

Grand River Conservation Authority

Report number: GM-04-23-33

Date: April 28, 2023

To: Members of the Grand River Conservation Authority

Subject: Current Watershed Conditions as of April 15, 2023

Recommendation:

THAT Report Number GM-04-23-33 – Current Watershed Conditions as of April 15, 2023 be received as information.

Summary:

March was a wet and slightly warmer than usual month. The month started with temperature swings and two major snow storms which reformed the lost snowpack to conditions that were near or above the long-term average in most parts of the watershed. Warmer temperatures were observed during mid to late March into April.

Two major snow storms in early March and warm temperatures and rainfall observed in the second half of March and early April resulted in a widespread snowmelt and runoff across the watershed in early April. The available storage in reservoirs was used to mitigate the impact from snowmelt and rainfall generated runoff. On Friday March 31, and Saturday April 1, a combination of 30 to 60 millimeters of rainfall and snowmelt resulted in minor flooding for low-lying areas in communities of Drayton, West Montrose, New Hamburg and Ayr.

With respect to low water conditions, the short-term and mid-term precipitation patterns have recovered when compared to long-term normal, however, review of the groundwater conditions indicates that groundwater levels have yet to recover and still remain low. As such, the watershed is still in a Level 1 Low Water Condition.

Lake Erie continues to be above the long-term average, but below the levels in 2022. Lake Erie is mostly free of ice.

The long-term forecast over the next three months is for near normal temperatures and slightly above normal precipitation.

Report:

Precipitation

March precipitation was above normal, mostly in the form of snowfall. A significant winter snow storm occurred on March 3 resulting in 20 to 30 centimeters of snowfall across the watershed and another winter storm brought heavy snow on March 10th. The snow survey conducted on March 15th, showed that many of the northern parts of the watershed had a snowpack slightly above or close to the long term average, while the other parts of the watershed had a relatively higher snowpack. Average depth of snow above the large dams ranged between 25 to 35 centimeters by mid-March. By the end of the month, the upper portion of the watershed, specifically areas upstream of Shand Dam, still had a significant snowpack.

Precipitation over the first two weeks of April has been well above normal for the first half of the month, as shown in Table 1. A strong low-pressure system moved into the region on early hours of Friday, March 31, 2023, which resulted in 30 to 50 millimeters of rain throughout the Grand River watershed. Thunderstorms overnight resulted in periods of intense rainfall. The watershed

received an additional 10 to 20 millimeters of rain through the day on Saturday. In addition to the rainfall, increased temperatures during this period resulted in a watershed wide snowmelt, which consequently contributed to the loss of snowpack in most areas of the watershed. Runoff associated with this event resulted in minor flooding in several communities across the watershed, including West Montrose, Drayton, New Hamburg and Ayr. Water levels in these communities reached to level 1 warning zone. Some low-lying areas in the lower part of the watershed also experienced minor flooding.

Trends in precipitation, Table 2, show that over the short term, the watershed is showing signs of recovery from dry conditions in 2022. Over the long term, the precipitation levels appear to be closer to normal averages; however, they are still slightly below the long term average values, specifically for 12 to 18 month periods. In other words, the watershed is still in a precipitation deficit. In particular, over the past 12 months the watershed has averaged only 83 percent of normal precipitation. A prolonged period of at or above normal precipitation is needed for the watershed to recover from the extended dry period in 2022. A visual representation of these trends for the Shand climate station is also provided in Figure 1.

Table 1: Current monthly precipitation for climate stations across the watershed up to April 15, 2023 including the long term average precipitation for half of April.

Climate Station	Current Month Precipitation (millimeters)	Long Term Average Precipitation (millimeters)	Percentage of Long Term Average (%)
Shand	47.7	38.9	123%
Conestogo	55.2	39.7	139%
Guelph	55.2	37.7	146%
Luther	59.0	39.0	151%
Woolwich	51.6	32.7	158%
Laurel	66.2	39.4	168%
Shades	66.9	39.2	171%
Brantford	62.6	33.1	189%

Table 2: Precipitation trends as a percentage (%) of the long-term average over the last 18 months

Climate Station	Last Month	Last 3 Months	Last 6 Months	Last 12 Months	Last 18 Months
Shand	159%	132%	99%	86%	94%
Conestogo	146%	116%	93%	90%	92%
Guelph	148%	127%	97%	84%	93%
Luther	133%	129%	110%	91%	97%
Woolwich	152%	115%	93%	83%	87%
Laurel	137%	117%	90%	73%	83%
Shades	138%	108%	91%	73%	85%
Brantford	211%	167%	106%	88%	98%

Air Temperatures

March was a relatively normal month. The average temperature during the month was approximately 0.6 degrees above the long-term average. At the Shand Dam climate station, daily temperatures ranged between -7 to 3 C with an average daily temperature of -1.6 C.

The first half of April was significantly warmer than March with temperatures peaking to mid to high 20s in parts of the watershed. The average temperatures at the Shand Dam climate station over the first two weeks of April was negative 7.2 degrees. This is approximately 3.9 degrees above the long-term average for the first half of April.

A visual representation of these trends for the Shand climate station is provided in Figure 2.

Lake Erie Water Levels

During March, the average lake level was approximately 0.33 meters above the long-term average. Levels remained elevated during the first half of April and are approximately 0.44 meters above the long-term average. The forecast for Lake Erie is for lake levels to continue to increase over the spring months following regular seasonal patterns. Lake Erie is currently not ice covered and is anticipated to remain ice free. Figure 3 shows the range of water levels that is expected over the next six months as well as the observed water levels over the last three years.

Reservoir Conditions

Runoff from the rainfall and snow melt events in late March and early April has been routed through the reservoirs. With the snowmelt at the end of March and runoff generated by rainfall events on April 1, the Shand, Conestogo and Guelph reservoirs were filled to their normal spring operational targets.

Reservoirs will be used to manage flows during spring rain events over the next couple of months. The amount of flood storage available will be balanced with the amount of runoff expected from precipitation. Year to date reservoir levels and operating rule curves are shown in Figures 4 and 5 for the four largest reservoirs.

Groundwater Resources

Groundwater levels in the Provincial Groundwater Monitoring Network and Grand River Conservation Authority monitoring wells across the watershed were analyzed to the end of March 2023, as shown in Figure 6.

Groundwater levels in these networks began reaching all time lows in November 2022 in response to drought conditions experienced throughout most of 2022. Through the winter months of 2023, precipitation was close to the long-term normal range, however groundwater levels still remain impacted by the drought of 2022 into March of 2023. If groundwater levels do not return to approximately their seasonal spring levels as seen in previous years (ie from further lack of precipitation/recharge), the amount of baseflow available to streams may be reduced throughout the summer/fall seasons which in turn can affect flows and stream temperatures.

Long Range Forecast

Environment and Climate Change Canada is forecasting near normal temperatures and slightly above normal precipitation over the next 3 months.

Flood Preparedness and Flood Centre Activities

A watershed Condition Statement was issued on March 24th to notify the watershed residents of potential impacts of the low-pressure system moving through the watershed on March 25th. This event resulted in no flooding and available storage in reservoirs was used to mitigate the resultant runoff. Warm temperatures and 30 to 60 millimeters of rainfall at the end of March and beginning of April resulted in minor flooding in low-lying areas of the watershed including communities of Above Drayton, West Montrose, New Hamburg and Ayr. In Addition, a minor

Lake Erie surge was observed on April 1. A total of 6 messages and a High Lake Erie flood warning message were issued during this event. Details of these events have been provided in a separate report.

Reservoir conditions are being monitored closely and staff continue to hold weekly meetings as part of planning initiatives, dam operations and flood emergency preparedness. Training sessions on the flood program and emergency management are underway for new staff and for staff in new roles.

Financial Implications:

Not applicable

Other Department Considerations:

Not applicable

Prepared by:

Vahid Taleban, M.Sc., P. Eng.
Senior Engineer-Flood Management

Approved by:

Samantha Lawson
Chief Administrative Officer

Figures:

Figure 1: Shand Dam Monthly Precipitation 2019 to April 15, 2023

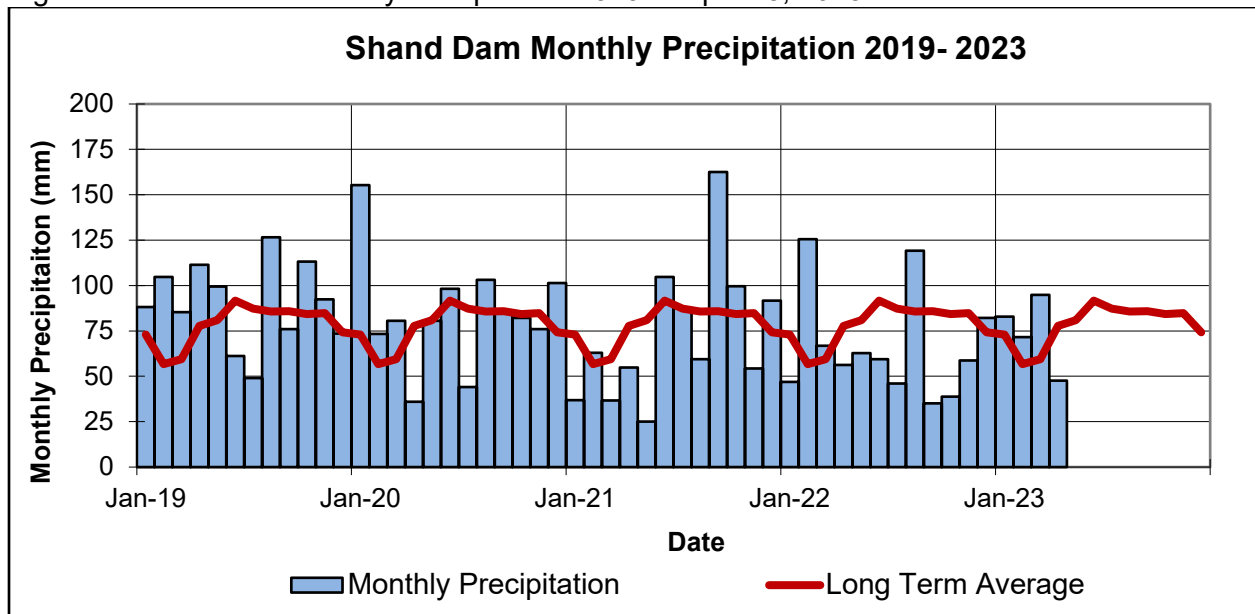


Figure 2: Monthly Average Air Temperatures at Shand Dam from 2019 to April 15, 2023

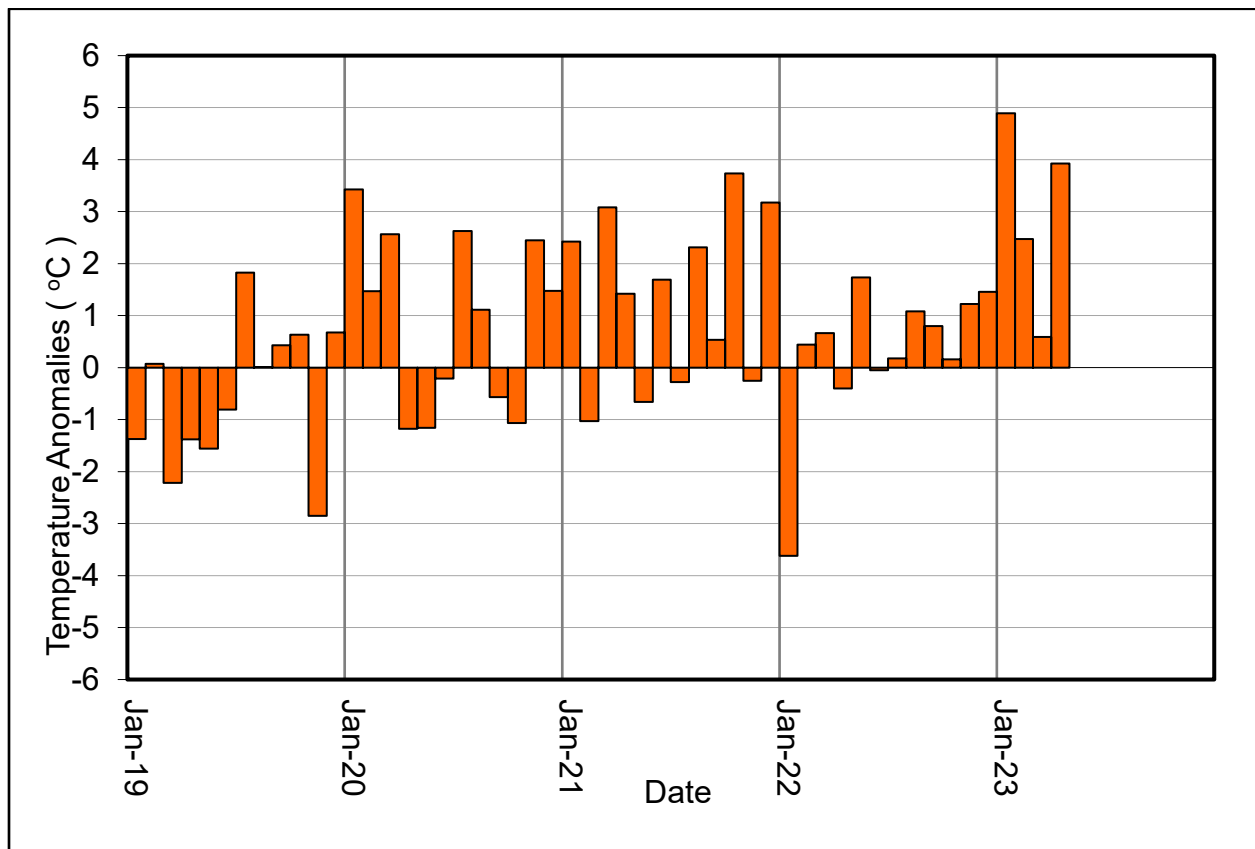


Figure 3: Water levels for Lake Erie at Port Colborne

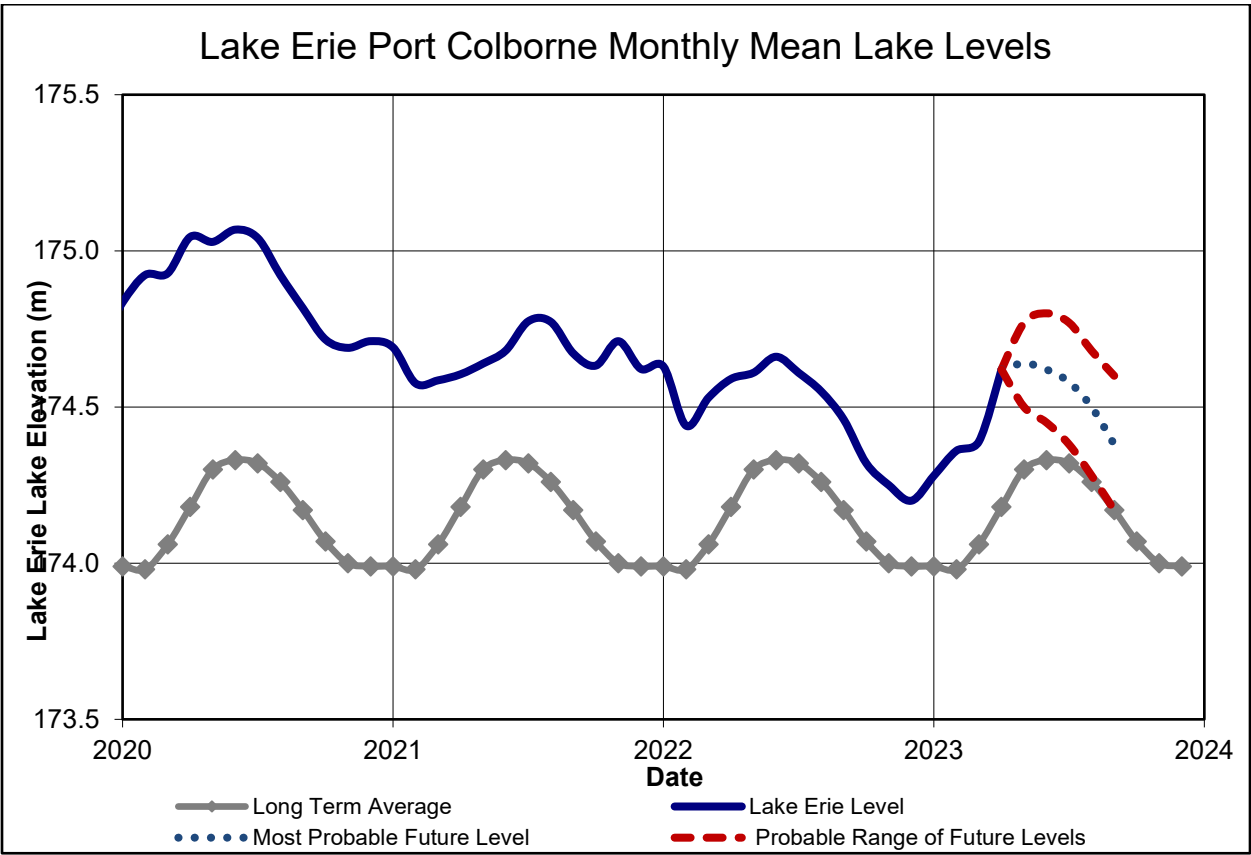


Figure 4: Shand and Conestogo Reservoir Elevation Plots for 2023

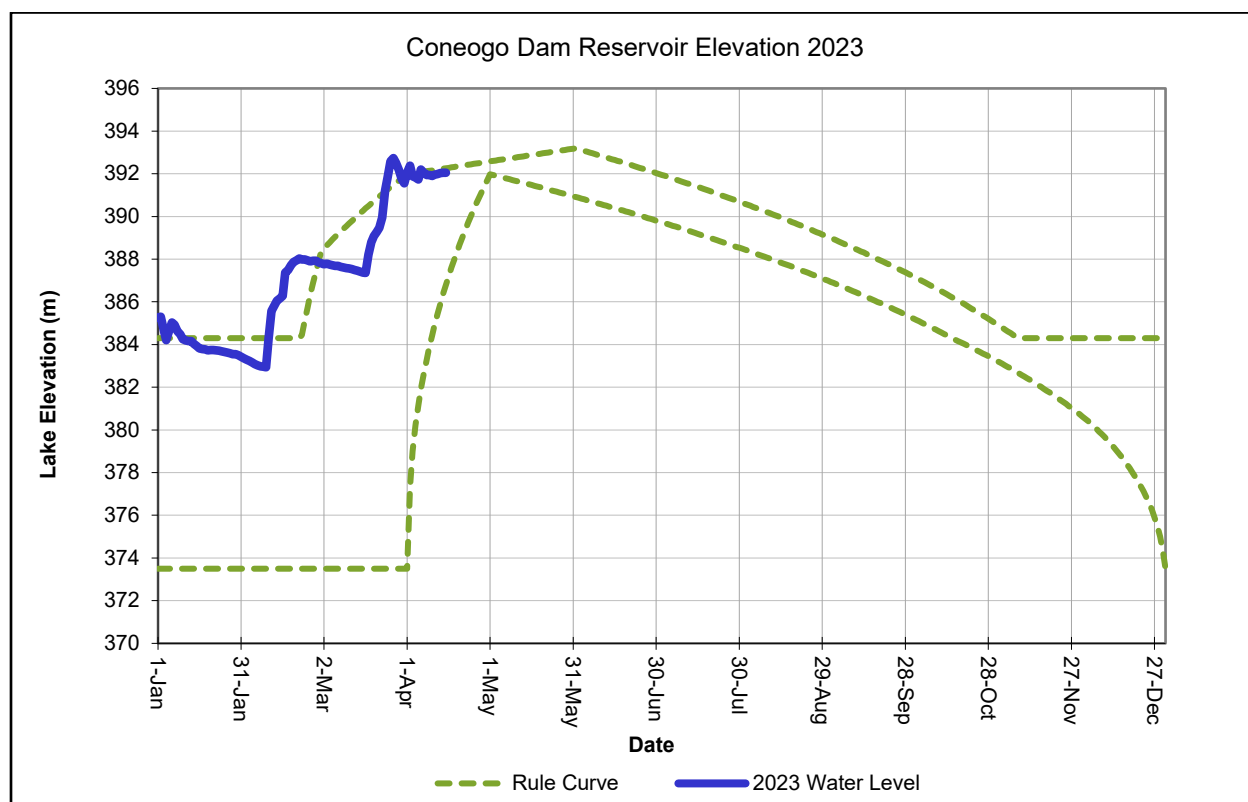
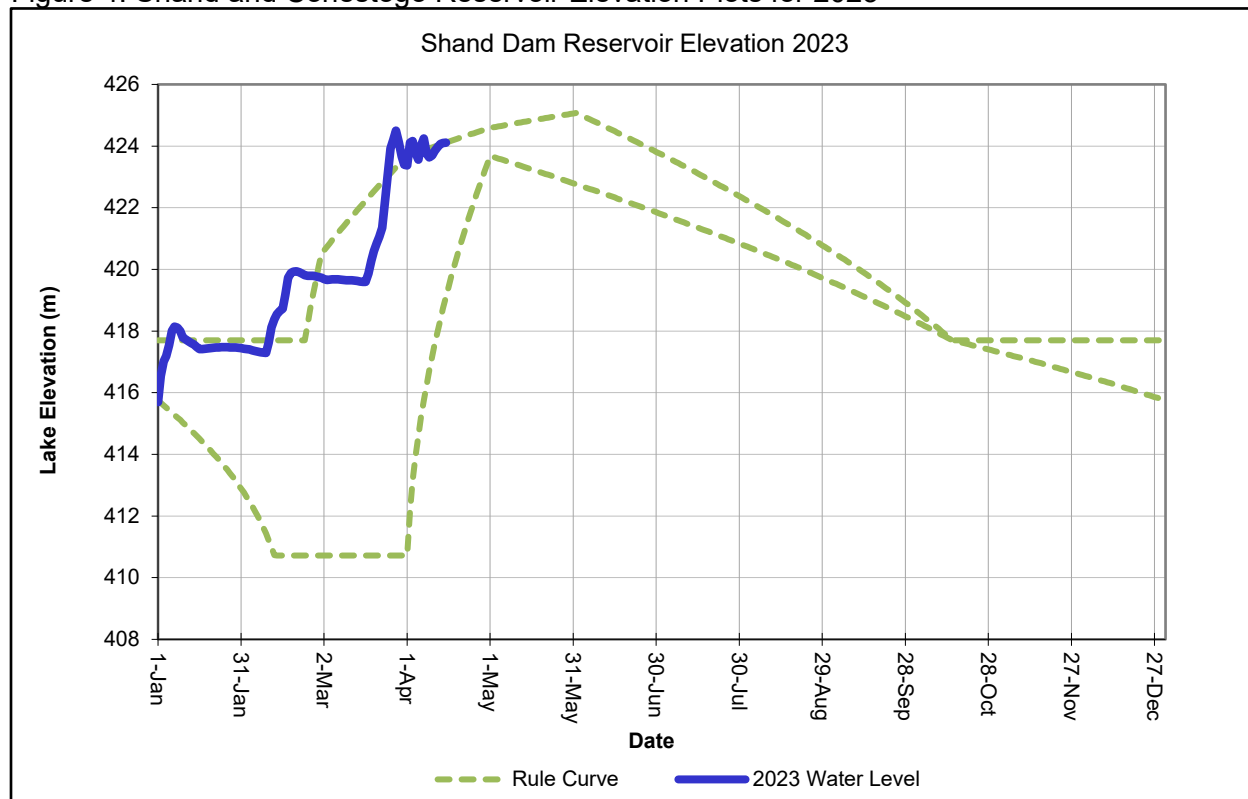


Figure 5: Guelph and Luther Reservoir Elevation Charts for 2023

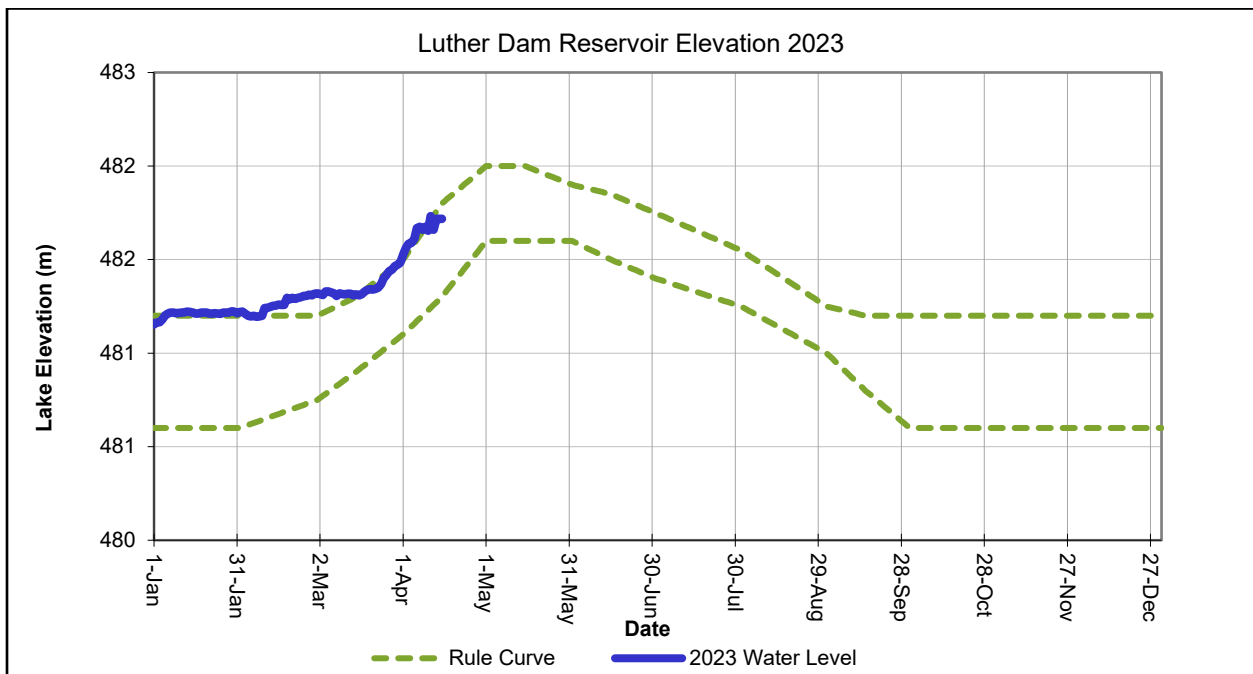
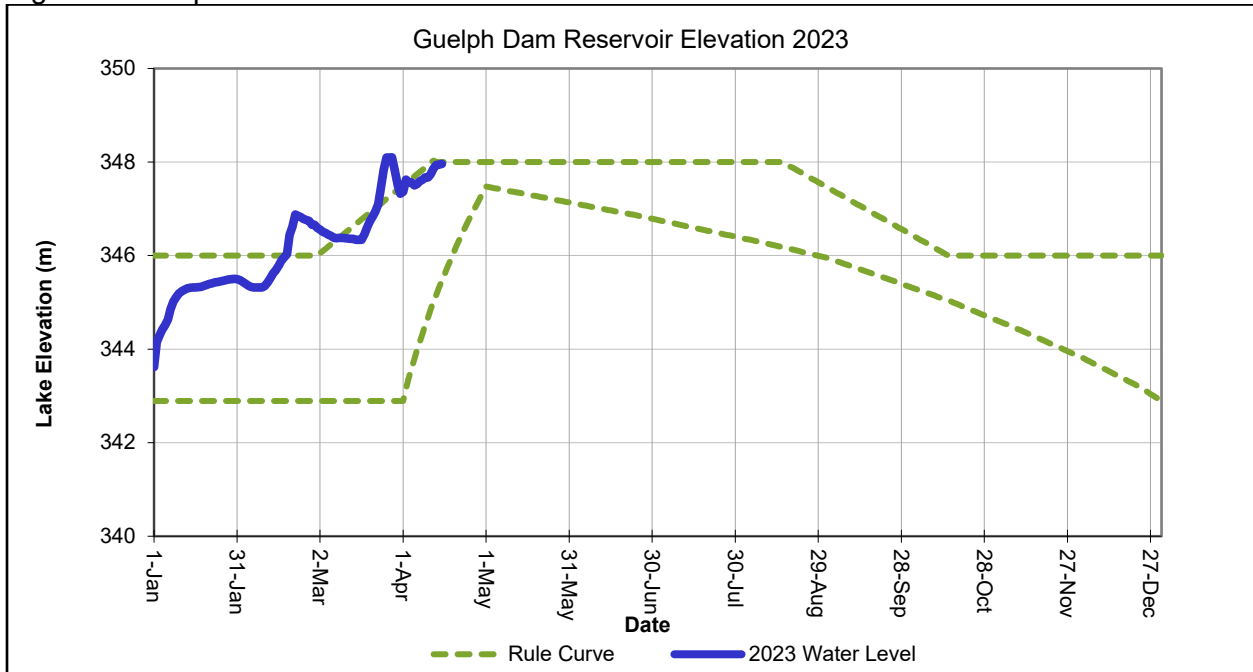


Figure 6: Groundwater Level Conditions by the End of March 2023

