UPPER THAMES RIVER
CONSERVATION AUTHORITY

Upper Thames River Conservation Authority

Operational Plan for Fanshawe Dam

November 26, 2024

Table of Contents

Table of Figures

1. Purpose of Operational Plan

Ontario Regulation 686/21 requires that a Conservation Authority (CA) provide programs and services that support the operation, maintenance, repair, and decommissioning of the following types of infrastructure the CA owns or manages:

- Any water control infrastructure, the purpose of which is to mitigate risks to life and damage to property resulting from flooding or to assist in flow augmentation.
- Any erosion control infrastructure.

Programs and services provided shall include the development and implementation of an operational plan on or before December 31, 2024.

Some water control infrastructures in the Upper Thames River Conservation Authority (UTRCA) watershed are not owned by the CA but are managed through an agreement with the owner. These structures also require operational plans.

2. Purpose of Structure

2.1. Flood Control

Fanshawe Dam is just one of the series of eight dams recommended by the Upper Thames Valley Conservation Report (1952) as an essential component for complete flood control on the Thames River system. The primary purpose of Fanshawe Dam and Reservoir is to assist in flood control efforts to reduce flood damage in the City of London. Fanshawe Dam was constructed between 1950 and 1952, and cost $5M at the time, including land assemblage and the structure. Figure 1 shows the location of Fanshawe Dam and Reservoir on the North Thames River, and the reservoir drainage area.

During a flood, the dam can reduce downstream flows on the North Thames River through London by storing flow in the reservoir and releasing it later. The level of flow reduction can range from 10% to 50%, depending on the type and severity of the flood and when it occurs.

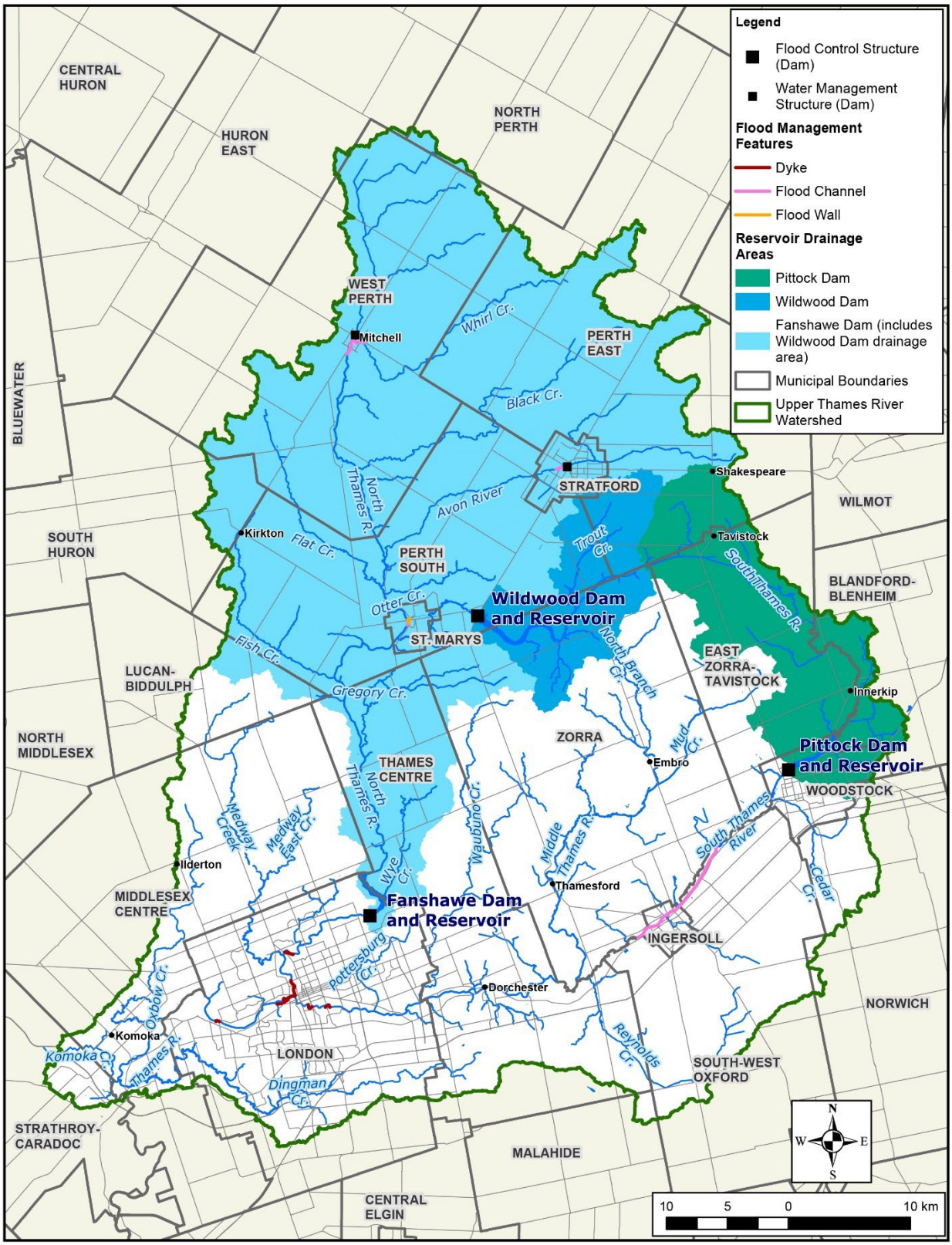

Figure 1. UTRCA water management structures and reservoir drainage areas

2.2. Recreational Use

When the Upper Thames Valley Conservation Report (1952) was released, it made several recommendations about various forms of recreation in the UTRCA watershed, including:

- Beaches and pools for swimming,
- Boating and fishing areas,
- Individual picnic sites and group picnic grounds in parks,
- Individual and group camping areas,
- Trails for riding, hiking, and nature study.

The construction of Fanshawe Reservoir included acquisition of the surrounding lands comprising the Fanshawe Conservation Area (FCA), which over the years has provided all the above recreational opportunities. Services managed by the FCA staff include short term and seasonal camping, day use areas, and trails. In addition to these services, there are also seasonal land leases with private individuals, and lands leased for other recreation.

2.3. Hydro-electric Generation

In 1984, a small hydro-electric generator was added to Fanshawe Dam. A penstock was added to one of the previous 60-inch valves to direct the flow through a turbine to generate 500 MW of electricity, with appropriate flow and reservoir water level. This generator is operated as a run of the river generation facility without significantly impacting the levels or flows through the reservoir. Its operation is guided by a Water Management Plan.

3. Level of Service

Level of Service (LOS) refers to the ability of an asset or its components to perform the role for which it was designed and to the level or quantity of use for which it was intended. Because of the importance of Fanshawe Dam in continuing to reduce the risk of flooding along the North Thames River in the City of London, the LOS would be high. The amount of attention to and funding for operation and maintenance must reflect the importance of this asset.

LOS will be further considered through Asset Management Planning, and this section will be updated to reflect that ongoing work.

3.1. Service Life

A concrete/earthen embankment dam, such as Fanshawe Dam, should last at least 100 years, with proper inspection and maintenance. The lifespan of hydromechanical steel structures, electromechanical equipment, and control units is shorter than that of the main civil/structural components and are specified by the suppliers, who also provide instruction manuals describing operation and maintenance. Continued routine and

preventative maintenance and the timely replacement of equipment will allow the dam to continue to meet its expected level of service and extend the structure's service life considerably.

4. Stakeholders and Beneficiaries

When operating dams, it is important to understand those who are impacted by the operations. Stakeholders of Fanshawe Dam are discussed below based on the type of benefits they receive from the operation of the dam.

Funding for the operation and maintenance of Fanshawe Dam is levied to the municipalities which shared in the funding of the local share of the dam. The City of London has annexed all the land adjacent to the river downstream of the dam and, as such, the City is the sole beneficiary of the dam’s flood control benefits. London funds the local share of the operation and maintenance of the dam through levy paid to the UTRCA.

From a flood control perspective, the City of London, its residents and business owners whose flood risks are reduced through the operation of the dam, all benefit from Fanshawe Dam. Fanshawe Dam controls only 47% of the drainage area of the Thames River to the Forks of the Thames; therefore, the dam’s flood risk reduction downstream of the Forks is lessened.

Fanshawe Conservation Area (FCA) was established around the reservoir to take advantage of the large waterbody created by the dam. The conservation area provides recreational opportunities for camping, boating, fishing, hiking, cycling, and other day use activities. Land lease and other lease holders also benefit from the reservoir. FCA is a recreational destination and provides social and economic benefits to the surrounding area.

4.1. Communication with Stakeholders

Communications with stakeholders are important to the operation of the dam. Conservation area and property staff have established relationships with the various user groups around the reservoir and can efficiently distribute messages to these stakeholders. As such, it is important that these staff are kept up to date on any significant variation from typical operating conditions, such as unseasonably high or low water levels in the reservoir.

UTRCA flood control staff undertake flood time communications directly with municipal flood coordinators. In the event of a major flood where significant gate operations are necessary at Fanshawe Dam, communications with the City of London are through their municipal flood coordinator, consistent with the UTRCA Flood Contingency Plan.

5. Operations

5.1. Physical Characteristics

Fanshawe Dam controls runoff from 1420 km^2 of upstream drainage area, with a normal summer surface area of 260 ha, and a maximum surface area of 650 ha. Fanshawe is controlled by six vertical sluice gates, each measuring 30’ x 30’, as well as one 60-inch low flow control valve, and one 60-inch penstock to a small hydro-electric power generation facility downstream of the stilling basin.

Fanshawe Reservoir was designed as a run-of-river dam, meaning it is usually at its normal level of near 0.0 m relative (262.13 metres above sea level, masl, 860 feet above sea level, fasl), unless storage is required to reduce flooding. With the gates open, water freely discharges over the sill. As inflow increases, the water level rises, increasing discharge over the sill until the level reaches the gates. Once the water level rises sufficiently, the gates may be operated to control discharge downstream. The maximum operating level of Fanshawe Reservoir is 9.14 m (271.27 masl, 890 fasl).

The maximum discharge capacity of the Fanshawe Dam is calculated as 2600 m^3/s. This is sufficient to safely pass the probable maximum flood (PMF) safely through the dam.

The storage characteristics of Fanshawe Dam are illustrated in Figure 2. The green line represents storage in terms of hectare metres as a unit of volume (1 ha-m = 10000 m^3). The blue line shows the same information in terms of runoff storage in mm from the entire upstream drainage area of 1420 km^2. Both storage units are presented relative to the sill of the dam, which is the 0 m reference elevation.

The reservoir may be drawn down below the sill for maintenance purposes by using the valve and/or hydro-electric plant.

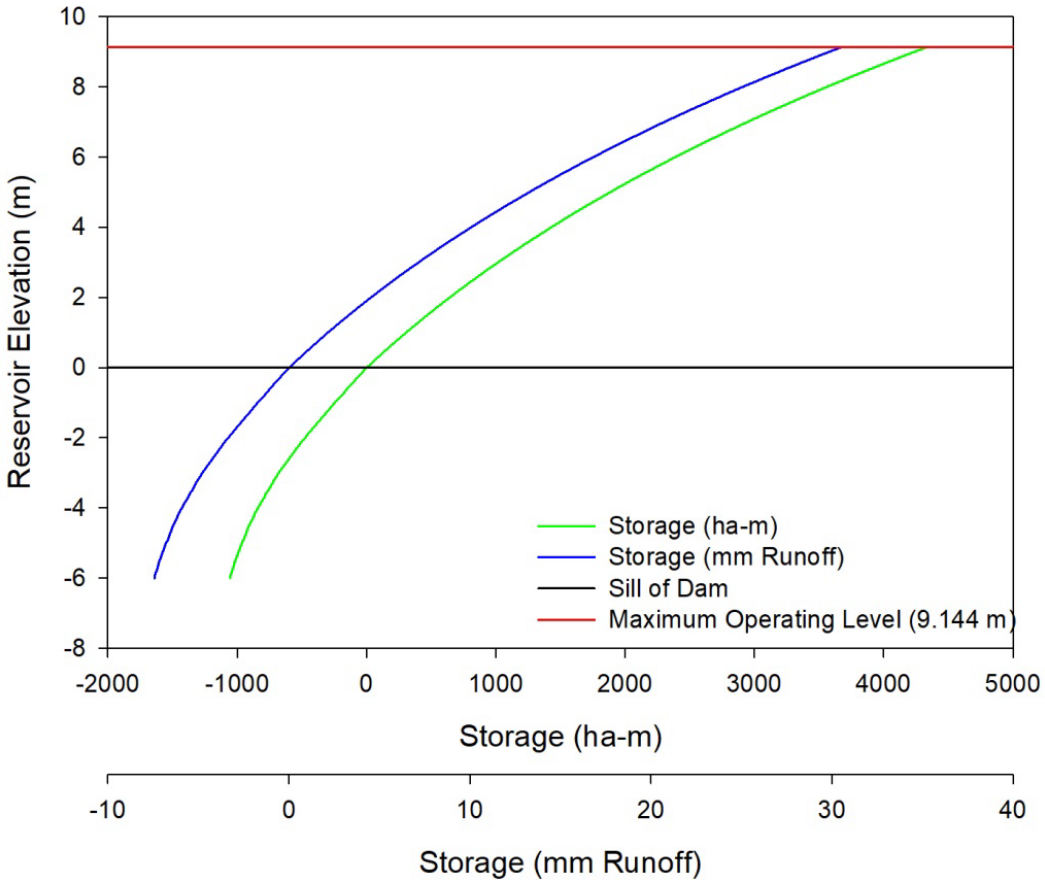

Figure 2. Fanshawe Reservoir storage characteristics

Reservoir operation guidelines are shown in Figure 3. Note that these guides are dictated by recreational and hydro-electric plant operation constraints and are disregarded in the event of flood control requirements. Notification of stakeholders is especially important when levels are forecast to rise above seasonal recreational constraints. The high constraints in the winter reflect when the hydro-electric plant may need to be closed down due to the head in the reservoir.

In this sense, this operating curve is less restrictive than typical flow augmentation operation guideline curves as the curves do not reflect flood control considerations. The graph does, however, provide a quick graphical reference to the seasonal variation of recreational constraints.

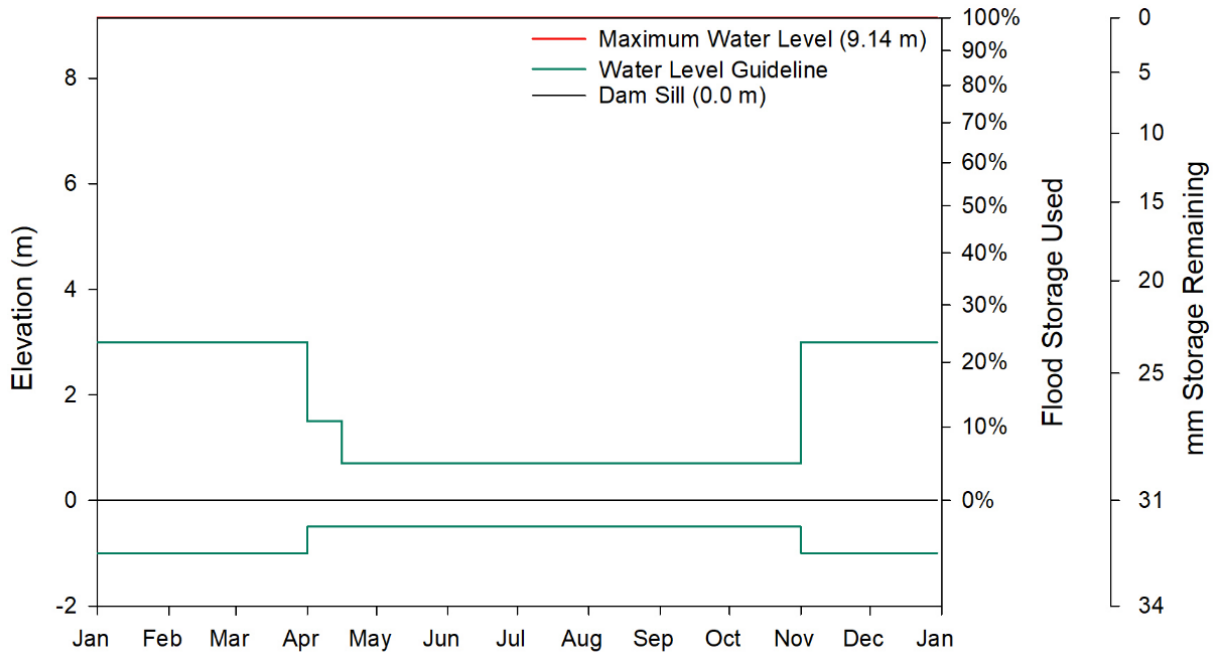

Figure 3. Fanshawe Dam operation guidelines

5.2. Flood Routing

When Fanshawe Dam was first commissioned in 1953, a set of instructions was provided on routing floods through the reservoir. Two separate routing schedules were provided, based on whether the flooding was rainfall or snowmelt based. For rainfall events there were two schedules, one for minor floods (less than 2" runoff, rainfall less than 2"-3" in 12 hours), and one for moderate (2"-4" runoff, 3"-6" rain in 24 hours or less). For snow melt events, there are also two schedules. When Fanshawe Reservoir is at its normal operating level, it retains about 30 mm of runoff storage. Fanshawe is capable of reducing downstream flooding by 10%-50%, depending on the magnitude of the event and whether it is the result of rainfall or snowmelt.

5.3. Downstream Constraints

The original Fanshawe Dam design specified the downstream channel capacity at 13000 ft^3/sec (370 m^3/sec), which in practice has proved reasonable, with minor flooding, road closures at Windermere Road and Adelaide Street, and some property damage beginning above this threshold.

A real-time hydrometric gauge, called North Thames River near Thorndale (02GD015), is located upstream. This gauge is operated by the Water Survey of Canada (WSC) with assistance from UTRCA under agreement. This gauge began recording data and estimating discharges in 1953. Note the UTRCA often refers to this station by a different nearby community, Plover Mills. The Thorndale station has an upstream drainage area of 1320 km^2 which represents 93% of the drainage area into the reservoir and provides an excellent source of reservoir inflows and timing.

6. Routine Maintenance

Routine inspection and maintenance are important to ensure the flood control structures are able to meet their purposes. Inspection and maintenance are guided by the structure's Operation, Maintenance and Surveillance Manual (OMS Manual). This manual identifies:

- Weekly inspections – carried out by maintenance mechanics, include a visual inspection of the buildings and equipment, verification of the operation of the discharge facilities (gates, valves) to the extent possible.
- Monthly inspections – generally carried out by the maintenance mechanics.
- Annual inspections – generally undertaken by engineering staff and maintenance mechanics, include a more thorough visual inspection of the dam embankment, buildings, and equipment, and testing the operation of equipment.

These inspections are in addition to routine health and safety inspections undertaken by the Joint Health and Safety Committee. Dam Safety reviews and external inspections are also carried out approximately every 10 years.

7. Emergency Planning

As part of the UTRCA's Dam Safety Program, Emergency Preparedness Plans (EPP) and Emergency Response Plans (ERP) are being developed. The response to dam emergencies that may require communication with watershed residents relies on the Flood Contingency Plan, which uses flood bulletins to communicate conditions to municipal flood coordinators, who implement municipal Emergency Plans. Recent municipal and joint agency tests of emergency plans have involved dam emergencies.

8. Roles and Responsibilities

Operations are directed by senior engineers based on the general principles described in this document. Careful consideration of the watershed conditions and forecasts requires the careful application of engineering judgement. Operations are undertaken by trained operators which include parks staff, maintenance mechanics, and other trained water and erosion control structure staff.

Routine maintenance is undertaken by dam maintenance mechanics and contractors, where necessary.