Arrowhead Beach Park - 2023

Site Information and Background:

General Information:

Name: Arrowhead Park Beach
Location: Yacht Club Ln, Kingston, ON K7K 5G2, Canada

- Coordinates: 44.2358, 76.4487

Year of Identification: 2021
Responsible Authority: Swim Drink Fish Canada - Kingston Water Monitoring Hub
Monitoring Points: Figure 1 (appendix)

Waterbody Information:

Waterbody type: Freshwater, River
Watershed: St. Lawrence River, Deadman's Bay (Figure 2, appendix)
Drainage Area (km2): 0.599
Annual Precipitation for Watershed (mm): 41.12 mm (1.62 inches)

Surrounding Land Use:

- Residential
    - Military Housing: *Queenston Heights Road*
- Harbour
    - CFB Kingston Yacht Club: *4 Yacht Club Ln, Kingston, ON K7K 5G2*
    - Kingston Yacht Club Boat Launch: *5-7 Yacht Club Ln, Kingston, ON K7K 5G2*
- Parkland
    - Picnic areas
    - Public Gas Barbeques
    - Field
    - Park Play Structure
- Commercial
    - Kingston Military Family Resource Centre: *32 Lundy's Ln, Kingston, ON K7K 5J3*
    - CFB Kingston Yacht Club Member Building: *4 Yacht Club Ln, Kingston, ON K7K 5G2*
- Parking Lots
    - CFB Kingston Yacht Club Parking Lot

Residential Use Summary:

Arrowhead Park Beach is located on the Fort Henry Heights Military Base where there is a lot of residential housing for members of the military and their families. This can have a significant impact on the amount of people visiting Arrowhead Park Beach, increasing beach visitors as well as a potential increase in litter and debris found at the beach.

Harbour Use Summary:

The Canadian Forces Base Kingston Yacht Club harbour and boat launch are situated West of the Arrowhead Park Beach swimming area. The Harbour docks a large number of watercraft that has the potential to impact water quality through biological and chemical hazards. Fecal contamination from wastewater dumping as well as chemical runoff from boats including chemical cleaners and boat fuel pose a possible risk for pollution.

Parkland Use Summary:

There is a large amount of green space surrounding Arrowhead Beach. The greenspace is equipped with multiple benches and picnic tables, gas fueled barbeques, and a large park play structure. Due to the public accessibility of this parkland and its amenities on site, many people as well as their pets use the space surrounding the beach. This could increase pollution risks, especially after heavy rainfall as the beach is located downhill from most of the green spaces.

Commercial Use Summary:

The Kingston Military Family Resource Centre is located uphill and Northeast of the beach area. The Resource Centre has a pool and a splash pad which could pose both a biological and chemical contaminant risk during periods of heavy rainfall which may result in pool overflow and stormwater runoff from nearby surfaces. The Yacht Club has a clubhouse building for club members to use a number of amenities including showers, bathrooms, a kitchen, outdoor barbecues, and an outdoor garbage bin. The clubhouse is not accessible to the general public. Possible contamination risks from the clubhouse and surrounding outdoor amenities include risks of pollution from outdoor cooking on the gas barbeques (ie. cooking oil spills) and associated litter from picnicking such as food wrappers. There is also a large dumpster located on the property at the Northwest edge of the parking lot. During site visits this dumpster has been surrounded by disposed of materials such as treated wood and boat materials (Figure 3). Any litter outside of the dumpster has the strong potential to spread across the site and into the water during periods of high winds and more extreme weather.

Parking Lot Use Summary

There is one parking lot located uphill from the Yacht Club Marina where numerous members park their vehicles and boats. The large garbage disposal dumpster is also located in this parking lot near the Clubhouse building. Stormwater runoff from the parking lot would flow directly downwards into the marina which is extremely close to the swimming area. The parking lot may also be used by beach goers and people visiting the park just north of the beach area.

Upstream Pollution Risks:

Based on the watershed of Arrowhead Park Beach, stormwater runoff from multiple commercial, parkland, and parking lot areas pose a risk for potential upstream pollution. The Kingston-Wolfe Island Ferry may contribute to biological, chemical and physical contaminants from the large watercraft waste tank, boat fuel, cleaning chemicals, and a possible increase in litter from ferry commuters that may end up in the water. The ferry docks in the water just off of Barack St., and the route from Kingston to Wolfe Island passes the west edge of Deadman Bay (Figure 4), where Arrowhead Beach is located at the far East end of the Bay. With both the boat flow and the prevailing winds coming from the west, there is a potential for these upstream pollutants to flow directly into the Bay and contaminants may end up close to the marina or the swimming area. Due to the beach area being located in Deadman's Bay, there is a strong potential for contaminant entrapment, as there is no opening at the east edge of the bay (Figure 5).

Additionally, there are multiple parking lots that are a risk for stormwater runoff pollutants. Parking lots include the Great Hall of Fort Henry lot, multiple parking lots located around the Royal Military College, as well as the Wolfe Island Ferry commuter parking. All of these lots are located along the water's edge and may have an impact on chemical and physical pollutants that come from these gray spaces that flow into the water through stormwater runoff.

Potential Sources of Pollution:

1. Microbiological Hazard Assessment

Potential Sources of Fecal Contamination

- Combined Sewer Overflows
- Waste tanks of boats at Marina
- Stormwater Drains/Discharges

Other Environmental Sources of Fecal Contamination

- Birds
    - The site has an average amount of large bird sightings during site observations. The main birds identified are ducks and Canadian geese. Bird poop on the shoreline and green space has also been noted in significant amounts.
- Other Wild Animals
    - A few other animals that could impact the fecal contamination of the site have been noted during site visits. These include snakes, large fish, and muskrats.
- Pets

    - Residential space surrounds Arrowhead Park Beach, and the park has open grassy areas which can be used to walk pets. Many dogs are noted close to the shoreline and in the swimming area during site observations, and their high frequency could contribute to fecal matter at the park.
- Swimmers
    - Arrowhead Park Beach is a popular swimming location, so there are typically a significant number of local swimmers in the area. During the summer season, there are a few Kingston swimming clubs which use the site for a few hours most mornings.

Overall Risk from Microbiological Hazards:

Combined Sewer Overflows (CSOs): **LOW**

- There are no CSOs located at Arrowhead Park Beach.
- All CSOs are located a significant distance away from the beach and are not classified as a strong risk. All combined sewer outflows are located on the west side of the Cataraqui River (Figure 6). See the CSO Map provided by utilities Kingston.[1]

Waste tanks of boats at CFB Kingston Yacht Club: **MEDIUM**

- CFB Kingston Yacht Club has waste tanks on site within the boats kept at each facility. These have the potential to pose a microbiological hazard if improperly managed and maintained.
- There are no pumpout station services offered at the CFB Kingston Yacht Club Marina which poses a medium risk if boat owners are not disposing of their watercraft wastewater at proper disposal sites.[2] The two nearest pumpout stations are at the Kingston Marina (349 Wellington St, Kingston) and Portsmouth Olympic Harbour (53 Yonge St, Kingston). If boat owners do not use pump out stations to dispose of their grey water, this can be a source of fecal contamination, especially if dumped in the Yacht CLub Marina next to the Arrowhead Park Beach swimming area which are in extremely close proximity.

Stormwater Drains/Discharges: **MEDIUM**

- There are no stormwater drains found at Arrowhead Park Beach near the swimming area. However, there is a lot of green space next to and uphill from the beach that may contribute to the fecal contamination of the bathing area. Significant amounts of animal fecal matter has been noted during observations of the park. Fecal matter from waterfowl have been found mainly in the green space directly north of the swimming area, situated on a slope that leads down to the water entrance. Due to the nature of the site being on a slope, fecal matter bacterias has a strong probability of entering the water during periods of heavy rainfall.

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[1] https://utilitieskingston.com/Wastewater/SewerOverflow/Map
[2] https://sites.google.com/site/cfbkyc/reciprocals

Environmental Sources of Fecal Contamination: **LOW**

- Dogs, swimmers, and waterfowl are the primary sources of fecal contamination for the beach. Dogs are frequently noted during monitoring, both along the shoreline and in the swimming area. There are also a significant number of people who use Arrowhead Park Beach for swimming during the summer season. Frequent beachgoers include both adults and children, and the beach site has been observed to have the most primary water users out of all of our site locations across Kingston. Wildlife sightings at Arrowhead Park Beach are limited, with only a few birds noted during each site visit. All three sources combined when in the swimming area can directly contribute to microbiological contamination of the site and therefore affect the water quality of the beach.

2. Chemical Hazards

Potential Sources of Chemical Contamination

- Commercial/Industrial Discharges
    - The Kingston Military Family Resource Centre
        - The resource center uphill from the park may produce chemical discharge that would flow downhill into the primary swimming area. The center has a splash pad which may use chemicals to clean it that could be discharged down the hill. Furthermore, the center may also produce additional forms of chemical discharge from the facilities indoors.
    - CFB Kingston Yacht Club and Motorized Watercrafts
        - The CFB Kingston Yacht Club is found directly adjacent to the Arrowhead Park Beach swimming area (20 m), which can impact the level of contamination at the site. The high frequency of boats can lead to the dumping of chemicals into the water, such as spilled oil and fuel.

- Stormwater Runoff From:
    - Parking Lots:
        - There is one parking lot uphill from the bathing area which can impact the chemicals entering from stormwater runoff. The parking lot is used for the CFB Kingston Yacht Club, so multiple boats are also stored/stationed in the parking lot.
    - Parkland:
        - There is one main road uphill from the bathing area and the CFB Kingston Yacht Club, located to the right of the site, also has a significant amount of gray walkway space.
        - Arrowhead Park Beach has a significant amount of green space uphill from the swimming area. These spaces in the park could affect chemical contamination due to fertilizer and pesticide runoff. While it is not evident if

the City of Kingston uses them in this area, machines managing the park's grass have been noted on multiple occasions.

- Residential:
    - Multiple residents are located uphill and across from the shoreline, which could impact chemical contamination from stormwater runoff in the area. There is also a neighborhood located uphill and behind the bathing area along Queenston Heights Road which may influence the water quality during rain.
- Commercial:
    - The Kingston Military Family Resource Centre can be found uphill from the bathing area and may contribute to the chemical contamination in the area. The center includes multiple playgrounds, a large building, and a water splash pad.

Overall Risk from Chemical Hazards:

- Commercial/Industrial Discharges: **MEDIUM**
    - The Kingston Yacht Club and the Military Family Resource Centre around/uphill from Arrowhead Park Beach pose a medium risk of discharge and chemical contamination of the site. The dumping of chemicals from boating tools and equipment could be influential in this contamination. This is of additional concern due to the close proximity of the boats to the bathing area (20m). Additionally, discharge from the splash pad and the facilities inside of the resource center may also contribute to chemical contamination of the water and swimming areas.
        - Despite this, more data is needed to conclude the extent to which motorized boats and the resource center are able to circulate/discharge chemical contaminants at this site.

- Stormwater Runoff: **MEDIUM**
    - The combined impacts of green spaces, parkland, commercial buildings, parking lots, and residential neighborhoods/areas uphill from Arrowhead Park Beach contribute to a significant risk level for chemical contamination from runoff.
    - The park uphill from the beach is primarily made of green spaces, which could contain fertilizer and pesticides. The area appears to be actively maintained by the city/officials on the Fort Henry Military base (as landscaping machines have been noted), so the use of fertilizers and pesticides may be utilized. However, this cannot be considered an active chemical contamination hazard without confirmation of chemical use.
    - The parking lots for the Yacht Club and the Family Resource Centre are located uphill from the bathing and swimming areas, which can contribute to the runoff of chemicals into the water. Chemical contamination from cars and boats is of primary concern.

- Residence and commercial land use uphill from this beach also contribute to the risk level of stormwater runoff. The neighborhoods on the military base behind the swimming area and the houses on the opposite side of the bay can contribute to chemical contamination in the water. Both residential areas are located uphill from the site, making stormwater runoff more likely. Additionally, the Military Family Resource Centre's location may impact the water quality, particularly due to the chemicals used in the on-site splash pad (ex. chlorine).

3. Other Biological Hazards

Other Potential Biological Hazards

- Cyanobacterial Blooms
  - During visits to and assessments of Arrowhead Park Beach, no cyanobacterial blooms were detected in the swimming area or the broader zone of influence.

- Schistosomes (Swimmer's Itch)
  - As of June 2023, no cases of swimmer's itch have been reported at Arrowhead Park Beach.

- Aquatic Plants
  - Arrowhead Park Beach has a minimal amount of aquatic plants in the water and along the shoreline of the swimming area. Plants below the surface were not noted in significant amounts.

Overall Risk from Other Biological Hazards:

- Cyanobacterial Blooms: **LOW**
  - No cyanobacterial blooms were detected during any of the multiple visits to Arrowhead Park Beach.

- Schistosomes (Swimmer's Itch): **LOW**
  - No cases of swimmer's itch have been reported at Arrowhead Park Beach.

- Aquatic Plants: **LOW**
  - The overall risk of aquatic plants as a biological hazard at Arrowhead Park Beach can be considered low. However, the specific species of plants are unknown, so the overall biological risk level at Arrowhead Park Beach is unknown.

4. Physical Hazards and Aesthetic Considerations

Sources of Subsurface Physical Hazards

- Uneven and Slippery Bottom
    - Arrowhead Park Beach's subsurface is made of rocks and stones of varying sizes and stability from sampling sites A to C. Entry into the water during site visits and assessments has been done with caution to avoid slipping or falling due to shifting rocks and other surfaces. However, the area is generally safe and easy to access despite a few areas.
    - During June 2023 visits to Arrowhead, an increased presence of algae on the rocks that make up the water's subsurface was noted as also making the ground slippery.

Other Physical Hazards and Aesthetic Conditions

- Litter on the Beach and Floating Debris
    - Significant amounts of litter in and around the bathing and swimming areas were not noted during site visits. Some debris identified included: cigarette buds, plastic bags, and various clothing items.
    - There was an average amount of floating debris identified when conducting on site assessments during the 2023 monitoring season. Floating litter identified included: food wrappers, microplastics, and various items of clothing.

- Seaweed and Algae on Beach
    - There is an average amount of seaweed and algae located along the shoreline of the swimming area and on the subsurface bottom. This can impact the shoreline and subsurface traction, resulting in slipping and falling incidents at the site.

- Boats and Watercrafts Near the Bathing Area
    - The site is located next to the CFB Kingston Yacht Club, which leads to a high volume of boats and watercrafts in the area. However, there are clear markers in the water to indicate the proximity of boats to the bathing area, which can improve the risk level of watercrafts in the area.

Overall Risk from Physical Hazards:

- Uneven and Slippery Bottom: **LOW**
    - Arrowhead Park Beach's subsurface is not of a high risk level to visitors and the general public. Despite the uneven bottom, the clarity of the water allows for improved visibility of areas which appear to be significantly unstable or have a high algae content. However, there is still some risk when entering the swimming area, as the general lack of stability in some areas can affect visitors walking on the subsurface despite the clarity. As well, the beach is overall easy and safe to access, despite a few specific areas.

- Litter on the Beach and Floating Debris: **LOW**
    - As the amount of litter on the beach and floating in the swimming area is not significant, it does not pose a high risk level for the general public and other visitors. Debris is sparse across the site and no medical waste or sharp objects have been identified that can pose a hazard for visitor health and safety.

- Seaweed and Algae on Beach: **LOW**
    - Average seaweed and algae was identified along the shoreline and at the bottom of the water's surface, which has been noted as causing slipping. However, the water's clarity and the sparsity of the algae on the shoreline makes this hazard of low risk to the public.

- Boats and Watercrafts Near the Bathing Area: **LOW**
    - As there are clear indicators for boats and other watercrafts regarding their proximity to the shoreline and swimming areas, this hazard is of low risk for site visitors. However, docking areas are located within 50 m of sampling sites A-C, so interaction between swimmers/secondary water users and boats may occur.

Facilities and Provisions:

Facilities:

Toilets: No public washrooms available at this site.

Showers: No public showers available at this site.

Drinking Water Fountains: No public drinking water fountains available at this site.

Litter Bins: Three

Recycling Bins: No recycling bins available at this site.

Access for Persons with Disabilities: The beach is found at the bottom of a steep hill without paved pathways, making it challenging to be accessed by a person with disabilities.

Safety Provisions:

Lifeguard Station: None on this site.

Life Saving Equipment: No equipment at this site.

Emergency Telephone: No

First Aid Station: Yes, found within the Yacht Club building at the top of the hill.

Beach Postings/Suitability for Swimming: Yes

Emergency Contact Information: No

Other Information:

Reporting Mechanisms:

- Call the MOECC - Spills Action Centre
    - Public pollution reporting hotline - Toll-free: 1-866-MOETIPS (6638477). Available 24/7.
- City of Kingston: Spills and Environmental Incidents Reporting
    - 613-546-4291 ext. 1368 or 1249 (during normal operating hours)
- Swim Drink Fish - (416) 861-1237

Where to find the water quality results:

- Call Kingston Public Health: (613) 549-1232
- Swim Drink Fish - 416-861-1237

Contact Details for EHSS information:

- Taylor Villa (taylor@swimdrinkfish.ca)
- Olivia Rideout (olivia@swimdrinkfish.ca)

Recommendations:

Assessment of the adequacy of facilities and safety provisions

There are no safety provisions at Arrowhead Park Beach (ex. First aid station, lifeguard stations, safety ring, etc.). As well, the beach area is generally inaccessible to individuals who are not able-bodied. Updated safety provisions and facilities are strongly recommended, as Arrowhead Beach has a significant number of visitors who consistently enter the swimming area. An inclusion of some new safety provisions and facilities could reduce safety concerns for swimmers or secondary water users in the area. Furthermore, developing an accessible pathway from the parking area to the beach would be beneficial for improving the site's accessibility for all visitors.

Evaluation of signs and other materials for public communication

The beach does have a sign indicating the suitability for swimming in the area, however, additional signage is recommended for the park outlining emergency content information and reporting information about Industrial Spills/Discharge or Waterborne Disease Outbreaks.

Appendix

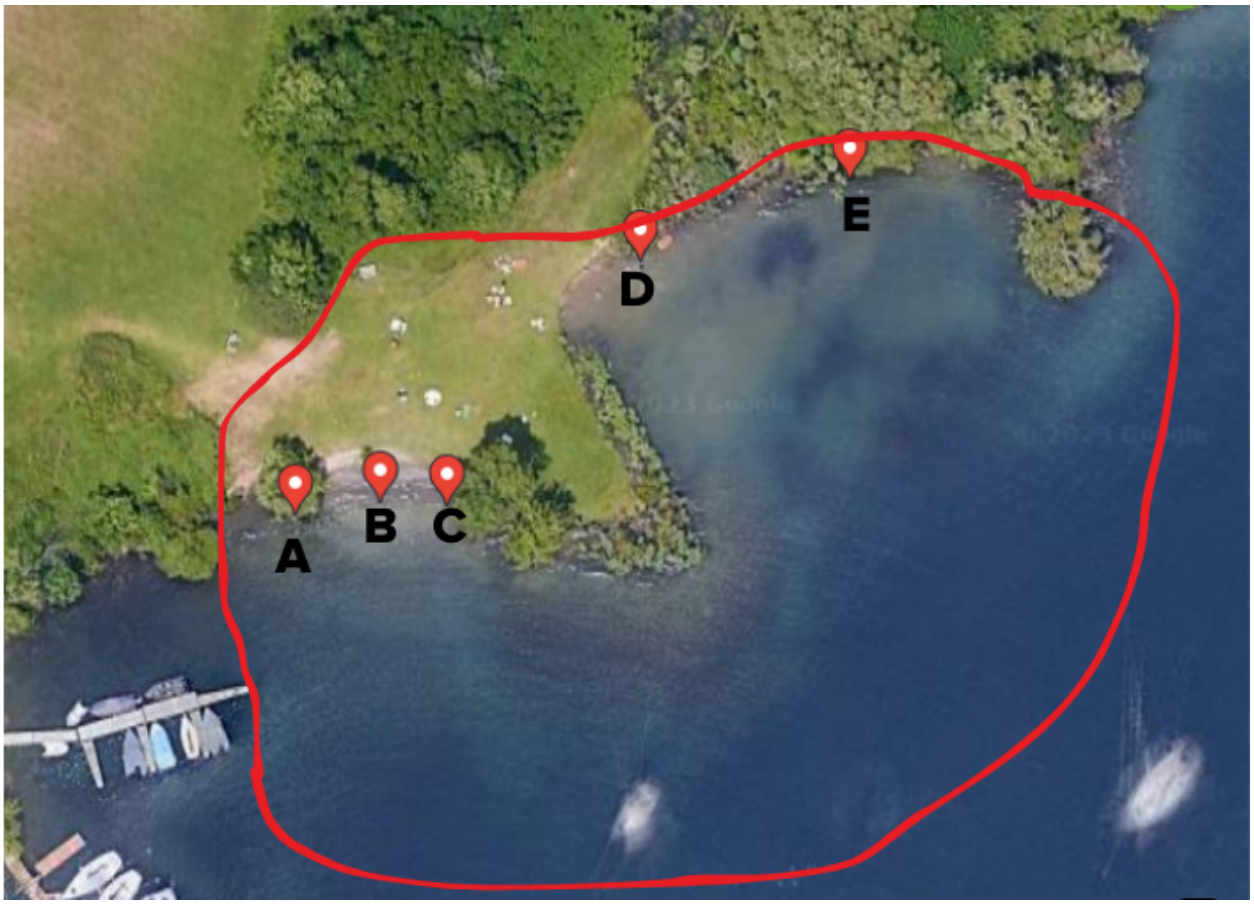

Figure 1. Arrowhead Park Beach monitoring sites A to E. The local zone of influence is indicated in the red outline.

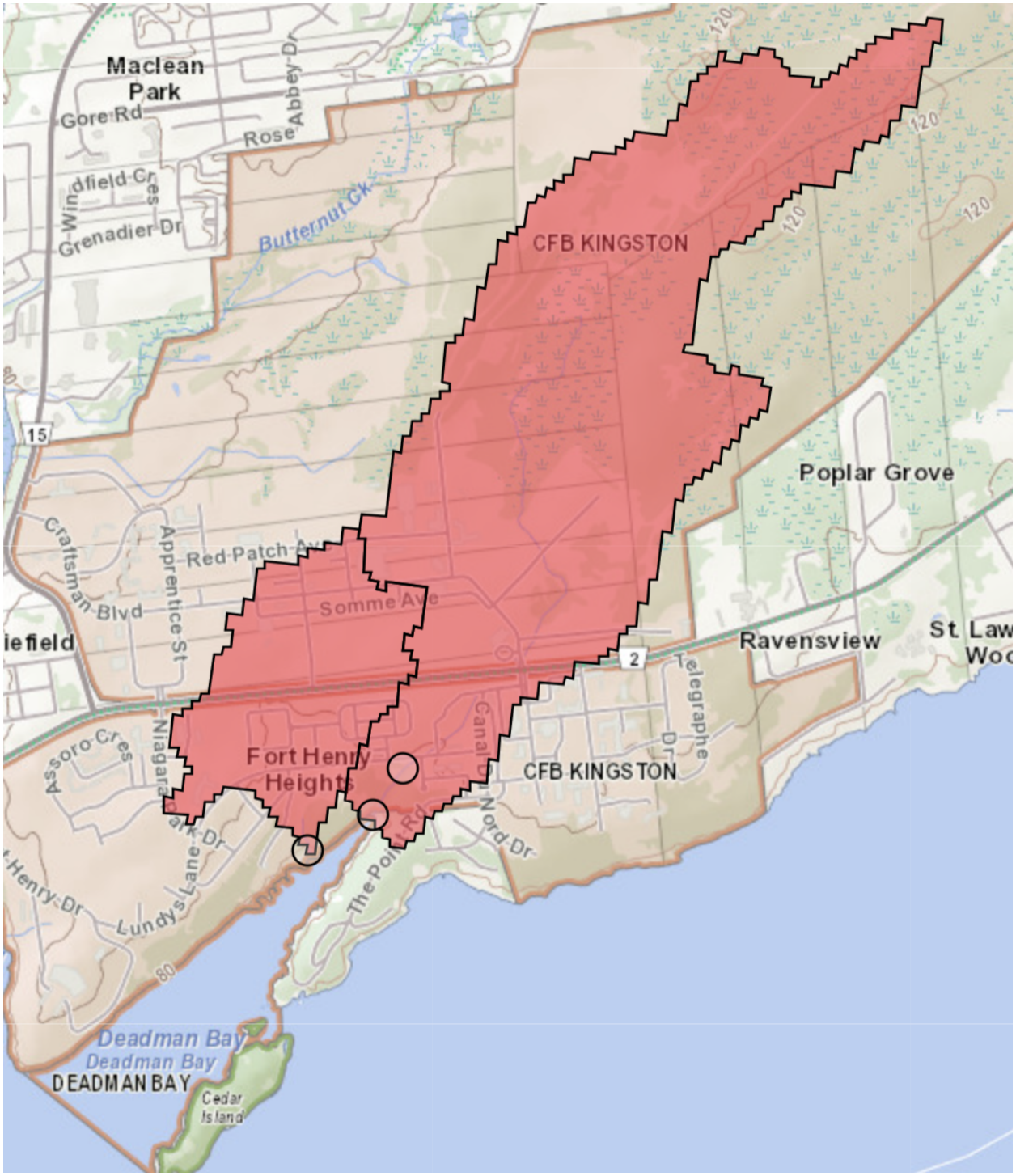

Figure 2. Map of watershed for Arrowhead Park Beach

Figure 3. The Yacht Club Clubhouse Dumpster located in the Northwest corner of the parking lot.

Figure 4. Kingston-Wolfe Island Ferry Route (route is indicated through the blue dotted line pathway) passing close to Deadman Bay, where Arrowhead Park Beach is located.

Figure 5. Arrowhead Park Beach located on the Northeast end of Deadman Bay where there is no flow back out into the river from the east side. There is a potential risk for contaminants to become entrapped in the Bay.

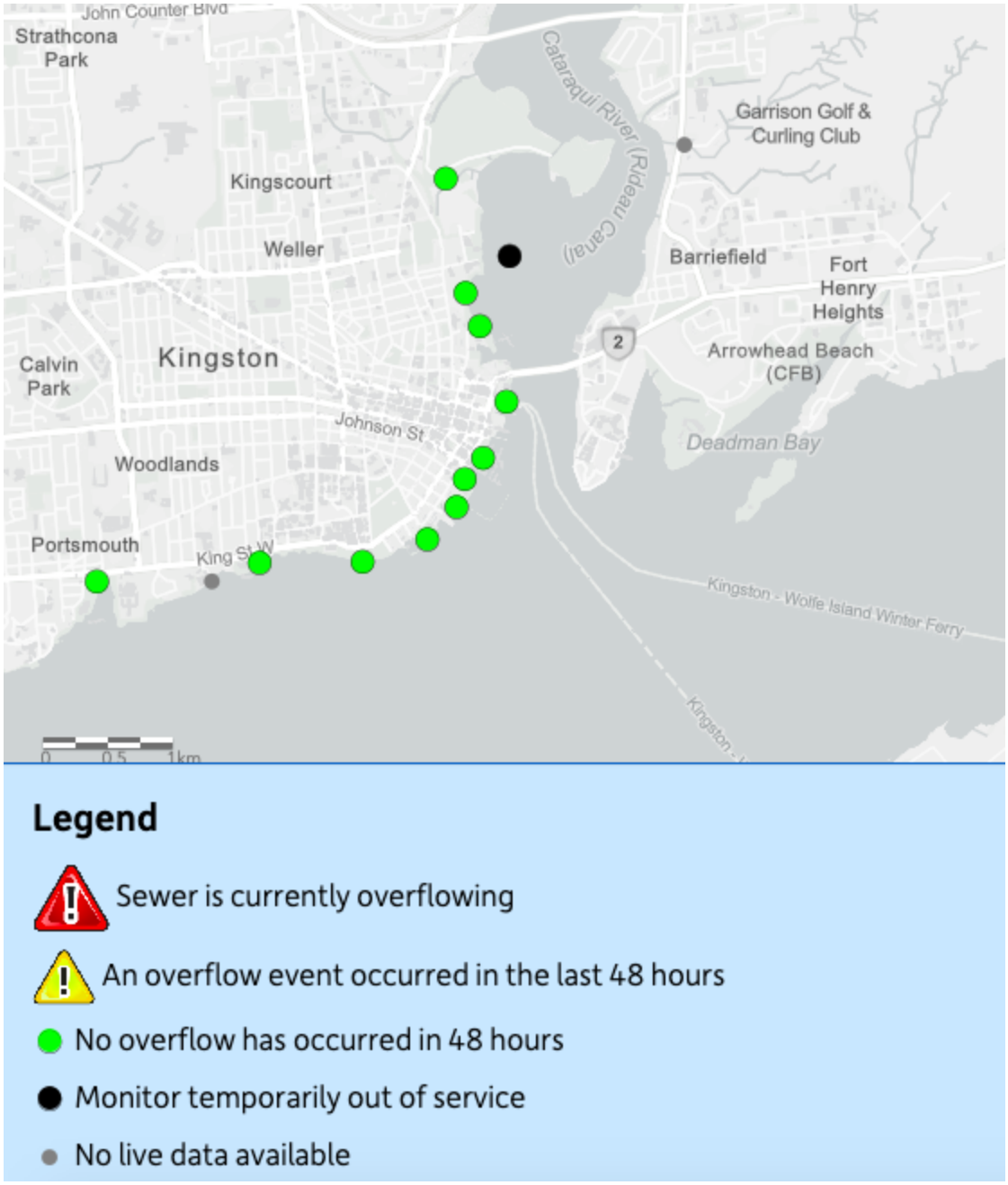

Figure 6. Map of combined sewer outfalls (CSOs) nearest to Arrowhead Park Beach. All CSOs are located on the west side of the Cataraqui River, a significant distance from the beach.