

DRAPE 2014

Digital Elevation Model

User Guide

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Additional Information

For more information about this document, please contact Spatial Data Infrastructure at sdi@ontario.ca.

Executive Summary

Key Words

Digital Raster Acquisition Project Eastern Ontario, Digital Elevation Model, Spatial Data Infrastructure, Elevation

Abstract

The DRAPE 2014 DEM is a 2m raster elevation product that represents a generalized representation of both surface and ground features. The product was generated by an imagery contractor for the purpose of ortho-rectifying the DRAPE 2014 ortho-photography. Digital Raster Acquisition Project Eastern Ontario (DRAPE) ortho-photography was collected through a collaborative funding partnership for eastern Ontario. Contributing organizations include the Ontario Government, municipalities, Conservation Authorities, the private sector and the Federal Government.

Table of Contents

Disclaimer	2
Additional Information.....	2
Executive Summary	3
Key Words.....	3
Abstract.....	3
Table of Contents.....	4
List of Figures.....	5
List of Tables.....	5
List of Acronyms.....	6
List of Definitions.....	7
Mass Points.....	7
Digital Elevation Model (DEM)	7
Digital Terrain Model (DTM).....	7
1. Product Description.....	9
1.1 Acquisition.....	9
1.2 Elevation Products	9
1.3 Geographic Extent.....	10
1.4 Reference System.....	11
1.4.1 Horizontal Reference System.....	11
1.4.2 Vertical Reference System.....	11
1.5 Resolution	11
1.5.1 Spatial Resolution	11
2. Product Details.....	12
2.1 DEM Product.....	12
2.2 Data Delivery Format	13
2.3 Use Restrictions	14

List of Figures

Figure 1: Product Work Flow	9
Figure 2: DRAPE 2014 DEM Boundary.....	10
Figure 3: Four Downloadable Packages	13

List of Tables

Table 1: Downloadable Packages.....	14
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List of Acronyms

ADS: Airborne Digital Sensor

AMT: Above Mean Terrain

CGVD: Canadian Geodetic Vertical Datum

DEM: Digital Elevation Model

DMC: Digital Mapping Camera

DRAPE: Digital Raster Acquisition Project Eastern Ontario

DSM: Digital Surface Model

DTM: Digital Terrain Model

GeoTIFF: Georeferenced TIFF

GIS: Geographic Information Systems

GSD: Ground Sample Distance

IfSAR: Interferometric Synthetic Aperture Radar

IMU: Inertial Measuring Unit

LAS: Laser File Exchange Format

LiDAR: Light Detection and Ranging

LIO: Land Information Ontario

MrSID: Multi-resolution Seamless Image Database

NAD: North American Datum

NIR: Near Infrared

RGB: Red Green Blue

SDI: Spatial Data Infrastructure

TIFF: Tagged Image File Format

TIN: Triangular Irregular Networks

UTM: Universal Transverse Mercator

List of Definitions

Mass Points

Mass points are irregularly spaced points, each with x/y location coordinates and z-values, typically (but not always) used to form a TIN. When generated manually, mass points are ideally chosen to depict the most significant variations in the slope or aspect of TIN triangles. However, when generated automatically, e.g., by LiDAR or IfSAR scanner, mass point spacing and patterns depend upon the characteristics of the technologies used to acquire the data.

Digital Elevation Model (DEM)

A generic term for digital topographic and/or bathymetric data that is comprised of x/y coordinates and z-values to represent an elevation surface.

The terms 'DTM' and 'DSM' should be used over the term 'DEM' to more specifically reference 'bare-earth' or 'surface elevation' model products when possible.

The term 'DEM' is to be used as a broader term when referencing a generic elevation data product. The Provincial DEM is an example of a generic elevation product given that it has been constructed using a combination of both 'DTM' and 'DSM' elevation datasets to achieve Provincial coverage.

Digital Terrain Model (DTM)

The bare earth surface (lowest surface, last reflective surface, or LiDAR last-return) represents the surface of the "bare-earth" terrain, after removal of vegetation and constructed features.

Photogrammetry has traditionally generated DTMs when elevations are generated by manual compilation techniques. Unless specified to the contrary, the bare-earth surface includes the top surface of water bodies, rather than the submerged surface of underwater terrain.

Similar to a DSM, a DTM can be structured either as a vector dataset (comprised of mass points and optionally 3D breaklines) to model bare-earth elevations or a raster dataset that is interpolated from the vector elevation data to model bare-earth terrain elevations.

Using modern elevation point cloud classification algorithms and file formats, such as LAS, a DTM can represent a mass point dataset that has been classified for 'bare-earth' terrain elevations.

1. Product Description

1.1 Acquisition

Digital Raster Acquisition Project Eastern Ontario (DRAPE) 2014 was collected through a collaborative funding partnership that involved municipalities, Conservation Authorities, the Province of Ontario, selected Federal Departments as well as private sector organizations. In total, there were more than 60 funding partners involved in DRAPE 2014.

The Digital Imagery was acquired between April 28th and June 7th 2014. The resulting Digital Elevation Model (DEM) has a resolution of 20cm.

1.2 Elevation Products

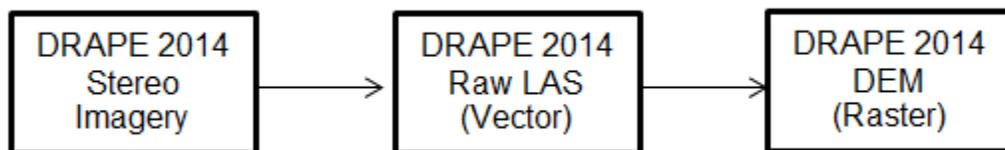


Figure 1: Product Work Flow

1.3 Geographic Extent

DRAPE 2014 DEM contains 37,290 non-overlapping tiles (1km x 1km) covering the Counties of Frontenac, Lanark, Lennox and Addington, Renfrew, the United Counties of Leeds and Grenville, Prescott and Russell, Stormont, Dundas and Glengarry, the Towns of Prescott, Gananoque and Smiths Falls, the Township of South Algonquin and the Cities of Cornwall, Brockville, Kingston and Ottawa.

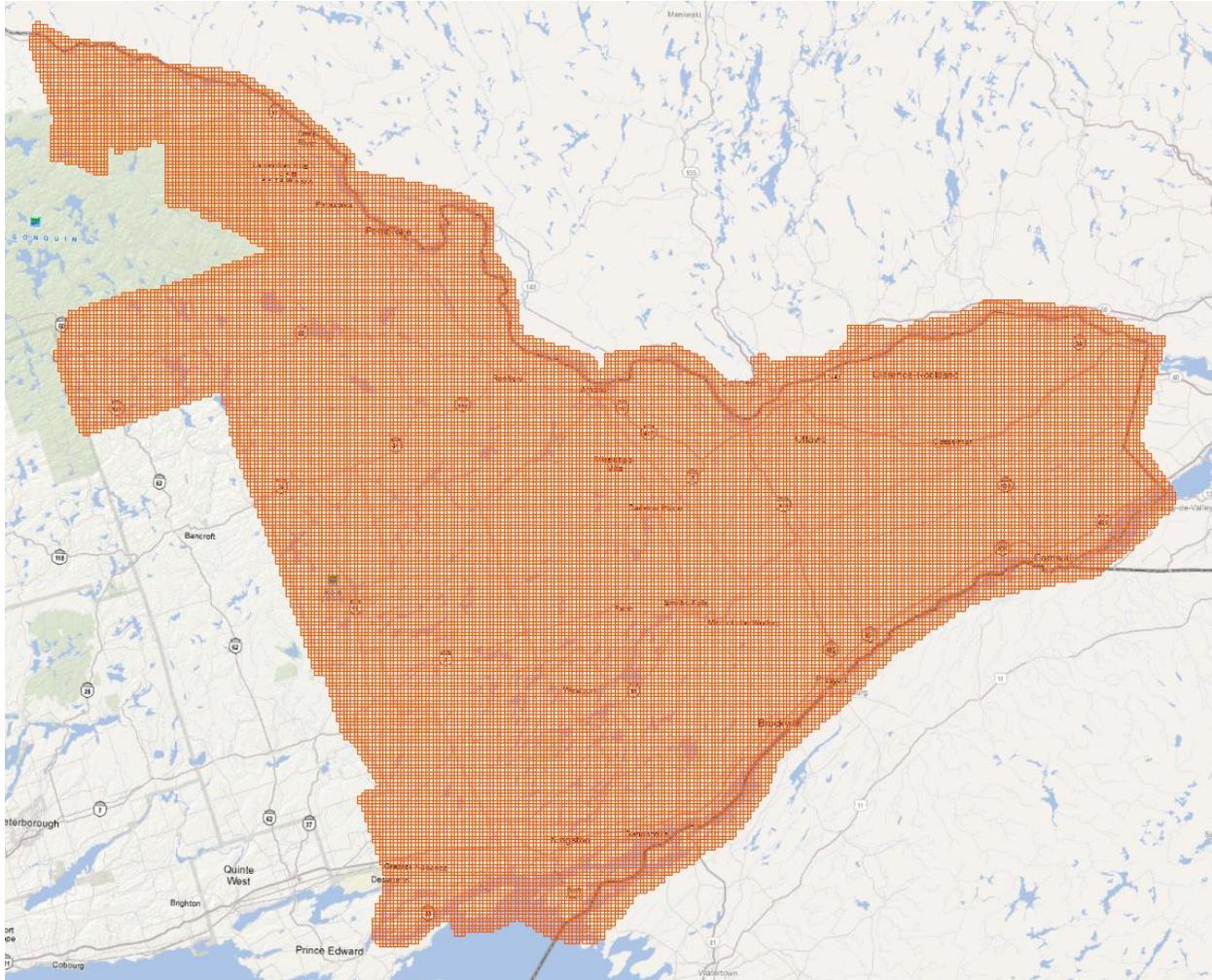


Figure 2: DRAPE 2014 DEM Boundary

1.4 Reference System

1.4.1 Horizontal Reference System

The horizontal coordinate system of the DEM is Universal Transverse Mercator (UTM) and covers zones 17 and 18. The horizontal datum of the DEM is the North American Datum of 1983 (NAD83).

The horizontal unit of measure (coordinate system axis units) for all raster grid cells in the DEM is metres (m).

1.4.2 Vertical Reference System

The vertical coordinate system of the DEM is based on the Canadian Geodetic Vertical Datum 1928 (CGVD28) of the Geodetic Survey Division, and is measured in metres above mean sea level. For more information please see the [Geodetic Survey Division of Natural Resources Canada](http://webapp.geod.nrcan.gc.ca/geod/) (<http://webapp.geod.nrcan.gc.ca/geod/>).

The vertical unit of measure (coordinate system axis units) for all raster grid cells in the DEM is metres (m). One single vertical elevation value represents each raster grid cell in the DEM.

1.5 Resolution

1.5.1 Spatial Resolution

The grid spacing is based on Universal Transverse Mercator (UTM) projection with a raster cell resolution of 2 metres.

2. Product Details

2.1 DEM Product

The DRAPE 2014 DEM is a 2m raster product that has been generated by an imagery contractor from the Raw LAS vector elevation dataset. The primary purpose for generating the DEM was to allow for the DRAPE 2014 imagery to be ortho-rectified by the imagery contractor. A proprietary 'steam rolling' algorithm was used to reduce raised surface features in the Raw LAS dataset. The DEM was delivered to MNRF as a derivative product as part of the imagery contract.

It is important to note that the DEM does not represent a full 'bare-earth' elevation surface. While the 'steam-rolling' algorithm has allowed for some raised features to be reduced closer to 'bare-earth' elevations (e.g. small buildings, small blocks of forest cover), many features are still raised above ground surface, such as larger buildings, larger forest stands and other raised features. The product is being distributed in the original state delivered by the imagery contractor without modification.

2.2 Data Delivery Format

The DRAPE 2014 DEM is currently stored and distributed through the [Land Information Ontario \(LIO\) Metadata Tool](#)

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

The DRAPE 2014 DEM can be downloaded in four packages: A, B, C and D (see Figure 3). Each package contains multiple DEM tiles in image (.IMG) format (see Table 1).

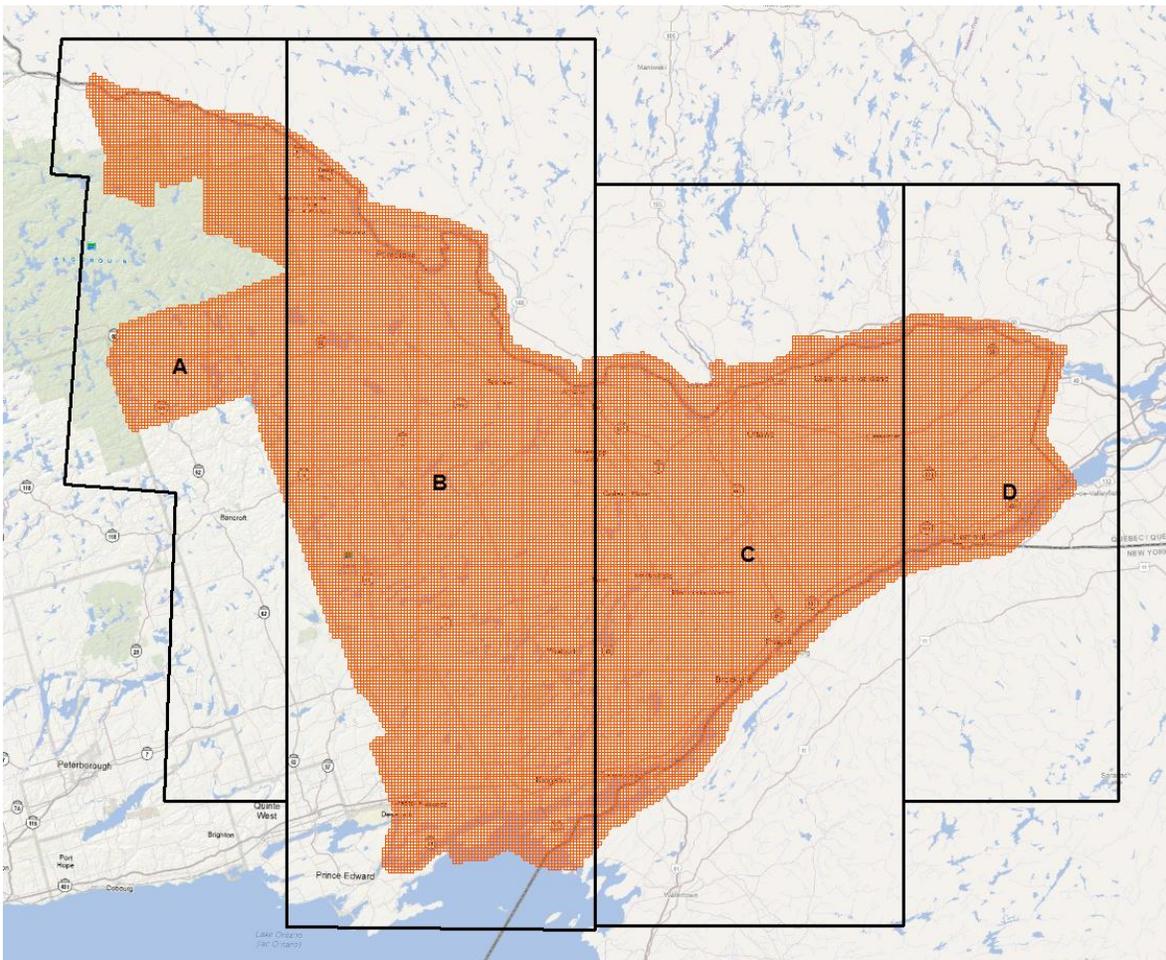


Figure 3: Four Downloadable Packages

Table 1: Downloadable Packages

Package	IMG Files Included	Compressed Size
Package A	4,413	685 MB
Package B	17,628	2.19 GB
Package C	11,491	2.27 GB
Package D	3,758	247 MB

2.3 Use Restrictions

The DRAPE 2014 DEM is considered Open Data and has no restrictions.

