A Method for Mapping Settlement Area Boundaries in the Greater Golden Horseshoe

Purpose

This paper describes a method for mapping and measuring the lands designated for growth and urban expansion in the area known as the Greater Golden Horseshoe under the provisions of the Growth Plan for the Greater Golden Horseshoe.

The Growth Plan was established in 2006 by the Province of Ontario to manage the rapid growth in the Greater Golden Horseshoe (GGH) shown in Figure 1, which includes 110 municipal jurisdictions: 10 single-tier municipalities, 11 upper-tier municipalities, and 89 lower-tier municipalities.

Figure 1: The Greater Golden Horseshoe

The Growth Plan contains many forecasts, policies, and targets; however two key elements in particular can be mapped and measured, because they contain specific numbers that can be used to assess whether municipalities are complying with the requirements of the Plan:

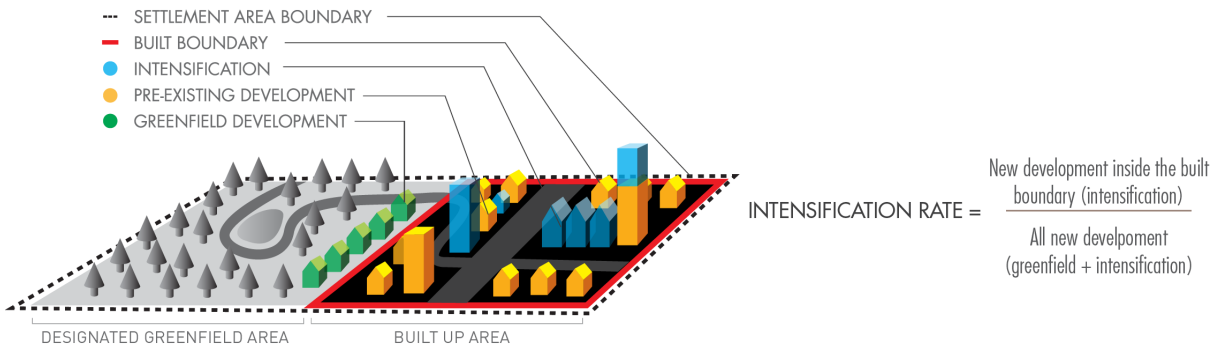
1. 40 percent of all residential development each year is to be directed to already built-up urban areas in existing settlements (the target is lower in some municipalities) (Growth Plan, Section 2.2.3). Municipalities are required to track their achievement of this level of intensification starting in 2015.

2. New development in *Designated Greenfield Areas* is to achieve a minimum density of 50 people and jobs combined per hectare (the target is lower in some municipalities) (Growth Plan, Section 2.2.7.2). This goal is to be averaged over upper- and single-tier municipalities; reporting requirements are not specified, although the Growth Plan mentions the importance of monitoring municipalities' implementation of this and other targets.

The implementation of the intensification rate target requires that the province, in consultation with each municipality, identify a *Built Boundary* for each municipality in the GGH. The *Built Boundary* is a fixed line that separates the existing built-up area within which new development is considered intensification from the *Designated Greenfield Areas*. Figure 2 illustrates this distinction. The *Built Boundary* is an important implementation and monitoring tool for the Growth Plan because it allows for the measurement of intensification and redevelopment within the built-up area and also allows new development outside the built-up area to be monitored.

Detailed mapping of the *Built Boundary* is available from the Ministry of Infrastructure.

Figure 2: Distinguishing the Built-up Area and the Designated Greenfield Area



Source: The Neptis Foundation

In order to implement the *Designated Greenfield Area* density target, each municipality must identify the *Designated Greenfield Area* – the area planned for growth *outside* the *Built Boundary* and inside the *Settlement Area Boundary* (see Figure 3). These areas are important, because 60% of residential development is permitted to occur in these areas. Municipalities are also required to demonstrate that development on this land has been planned to achieve the required minimum density target (people and jobs combined per hectare).

Figure 3: Distinguishing the Built Boundary and the Settlement Area Boundary

Source: The Neptis Foundation

Unlike the *Built Boundary*, the *Settlement Area Boundary* for each municipality was not determined by the Province and the Province does not make this information available to the public. *Settlement Area Boundary* information is found in municipal official plans, official plan amendments, and other planning documents from the many municipalities in the GGH. Moreover, the Province has not provided a uniform method or standard for defining a *Settlement Area Boundary*, so the approaches taken by municipalities to creating land use mapping in official plans vary considerably from municipality to municipality.

The Neptis Foundation, therefore carried out independent research to identify and map the location of each *Settlement Area Boundary* and to calculate the amount of land lying between the *Built Boundary* and the *Settlement Area Boundary.* This exercise was the first attempt to determine the total amount of land set aside for development up to 2031 throughout the entire GGH under the provisions and through municipal implementation of the Growth Plan.

Furthermore, as of 2006 some municipalities had already designated enough land to accommodate the forecast growth to 2031; in other cases, municipalities designated additional lands needed after 2006 to accommodate growth. Neptis researchers also distinguished between land designated before the Growth Plan came into effect in 2006 and land designated after that time.

This document describes the methods and sources of information used to define and map the *Settlement Area Boundary* and to measure the amount of land contained within the *Designated Greenfield Area* of each municipality.

Data

The data used to define the *Settlement Area Boundary* was derived from municipal official plan land use schedules and other mapping from other municipal planning documents; complementary data sources were also used to confirm the position and ensure the accurate alignment of the boundary.

Primary Data

Where possible, official plan mapping from upper- and single-tier municipalities was used to delineate *Settlement Area Boundaries*. The upper-and single-tier level was chosen as the preferred level of analysis because the Growth Plan is implemented by upper- and single-tier municipalities.

In many upper-tier official plans, however, detailed boundaries for smaller, less populated settlement areas are generalized or do not exist. The boundaries for these settlement areas were, therefore derived from lower-tier official plan maps. In some cases, maps from municipal planning documents other than official plans were used to identify the *Settlement Area Boundary*.

The Appendix at the end of this document lists the municipal mapping sources.

Complementary Data

The use of complementary data sources such as municipal boundaries and roads is important, because the *Settlement Area Boundary* was generated by georeferencing and digitizing municipal official plan land use schedules. The complementary data are used as geospatial references to ensure the positional accuracy of the digitized *Settlement Area Boundary*.

Complementary data includes:

1. Ontario Road Network (ORN)
   (www.http://www.mnr.gov.on.ca/en/Business/LIO/index.html)

2. National Hydro Network (NHN)
   (http://www.geobase.ca/geobase/en/data/nhn/index.html)

3. Municipal Boundaries (Upper-tier, Single-tier, and Lower-tier municipalities)
   (http://www.geobase.ca/geobase/en/data/admin/index.html)

4. Greenbelt Plan Boundaries (Ontario Regulation 59/05)
   (http://www.mah.gov.on.ca/Page190.aspx)

5. Built Boundary defined by the Ministry of Infrastructure
   (https://www.placestogrow.ca/images/pdfs/Built_Boundary.pdf)

Method

The method used to create the *Settlement Area Boundary* involves several steps and requires the use of Geographic Information Systems software.

Digital geospatial map files (i.e., GIS layer files) of detailed official plan land use maps are not publicly available from all municipalities in the GGH, and where they are available, there may be restrictions on their use., therefore, in order to map the boundaries of settlement areas and understand where land has been designated for growth, publicly available official plan land use maps in other formats (such as PDF) were used and the maps were digitized manually.

Following the selection of the most appropriate land use schedules from municipal websites, the PDF maps were georeferenced and the *Settlement Area Boundary* defined. The primary geospatial reference used for georeferencing was the Ontario Road Network (ORN).[1]

The process of digitizing the *Settlement Area Boundary* took one of two forms, depending on the location of the municipality:

1) For settlement areas located beside large waterbodies such as Lake Ontario, Lake Erie, Georgian Bay and Lake Simcoe, the *Settlement Area Boundary* was generated by splitting the Municipal Boundary according to the settlement area boundaries shown in the georeferenced land use schedules. The result is that shorelines and the boundaries between municipalities are those of the Municipal Boundary (and not those of the ORN or National Hydro Network). Every attempt was made to recognize where a settlement boundary coincided with the boundary of the Greenbelt, and to align to the Greenbelt boundaries in those instances.

2) For inland settlement areas, the *Settlement Area Boundary* was generated by digitizing the settlement area boundaries from georeferenced land use schedules. Where a settlement boundary was clearly aligned to a road, the boundary was digitized along the ORN centreline. Where a lake or major river formed part of a settlement boundary, the boundary was created along the shoreline as defined in National Hydro Network data set. Where the boundary of the Greenbelt formed a settlement boundary, the Greenbelt Plan data was used as the spatial reference. In some cases, a settlement area boundary overlapped two or more municipalities; here, the settlement area was defined using the Municipal Boundary.

Note: Rivers and waterbodies that are of significant size relative to the settlement area were removed from the area inside of the *Settlement Area Boundary*.

[1] There is a slight misalignment between the Municipal Boundary data and the Ontario Roads Network (ORN) because the municipal boundaries are not in perfect alignment with the ORN; for the purpose of georeferencing the ORN was taken to be more accurate., therefore official plan land use schedules were generally georeferenced using ORN road intersections.

Step 1: Define the areas to be mapped.

A standardized definition of "settlement area" is required to ensure mapping consistency across the various municipalities in the Greater Golden Horseshoe (GGH) because land use maps and associated definitions from municipal official plans are not consistent and can be difficult to compare., therefore the definition of "settlement area" from the Growth Plan was used to identify and standardize all settlement area boundaries in the GGH.

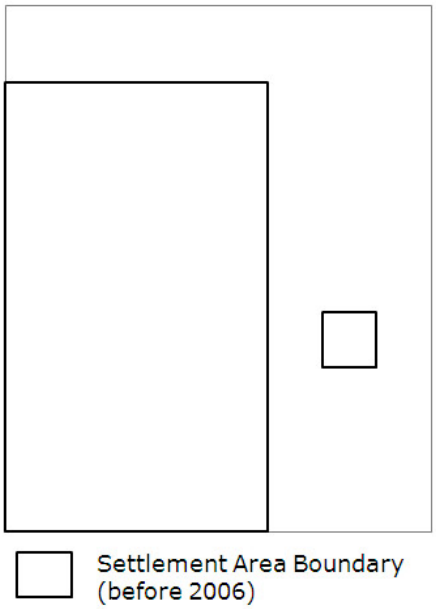
In this definition, settlement areas do not include estate residential, country residential, lakeshore residential, highway commercial areas, rural industrial areas, or recreational areas, unless these are contained within a larger identified settlement area. Only settlement areas as defined by the Growth Plan were mapped as part of the *Settlement Area Boundary*.

> *Growth Plan for the Greater Golden Horseshoe Definition*:
> **Settlement Areas**
> Urban areas and rural settlement areas within municipalities (such as cities, towns, villages and hamlets) where:
> 1. development is concentrated and which have a mix of land uses; and
> 2. lands have been designated in an official plan for development over the long term planning horizon provided for in the Provincial Policy Statement, 2005.
>
> Where there are no lands that have been designated over the long-term, the settlement area may be no larger than the area where development is concentrated.

Step 2: Identify settlement area boundaries as they existed before the adoption of municipal Growth Plan conformity amendments in 2006.

The boundaries of all settlement areas as defined by the Growth Plan were mapped from official plans approved prior to the adoption of municipal Growth Plan conformity amendments for each municipality.

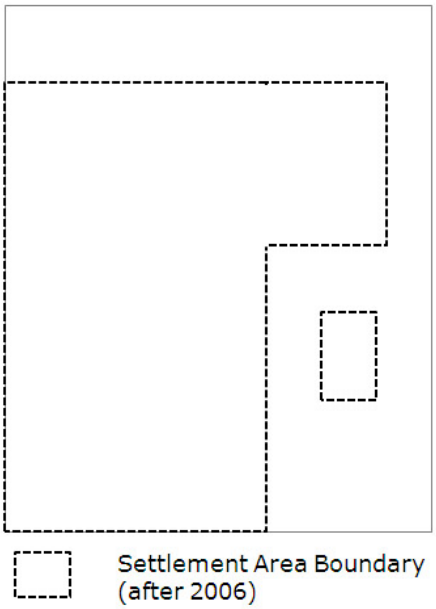
Note: Some municipalities do not define formal settlement area boundaries; in these cases, detailed land use designations were used to identify the boundary.



Step 3: Identify settlement area boundaries following the adoption of municipal Growth Plan conformity amendments since 2006.

This step involved mapping the boundaries of all settlement areas in the GGH using the most recent Council-adopted, publicly available mapping from new official plans, official plan amendments, and other planning documents that incorporated Growth Plan conformity amendments or that resulted in expansions to the settlement area boundary (such as the Hamilton Airport Employment Growth District).

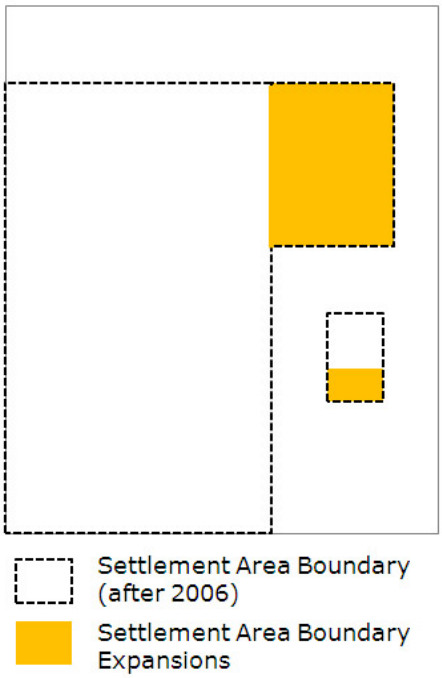
Note: The legal status of updated or amended settlement area boundaries varies by municipality, as the relevant official plans may be in different states of approval (approved, under review, proposed, or under appeal to the Ontario Municipal Board or other court). *The Settlement Area Boundary* may be modified depending on the outcome of the approval and/or appeal process. Neptis researchers made every effort to locate and use the most current and accurate maps available.



Step 4: Determine Settlement Area Boundary expansions.

Following the identification of *Settlement Area Boundary* mapping from before and after 2006 (steps 2 and 3), the two boundaries were compared to determine whether settlement area expansions had occurred.

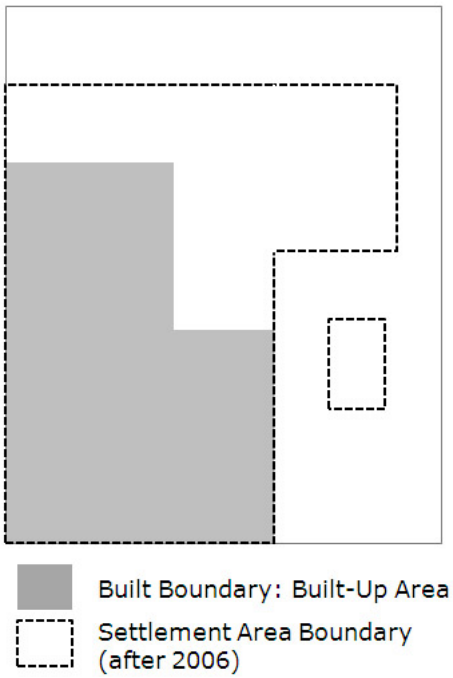
Any difference identified between the two boundaries that cannot be considered a technical adjustment (due to improvements in mapping technology, mapping accuracy, or mapping scale) was considered to be an expansion to the *Settlement Area Boundary*.



Step 5: Identify the Built Boundary: Built-Up Area for each municipality.

The digital map layer file (or shapefile) for the *Built Boundary*, delineating the *Built-Up Area* for each municipality in the Greater Golden Horseshoe, was obtained from the Ministry of Infrastructure.

The Ministry's *Built Boundary: Built-Up Area* does not differentiate between individual settlements where the settlement area boundary is contiguous between abutting municipalities, therefore an analysis was conducted to split the *Built Boundary: Built-Up Area* by upper-, single-, and lower-tier municipal boundaries.



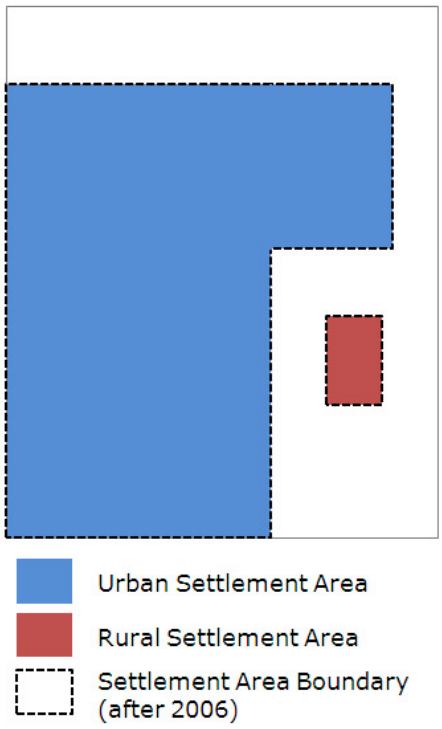
Step 6: Classify settlement areas as Urban or Rural.

Following the digitization of the *Settlement Area Boundary* for each municipality and the identification of *Settlement Area Boundary Expansions*, each settlement area was classified as Urban or Rural, depending on the presence of a *Built Boundary*, as defined by the Ministry of Infrastructure.

If a *Built Boundary* has been identified for a settlement area, the settlement area is classified as Urban. If no *Built Boundary* is identified, the settlement area is classified as Rural. Settlement areas with an Undelineated *Built Boundary* are classified as Rural.

Settlement areas with a *Built Boundary* are described in the Growth Plan as having full municipal services and the capacity to support significant intensification and future growth. Settlement areas without a *Built Boundary* are described as those without full municipal services that have limited capacity to accommodate significant future growth and are not intended to be a focus of intensification or future growth.

Note: In some cases, settlement areas were classified as Rural before the Growth Plan was introduced; however, following the municipal implementation of the Growth Plan some of these Rural Settlements have been reclassified as Urban Settlements. This situation occurs where a settlement area identified as Rural before the introduction of Growth Plan was absorbed into an Urban Settlement during the process of bringing municipal planning documents into conformity with the Growth Plan.

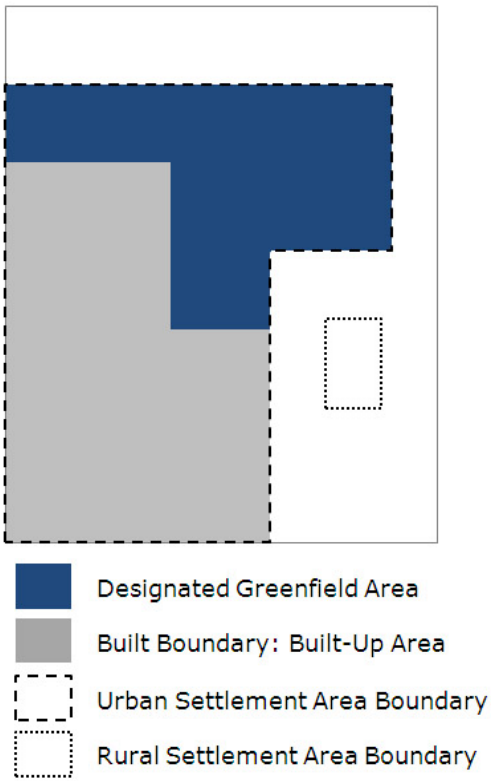


Step 7: Identify Designated Greenfield Areas.

In addition to built-up lands within an Urban Settlement Area (that is, lands within the *Built Boundary*), there are also lands approved for urban growth that are undeveloped, known as *Designated Greenfield Areas*. Over time, these *Designated Greenfield Areas* are intended to be developed for urban uses.

The *Built Boundary: Built-Up Area* was used to identify the *Designated Greenfield Areas* within Urban Settlement Areas.

A spatial analysis was conducted on the *Built Boundary: Built-Up Area* and the Urban settlement area. The analysis compares the two areas, eliminates any areas of overlap, and identifies the areas that do not overlap. These lands constitute the *Designated Greenfield Areas*; they are located inside the Urban settlement area, but outside the *Built Boundary*.



Step 8: Classify Designated Greenfield Areas.

The *Designated Greenfield Areas* are then classified according to pre-Growth Plan *Settlement Area Boundary* (identified in Step 2) and *Settlement Area Boundary Expansions* (identified in Step 4).

Designated Greenfield Areas within the pre–Growth Plan (2006) Settlement Area Boundary (Step 2) are classified simply as Designated Greenfield Areas.

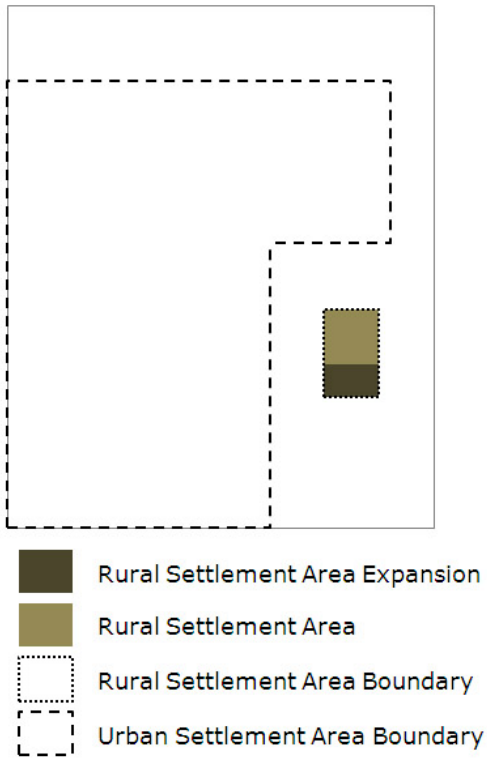
Designated Greenfield Areas within the *Settlement Area Boundary Expansion* areas (Step 4) are classified as *New Designated Greenfield Areas*. *New Designated Greenfield Areas* are lands added to the settlement area after the introduction of the Growth Plan in 2006.

Note: *New Designated Greenfield Areas* may be fully approved or Council-adopted, depending on the status of a municipal official plan amendment or new official plan. *New Designated Greenfield Areas* may also be under appeal and awaiting a decision from the Ontario Municipal Board or other court.

Step 9: Classify remaining Settlement Area Boundary *expansions.*

In addition to the boundary expansions to Urban settlement areas, expansions may also have been made to Rural settlement area boundaries.

The *Settlement Area Boundary Expansions* (identified in Step 4) that were not classified as Urban settlement areas (Step 6), and are not considered to be *Designated Greenfield Areas*, are classified as *Rural Settlement Area Expansion*.



Step 10: Integrate the Built Boundary with the Urban Settlement Areas.

Once the digitized settlement areas have been classified as Urban or Rural, and the *Designated Greenfield Areas* have been identified and classified, the Ministry of Infrastructure's *Built Boundary* was merged into the area inside the *Settlement Area Boundary*.

The integration of the area within the *Settlement Area Boundary* and the *Built Boundary* is not perfect. Adjustments are needed to rectify places in which the boundaries of the two areas do not align. The primary reason for differences of alignment and position between the areas is the different way in which the boundaries were identified. The *Built Boundary* was delineated using Municipal Property Assessment Corporation (MPAC) parcel data and a detailed methodology developed by the Ministry of Infrastructure, whereas the *Settlement Area Boundary* was created through the digitization of municipal official plan land use schedules that were georeferenced using the Ontario Roads Network as the geospatial reference.

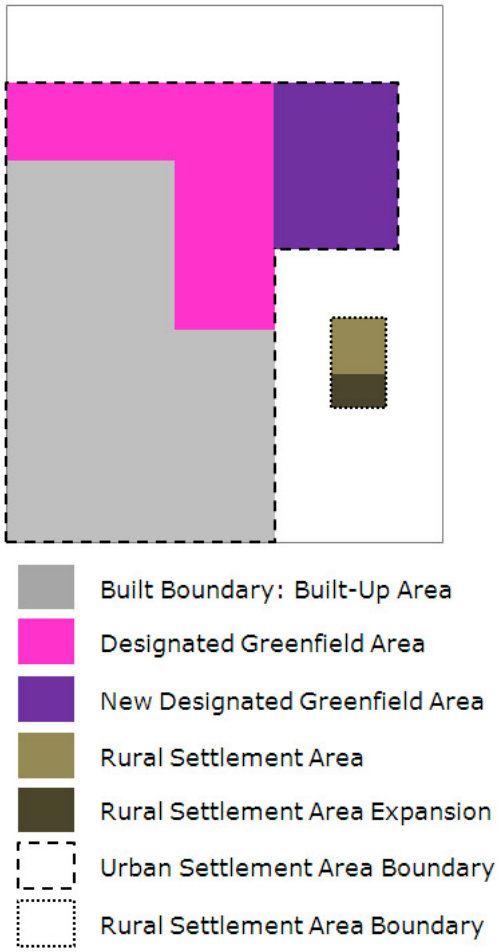
Most of the alignment issues were minor and required only slight adjustments. The land use schedules from municipal official plans were used to determine if the *Settlement Area Boundary* was intended to be aligned to a road, municipal boundary, water body, or some other feature. The areas along the Lake Ontario lakeshore had the greatest number and most significant misalignments due to boundary variation between the municipal land use mapping in official plans, Municipal Boundaries, the National Hydro Network, and the *Built Boundary*.

In some instances, the *Built Boundary* was mapped by the Ministry of Infrastructure outside designated settlement area boundaries identified in municipal official plans. In these cases, no adjustments to the *Settlement Area Boundary* were made and the position of the *Built Boundary* was retained. Only in locations where it was is apparent that the two boundaries should align were modifications made.

Final Result

The mapping and identification of the *Settlement Area Boundary*, *Settlement Area Boundary Expansions*, and the classification of settlement areas as Urban or Rural, including the identification of *Designated Greenfield Areas*, *New Designated Greenfield Areas, and Rural Settlement Area Expansions*, provide a complete picture of all land designated for settlement in the GGH and allow for measurement of each area, as well as the calculation of cumulative totals of all land designated for development.

Final Result



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