Guide to Surface Water Quality Data and Online Tools

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Table of Contents Water Quality Data (WQD) Portal

Background

EPA, and its partners, monitor surface water quality in waterbodies across the province. The Water Quality Data Portal (WQDP) (https://environment.extranet.gov.ab.ca/apps/WaterQuality/dataportal/) provides tools that can inform data requests, and support the search, view and download of data.

The data available on the WQDP are:

- **Sample Class 'A'** data, collected by EPA staff, or partners trained and audited by EPA staff. Authentication of the data for samples collected since 1996 is in accordance with EPA's verification/validation process.
- **Agency Code '211'** samples, collected by or for EPA's Surface Water Monitoring group.

For information on EPA's SWQ Monitoring Programs:

- https://open.alberta.ca/publications/ambient-aquatic-ecosystem-health-mer-plan-alberta-lakes-and-reservoirs
- https://open.alberta.ca/publications/9781460141366
- https://www.alberta.ca/albertas-environmental-science-program.aspx

Disclaimer

The data have been subjected to a verification and validation process; however, occasional errors or anomalies may occur. When comparing water quality samples collected over time, be aware of changes and improvements to field sampling, measurement qualifiers, and analytical laboratory methods (for example, improved method detection limits).

Contact:

swq.requests@gov.ab.ca

- For further information or additional data unavailable online
- If anomalies are discovered in the dataset

EPA.WQDPinfo@gov.ab.ca

When encountering technical issues while accessing or using the WQD Portal

WQDP Station Searches

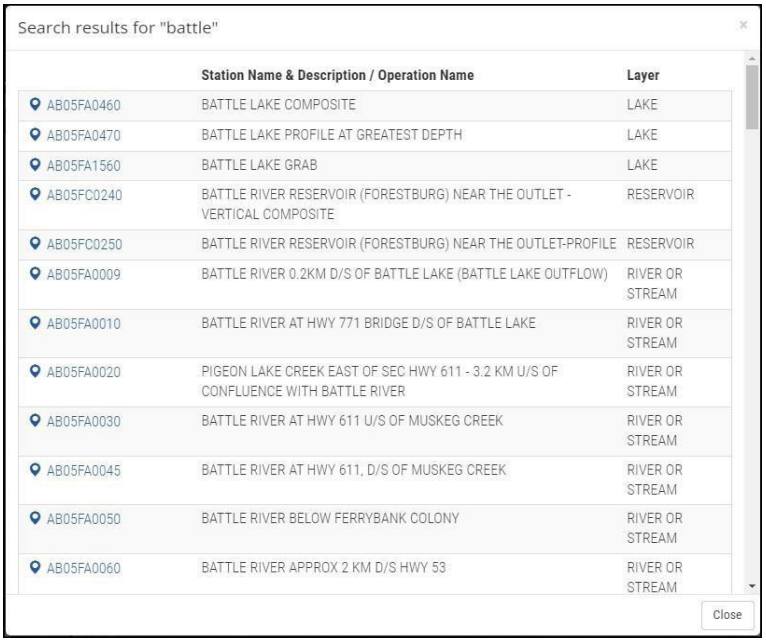
The River or Stream, Lake or Reservoir, and 'Other' layers display stations for which station inventory and measurement data are available for download.

Note: The 'Other' layers consist of less commonly monitored station types (e.g., irrigation canals, snow stations, wetlands).

Turning on the administrative boundaries can be helpful in narrowing down stations of interest (e.g., Alberta Sub Basins, Watersheds).

The search field (red highlight below) is case-insensitive and supports searches for full or partial station codes or names.

A search for 'battle' returns the following results. Selection for map display is limited to one choice.



Selecting a station code on the map opens a bubble. A station may have more than one station code assigned to it.

In this case there are two station codes for Battle Lake, indicating profile and composite sampling.

Reporting Tools

Station Inventory

A summary of sample locations and associated metadata, including:

- latitude and longitude
- sample matrix (for example, water, sediment)
- sample count (approximate number of samples) by decade
- water quality variable categories (for example, routine ions, nutrients, metals)

Note*: Sample counts* (decadal) are based on water quality variables indicative of each category/group and are approximate.

Data Download

A comprehensive set of variables for view or download, in a one measurement per row (long) or pivoted (wide) format.

Long Term River and Tributary Monitoring Station Data

The Long-Term River Network (LTRN) is a well-established core provincial monitoring program for Alberta's major rivers, several of which cross interprovincial and international boundaries. The Network consists of over 30 stations located along 13 river systems. In addition to monthly samples (identified by project codes with the format ABS*34) the LTRN data set also includes samples that have been collected at these stations outside of the regular LTRN monitoring program.

The Tributary Monitoring Network (TMN) is a core program of water quality monitoring stations located on more than 70 tributaries that contribute water to many of Alberta's major rivers. In addition to monthly samples, the TMN data set also includes samples that have been collected at these stations outside of the regular TMN monitoring program. See the guidelines document for a list of TMN project codes.

For further information about the LTRN and TMN monitoring programs:

https://open.alberta.ca/publications/9781460141366

Lake/Reservoir Station Data

Data collection from approximately 30 lakes and reservoirs occurs annually. Data are available in two forms: raw water quality data and summary format of lake condition (table or graph).

For further information about the lake monitoring program:

https://open.alberta.ca/publications/ambient-aquatic-ecosystem-health-mer-plan-alberta-lakes-and-reservoirs

Raw Water Quality Data

The lake/reservoir water quality data downloads consist of:

- Whole-lake (composite) samples comprised of multiple sub-samples of the upper water column

taken throughout the lake (basin). The sub-samples combined make up a composite sample used to determine the overall water quality conditions of an individual lake or reservoir during the open-water period (May to October).
- In situ measurements (temperature, specific conductivity, dissolved oxygen and pH) taken at the deepest area (profile station) of the lake basin(s) with an electronic meter at a specific depth interval.
- Samples collected at profile stations at specific depths.
- Samples collected at grab stations (one location on the lake/reservoir).

Summary of Lake Condition

Lake condition is often based on the level (or concentration) of 2 key trophic indicators:

- total phosphorus (a key nutrient)
- chlorophyll-a (a general measure of algal biomass)

These measurements, which can be representative of biological productivity, group Alberta lakes into a range of trophic categories:

- oligotrophic (low productivity)
- mesotrophic (moderate productivity)
- eutrophic (high productivity)
- hyper-eutrophic (very high productivity)

The following tools provide summary formats of lake condition.

Trophic Condition of Alberta Lakes

A summary of lake condition by trophic category. Trophic condition is determined by calculating the overall mean (from each lake's annual average) of total phosphorus or chlorophyll-a concentrations for lakes with at least three composite samples in any single year (May to October).

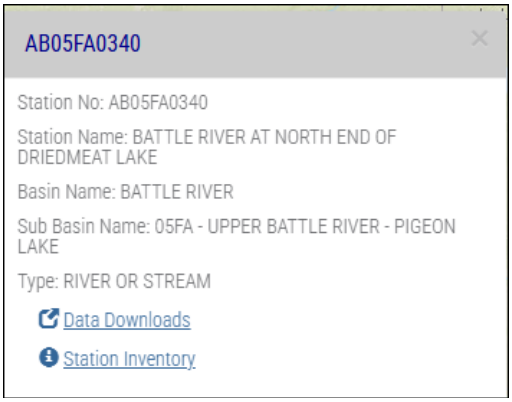
Trophic Data: Annual Mean Concentrations

Annual trophic data (total phosphorus, chlorophyll-a, and secchi depth) for an individual lake.

Viewing and Downloading Data

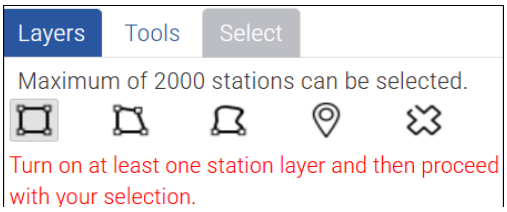
Accessing data for a single station of interest:

- Select the station on the map. The bubble contains links to the reporting tools for downloading station inventory and measurement data.



Accessing data for multiple stations:

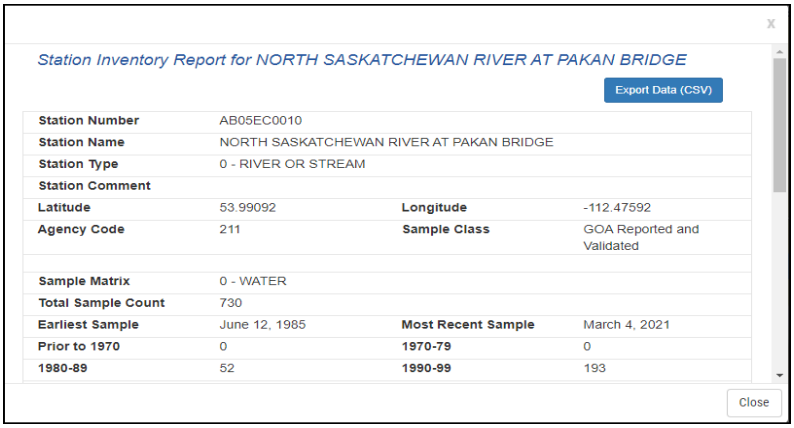
- Use the multi-point select function to export inventory or measurement data for up to 2000 stations across a map layer. The map layer of interest must be turned on.



- Use the data download link located under the **SWQ DATA** tab to export measurement data for one or many stations for a specific station type.

Station Inventory

The Station Inventory link populates the bubble with inventory details, with the option to export as a csv file.



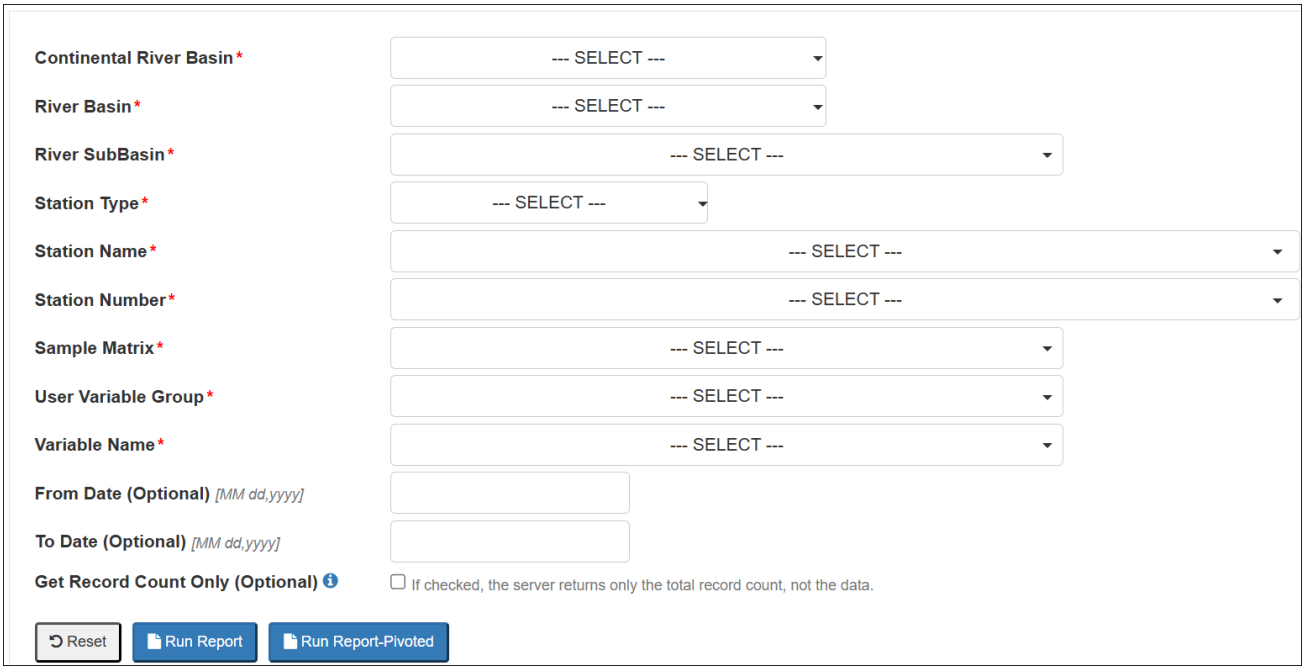
Data Download

The Download report is available in a one measurement per row (long) or pivoted (wide) format.

The long format contains additional columns of metadata.

Field	Long Format	Wide Format
ProjectNumber	Y	Y
SampleNumber	Y	Y
ContinentalRiverBasinCode	Y	Y
RiverBasinCode	Y	Y
RiverSubBasinCode	Y	Y
StationTypeCode	Y	Y
StationNumber	Y	Y
Station	Y	Y
LatitudeDecimalDegrees	Y	Y
LongitudeDecimalDegrees	Y	Y
SampleMatrixCode	Y	Y
SampleTypeCode	Y	Y
CollectionCode	Y	Y
QCSampleFlag	Y	Y
SampleComment	Y	Y
SampleDateTime	Y	Y
Depth of Sampling from Surface	Y	Y
VmvCode	Y	Y
VariableCode	Y	N
Variable Name	Y	Y
MeasurementFlag	Y	Y
MeasurementValue	Y	Y
Unit Code	Y	Y
SampleDetectLimit	Y	N
MeasurementComment	Y	N
MeasurementQualifier	Y	N
MeasurementQualifierDescription	Y	N
MeasurementQualifierComment	Y	N
MethodCode	Y	N
MethodDetectionLimit	Y	N
LabCode	Y	N

All filter or search categories, apart from date fields, are required to produce a report; nested filters are in order of top-down.



Reports are:

- limited to one station type per download i.e. rivers, or lakes, or an 'Other' station type.
- station centric. LTRN and TMN datasets include enhancement samples collected in addition to regular monthly monitoring. The sample codes link under Codes and Descriptions provides a list of LTRN and TMN project codes which can be used to further filter the final download if interest is limited to regular monthly monitoring data.

When running the report from the link in the station bubble or when using multi-point selection, the download form auto populates the filters prior to sample matrix.

Note: The maximum row limit for exporting to Microsoft Excel is 1,048,576. When selecting large datasets for download, it's advised that Excel users get an initial record count prior to running the report, to determine whether the row limit has been exceeded. The count provides an opportunity for changes to be made to date ranges or selected criteria, to limit the size of the final download.

Reset to clear search fields.

User Variable Groups (UVGs) represent analytical scans requested for samples submitted to laboratories for analysis. The exception is INORGANICS NO METALS, which includes field readings and observations, as well as variables belonging to several different analytical packages (routine, nutrients, bacteriological, chlorophyll, isotopes).

Note:

- Some organic variables are reported under more than one analytical scan and therefore belong to more than one UVG. The Crossover Variables in UVG Lists provides information about these variables and can assist in ensuring a comprehensive download of data for specific variables of interest.
- Some dissolved elements and ions share the same variable name (e.g., Magnesium Dissolved). The "Qualitative assessment of the comparability of Alberta's laboratory analytical method descriptions. Part 1 : trace elements in water" (https://open.alberta.ca/publications/qualitative-assessment-comparability-of-laboratory-analytical-method-descriptions-part-1) contains information that assists in distinguishing between the two. The ion reported under the analytical routine scan is in the 'Inorganics No Metals' UVG.

MISSED SAMPLE measurements are numeric values that correspond to reasons for missing data (ReasonForMissingSample).

VMV is the acronym for Valid Method Variable. The VMV code is a unique combination of variable, method of analysis or measure, unit of measure and method detection limit. As a result, the same variable name can be reported under different VMV codes.

SampleDatetime	Station	2010 PHOSPHORUS TOTAL DISSOLVED mg/L	15103 PHOSPHORUS TOTAL DISSOLVED mg/L	15423 PHOSPHORUS TOTAL DISSOLVED mg/L	15114 PHOSPHORUS TOTAL DISSOLVED mg/L	15105 PHOSPHORUS TOTAL DISSOLVED mg/L
05/02/1989 12:00	BATTLE RIVER, APPROX 2 KM D/S HWY 53				0.087	0.078
08/23/1989 11:45	BATTLE RIVER, APPROX 2 KM D/S HWY 53		0.132			
11/12/2003 14:00	BATTLE RIVER, APPROX 2 KM D/S HWY 53	0.13				
12/16/2003 12:00	BATTLE RIVER, APPROX 2 KM D/S HWY 53			0.088		

In this example, there are five VMV codes for reported results of Phosphorus Total Dissolved. The different VMVs are due to different methods of analysis or different method detection limits.

There is no variable combining in the data downloads.

- Use the VMV or method codes in the downloads to filter for analytical method descriptions in the EMS-VMVMethodDescriptions table. Method descriptions assist in making decisions about variable combining.
- The 'Variable Combining' section below contains further information about comparison of analytical methods for combining variables.

Note:

- The combined measurement flag and measurement in the pivot requires that measurement values be converted to number format in excel.
- In the long format, DepthOfSampling is an attribute (column) for Profile stations; it is a measurement for the other station types.

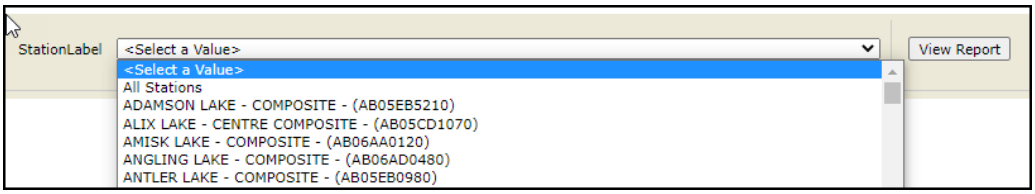
In addition to field measurements, the downloads include field observations pertaining to the water body or sample. Observations for flow, turbidity, colour, foam and odour are estimated measurements entered as numerical codes.

- Flow, Turbidity, Colour and Foam, unless otherwise specified, are: 0-Absent, 1-Low, 2-Moderate, 3-High
- Odour is: 0-Absent, 1-Present

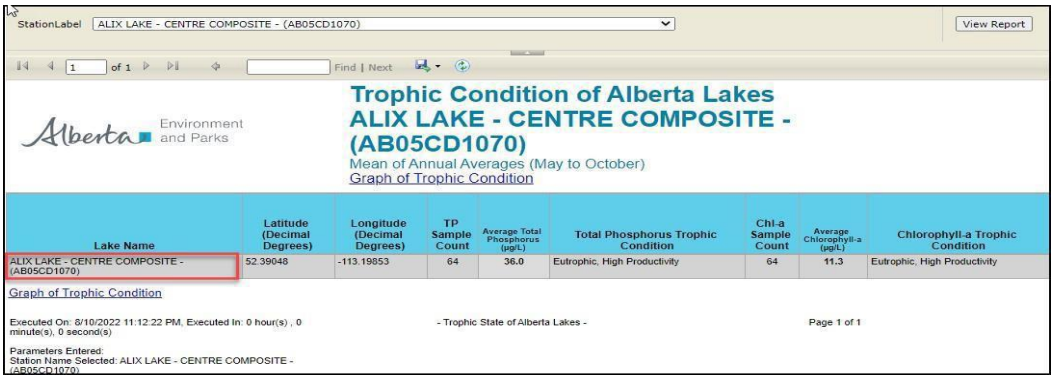
Measurement qualifiers and comments impart additional information about a measurement (e.g., hold time exceedances, sample dilutions, suspect values). Over the years there has been increased streamlining of processes employed in qualifying data.

The majority of qualifiers are added to measurements as part of EPA's validation of preliminary data. ValidationRulesandProcedures provides further information about this.

Trophic Condition of Alberta Lakes



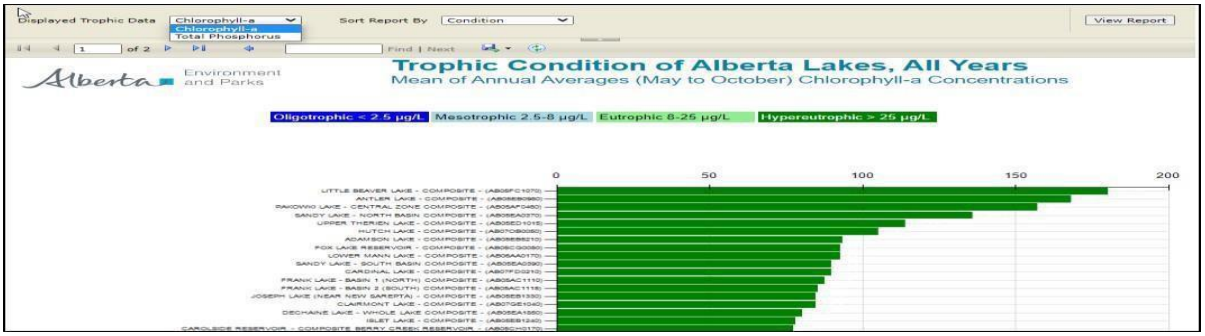
Select an individual lake or “All stations” and “View Report” to view the summary table.



From the table, select the lake name to view annual data. From there, select a year to view monthly sampling data. Export the data to .csv from any of the tables.

View the summary graph by clicking on “Graph of Trophic Condition” link.

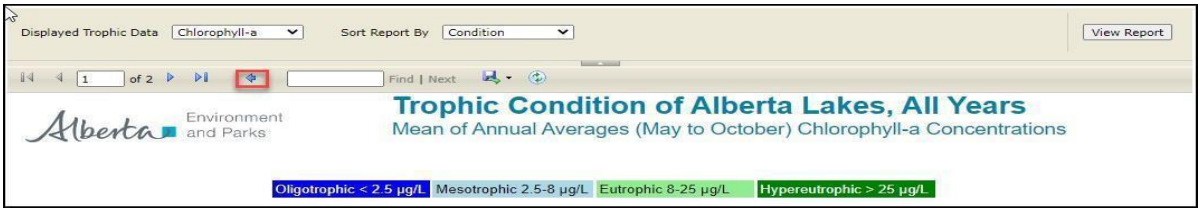
Once in the graph, use the dropdowns to select total phosphorus or chlorophyll-a, and the option to sort by trophic condition or lake name.



The *trophic categories* (oligotrophic, mesotrophic, eutrophic and hypereutrophic) are based on the 1982 publication, *Eutrophication of Waters, Monitoring Assessment and Control,* by the Organization for Economic CoOperation and Development (OECD, Paris, France). These categories (commonly in use worldwide), have been used in Alberta since the 1980s.

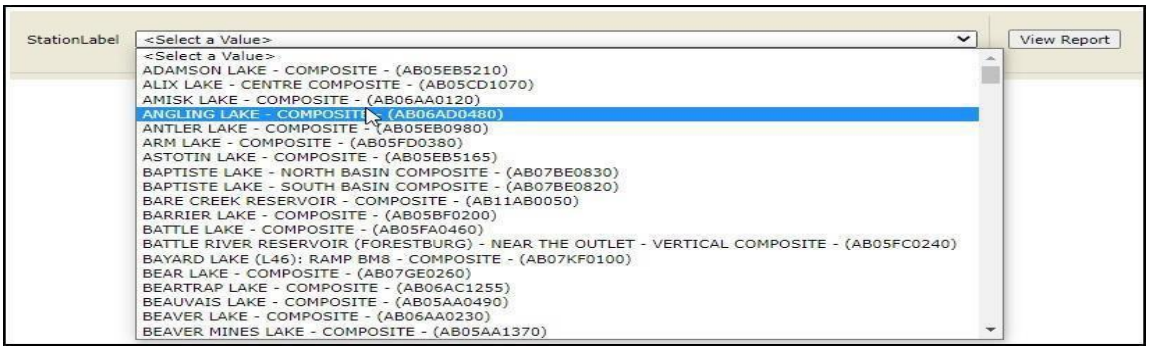
Note: It is recommended that downloading data from the graphs be avoided because the column headers are improperly formatted and, in the case of the Trophic Condition graph, the Chlorophyll continues to be the column header when Phosphorus is selected. There is also no control of page breaks when exporting the graph to pdf, which can result in a portion of the station name flowing onto the next page.

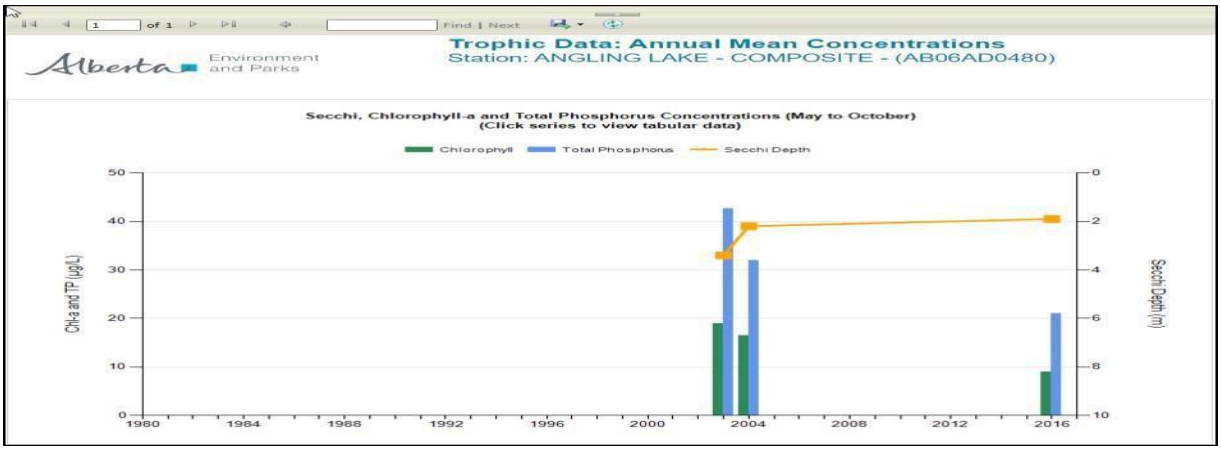
To navigate back to the main page from the trophic graph and sub-reports, use the blue back arrow in the report header (highlighted below).



Trophic Data: Annual Mean Concentrations

For a graph of annual trophic data for an individual lake, select a lake to access the graph.





Click on the graph to access data that can be exported to .csv format.

Codes and Descriptions

Station Number is a unique code for a specific surface water site or combination of sites. Surface water station numbers have the format AB05CE0350, where:

- "AB" is the Province
- "05" represents the continental river basin
- "CE" the sub-basin
- The last four numbers are arbitrarily assigned (number order does not determine upstream to downstream locations)
- See RiverBasinandSub-basinCodes

Transect Stations include surface water quality samples taken across the width of a river. There are two formats for the data:

Originally, each sampling point across a transect was assigned a separate station number (e.g., three distinct station numbers for Oldman River near Brocket at Right Bank, Centre and Left Bank).

Since 2009, transects sites are given only one station number (e.g., North Saskatchewan River at Devon). Each sample in the transect is assigned additional measurements (e.g., Distance from Right Bank with units of % or meters) to identify where it was collected across the river channel.

Station combining for all transects is underway. Transects that have been combined under one Station Number contain 'Transect' in the station description.

Note: distance from left bank is the standard, although distance from right bank was also used on occasion in the past.

Surface water station numbers are composed of a Station Name/Station Description (e.g., "North Saskatchewan River at Devon"). The Station Name ("North Saskatchewan River") provides a general description of the sampling location, and the Station Description ("at Devon") provides specific information about the sampling site. For lakes….

Sample Matrix is a numeric value identifying the substance or material sampled (e.g., water, sediment). In addition to the data available for download, samples falling under other matrix types may also be available at a sample location (for example, effluent, benthic invertebrates).

Collection Code is a numeric value identifying the method used to collect the water, sediment or biota components of a sample.

Sample Type Code is a numeric value identifying the type of sample collected (e.g., composite, grab).

Station Type Code is a numeric value identifying the type of site sampled (e.g. 0 =Rivers/streams, 1= Lakes, 5=Reservoirs).

See SampleCodes for Matrix, Collection, Sample type, Lab and Project (LTRN, TMN).

Variable Combining

The data downloads do not employ any rules for combining data. An ongoing qualitative approach of assessing method comparability of data for the purposes of combining is available here:

https://open.alberta.ca/publications/qualitative-assessment-comparability-of-laboratory-analytical-method-descriptions-part-1

This assessment compares methods to international standards or scientific literature to provide reasons for why a method may not be comparable to others. The document intends to provide internal and external stakeholders with a reference; the final decision for data combining remains with the user or decision maker.

Note: The assessment speaks to analytical method comparison for elements (including ions and phosphorus). Method comparability assessments for routine, nutrients and organics are underway.