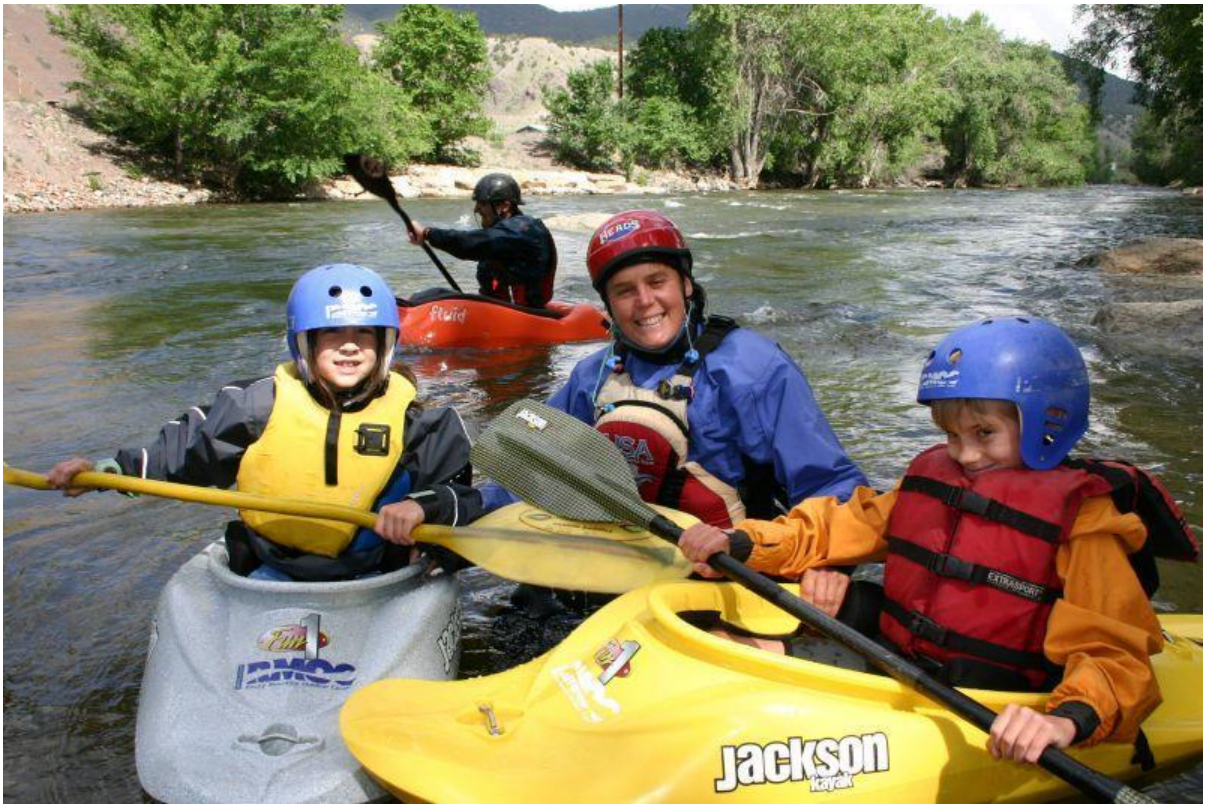

Site Visit and Conceptual Design Study

Saranac Whitewater Park
Saranac Lake, New York

December 19, 2018

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Introduction

Figure 1: A before and after view of the Hawea Whitewater Park

The Town of Saranac Lake is investigating the idea of creating a whitewater park in its central business district. Saranac Lake, which is already a destination for outdoor recreation, wishes to further enhance this reputation by bringing new activities to its central business district. A whitewater park located within this business district would bring thousands of visitors per year and would have significant economic impacts to the Town's businesses.

Similar whitewater parks, surrounded by trails and recreational areas, have not only achieved their original objectives of providing a venue for local water sports enthusiasts, but have often exceeded expectations by becoming focal points for their communities and recreational destinations for outdoor tourism on a regional basis. These facilities often play host to competitions, river festivals, and other events that host local users as well as out-of-town visitors alike. In addition, Whitewater Parks have been shown to have a positive economic impact on the local community, as visitors spend money at local restaurants, lodging, and retail establishments. Economic impacts from similar parks vary between $2.1 million USD per year for in-river parks and up to $37 million USD per year for large active-flow whitewater parks.

This study was commissioned by ADKAction, a non-profit organization in New York that works to address unmet needs in the State. The purpose of the study is to determine the viability, design, potential impacts, and requirements associated with designing and constructing a whitewater park in the central business district of Saranac Lake. The report will provide local decision with the information needed to make an informed decision with regards to moving forward with the project.

Section 1: Whitewater Parks

While a movement to build more whitewater parks in the United States is growing, they are still relatively rare recreational attractions that many have never visited. This study first looks at what Whitewater Parks are, and what they do, prior to analyzing site specific feasibility and concepts in Saranac Lake.

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Whitewater Parks Defined

Figure 2: The Hawea Surf Park is a natural-river type surf park, placed in the Hawea River, NZ

Whitewater Parks are river parks in which the whitewater has been designed in order to create a regional attraction[1]. In some cases, whitewater parks are built in natural rivers and consist of natural rock "drop structures". At higher flows these parks create waves, eddies, deflectors and other features conducive to recreational, instructional, and often competition-level kayaking as well as rafting. At lower flows these features are less powerful and allow for all-types of in-stream usage including tubing and other float traffic. The parks are designed to function in a number of ways providing streamside access for fishermen and other visitors to the park as well as viewing for spectators and spaces for the general public to gather and recreate on the banks as well as in the water.

In other cases—cases where natural flow and gradient sufficient for whitewater do not exist—whitewater rapids are artificially created through the use of pumps and purpose-built channels. These systems recirculate water in the same manner that theme parks or fountains draw from a single source, and do not rely on the flows of nearby rivers and streams. Figure 3, shown below, is an example of a pumped recirculating, whitewater park:

[1] Whitewater Parks, like many specialty fields, have a language all their own. Definitions for typical terms are shown in Appendix B

Figure 3: The US National Whitewater Center is a pumped whitewater park that pushes water from the bottom pond to the top where it then flows naturally through four channel segments.

Figure 6 shows the US National Whitewater Center in use. These types of whitewater parks are typically designed to host all types of users from highly experienced competitors who come to these whitewater venues for Olympic-standard events to families and tourists who come to these venues to experience whitewater for the first time. The venues provide for commercial rafting wherein visitors are able to buy a rafting pass and take a guided raft trip down the channels, as well as recreational kayaking, floating, streamside seating and events.

Figure 4: The US National Whitewater Center features commercial rafting as well as a number of other active outdoor activities.

Both in-stream and pumped whitewater parks can become significant regional attractions that draw people not just from surrounding states, but from throughout the country and world. Often the visitors are drawn not just for the whitewater, but for the events that are hosted at these parks.

Designing whitewater parks to accomplish all of these objectives is a process. Often the process is iterative and includes opportunities for local stakeholders to comment and update the designs. The following section details this process.

The Whitewater Design Process

Figure 5: Whitewater Parks are designed for many differing kinds of users.

Whitewater Parks typically require several stages of design. These stages include:

a) **Feasibility/Conceptual Design**—this is the current stage of the project. This phase is tasked with determining whether a particular project is possible and, if so, how it could look and function and what the approximate costs of the project would be. If done right this part of the project is very powerful as it provides the client with the materials necessary to pursue funding and grants. Deliverables include a report and design documents such as a conceptual design and cost estimate, tasks required to complete a project, and permit requirements.

b) **Preliminary Design**—this phase gets to the heart of the design elements of project. If the Feasibility phase is about identifying what needs to be done to complete a project, Preliminary Design is about doing them. It is a phase tasked with completing the necessary actions required to finalize the design functionality and layout and to gather and process the data necessary to undertake detailed design. Preliminary Design often includes all of the tasks related to preparing for permitting, surveying, creating baseline models, meeting with stakeholders and agencies to define constraints and objectives, and completing design documents to the permitting level.

c) **Permitting**—permitting is a process that permeates most of the design phases. It is typical to work with regulatory authorities during the preliminary design phase to establish criteria and priorities for the project. Permit applications are typically submitted following the completion of

Preliminary Design. Some permits, as outlined below, have lengthy review times for specialty projects such as Whitewater Parks.

d) **Detailed Design**—the detailed design is about getting to the nuts-and-bolts of the project. Now that the project has been defined and adapted to the constraints and objectives laid out in Preliminary design the project is ready for detailed calculations and modeling. Often the level of computations and modeling is defined by the nature of the project. In some cases, such as the Holme-Pierrepont Whitewater Park, the project can be accomplished with 1-dimensional modeling. In other cases, such as the Calgary Whitewater Park, detailed physical models were undertaken.
e) **Construction Documentation**—this is the "after-design" phase. Documents are created that help define the project for the contractor including all sections, details, specifications and bid items. Often the whitewater park designer will work with the client or the community to step through these processes.
f) **Project Bidding and Construction**—the project is put to bid by the project owner and a contractor is selected and contracted.
g) **Construction Oversight and Inspection**—this is the dirty work. In this phase the contractor and the design team work together to build the project to our exacting specifications. Often, we have representatives in the field virtually full-time to ensure an accurate build that is aesthetically beautifully and highly functional!
h) **Course Commissioning**—the final phase and the one where we finally get to get wet! Paddling experts get in the water and test the project, often tuning wave characteristics and project features until the project is fully functional and meets design objectives.

The process of design is informed by the input given from local stakeholders and regulatory agencies and is typically based on a standard of care that is evolving for this new industry. The following section details the many design factors which impact a project.

Typical Economic Impacts of Whitewater Parks

Figure 6: The US National Whitewater Center features commercial rafting as well as a number of other active outdoor activities.

Whitewater Parks that have been built in other locations around the world have become significant attractions. They bring enthusiasts and spectators alike to the residing communities, and have significant economic impacts through increased property values, direct spending at the site, new jobs, tourism dollars, and dollars spent at local restaurants, shops, and businesses. A whitewater park like the one proposed in Saranac Lake can attract tourists and have an economic impact that is measured in the millions of dollars per year. The numbers shown in Table 1 are based off of economic impact studies conducted for similar projects. In order to truly understand the economic impacts of the proposed park, a dedicated study should be undertaken for this venue. Table 1, shown below, illustrates some typical economic impacts of these parks.

Economic Impacts of River Parks

River	Location	User Days	Additional Spending	Total Impacts (Millions)
Clear Creek	Golden, CO	13,000-14,000	$910,000-$1.1 Million	$1.3-2.2 Million
Blue River	Breckenridge, CO	1,200-2,300	$220,000-$460,000	$0.4-$1.1 Million
Gore Creek	Vail, CO	1000-2,300	$3.5 Million	$3.5-$4 Million
Sacandaga River	Saratoga/Warren County, NY	17,600-25,400	$1.8-$2.8 Million	$2.3-$3.7 Million
Cuyahoga River	Kent, OH	10,000-40,000	$200,000-$800,000	$0.5-$1.7 Million
Yampa River	Steamboat Springs, CO	75,700	$4.9 Million	$7.2 Million

Figure 7. Economic Impacts of typical whitewater parks.

The impacts of these parks are significant and are based on regular usage, as well as instructional programs, competitions, festivals, and other attractive events. Events can bring millions of dollars into

the local economy on a single weekend alone. For example, the TEVA games in Vail, Colorado have a documented yearly economic impact of $3.5 million dollars. In addition to creating economic impacts, these events also help to market a particular community as an outdoor town and whitewater destination.

Section 2: Saranac Lake Site Information

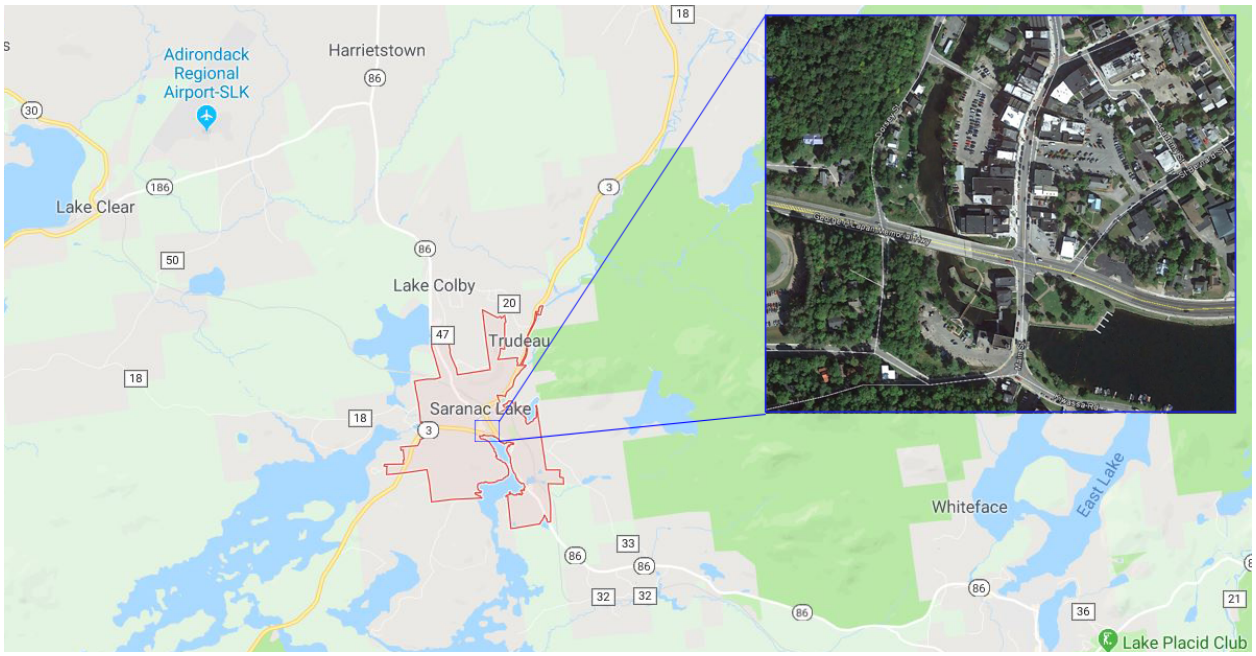

Figure 8. The proposed site location is below the existing Lake Flower Dam.

Saranac Lake, NY

Saranac Lake, sometimes referred to as the "Capital of the Adirondacks", was named after the upper lower, and middle Saranac lakes which are located nearby. The Village includes an area that includes three different towns, Harrietstown, St. Armand, and North Elba and that spans two different counties, Franklin and Essex. Interestingly, the Town lies within the boundaries of Adirondack Park. The 2017 U.S. Census estimates the population of Saranac Lake to be 5,283. Saranac Lake was named as the best small town in New York State and ranked as 11th in the United States in the Best 100 Small Town in America. (Wikipedia, 2018).

Although Saranac Lake is a small town, it resides near significant outdoor attractions including Adirondack Park, local whitewater attractions such as the Beaver and Raquette, and the US Olympic Training Center in Lake Placed New York. The site is also located relatively close to the Sacandaga River which has previously conducted preliminary studies, including an economic impact study, related to whitewater parks.

The Saranac Lake whitewater park is expected to be a local and regional destination as well as a tourist attraction for the surrounding region. A good rule of thumb is that a facility such as this will draw 60% of

its visitors from the 1 hr drive radius and 80% from within a 3 hour drive radius. A quick survey of major cities and towns within a 1-hour drive and 3-hour drive of this location is shown below:

Table 2. Some significant municipalities are located within a 3-hour drive time of Saranac Lake ((US Census, 2018))

Place	Distance	Population
Plattsburgh, NY	50 min	19,696
Burlington, VT	1 hr, 9 min	42,239
Montreal, Quebec, Canada	1 hr, 43 min	1,700,000
Saratoga Springs, NY	2 hr, 3 min	28,027
Albany, NY	2hr, 32 min	98,251
Ottawa, Ontario, Canada	2hr, 52 min	964,743
Montpelier, VT	2 hr, 40 min	7,484
Syracuse, NY	3 hr, 22 min	143,396

These numbers suggest that there is a lower population near the project site, but that there are some major cities, particularly in Canada, within easy driving distance of the project. Studies have shown that Canadians often cross the border from Ontario to pursue adventure sports, including boating, in New York.

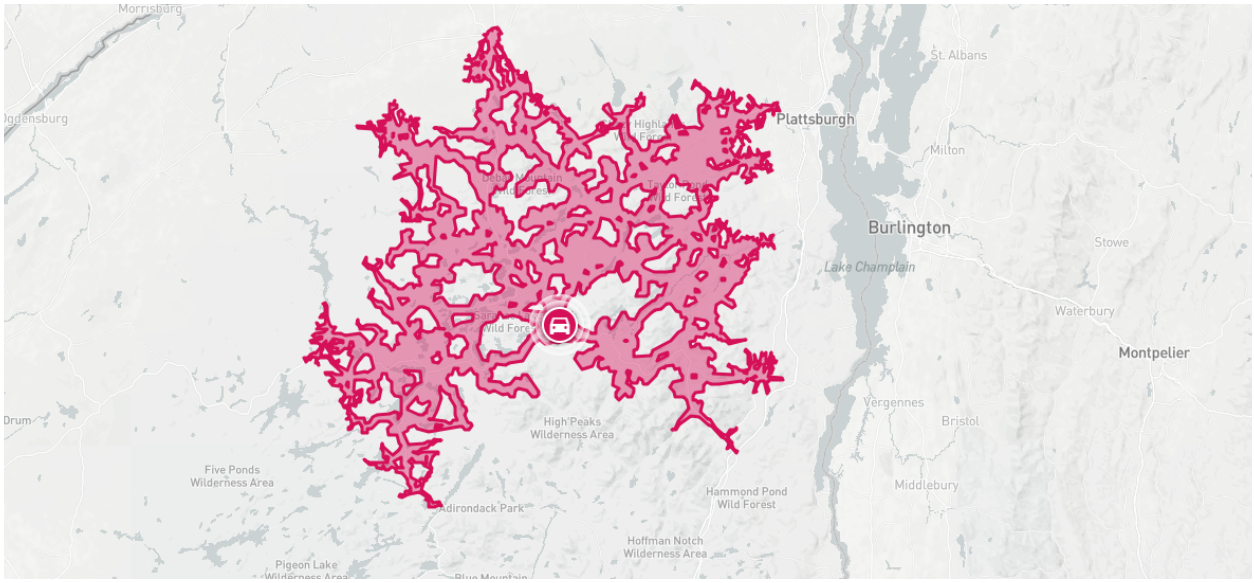

Figure 9. One-hour travel time from Saranac Lake (API, 2018).

The demographics of the tourist population to this region also support this type of active, outdoor, recreation. The Village lies within the boundaries of Adirondack Park and is 9 miles West of Lake Placid. (Saranac lake, 2018). Tourists to this region pursue a variety of activities predominantly associated with healthy, active, outdoor, recreation.

Temperatures in Saranac Lake, New York

Usage at other, similar, sites suggests that on-the-water usage at the site can be impacted by temperatures in the area. The average temperatures are shown below.

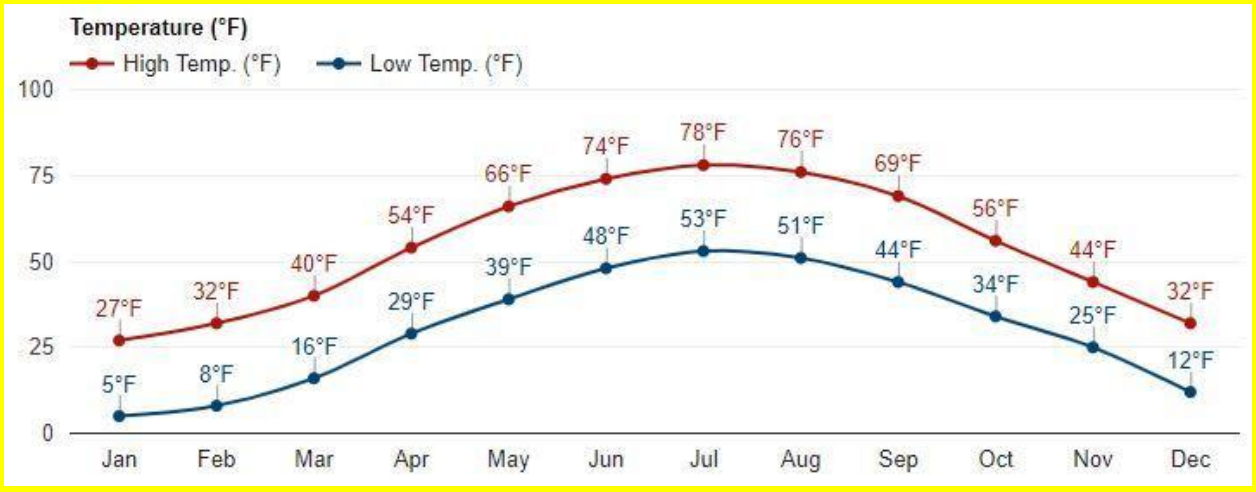

Figure 10. Average temperatures in Saranac Lake, NY (Weather Atlas, 2018)

Based on a study conducted in Texas in 2008 by RPI, inc. showed that people will generally pursue on-the-water boating recreation when the temperatures are greater than 60 degrees, and will not generally pursue immersion sports until the average temperatures are considered hot in the region. This suggests that the park will be primarily utilized between the middle of April through the middle of September with peak season in June, July, and August. Paddlers who are highly enthusiastic about the sport will likely utilize the site throughout the floatable season.

Project Site

Hydro Point Park and Beaver Park

S2o Design and Engineering conducted a site visit in October of 2018. During the visit S2o inspected two likely sites, but focused on Hydro Point Park as the primary site. This site is located adjacent to the Town's Central Business District, has adequate and reliable flows, and is surrounded by public parkland with parking, trails, and access.

The Saranac River at this location is already highly impacted. There is a dam and hydropower located immediately upstream of the site. This dam is a total barrier to fish passage and navigation. Additionally, the banks are channelized and armored throughout the project site including rip rap and concrete bank treatments as well as a boardwalk through a portion of the project site. The in-stream site is similarly impacted with man-made groynes throughout the site, augmented armoring, and random boulders placed in some locations. There is also a power canal which enters the project site mid-way down the reach. The site does feature adequate drop and flow, however, to create a whitewater park and is, in fact, the site of a former slalom training site and river recreation improvements project.

The site also features parking, existing trails and bridges, a construction access and staging area, and trail access for the public to both banks of the river.

The project site is shown below in Figure 11:

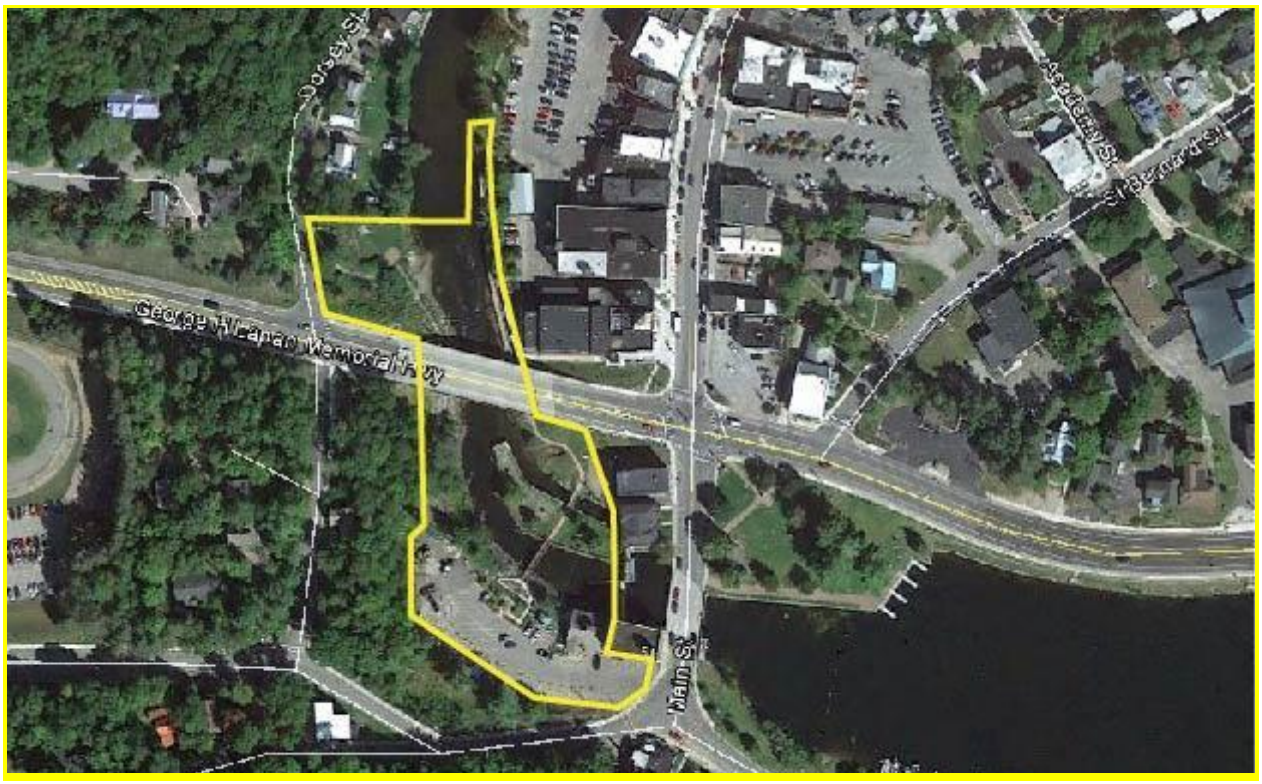

Figure 11. The proposed site location map

The proposed site is the site of a previous whitewater improvements project. Hydro-Point Park was formerly improved as a part of a community project that placed existing deflectors in the main stream to create improved eddies and a central drop area underneath the bridge. These improvements have fallen into disrepair but can easily be refurbished as a part of this project.

Figure 12. The site has been previously configured as a whitewater park.

Land Ownership

Figure 13: The Parcel Map is from the Franklin County Map Viewer (County, 2018).

The proposed project site is primarily on land already designated as a park or owned by the Village of Saranac lake or the Town of Harrietstown. The river left side of the project lies within the Hydro Point Park, on the upper portion of site, the George Lapan Memorial Highway Bridge underpass in the middle

of the site, and Beaver Park on the lower portion of the site. The river right side of the project is split between the Hydro Point Park on the upper portion, and the George Lapan Memorial Highway Bridge underpass, private property, and Harrietstown property on the lower portion of the project. All of the proposed improvements will be located on Town or Village land. Detailed project ownership is shown below:

Parcel #/ Print Key	Owner	Village Zoning District	Property Class Code	Address
River Left:				
458.21-2-1	Village of Saranac Lake	E2	712 (High Tech. Manufacturing and Processing)	39 Main St., Ste 9
447.77-12-6	Village Improvements	E2	963. Wild Forested Conservation Lands and Public Parks	48 Dorsey St.
447.77-12-7	Race Willard Jason III	F2	411 (Commercial Apartments)	18 Dorsey St.
River Right:				
458.21-2-2	Village Of Saranac Lake	E2	712 (High Tech. Manufacturing and Processing)	17 Main St.
447.77-9-1	Willgro Inc	E2	482 (Commercial Downtown Row Type, Detached)	27 Main St.
447.77-3-22	Town of Harrietstown	E2	652 (Community Services, Office Building)	39 Main St.
447.77-3-21	Rice G Carver Inc	E2	482 (Commercial Downtown Row Type, Detached)	43 Main St.
447.77-3-20	Towsley Property LLC	E2	482 (Commercial Downtown Row Type, Detached)	47 Main St.
447.77-3-26	Village Of Saranac Lake	E2	438 (Commercial Parking Lot)	48-56 Main St.

Figure 14: Land Ownership is from the Franklin County Map Viewer (County, 2018).

Hydrology of the Saranac River

The Saranac River in the Town of Saranac Lake is a modestly sized river with a drainage area of approximately 185 square miles. Floods on the river are mitigated by a dam located on Flower Lake as well as the system of lakes which make up Saranac Lake. Large flooding events are relatively trivial in comparison to floods on nearby rivers such as the Raquette, which is highly regulated, yet which stil sustains significant flood events.

Within the United States flood damage and the national flood insurance program are regulated by FEMA. FEMA defines the flows with which it regulates the flood insurance program based on statistical probability of events. The most commonly referred to event is the 100-year event, which correlates to the 1% chance flood. This flood is statistically expected to occur once every 100 years. The regulatory discharges from the Flood Insurance Study (FEMA, 1992) are shown below:

Table 3. Summary of Discharges for the Saranac River above the Hamlet of Trudeau, NY

Summary of Discharges	
Saranac River	
Above Hamlet of Trudeau	
Return Interval	Flow (cfs)
10 year	1990
50 year	2320
100 year	2400
500 year	2700

FEMA utilizes these flows and a freely available software known as HEC-RAS (this software was created by the US Army Corps of Engineers), to define water surface elevations for the 100 year (and other) flood events. This information is utilized to create a FEMA Flood Insurance Map which delineates not only the

expected extents of the 100 year flood, but also the extents of the active floodway. The active floodway is the portion of the river which conveys flood flows. A portion of the project is located in the designated floodplain of the Saranac River and is shown below in Figure 14.

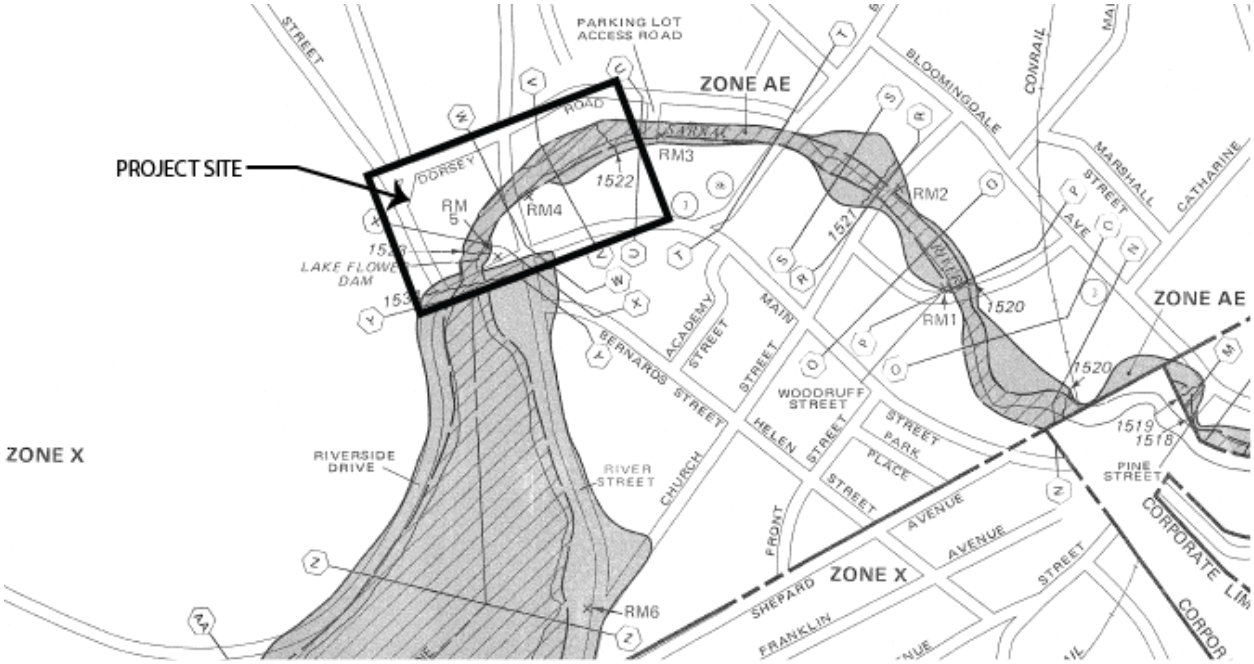

Figure 15. Floodplain map for the proposed project site (Franklin County Auditor, 2018)

These maps show that the river is confined from the dam, through the project site to a location downstream of the bridge. Adjacent to Beaver Park there is some widening of the floodplain as the banks become less steep and confining. The proposed design solution for the project will be designed to have no impact to this regulatory floodplain.

In designing whitewater parks, designers typically look at likely flow data to determine flow rates for which the park is designed, as well as regulatory flood flows to determine the impacts of the design to the regulatory floodplain as well as to buildings in the near area. In Saranac Lake it will be a requirement that the design of this project have no impact to the 100 year floodplain and that the project have no net effect to insurable structures within the river corridor.

The project will largely function utilizing the average flows in the river. S2o was able to attain 5 years of flow data for analysis. Based on this analysis, average flows for the proposed project site are shown below in Figure 15:

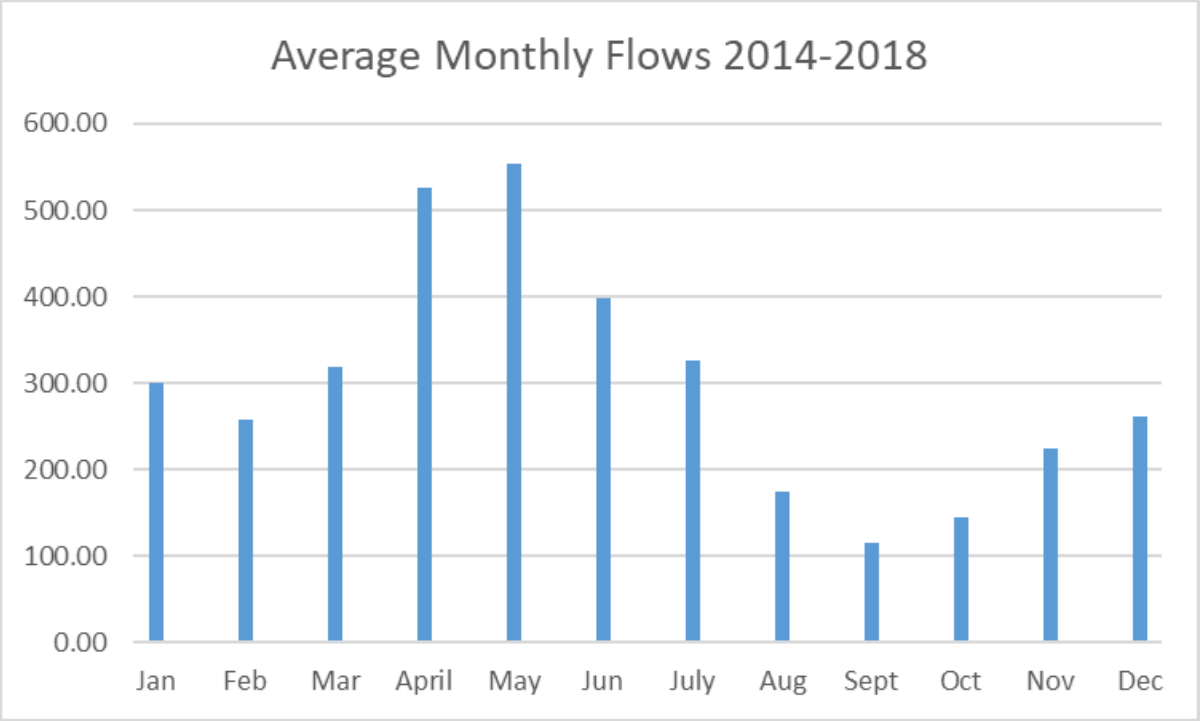

Figure 16. Average monthly flows of the Saranac River at the project site

Figure 15 shows a river with modest daily flows suitable for beginner and intermediate paddling. Typically at whitewater parks 3-400 cfs is sufficient for lower water surfing, slalom and recreational skills practice, and recreational floating including tubing and funyaks. Larger freestyle features occur at higher flows of greater than 900 cfs. At these flows intermediate and advanced playboating will become possible including aerial tricks such as loops. A detailed look at the flows in the Saranac show a river that is rainfall dependent and that rises quickly with large rain events. A full history of flows over the last five years is shown below in Figure 17:

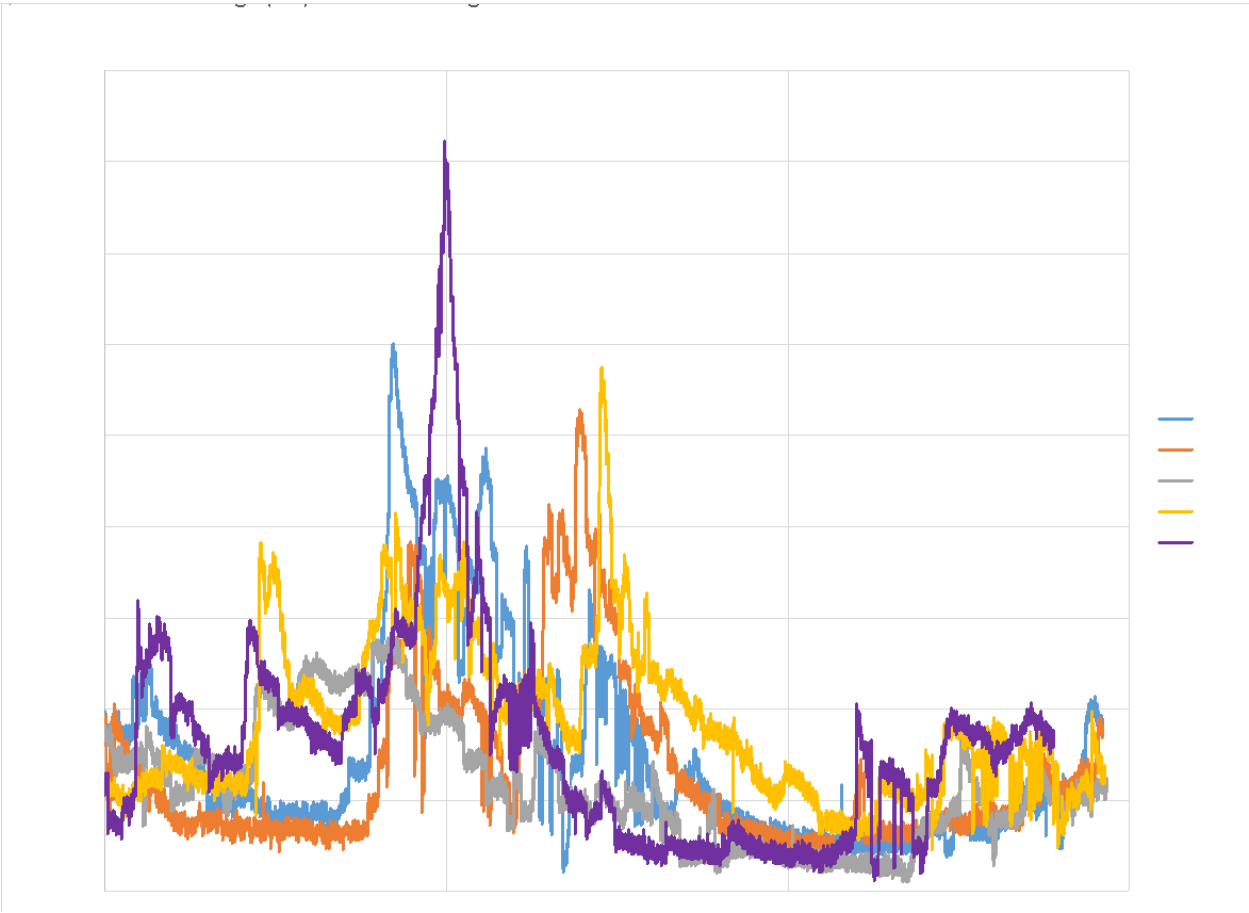

Figure 17. A look at instantaneous flows shows that the river regularly features high flow events in the spring and summer months.

Figure 16 shows that the river fluctuates often during the spring and summer months. These flows are significant and, with an appropriate design, would create a hydraulic jump/wave feature that is suitable for intermediate and advanced freestyle boating at higher flows.

Additional Considerations

Historic Structures

The national register of historic places lists 79 historic structures in Franklin County. S2o mapped these structures and found only one adjacent to the project area which was listed as Paul Smith's Electric Light and Power and Railroad Company Complex. Wikipedia describes this as:

Paul Smith's Electric Light and Power and Railroad Company Complex *is a national historic district located at Saranac Lake in Franklin County, New York. It contains two contributing buildings (a powerhouse and an office building) and two contributing structures (a dam and a bridge). The powerhouse was built in 1908-1909 and is a one-story, single room brick building on a stone foundation measuring 40 feet by 55 feet. The office building was built in 1927 and is a three-story steel and masonry building with a terra cotta exterior. It is three bays wide by four bays deep. The Main Street Bridge is a concrete slab bridge built between 1924 and 1931.*

The Lake Flower Dam and Power Flume was built between 1936 and 1938 with Works Progress Administration assistance.

The location of this facility will likely require consultation during the permitting process.

Protected View sheds

S2o found that the project area is included in the documented visual resources of the Town of Harrietstown (a part of Saranac Lake). The following map was snipped from the Town's map of visual resources:

Figure 18. A map of visual resources within Harrietstown, NY includes the project site in two listed views.

Given the location within these vsual resource areas the project will likely require consultation with the Town to ensure that the project does not impact the visual resources of the Town.

Endangered Species

The following excerpt is taken from the website "Adirondack Explorer" and provides a summary of threatened and endangered species in the Adirondacks.

The NY DEC's website says species are labeled as endangered if they are "native species in imminent danger of extirpation or extinction in New York State." Of the fifty-three species that the department has identified as endangered, only eight live in the Adirondacks:

- **Indiana bat.** This small bat (two inches long) hibernates in caves in Essex and Warren counties. The bats hibernate in clusters of three hundred to four hundred per square foot. About 85 percent of the nation's Indian bats hibernate in seven caves, making them especially vulnerable to threats. In the past decade, white-nose syndrome has decimated populations in the state and across the country.
- **Round whitefish**. These medium-size fish (eight to twelve inches long) feed on the bottoms of freshwater lakes. They once were found in more than sixty lakes in the Adirondacks. They are

now found in only nine. Acid rain, overfishing, and predation by invasive species are among the possible reasons for their decline.

- **Spruce grouse**. In New York State, spruce grouse dwell primarily in the Adirondack foothills of Franklin and St. Lawrence counties in mid-successional coniferous forest with an understory of berries and with openings in the canopy. The grouse's habitat has shrunk drastically over the years. Recently, DEC began reintroducing the grouse to the Park.
- **Peregrine falcon**. The fastest bird in the world, the peregrine can reach speeds of two hundred miles an hour when diving at prey. It dwells on cliffs in Clinton, Essex and Warren counties. They all but vanished from the state in the early 1960s, due to pesticide poisoning. They have been making a steady comeback since the 1980s.
- **Short-eared owl**. Of all northeastern owls, these are the most active during the day and often can be observed during the late afternoon. They can be found in Clinton, Essex, and Franklin counties in open wetlands or fields. The owls are at the southern edge of their breeding range in New York. Biologists believe reforestation has contributed to its decline.
- **Tomah mayfly**. This is the only carnivorous species of mayfly: it eats larvae of other mayflies. It has been documented only in New York State and Maine. In New York, it is found on the western fringe of the Adirondacks and in the Tug Hill region. It lives in sedge-filled meadows along streams.
- **Persius duskywing butterfly**. This brown butterfly can be found in much of the country, but it is more common out west. It lives in mountain grass habitats and pine barrens and has been seen in Essex County.
- **Karner blue butterfly**. This small dark-violet or blue butterfly is found mostly south of Adirondacks, but it has been seen in Warren County. It dwells in open woods and fields with blue lupine. Its decline is attributed to habitat loss. The butterfly was first identified by the novelist Vladimer Nabokov.

Of these eight species, only the Indiana bat is on the federal list of endangered species. Daniel Rosenblatt, a DEC biologist, said the bat and the spruce grouse are the most endangered species in the Adirondacks.

Threatened species

DEC designates as threatened "any native species likely to become an endangered species within the foreseeable future in New York State." DEC has identified thirty-six species as threatened. Nine of them are found in the Adirondacks.

- **Lake sturgeon.** One of New York's largest freshwater fish, lake sturgeon can grow to over seven feet long and three hundred pounds and can live for fifty years. It exists in Lake Champlain on the eastern edge of the Park. On October 12, DEC introduced a plan to restore lake sturgeon populations so it can be removed from the threatened species list by 2024.
- **Timber rattlesnake**. The longest venomous snake in New York can grow to more than four feet long. The snake was killed indiscriminately in the past. It is still found in the Lake George region and on Split Rock Mountain in Essex County.
- **Bald eagle**. One of the largest raptors, it can live for thirty years in the wild. Eagle populations plummeted in the 1960s due to pesticides. DEC began reintroducing eagles to New York in the 1970s. The bird is now found in a number of Adirondack counties.

- **Pied-billed grebe**. This small, secretive water bird recognizable by its two-colored beak. Found in marshy areas in Essex, Franklin, Clinton, Herkimer, and Warren counties. Because of the pesticide DDT, grebe populations dropped throughout the country in 1960s to 1990s.
- **Least bittern**. This is the smallest heron in North America, weighing less than three ounces, with a bright yellow eye and beak. Found in cattail marshes in Essex, Clinton, Franklin, Herkimer, and Warren counties.
- **Northern harrier**. Formerly known as the marsh hawk, this pale-gray, acrobatic raptor can fly up to a hundred miles in a day. Habitat destruction and pesticides are factors in its decline in many places. However, populations are stable in Herkimer, St. Lawrence, Clinton, Franklin, Essex, and Warren counties.
- **Upland sandpiper**. This mid-size sandpiper lives in grasslands in Essex and Washington counties. In the nineteenth century, the sandpiper was hunted. In recent times, the biggest threat is the loss of grassland habitat.
- **Sedge wren.** This small, dark-brown wren with a distinctive white eye stripe dwells in wet meadows and fields in Clinton and Franklin counties. The wren has experienced declines throughout its range, due mainly to the draining of wetlands.
- **Northern long-eared bat.** This dark-brown bat with a wingspan up to nine inches is also on the federal list of threatened species. Since white-nose syndrome first found in New York in 2006, its population has decreased by 98 percent.

Section 3: Proposed Improvements

Project Objectives

Figure 19: Spectators watching the Animas River Days event.

This project is tasked with creating a local amenity that will drive tourism and contribute to the quality of life in Saranac Lake, New York. In an effort to meet this goal, this project is envisioned as a community and regional attraction that will provide recreational and competitive paddling opportunities.

Conceptual Design

Saranac Lake Conceptual Design Rendering

The proposed design shown below in Figure 18, builds on the existing instream and bankside amenities currently offered at the site. The design includes the addition of one whitewater drop structure that will create a hydraulic that works at a variety of flows, and for a variety of paddler experience levels. The size and power of the hydraulic jump created at the drop structure will vary in size depending on the amount of flow. Lower flows will create current, and a small wave sufficient for beginner and intermediate

freestyle boating. As flows increase, this wave will grow in power and size. At medium and high flows, the hydraulic will provide the opportunity for freestyle paddlers and surfers to perform tricks and maneuvers.

The design also reinforces and adjusts the existing instream deflectors, weirs, and habitat boulders to provide an ideal recreational learning and slalom training area. The placement of the deflectors, weirs, and habitat boulders will also improve the aquatic habitat throughout the project reach, by creating ideally located riffles, eddies, and pools.

The bankside improvements will augment the existing trail system and will include bank terracing, the replacement of the existing boardwalk, and river access points for paddlers, fishermen, and passive river users.

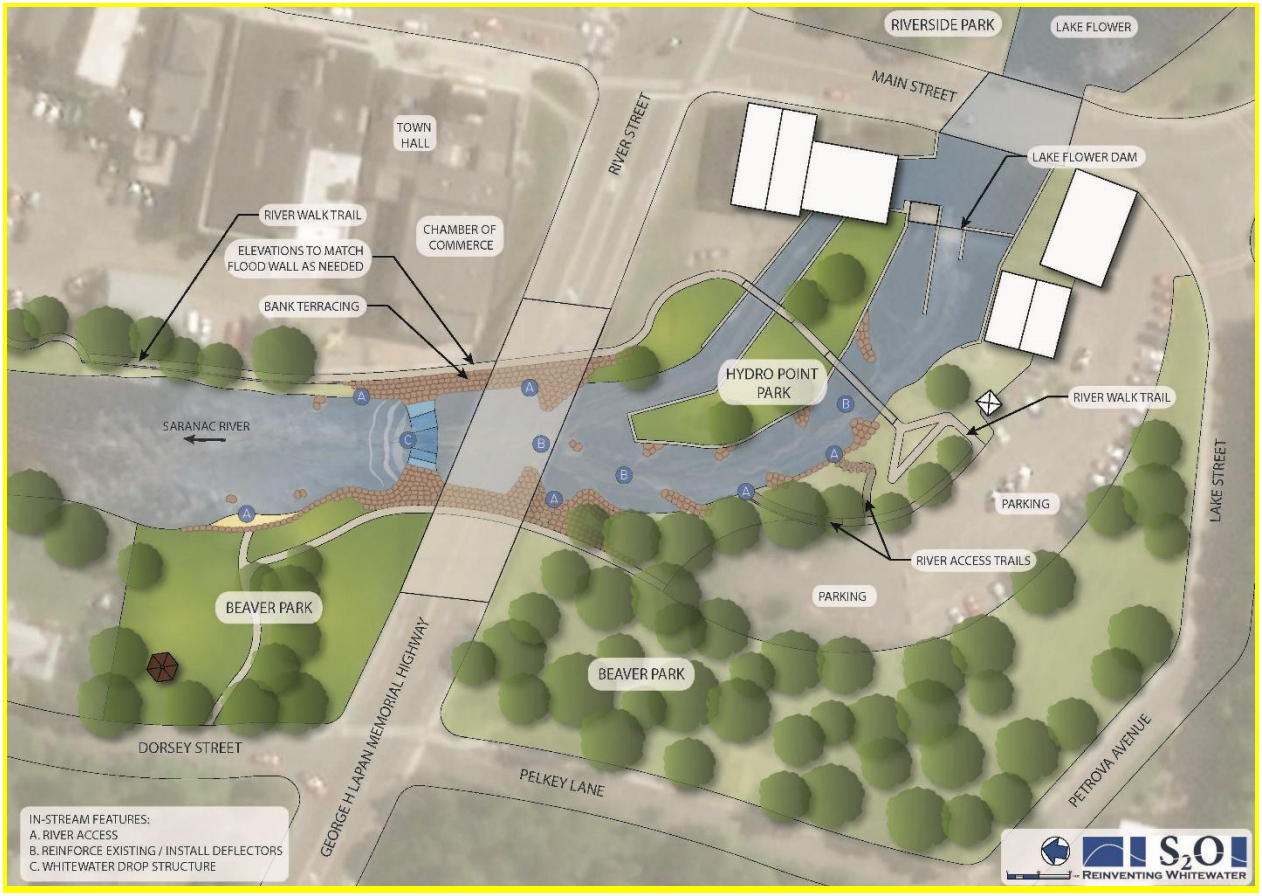

Figure 20: The Saranac Lake Whitewater Park Concept Design.

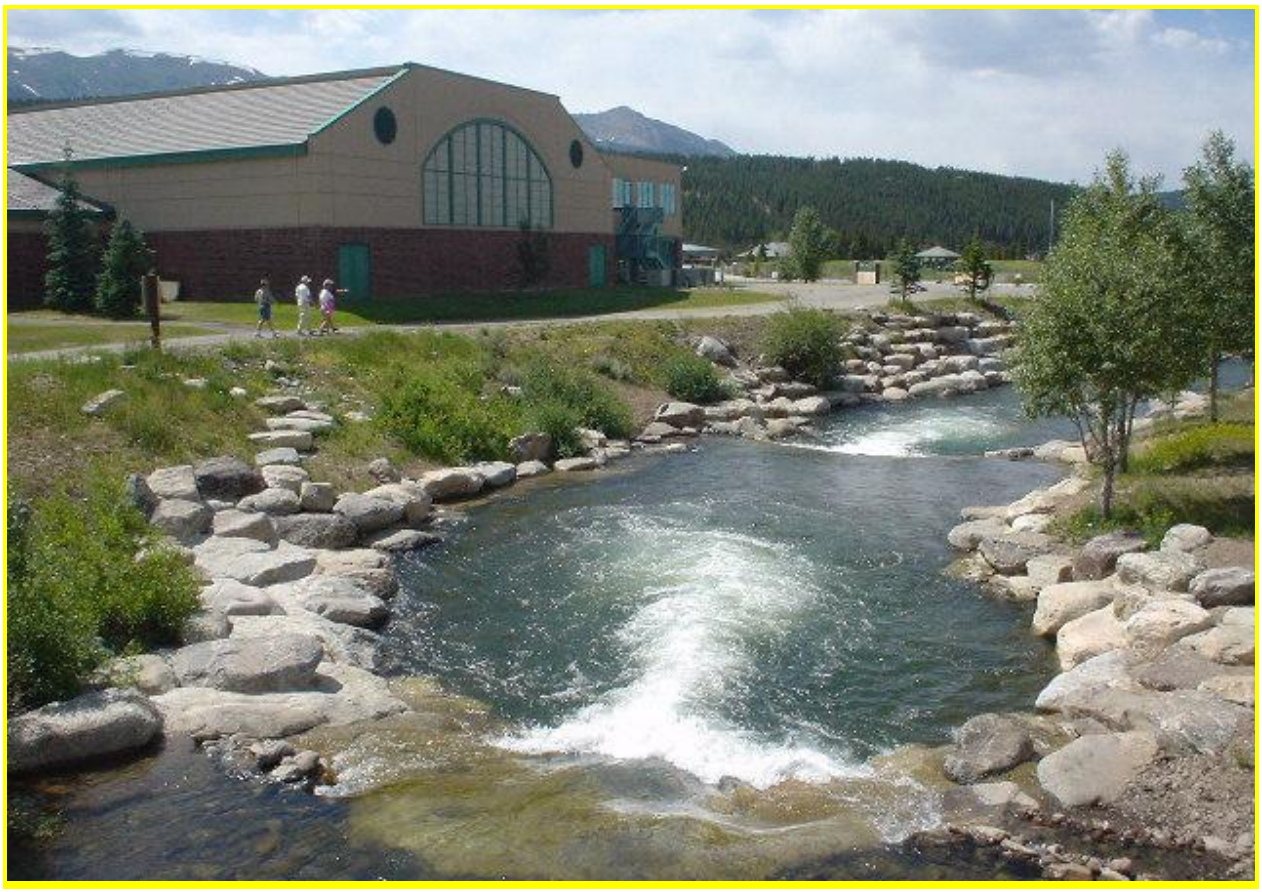

Figure 21. The natural channel would be rock-lined with step drops separated by pools that would allow tubers and beginners to recover between drops in a similar fashion to this park in Breckenridge, CO.

Costs of Construction

The cost estimate in cost associated with proposed Saranac Lake Whitewater Park Concept Design.

Table 5, below, displays an estimate of the construction cost associated with proposed Saranac Lake Whitewater Park Concept Design.

Table 5: Cost estimate for the Saranac Lake Whitewater Park

Description	Quantity	Unit	Unit Cost	Item Total Cost
Install Boulder (36" min)	1,144.33	CY	$ 75.00	$ 85,825.00
Furnish Boulder (36" min)	1,144.33	CY	$ 65.00	$ 74,381.67
Furnish & Install Bedding Material	333.67	CY	$ 45.00	$ 15,015.00
Furnish & Install Concrete Grout, Including Rebar & Marine Epoxy	53.75	CY	$ 272.00	$ 14,620.00
Furnish & Install Mirafi 180n Filter Fabric	1,001.00	SY	$ 11.00	$ 11,011.00
Furnish Riprap Armoring	111.33	CY	$ 55.00	$ 6,123.33
Sort & Install Alluvial Riprap Armoring (Type VH)	111.33	CY	$ 50.00	$ 5,566.67
Excavate & Grade Native Alluvium	805.63	CY	$ 18.00	$ 14,501.33
Excavate/Grade/Install Concrete Walkway	845.00	SF	$ 14.50	$ 12,252.50
PROJECT SUBTOTAL				**$ 239,296.50**
ADD - DEMO BOARDWALK & INSTALL RETAINING WALL/CONCRETE PATH				
Demo Timber Boardwalk & Concrete Pilings	1,086.00	SF	$ 8.00	$ 8,688.00
Excavate/Grade/Install Concrete Walkway	1,234.00	SF	$ 14.50	$ 17,893.00
Install Concrete Retaining Wall	103.89	CY	$ 272.00	$ 28,257.78
ADD SUBTOTAL				$ 54,838.78
Contingency (20%)				$ 47,859.30
CONSTRUCTION SUBTOTAL				$ 287,155.80
Bathymetric/Topographic Survey				$ 8,614.67
Engineering Design				$ 17,229.35
Hydraulic Modeling				$ 11,486.23
Permitting 404, 401				$ 8,614.67
Permitting Floodplain				$ 5,743.12
Construction Bonding/Ins				$ 8,614.67
Construction Mob and Demob				$ 14,357.79
Construction Stakeout				$ 4,307.34
Construction Monitoring				$ 25,844.02
Expenses				$ 7,178.90
TOTAL PROJECT COST OPINION				**$ 399,146.6**

* *This estimate is for preliminary budgeting purposes only and does not represent the Developer's actual or guaranteed costs.*

Typical Project Images

The following photos show typical whitewater parks in action and area an example of what can be built in Saranac Lake:

Figure 22. The Estes Park Whitewater Park features a low-flow channel through a community park

Figure 23. The Estes Park channel features access points and trails.

Figure 24. A staircase in Estes Park

Figure 25. Competition at the US National Whitewater Center

Figure 26. a lone surfer on a fall day.

Figure 27. A kids group paddles in the wave.

Section 4: Process and Permitting

Process

This study has evaluated the opportunity to improve the existing in-stream and bankside recreation at the Hydro Point and Beaver Park and has suggested a design solution that meets the site constraints and requirements and that would provide a recreational attraction. This is not, however, a completed design that is ready to be constructed. Typically, our design process would incorporate Preliminary Design, Permitting, Detailed Design, and Construction Documents design phases. Following the preliminary phase, permit applications would be submitted and permits would need to be obtained. This may require some design adjustment. The design and permitting phases of a project of this type typically take 1.5 to 2 years but can be accelerated if required.

Once construction documents have been completed and the permits have been obtained the project will need to be constructed. Typical construction times for a project of this size would be approximately 10-12 months.

At a minimum, the project will require the following permits:

Federal and State Permitting:

A typical whitewater park would require Federal Clean Water Act Permits including 404 and 401 certification. Consultation, as noted above, will be required with a number of state agencies, local stakeholders, and the public.

County and Village

Local flood damage reduction regulations protect life and property, encourage development outside of regulatory floodplains, promote mitigation and floodproofing techniques, encourage greenways and passive recreational opportunities, reduce public funds used in relief efforts, and maintain the Municipality's eligibility in the National Flood Insurance Program (NFIP). Participating in the NFIP allows local residents to purchase Federally-backed flood insurance that is not available, or that is extremely expensive, through a standard homeowner's insurance policy.

The Village has adopted local flood reduction regulations to comply with FEMA requirements. These define the requirements for developing in regulatory floodplains and applies to all unincorporated areas of Franklin County. Harrietstown has also adopted these regulations and has a similar floodplain permitting process. The NFIP requires, prior to any development in a regulatory floodplain, that an NFIP permit be issued. Development includes any man-made change to a property including but not limited to the construction of buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, or storage of equipment or materials.

Other typical permits for this type of project include:

- Stormwater Management Permit (required for the entire park)
- Erosion Control Permit

- Building Permit

A number of tasks will be required in order to attain these permits including a detailed site survey with wetland delineation, a flood model to establish no-rise, and design drawings stamped by a licensed professional engineer. Other studies may be required in order to assess habitat, environmental, or other impacts.

Construction Requirements Analysis

The construction of whitewater parks typically requires a detailed construction plan. Whitewater Parks normally require a large staging area for materials, access to and from the project site, and an area for offices and site management. These areas have been identified on the south bank of the river.

Figure 28: The Eagle Whitewater Park under construction

The drop structures are typically made from boulders grouted with hydraulic concrete for increased resilience and stability. Additional earthwork including rough grading as well as fine grading will be required for site finishing.

Operations

The project would function similar to other Saranac Lake Public Recreational Facilities with limited maintenance and tuning required, particularly in the first year of operations.

Figure 29: An eleven-year old boater surfs the Hawea wave during competition.

Conclusion

Figure 30: Spectators watching rafters surf the wave.

S2o has proposed a concept design and cost estimate that improves the existing instream and bankside amenities currently offered at the site. The proposed additions to the existing instream recreation at the Hydro Point Park and Beaver Park, in Downtown Saranac Lake, New York could host a variety of active and passive recreational opportunities, create an outdoor river culture, and become a local economic generator.

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Appendix A: Glossary

These terms are often used in the whitewater parks business. Let us know if you are left wondering about a term or phrase—we'll add it to the list!

2-Dimensional Flow Models: Flow models such as River 2D show the nature and distribution of flows. Flow 2d models are often useful for establishing fish passage by adjusting the design to meet flow criteria established with permitting authorities.

3-Dimensional Flow Models: Flow models such as Fluent or Flow 3d that use computational fluid dynamics to compute virtually every characteristic of the flow including vortices, turbulence, water surface character, and more. These models are often less informative and more expensive than creating an actual physical model.

Business and Market Analysis: A study that establishes what the market potential for a whitewater park is in a given community including total expected visitorship and the character and demographics of these visitors. We also use research data to establish price point and complementary amenities. Based on this information we create a business and operations model for the client. Our models are very robust and have, without comment, been reviewed by independent as well as state and banking reviewers in preparation for grant and loan funding. Beware of freebie and cheap "general purpose" business models. These are the only whitewater park business models that provide operators and financiers the information that they need, for their project, to make it happen.

Class I-VI: Whitewater rapids can be classified according to difficulty and risk. A generally accepted classification system typically uses roman numerals between I and VI with I being the easiest to navigate and appropriate for beginners with obvious lines and very little power and class VI being the most difficult with steep and powerful lines that are difficult to attain and maintain even for the best expert boaters.

Dangerous "Keeper" Hydraulic: Hydraulic jumps vary in power and character. In general the gamut of hydraulic jump types varies from glassy green wave to a hydraulic jump that features dangerous recirculating currents that swimmers have difficulty existing. The designers challenge in whitewater park design is to create a whitewater feature that has sufficient power to be a play feature, but not so much power that it creates a hazard to beginner boaters.

Economic Impact Study: A study completed in cooperation with a PhD in economics. We study the economics of the region surrounding the park and establish, based on published data (or surveyed data if published data does not exist) what the economic impact of a whitewater park will be to a host community in terms of total dollars, increased tax revenue, increased average incomes, increased jobs, and other pertinent economic metrics.

EPDUK: S2o's design partner in Great Britain. S2o and EPDUK partnered together on several projects including the London Olympic Park Project.

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Floodplain Analysis: A process that undertaken to understand the effect of a whitewater park on a floodplain at a particular project site. Often the floodplain analysis is conducted hand-in-hand with the project design to minimize or eliminate flooding impacts.

Freestyle Feature: A surf or play feature of sufficient size and power to be used for Freestyle, or trick kayaking, competitions.

Freestyle kayaking: A type of whitewater competition in which paddlers surf in a wave or hydraulic and perform tricks over a set time period. The paddlers are scored according to style, difficulty, and number and variety of tricks. Large events such as the Teva Mountain Games, which are held in the Nick Turner (now of S2o) designed pneumatically adjustable play feature can have an economic impact of $3.5 million dollars in a single weekend event!

HEC-RAS Model: a one-dimensional flow model developed by the Army Corps of Engineers to predict flood elevations in rivers. This software has limited applications to Whitewater Design—particularly within floodplains.

Kayak Park: A whitewater park designed specifically for kayaking. Many of the freestyle whitewater parks are custom designed to create waves and play-holes specifically for kayaking

Physical Model: A Froude scaled model that is hydraulically scaled (using the Froude number relationship) to mimic the behavior of a full-sized river. If done properly this model can accurately predict wave size, height, and shape as well as depths, velocities, and other pertinent course features.

Play Features: Similar to Surfing Features. Surfing features in whitewater parks are waves or hydraulic jumps which are conducive to surfing a kayak, stand-up-paddleboard (SUP) or surf board. These waves are called standing waves and remain stationary in the current (in comparison to waves in the ocean which transit a body of water and break on the beach).

Run-Of-The-River Type Features: Whitewater Park features which are a challenge or that augment the experience of running the river. These features contrast with Freestyle and Play features in that they provide a navigational challenge to varying levels of boater.

Slalom kayaking: A type of whitewater competition in which kayakers are timed going through a set course of slalom gates (poles hung from wires above the river/channel). Paddlers are timed and scored with the winner posting the fastest time. Large events, such as the 2008 Olympic Team Trials can have as many as 30,000 spectators in a single weekend and can have millions of dollars in economic impact to a hosting town or city.

Slalom Racing/Slalom Features: Whitewater Slalom Racing is a timed event wherein kayakers race through a set of 18-25 slalom gates hung in a whitewater rapid. Athletes are scored based on total running time plus assessed penalties for touching or missing the gates. Slalom Features are features that are conducive to setting challenging slalom courses.

Surfing Features: Similar to Play Features. Surfing features in whitewater parks are waves or hydraulic jumps which are conducive to surfing a kayak, stand-up-paddleboard (SUP) or surf board. These waves are called standing waves and remain stationary in the current (in comparison to waves in the ocean which transit a body of water and break on the beach).

Swiftwater Rescue Park: a park designed specifically to help train rescue authorities in swiftwater rescue. These parks can hold cars, trees, and platforms in the main flow and can be turned off in an instant if a rescue or scenario becomes dangerous.

White water Park Design: The planning, design, market and business analysis, and creation of construction documents for a whitewater park.

Whitewater Raft: a watercraft that is inflatable that is typically designed to carry paddlers through a whitewater rafting. Rafters can be commercial rafters as a part of a for-profit business, or private rafters, who own or acquire their own inflatable watercraft.

Width, Depth, And Aspect Ratio When Referring to Whitewater Features: Constructed whitewater features—in particular freestyle features—typically span the river or channel in which they were built. These features, in order to meet permit and FEMA requirements need to match existing river morphology in the reach. As a rule, the existing bed therefore defines the width, depth, and aspect ratio of the existing river bed and the designer often checks, by inspection, that the selected location is appropriate for improvements given the existing aspect ratio of the river.

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