

# Ontario Hydro Network (OHN)

## User Guide



*This document contains a general overview of the OHN and highlights details that the general user should be aware of.*

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## Contact Information

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Please report any mistakes, omissions or website links that need updating. Recommendations and ideas to improve this document are welcome.

## Table of Contents

Disclaimer .....	2
Contact Information.....	2
Additional Information .....	4
Introduction .....	4
Glossary of Terms.....	6
OHN - Watercourse.....	6
Watercourse Type .....	8
Flow Direction Verified.....	8
Permanency .....	8
Flow Classification.....	8
Geometric Network.....	10
OHN - Waterbody .....	10
Waterbody Type .....	10
Permanency .....	11
OHN - Shoreline.....	11
OHN - Hydrographic Point, Line, Polygon .....	12
Official Name Label and GEL Name Ident.....	13
Attribute source – OHN vs GEL .....	13
Unique feature identification .....	13
Official Name and Official Alternate .....	13
Overlapping Named Extents.....	13
OHN - Common Attributes .....	14
OHN - Small Scale Data .....	15
OHN – Data Maintenance .....	15
Related Data Layers .....	16
Islands.....	16
Enhanced Watercourse .....	17
Wetlands .....	17
Constructed Drains.....	18

## Additional Information

This document is one of several that contain different levels of content and detail about the Ontario Hydro Network (OHN). Depending on your needs refer to one or more related documents:

- **OHN Maintenance Guide** – The maintenance guide is intended for those who will be editing the OHN data and contains details specific to maintenance. It will also duplicate some but not all of the content from the *OHN User Guide* and the *Data Capture Specification for Hydrographic Features* document.
- **Data Capture Specification for Hydrographic Features** – The data capture specification is intended for anyone capturing OHN data and should also be referenced for data maintenance. It contains detailed OHN medium scale data specifications.
- **Standard NRVIS (Natural Resources Values Information System) Interchange Format (SNIF) Report** – This report describes the contents and structure of the selected data class package in SNIF format. All data classes are extracted from and published to the Ontario Land Information Warehouse in SNIF format. The purpose of this report is to assist data users in understanding the data received in the SNIF package.
- **Metadata Record** – Metadata describes data. From the metadata, you can determine the age of the data, who collected it, what the intended purpose of the data was and other important information.

These documents are available at the following LIO websites:

[http://www.mnr.gov.on.ca/en/Business/LIO/2ColumnSubPage/STEL02\\_168199.html](http://www.mnr.gov.on.ca/en/Business/LIO/2ColumnSubPage/STEL02_168199.html)

<https://www.appliometadata.lrc.gov.on.ca/geonetwork/srv/en/main.home>

## Introduction

The **Ontario Hydro Network (OHN) User Guide** contains a general overview of all the OHN feature classes and highlights details that hydro data users should be aware of. Hydro data is defined as surface water information including lakes, rivers, streams, barriers and obstacles.

The OHN data is distributed through the LIO warehouse in Standard NRVIS Interchange Format (SNIF). Contact [lio@ontario.ca](mailto:lio@ontario.ca) for documentation about SNIF. The OHN is continually being updated, therefore for users to be notified of updates they must first subscribe to changes through the LIO warehouse.

The OHN is a provincial medium scale product originating from data with regional scales of 1:10,000 in Southern Ontario, 1:20,000 in Northern Ontario and 1:50,000 in the Far North.

The OHN consists of the following six data classes:

1. **OHN – Watercourse** - Line features (natural or manmade) that represent flowing surface water.
2. **OHN – Waterbody** - Polygon features (natural or manmade) that represent bodies of surface water.
3. **OHN – Shoreline** – Lines that represent the shorelines of waterbodies. The shoreline is derived from the OHN - Waterbody data class and will be a read only class stored in the LIO warehouse and viewable in NRIVS. It has been developed as a cartographic product only.
4. **OHN – Hydrographic Point** – Point features (natural or manmade) that occur on waterbodies or watercourses which may pose hazards or impediments to waterflow or navigation.
5. **OHN – Hydrographic Line** – Line features (natural or manmade) that occur on waterbodies or watercourses which may pose hazards or impediments to waterflow or navigation.
6. **OHN – Hydrographic Poly** – Polygon features (natural or manmade) that occur on waterbodies or watercourses which may pose hazards or impediments to waterflow or navigation.

The OHN data is being provided to Natural Resources Canada (NRCan) to be incorporated into the National Hydro Network (NHN). The NHN specifications differ from the OHN and therefore the NHN geometry and attributes may differ from the OHN.

Geographic names on NHN data posted to GeoBase for Ontario are sourced from the Canadian Geographical Names Data Base (CGNDB). As a result, geographic names on the NHN product for Ontario may differ from the Ontario Geographic Named Extent Layer (GEL).

The official toponymy of Ontario as authorized through the Ontario Geographic Names Board Act can be obtained from the Ontario Geographic Named Extent layer which is available through the Land Information Ontario (LIO) warehouse. The OHN is the official Ontario medium scale dataset.

## Glossary of Terms

- **Feature** – A point, line or polygon representation of (all or a portion of) a real world object, such as a lake, stream, dam or rapid.
- **Data class** – A collection of similar features. For example, the OHN – Waterbody data class contains a collection of waterbody polygons.
- **Divergence** – One watercourse line diverges into two watercourse lines.
- **Confluence** – Two watercourse lines converge into one watercourse line.
- **Vertex (vertices)** – Points along a line or a polygon edge used to create angles in the shape of the feature.
- **Nodes** – The vertices at the ends of a line are referred to as nodes. A line will have a *from node* (at the start) and a *to node* (at the end) giving the line direction.

## OHN - Watercourse

Watercourse features are line features (natural or manmade) that represent the location of flowing water. The OHN Watercourse features may be used for cartographic or network analysis purposes. The bullets below explain some options to consider depending how the data is to be used.

- **Flow direction** – The watercourse lines are oriented in the direction that water normally flows across the landscape. The direction is usually governed by changes in ground elevation.

Cartographic products typically symbolize streams as blue lines and are not concerned with the flow direction (Figure 1: a).

For network analysis the flow direction is crucial for tracing up or down stream, stream ordering, creating watersheds, etc. The watercourse lines may be symbolized as lines with arrows to display the direction (Figure 1: b).

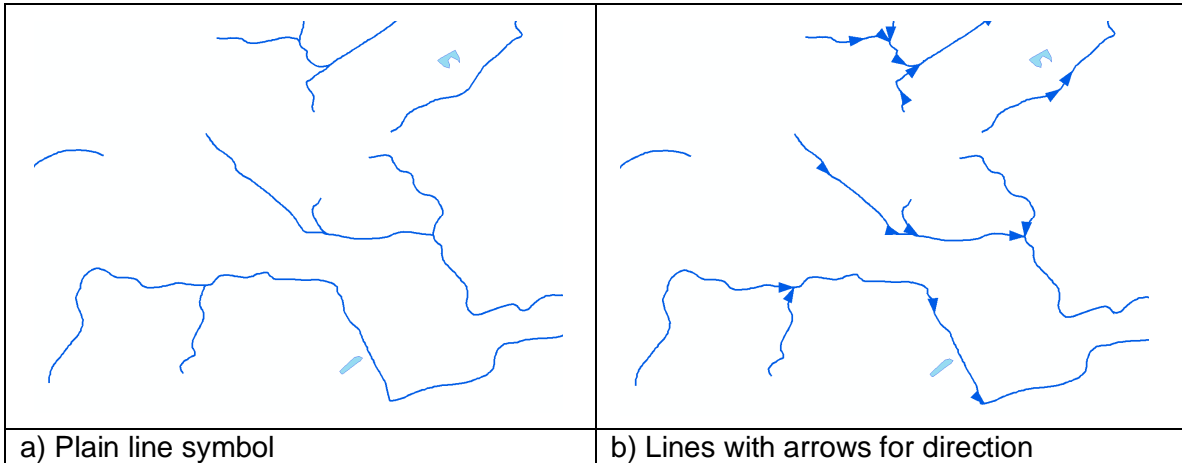


Figure 1: Watercourse lines symbology.

- Connectivity** – Connectivity is crucial for network analysis. The OHN Watercourse features consist of four types which are Stream, Virtual Flow, Virtual Connector, and Ditch. Streams entering and exiting waterbodies are connected with virtual flow lines through the waterbodies.

Cartographic products typically ignore the virtual flow lines so that they are not displayed in the waterbodies (Figure 2: a). Alternatively the virtual flow line may be symbolized as a dashed line or as a different colour (Figure 2: b).

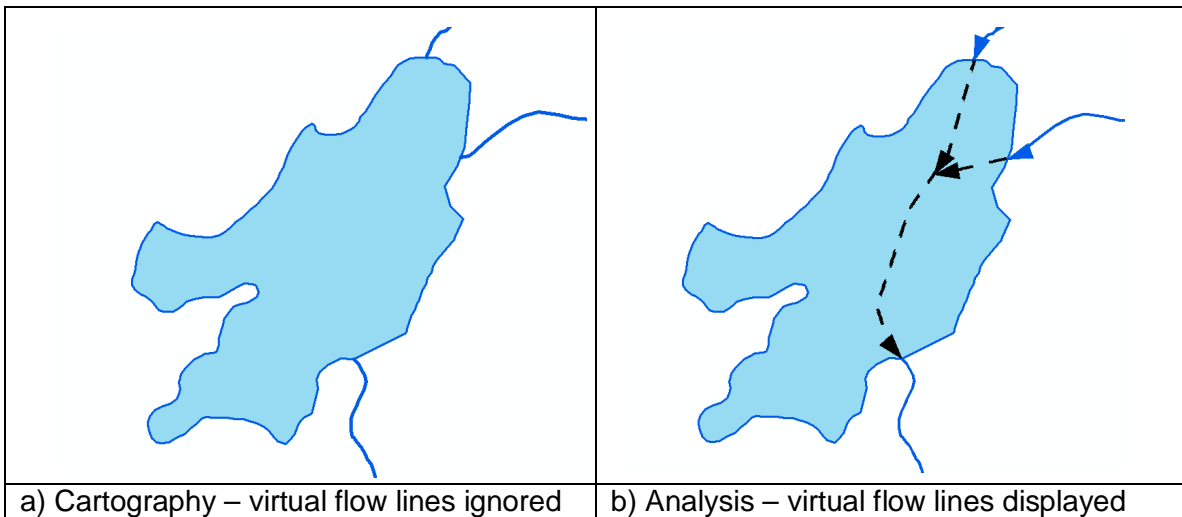


Figure 2: Virtual Flow line symbology.

### *Watercourse Type*

Watercourses are line features (natural or manmade) that can be defined as flowing water within a defined channel with bed or banks and usually discharges itself into some other watercourse or waterbody. A digitized watercourse can also be a virtual flow that traces the movement of water in a one dimensional water flow route within a waterbody.

- **Stream** (default) - A natural body of water (such as a river, stream or creek) through which water flows.
- **Virtual Flow** - An inferred watercourse feature **inside** a waterbody needed to maintain the continuity of water flow between adjacent water features. These will be lines through a waterbody that connect all adjacent water features.
- **Virtual Connector** - An inferred watercourse feature **outside** of a waterbody needed to maintain the continuity of water flow between adjacent water features. These will be lines where flow is known to exist but is not directly mapped, such as underground conduits.
- **Ditch** - A small, open manmade channel constructed for the purpose of conveying water. Open conduits, constructed drains, irrigation channels, aqueducts, penstocks, flumes and sluices are included.

### *Flow Direction Verified*

An indicator of known correct geometry direction. This is a Yes/No field with No being the default value.

### *Permanency*

An indication of the permanency of the water feature.

- **Permanent** – (default) A watercourse is considered permanent if it contains flowing water at least 9 months of the year.
- **Intermittent** – A watercourse is considered intermittent if it contains flowing water less than 9 months of the year.

Note: Virtual Flow segments must be assigned the permanency value of 'Permanent'.

### *Flow Classification*

This attribute is typically used for network analysis purposes and may be ignored for most cartographic purposes.



The Flow Classification attribute is used to identify the different pieces of a loop (sometimes referred to as a ‘cycle’). A loop is created when one watercourse line diverges into two lines and further downstream converges back into one line (Figure 3: a). Loops may occur inside (with virtual flow lines) or outside of waterbodies. The following bullets explain the three pieces of a loop.

- **Primary** (default) – All watercourse lines are initially considered to be primary. Only inside of a loop are some of the lines classified otherwise.
- **Secondary** – At a divergence, the side of the loop that is considered to be the main flow channel remains classified as primary. The side of the loop that is considered to be the secondary flow channel is classified as secondary until the next feature (e.g. confluence or waterbody)(Figure 3: c). From that next feature, the rest of the secondary side of the loop would be classified primary.
- **Flow Gap** – Loops need to have a piece removed (to break the loop) for some network analysis processes. The Flow Gap value is assigned to the first watercourse line on the Secondary side of the divergence (Figure 3: d). If required, the Flow Gap lines can be removed before performing network analysis.

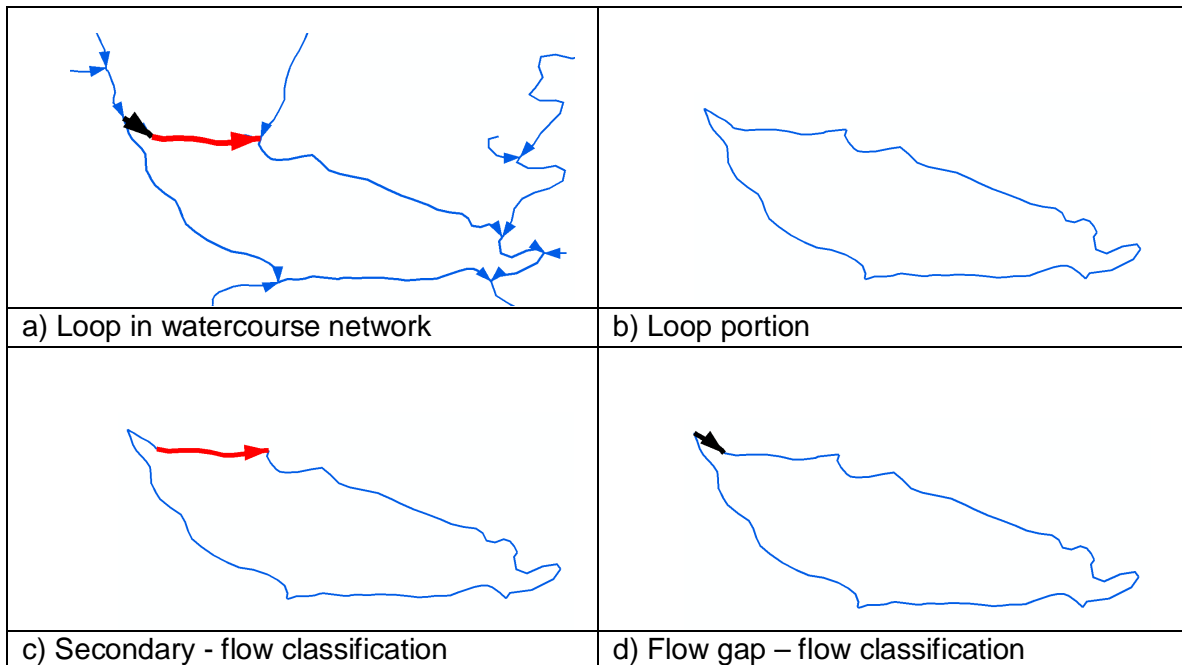


Figure 3: Flow Classifications – Primary, Secondary and Flow Gap.

- Note: Watercourse segments that are isolated from the flow network may form incomplete loops. They may diverge into two or more streams and not converge back together. In these cases the same rules stated above will apply for *primary*, *secondary* and *flow gap*.

### *Geometric Network*

The OHN Watercourse data class contains directionality and connectivity to support a geometric network for hydrological analysis.

For details on how to create a geometric network, see your GIS software documentation or contact your GIS software support.

## OHN - Waterbody

Waterbodies are polygon features (natural and manmade) that describe various realizations of surface water.

For cartographic uses, see the ORN Shoreline section below.

### *Waterbody Type*

Mandatory attribute. The nature of a body of water defined according to its water velocity and usage. Available values are:

- **Lake** (default value) - A natural, usually flat, open body of water, which excludes wetlands, islands, surface rocks or other hazards to waterflow and/or navigation.
- **River** - A natural body of water usually narrower than a lake through which water may flow.
- **Canal** - An artificial watercourse serving as a navigable waterway or to channel water.
- **Reservoir** - A wholly or partially manmade body of water for storing and/ or regulating and controlling water.
- **Kettle Lake** - A shallow, sediment-filled lake formed by retreating glaciers or draining floodwaters.
- **Pond** - A body of standing water, usually smaller than a lake. This feature type is used to differentiate non-lake features from lakes, including: irrigation ponds, reservoirs, flooded gravel pits and quarries.
- **Beaver Pond** - A pond that is created by a beaver dam.
- **Ocean** - A coastal waterbody (Hudson Bay and James Bay).

## *Permanency*

Indication of the permanency of the water feature.

- **Permanent** - A waterbody is considered permanent if it contains water at least 9 months of the year.
- **Intermittent** - A waterbody is considered intermittent if it contains water less than 9 months of the year.

## OHN - Shoreline

The *OHN Shoreline* data class is derived from the *OHN Waterbody* data class. It can be used to cartographically display the line where water meets the land.

The shoreline can differ from the outline of waterbody polygons. For example, a large lake may be divided into several polygons which would result in outlines running through the lake. Another example would be where a lake polygon is adjacent to a river polygon. The adjacent outlines would appear to run through the water (Figure 4: a).

The solution is to symbolize the shoreline as a dark line and leave the waterbody outlines transparent (Figure 4: b).

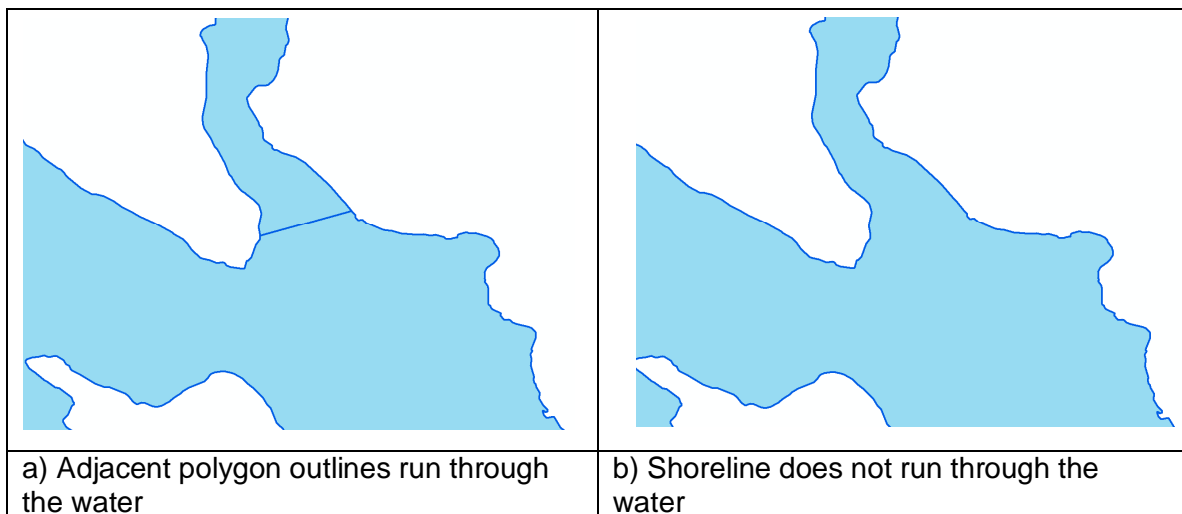


Figure 4: This example contains a lake polygon and an adjacent river polygon.

## OHN - Hydrographic Point, Line, Polygon

Natural or manmade features that occur on waterbodies or watercourses which may pose hazards or impediments to waterflow or navigation. Some features are represented as all three types, point, line and polygon for use at different scales while other features are represented only as points or lines or polygons. See table 1 below for details.

### *Hydrographic Types*

The type of manmade or natural features that occur on waterbodies or watercourses which may pose hazards or impediments to waterflow or navigation. There are no default values for hydrographic types.

- **Falls** - A perpendicular or steep drop in a body of water over which water flows.
- **Rapids** - A fast-flowing, often turbulent, section of a body of water, generally containing exposed rocks or boulders.
- **Rocks** - A rock or earthen formation always visible above the water surface.
- **Dam** - A feature representing an obstacle that disturbs or impedes the flow of surface water, excluding beaver dams, water-crossings and culverts.
- **Hydro Wall** - A manmade structure built in a waterbody and possibly extending onshore, or built along a waterbody forming the shoreline, that does not allow water to pass under it, but allows water to pass around it. Hydro walls may extend along and/or may be contained within a waterbody, and may include wharfs, docks, piers, jetties, headwalls, groynes, locks, berms or embankments.
- **Lock-Gate** - A gate on a navigable canal used to raise or lower the water level so that boats may pass from one level to another.
- **Sea Lamprey Barrier** - A feature on a watercourse or waterbody that forms a barrier (either electrical or physical) to the migration of Sea Lamprey.
- **Wreck** - The remains of a grounded ship that is partially above the water surface.

Table 1: Feature types found as a point, line or polygon marked by 'X'.

Feature Type	Point	Line	Polygon
Falls	X	X	
Rapids	X	X	X
Rocks	X		
Dam		X	X
Hydro Wall		X	X
Lock-Gate		X	
Sea Lamprey Barrier	X	X	
Wreck	X	X	X

## *Dams and Barriers*

The Dams and Barriers data class contains point features for the locations of dams and barriers throughout the province. To avoid duplication, the dams' point locations have **not** been included in the *OHN Hydrographic Point* data class. The Dams and Barriers data class is available from the LIO warehouse.

If a line or polygon representation of a dam exists, it can be stored in the OHN Hydrographic Line or OHN Hydrographic Poly data classes.

## Official Name Label and GEL Name Ident

The Geographic Named Extent layer (GEL) data class contains Ontario's approved official names along with their geospatial extent polygons and is available from the LIO Warehouse.

### *Attribute source – OHN vs GEL*

The *Official Name Label* and *GEL Name Ident* attributes on the OHN - Waterbody and OHN - Watercourse features will be populated from the GEL. The process of populating these two attributes may not be 100% accurate or complete. Therefore the *Official Name Label* and *GEL Name ID* attributes on OHN features should not be considered 100% accurate in all cases. Users should refer to the GEL data class to verify official names when needed.

### *Unique feature identification*

If selecting OHN features by the Official Name Label attribute be aware that more than one feature may have the same name in different parts of the province (e.g. Round Lake).

The *GEL Name Ident* attribute on an OHN feature contains a 32 character alphanumeric identifier from the GEL dataset that is unique for each feature. If there are several features with the same name, they will each have a different GEL Name Ident value. Use the GEL Name Ident to uniquely identify a specific feature.

### *Official Name and Official Alternate*

If an OHN feature has an official name and an official alternate name, then the *Official Name Label* will contain the official name and the official alternate in parenthesis (e.g. **Lake Ontario (lac Ontario)**). Very few named extents will have an official alternate name.

### *Overlapping Named Extents*

A group of OHN features such as a group of lakes may be considered as one extent in the GEL and would then be represented as one multi-part feature in the GEL data

class (e.g. Kawartha Lakes). Multi-part features will have the same GEL Name ID on each part.

Some multi-part GEL features (e.g. a group of lake polygons with a single name, like "Kawartha Lakes") will have individual GEL features for each part (e.g. Pigeon Lake, Stony Lake, etc). In these cases the OHN feature will only store one official name in the Official Name Label field. The more detailed name (e.g. Pigeon Lake) will be stored on the OHN feature.

## OHN - Common Attributes

The attributes listed in this section are found on all OHN data classes except for Shoreline. Attributes that are specific to data classes can be found in earlier sections.

**FMF Object ID** - This is the unique number that may be used to link any feature to its related records in other tables.

**Location Accuracy** - The degree of conformity or closeness of a measurement within the database to its true value in the world.

**Verification Status** - An indication as to whether a qualified employee has verified the existence of the geographic unit.

**Verification Status Date** - The date that the geographic unit was verified/validated.

**General Comments** - A 2000 character field for general comments about the feature.

**Justification ID** - The justification ID number on features can be used to link to the FMF Object ID number in the Justification table. The Justification table contains the justification reason, date and comments.

**Source ID** - The Source ID number on the features can be used to link to the FMF Object ID in the Source table. The Source table contains the source name, date, originator, scale, horizontal and vertical datum and projection.

**Source Detail** - A 254 character field that contains what part of the source pertains to the feature. Examples: Summary data from a database, pages in a book or atlas, figure number and page from a publication, a section of a map, or record in a database.

**Effective Date/Time** - Date/time that the record was created in the LIO database.

## OHN - Small Scale Data

Small scale OHN data classes will be created from multiple sources and maintained from the medium scale OHN - Watercourse and OHN - Waterbody data classes. These are planned to be available in 2011/2012. The small scale data will also include a Shoreline data class derived from the medium scale OHN - Waterbody data class.

The small scale OHN products are intended for cartography and web application use. The proposed scales are as follows:

1:100,000	1:1,000,000
1:200,000	1:2,000,000
1:500,000	1:5,000,000
	1:10,000,000

## OHN – Data Maintenance

Most OHN data maintenance will be performed by GIS officers and technicians in MNR district offices throughout Ontario or the Base Data Infrastructure (BDI) Unit of the Geographic Information Branch.

The Water Resource Information Program (WRIP) participates in the quality assurance of the OHN – Watercourse flow information. The MNR Geomatics Service Centres may be involved in OHN maintenance through BDI or WRIP projects. The NRVIS data load team may also be involved with OHN maintenance under BDI direction.

The data described in this document are considered 'live' datasets, which means they are expected to be continually updated over time. Users are encouraged to check back often for updates and to pay special attention to significant revisions published via LIO Technical Bulletins.

Updates will come from various data sources including large scale data being collected by MNR Districts and external agencies such as Conservation Authorities and OMAFRA. These data will be filtered up to meet the standard requirements defined in the medium scale data specifications. Fostering a good working relationship with our partners is vital for the successful ongoing maintenance of these complex and integrated datasets. It is also important that we have a common up-to-date and relevant data repository that can be used for key regional applications not only within MNR and the OPS but with the general public as well.

## Related Data Layers

### *Islands*

The OHN does not contain island polygons. Islands are represented as holes in waterbodies.

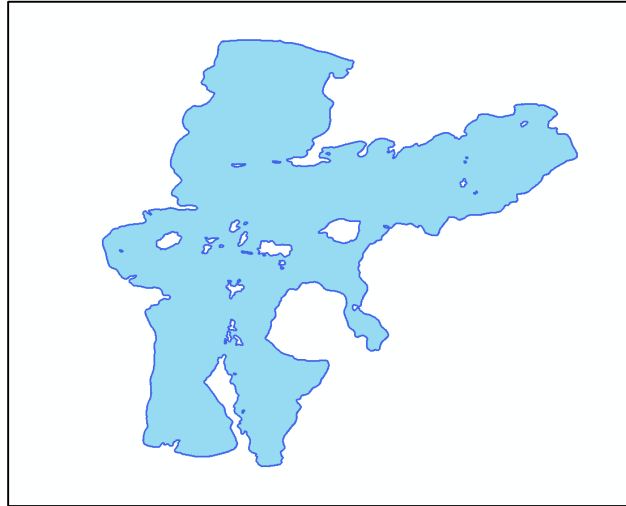


Figure 7: OHN Waterbody with holes that represent islands.

### *Creating Island Polygons*

The following steps can be used to create island polygons from waterbodies with holes.

1. Create a polygon larger than the extent of the lakes being used
2. Erase the lakes from the large polygon
3. Convert the result from a multi-part feature to single-part features
4. Delete the outer feature which was the outer part of the large polygon and that will leave the island polygons

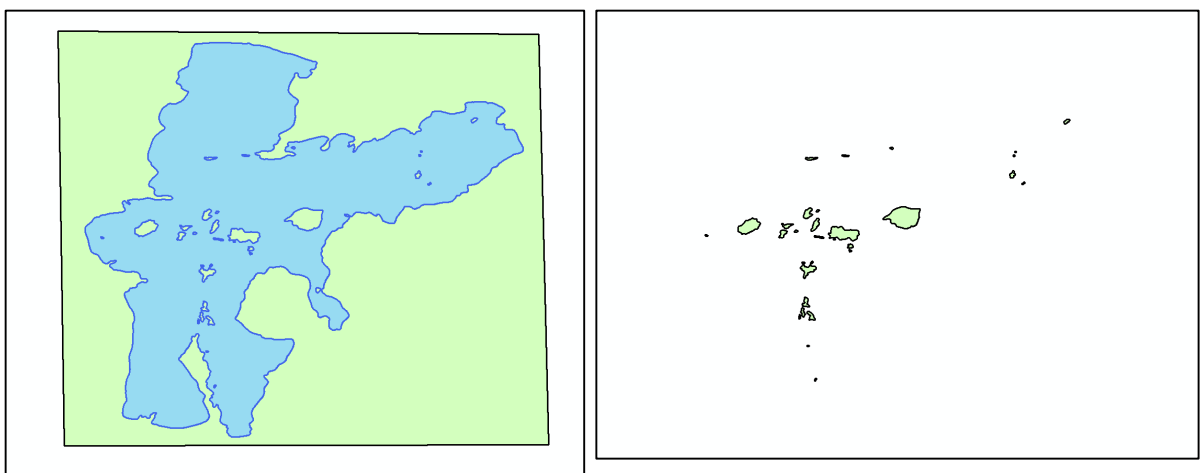


Figure 8: Polygon around the lake and the resulting island polygons after erasing the lake.



## *Naming Islands*

To add names to the islands, copy the official names, where they exist, from the GEL data class.

## *Enhanced Watercourse*

The *Enhanced Watercourse* is derived from the *OHN Watercourse* data class. Periodically the Water Resources Information Program (WRIP) will take a copy of the OHN Watercourse data, and through a process, adds Strahler and Shreve stream order attributes, watershed codes, and possibly other attributes.

The Enhanced Watercourse data class is a static product of a particular date and not to be confused with the OHN Watercourse data class which is continually maintained.

The Enhanced Watercourse is used by WRIP in the production of other derived products including the Enhanced Flow Direction Grid, hydrologically conditioned Digital Elevation Model (DEM) and watershed delineations.

The Enhanced Watercourse is available as a packaged product from the LIO warehouse.

## *Wetlands*

Currently wetland data is not part of the OHN. The Wetland Unit data class is available from the LIO warehouse.

The Wetland Unit data class provides the spatial representation and basic information for all wetlands in Ontario. The attributes identify which wetlands have been evaluated and of those which ones have been designated as Provincially Significant.

Previous to 2011 this data class contained only Evaluated Wetland data.

In the spring of 2011 through the Wetland Consolidation project business areas were consulted to identify the best available existing MNR wetland data for each MNR district. The resulting data was added to this data class where it did not overlap existing Evaluated Wetland data. Sources for wetland data included Wetland Interim (OBM/NTS), Forest Resource Inventory (FRI), Southern Ontario Land Recourse Inventory System (SOLRIS) and MNR district data.

Wetlands are lands that are seasonally or permanently flooded by shallow water as well as lands where the water table is close to the surface. In either case, the presence of abundant water causes the formation of moist soils and favours the dominance of water tolerant plants.

A Wetland Unit is an individual spatial polygon representing a discrete wetland type. The current wetland types are marsh, fen, swamp, bog, open water or unknown.

Evaluated Wetlands are those identified and assessed using the technical criteria in the Ontario Wetland Evaluation System (OWES) manuals. An evaluation may be for either an Evaluated Wetland or an Evaluated Wetland Complex. Not all wetlands in Ontario have been evaluated.

Wetlands that meet certain criteria through OWES are designated as Provincially Significant.

The Wetland Unit data are managed independently from other hydro data classes and may overlap waterbodies or other hydro data.

### *Constructed Drains*

The Constructed Drains data is not part of the OHN. The Constructed Drains data class is available from the LIO warehouse.

Constructed Drains are watercourses in the form of ditches, natural watercourses that have been modified to improve drainage, or buried tile systems.

The intended purpose for collecting the data is to keep Ontario Ministry of Agriculture, Food and Rural Affairs' record keeping current as to where drainage has been modified or newly constructed. The intent is also to have this data available for dissemination to all parties involved with drain construction or maintenance activities.

Some Constructed Drain features will overlap or duplicate OHN Watercourse features. The Constructed Drains features cannot be incorporated into the OHN Watercourse layer because their data model contains different attributes and their data specifications are for a larger scale product.