swale will be minimally impacted by restoration activities.

The other drainage corridor is a uniform, v-shaped channel that is part of a regional drainage network. This system conveys runoff from the surrounding hills, parking areas and other roadways to the lake. Small pockets of wetland species were identified within this corridor and, while a formal determination has not been made, it is assumed that this feature will be classified as a stream.

As the new marina entrance drive turns south, it crosses the v-shaped channel. From this point lakeward, the v-shaped channel will undergo significant enhancement to open up dramatic views of the lake and create a better functioning landscape. The crossing itself will be accomplished using a partially buried, reinforced concrete arch pipe. Architectural treatments for the crossing will include stone cladding. Thick timber guardrails will be built along each side and between the roadway and trail. The centerline of the channel will be realigned. Strategically placed stone shelves will be constructed to help slow flow rates and reduce the potential for scour. New vernal pools and riparian habitat will be created along both sides of the realigned corridor, increasing biodiversity and building on the ecological enhancements created along the marina's shoreline.

Examples of structures to reduce scour



Stream crossing character

3.4 Site Improvements

3.4.1 Landscape Treatment

Caesar Creek Lake is a part of the larger 7900 acre Caesar Creek State Park. Ensuring that the marina and associated upland site improvements fit with the overall character of the park influenced many of the design decisions, including the landscape treatment. The Schematic Design identifies the following landscape treatment zones (see page 19):

A. Naturalized Garden – around the marina drop-off and large group picnic area. Landscape plantings will be relatively low maintenance. These areas are highly visible from the marina and therefore are the most showy and manicured - although they will remain relatively informal in nature.

B. Biofiltration Areas – located within or adjacent to impervious parking surfaces. Plantings within these areas will include some canopy tree species as well as hardy forbs such as Asters, Common Rush, Spikerush, Sedges, Rice Cutgrass, Bulrush, Sedges, Canada Wild Rye.

C. Wet Mesic Prairie – low points located within prairie grass areas. Typical species include Silphiums, Sneezeweed, Asters, Sunflowers, Black-Eyed Susan, Tall Goldenrod, Fowl Manna Grass, Wild Rye, Little Bluestem, Joe-Pye-Weed, Cardinal Flower and Blazing Star.

D. Emergent Wetland – along the lake edge, in vernal pools and at stream edges. These areas are part of the overall stormwater treatment plan and improved drainage corridors. Typical species include Rice Cutgrass, Sharpwing Monkey Flower, Arrowhead, Hemlock Waterparsnip, Cardinal Flower, Blueflag Iris, Sweetflag, Carex spp., Swamp Milkweed, Bluejoint Grass Pickeral Weed, American Three-Square, Bulrush, and Arrowhead.

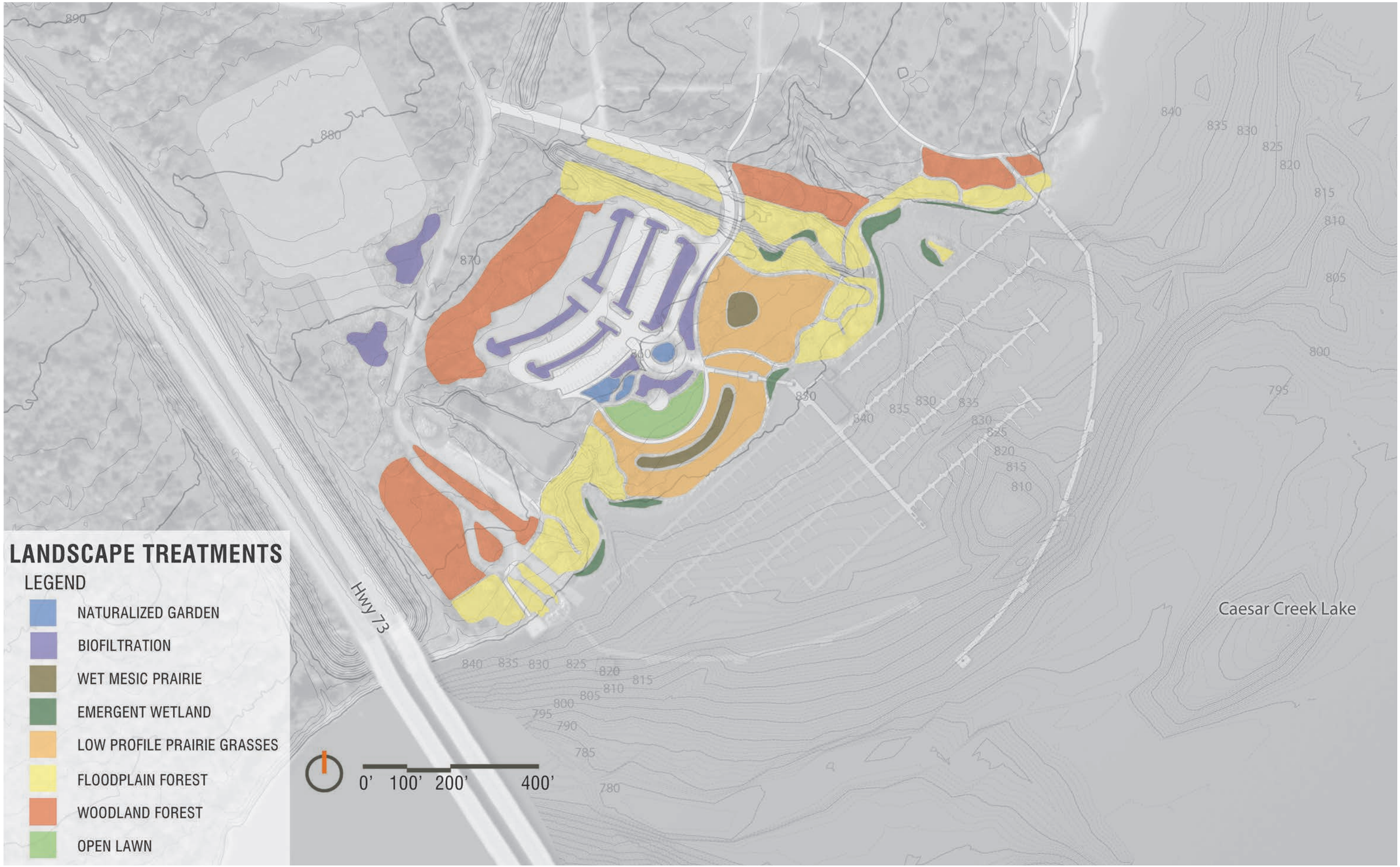
E. Low Profile Prairie Grasses – located between the upland improvements and shoreline. This treatment transitions from the more ordered, built portions of the site to the shoreline. Typical species include Little Bluestem, Sideoats Gramma, Prairie Brome, Canada Wild Rye, Sunflowers, Asters, Goldenrods, and Brown-Eyed Susan.

F. Floodplain Forest – adjacent to the lake and stream corridor edge. Typical tree species include Pin Oak, Swamp White, Oak, Green Ash, Black Ash, Shellbark Hickory, River Birth and Sycamore. Typical shrub species will include Buttonbush, Silk Dogwood, Swamp Holly, Swamp Rose, and Spicebush. The typical herbaceous species will include Wood Reed, River Oats, Downy Wild Rye, Goldenglow, Carex spp., Trumpetweed, Impatience, Wood Fern and Cinnamon Fern.

G. Woodland Forest – woods located upland from wet areas. Forested areas can be either 'open' (without understory plant species) or 'closed' (with understory plant species). Typical tree species within this zone include White Oak, Red Oak, Sugar Maple, Beech Ironwood, Blue Beach, Shagbark Hickory, Sweetgum, Tulip Poplar, and Sassafras. The typical shrub species will include American Hazel, Flowering Dogwood, Pagoda Dogwood, Juneberry and Redbud while typical herbaceous species include Asters, Wild Geranium, Rattlesnake Fern, Sedges, Wild Brome and Fescue.

H. Open Lawn – large areas intended for multipurpose use. The landscape treatments in this area will be fescue/bluegrass sod.

Areas not specifically referenced in this list and on the attached Landscape Treatments Plan (see page 19), will remain in their current state.

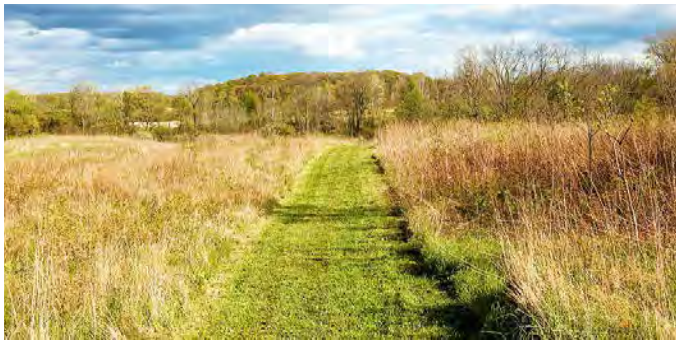

LANDSCAPE TREATMENTS
LEGEND
NATURALIZED GARDEN
BIOFILTRATION
WET MESIC PRAIRIE
EMERGENT WETLAND
LOW PROFILE PRAIRIE GRASSES
FLOODPLAIN FOREST
WOODLAND FOREST
OPEN LAWN
Hwy 73
Caesar Creek Lake
0' 100' 200' 400'

3.4.2 Trails & Paths

The Schematic Design identifies an interconnected network of trails and paths that vary in size and material. Paths located above elevation 855.4 are intended to provide a connection with the other regional amenities and park areas such as the nearby beach. These paths are typically 8-foot wide and made of concrete. Connections to improvements at the lower elevations are accomplished using trails constructed of crushed aggregate or wood chips with a stabilizing binder that prevents washout from overland flow or flooding. These paths are generally 4-feet wide. Informal trails extend from these gravel paths to more remote areas of the site, including those areas that are most likely to experience somewhat frequent inundation. These trails consist of mowed paths that offer the flexibility to be moved as traffic dictates. These informal paths are very low cost, require little maintenance and can be converted to more formal trails if demand warrants.

Wood chipped path

Crushed stone path



Informal mowed path

3.4.3 Site Furnishings

To further reinforce the overall concept of the upland improvements blending with the existing site character, furnishings and finishes will be rustic and park-like, replicating that of the Civilian Conservation Corps (CCC) and Works Progress Administration (WPA) era.

A. Benches – located in various places throughout the site. Bench types will be based on the character and style of the particular location.

B. Site lighting – consisting of vehicular and pedestrian scale lighting. Other lighting includes accent lighting in the drop off area and low-level lighting along the marina attenuators.

C. Walls – will be constructed of stacked limestone.

D. Fencing – rustic in style with stone piers and wood horizontal members.

E. Picnic Tables – are intended to be wood and simple in style.

F. Signage – should be simple, yet iconic. Materials include wood, laser cut Corten steel and stone.

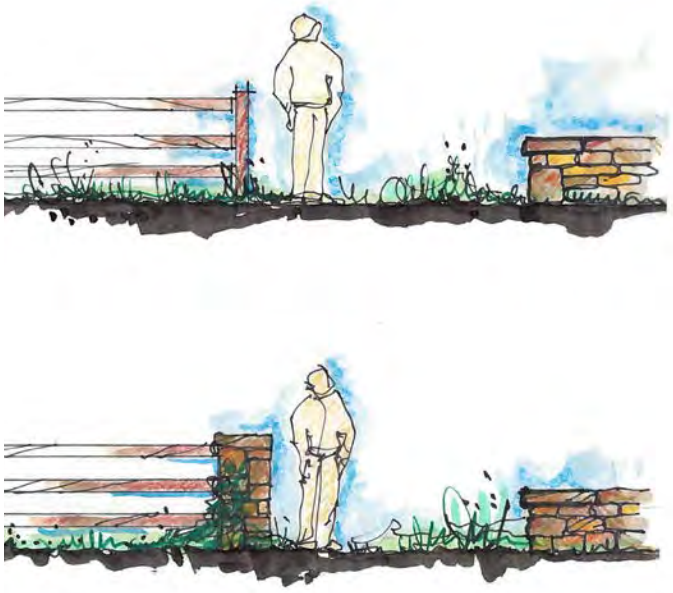
Typical style of Waterfront Plaza bench

Typical style of bench for picnic and fire pit areas

Typical site lighting examples

Site wall section elevation

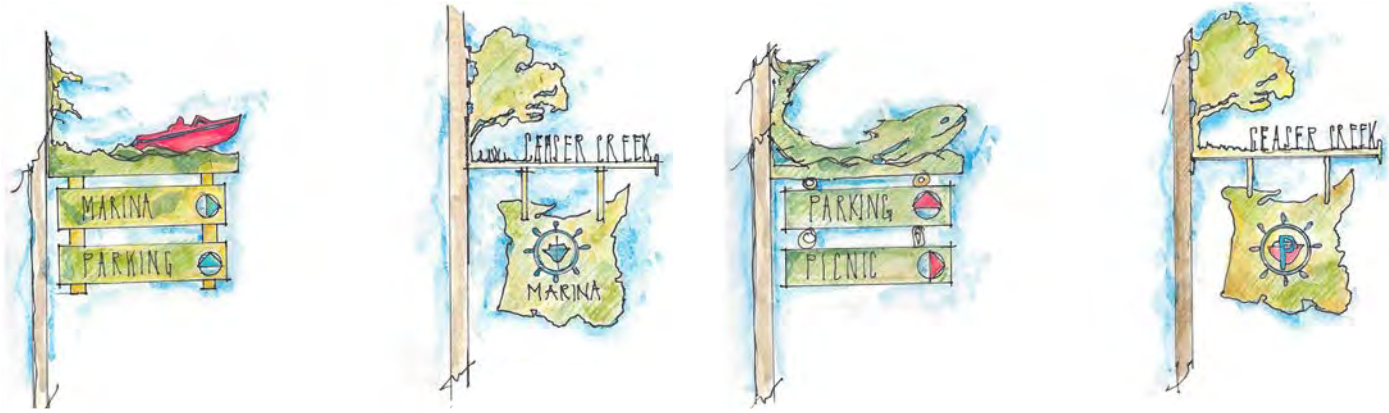
Typical site wall character



Waterfront Plaza wall adjacent to fence options

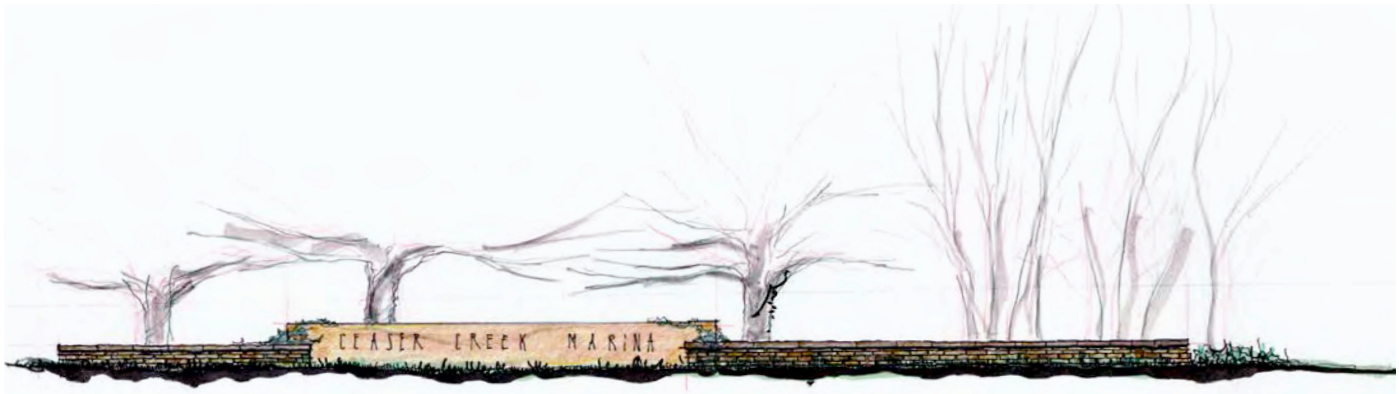
Typical fencing with stone pier

Typical picnic table



Site directional signage examples

Typical marina entry signage at main road



Marina entry signage at drop off

3.4.4 Parking

A total of 226 parking stalls are identified within the Schematic Design, including 8 accessible stalls located close to the main gangway. Asphalt paving will be used in the parking areas with concrete curbs serving as the edge restraint. Strategic breaks in the curb heads will be constructed to allow stormwater to flow into nearby filtration zones.

3.4.5 Stormwater Management

The native soil contains a high level of clay and offers very little to no infiltration. As a result, rainwater within the project limits quickly runs-off into the lake. With this understanding, water quality versus quantity is the primary stormwater management goal. To illustrate this emphasis, the design team set a goal to treat 90% of runoff from paved surfaces prior to entering the lake.

All parking areas are graded to direct water to a series of stormwater filtration zones located in the median between each tray. Small-scale treatment areas also line the lakeward side of the parking lot between the lot and the Waterfront Plaza and the main entry drive (see Stormwater Strategy plan on page 25). Water from these various small-scale BMPs are directed through an interconnected network of pipes and swales to staged treatment zones prior to discharging into the lake.

Typical stormwater filtration zone character

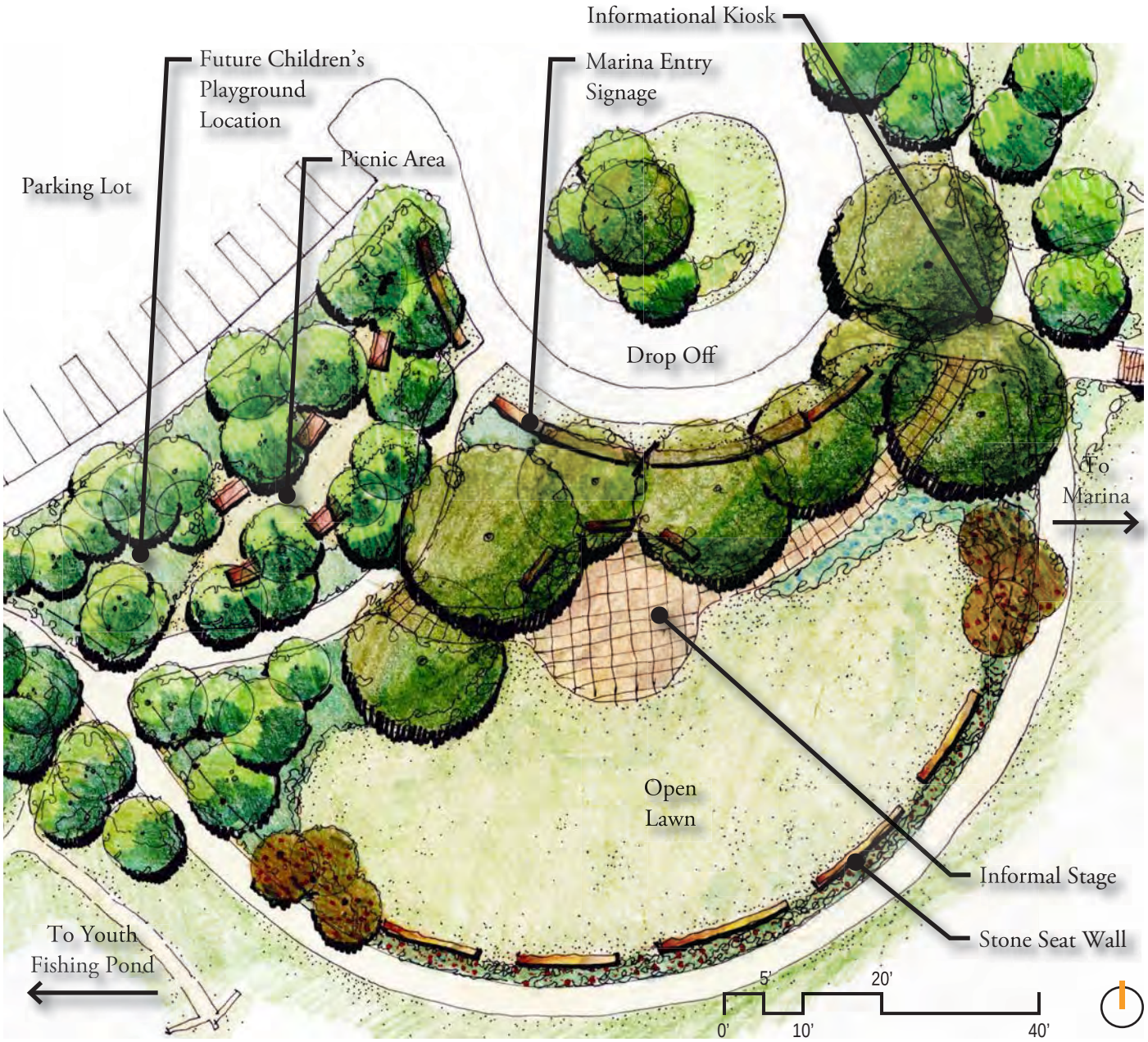
Typical parking lot stormwater filtration zone

STORMWATER STRATEGY
LEGEND
EXISTING WATER FEATURE
PROPOSED STORMWATER FILTRATION ZONES
EMERGENT WETLANDS
EXISTING DRAINAGE SWALE
PROPOSED STREAM CORRIDOR IMPROVEMENTS
PROPOSED STORM PIPING
0' 100' 200' 400'
Hwy 73
Caesar Creek Lake

3.4.6 Waterfront Plaza

Adjacent to the vehicle drop-off zone and perched above elevation 860.0 are a series of spaces referred to as the Waterfront Plaza. Beginning with the drop-off, the users' first experience is the marina entry signage and stone stacked seat wall. For those heading to the marina, they will encounter a small landscaped plaza that contains seating along with an informational kiosk. Passing through this space, they are rewarded with their first unobstructed vista of the marina below. From there, the central gangway leads to the slips and the marina administration building.

The Waterfront Plaza is located immediately south of the drop-off and offers boaters and non-boaters a great venue for a wide range of activities. After leaving the drop-off area, the pavement-type changes and the surrounding landscape character gives way to a more garden-like experience. To the north, picnic tables are tucked below a filtered, forest canopy along an accessible crushed gravel path. Nearby, a small open area is reserved as the potential home for a children's playground. A path cuts through the open space and connects to an informal paved area that can serve as a stage. Surrounding the "stage" is an area of gradually sloping open lawn. The space is designed to accommodate large tents and traditional audience style seating - all with expansive views of the lake.



Waterfront plaza enlargement

3.4.7 Picnic Areas

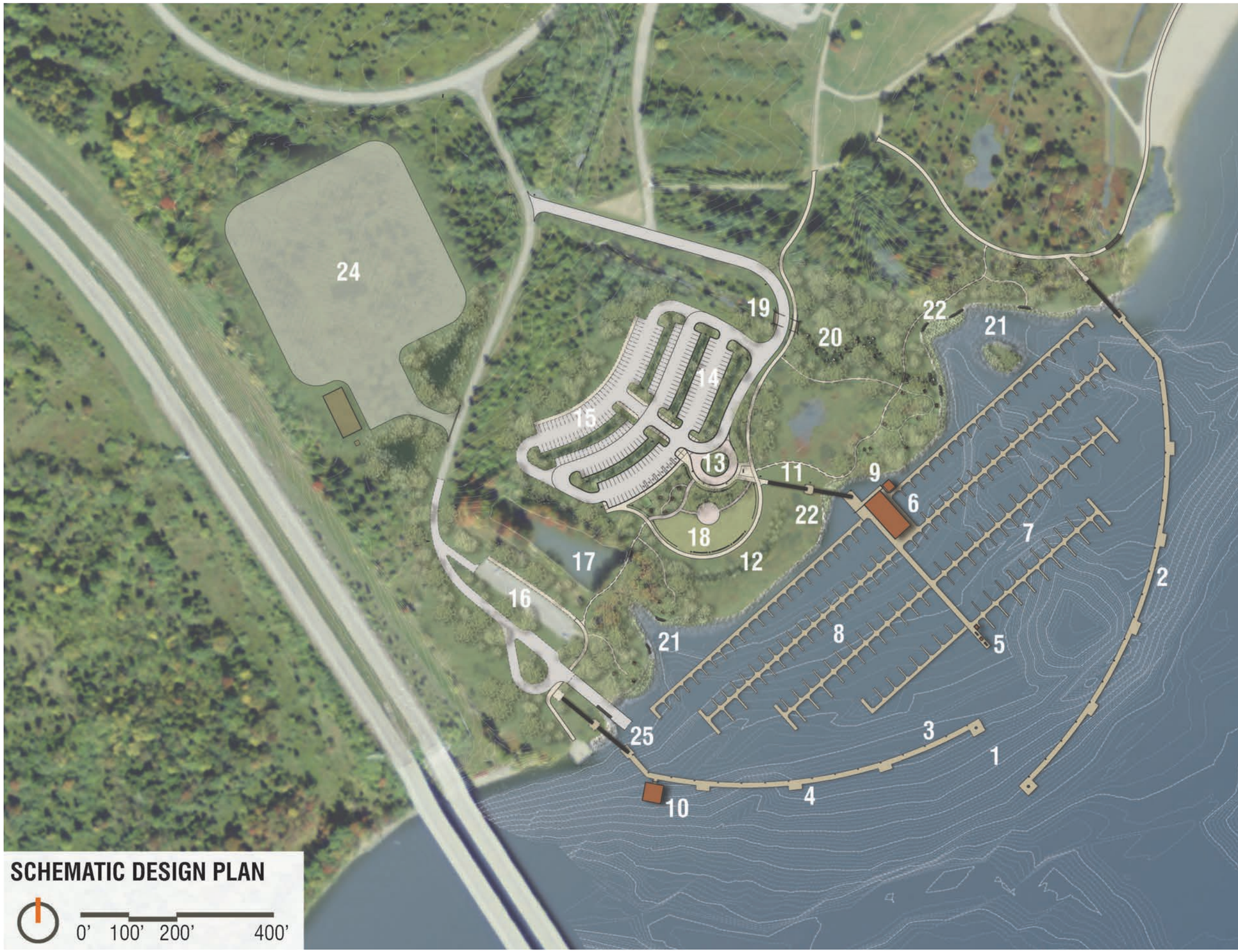
Picnic areas are strategically located along the various paths. Each picnic area has a slightly different view and varying amenities and levels of accessibility. Some of the picnic areas are more remote and secluded, while others are located along main trails and will experience heavier use.

Picnic areas will offer park-style tables and seating. Some locations may include benches made of logs, while others will include more formal accommodations. The large group picnic area near the gangway landing at the marina administration building is likely to be one of the most heavily used with its council ring-like set ups and fire pit.

Example of various picnic areas

3.5.1 Schematic Design Plan

All of the previously mentioned design features combine to create the Schematic Design Plan shown on page 29. Further discussion on economic strategies, phasing, cost and permitting follow in Sections 4 and 5.



SCHEMATIC DESIGN PLAN

LEGEND

1. MARINA ENTRY
2. PHASE 1 WAVE ATTENUATION STRUCTURE
3. PHASE 2 WAVE ATTENUATION STRUCTURE
4. FISHING PLATFORM
5. FUEL PIER
6. MARINA SERVICES BUILDING
7. PHASE 1 WET BERTHS **(227)**
8. PHASE 2 WET BERTHS **(192)**
9. FLOATING FUEL STORAGE
10. PATROL BOAT HOUSE (PHASE 2)
11. MAIN GANGWAY
12. STORMWATER FILTRATION
13. DROP OFF
14. PHASE 1 PARKING **(115)**
15. PHASE 2 PARKING **(111)**
16. EXISTING PARKING
17. YOUTH FISHING POND
18. WATERFRONT PLAZA
19. STREAM CORRIDOR CULVERT CROSSING
20. STREAM CORRIDOR IMPROVEMENTS
21. FISH SPAWNING BEDS
22. NATURALIZED SHORELINE EDGE
23. EXISTING ACCESSIBLE FISHING PLATFORM
24. POTENTIAL DRY-DOCK / SERVICE AREA
25. POTENTIAL PRIVATE BOAT LAUNCH

4.0 ECONOMIC FRAMEWORK

4.1 Implementation Strategy

Development of the Caesar Creek marina will be accomplished through a public-private partnership. The State's initial investment will construct a fully-functional first phase marina that is intended to be operational in 2015. This investment of public funds will generate revenue that will be used to leverage investment from a private partner. The terms of the public-private partnership are currently being developed and a competitive process will be used to evaluate, negotiate terms and select a suitable partner. The State anticipates that the selected concessionaire will be responsible for management of all marina operations and invest private resources to implement the remaining project phase(s).

4.2 Project Phasing

The Schematic Design illustrates a comprehensive vision that represents multiple phases of development and investment of both public and private funds (see Phasing Diagram on Page 33). The publicly funded Phase I improvements include development of the marina access drives and drop-off, the Waterfront Plaza, northeast marina basin and portions of the trail network. Phase II expansion of the marina, as well as other future investments made by the private partner may include elements such as a dry-dock and service facility, and will benefit both the public and private investment partner by increasing the revenue generating potential and expanding waterfront recreational opportunities. The following charts provide an approximate breakdown for wet berths (slips) and for Phase I (publicly funded) and Phase II (privately funded) improvements.

Marina Wet Berths

Phase 1		Phase 2	
Slip Size:	*Slip Quantity:*	*Slip Size:*	*Slip Quantity:*
20 ft.	82	24 ft.	119
24 ft.	44	28 ft.	46
28 ft.	55	32 ft.	16
32 ft.	21	36 ft.	11
36 ft.	25		
Total:	227	Total:	192

Parking Stalls

	Phase 1	Phase 2
Passenger Car Stalls:	107	111
Accessible Stalls	8	0
Total:	115	111

While the Schematic Design establishes a vision for private partner developed improvements, some changes to the suggested Phase II improvements may occur in response to their feedback. The south marina basin slip mix is one example of an element that may undergo revision. There are also two Lease Zones where the private partner will be permitted a greater level of flexibility to determine what, if any, improvements to construct (see Lease Zones on Page 35). Multiple potential uses that may be considered with each includes:

- Lease Zone A: Dry-dock facilities for trailered vessels during the summer or for winter storage; small boat maintenance and service facilities; recreation lawns and playground amenities; RV park; or small rental cottages.

- Lease Zone B: Summer or winter boat storage; launch ramp supporting nearby dry-dock / maintenance and or service facilities; or open space.

4.3 Opinion of Probable Cost of Construction

The following Opinions of Probable Construction Costs includes the major capital cost for elements identified within the Caesar Creek Schematic Design. Improvements within Lease Zone A and B are excluded due to their speculative nature. Each cost opinion includes a reasonable contingency figure and all numbers are rounded to the nearest $1,000. All costs are based on 2013 prices and a 5% percent (minimum) escalation factor is recommended beyond 2013.

Opinion of Probable Cost of Construction for Caesar Creek Marina - Phase I	
Project Cost Element	***Sub-total***
Site Preparation & Mobilization	$393,000.
Site Work & Utilities	$2,250,000.
Marina Dockage and Attenuators (North Basin)	$3,080,000.
Basin Excavation & Shoreline Improvements	$2,263,350.
Floating Administration & Fueling Buildings	$598,000.
Project Sub-Total	$8,584,350.
Contingency & Soft Costs (@25%)	$2,146,088.
Project Total	**$10,730,438.**

Opinion of Probable Cost of Construction for Caesar Creek Marina - Phase II	
Project Cost Element	***Sub-total***
Site Preparation & Mobilization	$155,000.
Site Work & Utilities	$614,000.
Marina Dockage and Attenuators (South Basin)	$2,677,000.
Project Sub-Total	$3,446,000.
Contingency & Soft Costs (@25%)	$861,500.
Project Total	**$4,307,500.**

Parking
(Phase 1)
Parking
(Phase 2)
North Marina
(Phase 1)
South Marina
(Phase 2)
(Phase 2)
Hwy 73
Caesar Creek Lake
PHASING DIAGRAM
0' 100' 200' 400'

LEASE ZONES
LEGEND
LEASE ZONE A
LEASE ZONE B
Hwy 73
Caesar Creek Lake
0' 100' 200' 400'

5.0 REGULATORY & PERMITTING SUMMARY

Implementing the schematic design for Caesar Creek Marina will require securing permits from federal, state, and local regulatory authorities. The project site is federally owned and leased by the Ohio DNR. While our understanding of the review processes and permit requirements are summarized below, they will be confirmed as the permit preparation process advances.

5.1 Federal & State Review and Permit Process

5.1.1 Section 106 National Historic Preservation Act

Section 106 clearance by the Ohio Historic Preservation Office is required as part of the Section 404 permit approval process. The archeological consultant has recommended that no further action be required and USACE concurs with this recommendation. Final concurrence by OHPO has not yet be received.

5.1.2 Section 404 - USACE

Section 404 of the Clean Water Act requires an Individual Permit to allow for development of this project. Pre-application conferences have been held with USACE to discuss the initial design concepts and formal permit application materials will be developed as part of the Design Development process.

5.1.3 Section 401 - OEPA

Section 401 of the Clean Water Act requires that a Water Quality Certificate be issued by Ohio EPA for any discharges of fill material into wetlands and other Waters of the United States. Section 401 reviews are typically done in conjunction with USACE Section 404 permitting processes. Concurrent with the Ohio EPA review, USFWS will review the area for any critical habitat. Ohio DNR will also review the project for any potential impacts to Natural Heritage Areas, significant breeding bird and endangered aquatic species concentrations.

5.1.4 State Isolated Wetland Permit (Ohio Bill 231) - OEPA

The discharge of fill into Waters of the State and isolated wetlands requires approval from Ohio EPA. USACE will determine the jurisdiction of the waters impacted through the Section 404 process.

5.1.5 NEPA - USACE Planning & Real Estate

An Environmental Assessment will be required as part of the National Environmental Policy Act (NEPA) review process as the proposed marina is located on federal property. This NEPA process will run parallel to the Section 404 process, but will require close coordination between the USACE NEPA administrator and USACE regulators.

5.1.6 Stormwater/Erosion Control

The National Pollutant Discharge Elimination System (NPDES) review and permit will be required for the construction site. Ohio EPA leads this review and permit process. Formal application for this permit will be done in conjunction with the other state and federal permit processes.

5.1.7 Fuel System

The fuel system will require both USACE (Real Estate and Engineering) and State of Ohio Department of Commerce approval. Preliminary discussions with both entities are ongoing and formal permit application will done in conjunction with the other state and federal permit processes.

5.1.8 Department of Commerce - Building Code Compliance

The project will require review and approvals from the Ohio Department of Commerce for the structural and mechanical systems, electrical and plumbing systems and sprinkler/fire protection. Reviews of the marina services and fuel attendant building are anticipated.

5.1.9 Department of Commerce - Industrialized Unit

The Industrialized Unit will review and approve the fuel system as well as any pre-manufactured building on the project. At this time, it is anticipated that the fuel attendant building will be a prefabricated structure.

5.1.10 Sewer and Water Extension

Extension of sanitary sewer and water to the marina site from existing systems will require permits from OEPA and USACE. The permits will be submitted with the final Design Development Plans.

5.2 Local Review and Permit Process

5.2.1 Grading/Erosion Control/Stormwater Management

Warren County Soil & Water Conservation District will have review authority over the implementation of the construction site erosion and stormwater control at the project site. Preliminary contacts have been made to discuss the submittal and timing requirements. It is anticipated that these permits will be submitted with completed Design Development Plans.

5.2.2 Sanitary Sewer and Water Extension

The extension of water main to the marina will require approval from the Warren County Sewer and Water Department. The permits will be submitted with the final Design Development Plans.

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