

*ISO 19131 AAFC Infrastructure Flood
Mapping in Saskatchewan – Data
Product Specification*

Revision: A

Data specification: AAFC Infrastructure Flood Mapping in Saskatchewan

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Data specification: AAFC Infrastructure Flood Mapping in Saskatchewan

1. OVERVIEW

1.1. Informal description

The fall 2011 LiDAR survey was completed over 13 flights between October 25th and November 20th, 2011. As the project extended late into the fall there were some delays in collection due to snow and as a result only the areas of Pheasant Creek, Roughbark, Moosomin, Braddock, Maple Creek, Eastend and Altawan were collected. Admiral, Russell Creek, Cadillac-Gouverneur and Lafleche areas were not collected in this time frame. In total there were 7 stand by days with no flight missions due to snow or high winds. Several airports were used to base collection missions out of, depending on proximity to the project area. Airports utilized included; Regina International Airport, Weyburn Airport, Virden Airport, Swift Current Regional Airport, Maple Creek Airport and Medicine Hat Municipal Airport.

The spring 2012 LiDAR survey was completed over 7 flights from April 13th-18th, 2012. In total there was 1 full and 2 half stand by days with no flight missions due to rain and low clouds. All flights were based out of the Swift Current Regional Airport.

1.2. Data product specification metadata

This section provides metadata about the creation of this data product specification.

Data product specification title:	AAFC Infrastructure Flood Mapping in Saskatchewan
Data product specification reference date:	April 10, 2013
Data product specification responsible party:	Agri-geomatics
Data product specification language:	English
Data product specification topic category:	Elevation

1.3. Terms and definitions

- Feature attribute
characteristic of a feature
- Class
description of a set of objects that share the same attributes, operations, methods, relationships, and semantics [UML Semantics]
NOTE: A class does not always have an associated geometry (e.g. the metadata class).
- Feature
abstraction of real world phenomena
- Object
entity with a well-defined boundary and identity that encapsulates state and behaviour [UML]

Semantics]

NOTE: An object is an instance of a class.

- Package
grouping of a set of classes, relationships, and even other packages with a view to organizing the model into more abstract structures

1.4. Abbreviations

AAFC	Agriculture and Agri-Food Canada
EPSG	European Petroleum Survey Group
NAD 83	North American Datum of 1983
UTM	Universal Transverse Mercator
HTTP	Hypertext Transfer Protocol
LiDAR	

2. SPECIFICATION SCOPE

This data specification has only one scope, the general scope.

NOTE: The term 'specification scope' originates from the International Standard ISO19131. 'Specification scope' does not express the purpose for the creation of a data specification or the potential use of data, but identifies partitions of the data specification where specific requirements apply.

3. DATA PRODUCT IDENTIFICATION

3.1. Data Series Identification

Title	AAFC Infrastructure Flood Mapping in Saskatchewan
Alternate Title	
Abstract	LiDAR data collected in the fall of 2011 and spring 2012 for AAFC owned water control structures in the Pheasant Creek, Roughbark, Moosomin, Braddock, Maple Creek, Eastend, Altawan, Admiral, Russell Creek, Cadillac-Gouverneur and Lafleche areas. Includes Digital Terrain Models, Grid Points, Hillshades, Contours and Orthorectified Imagery.
Purpose	LiDAR Data to be used by AAFC to assess whether additional land control should be pursued and other hydrological studies including potential dam break failure scenarios.
Topic Category	elevation
Spatial Reference Type	
Spatial Resolution	
Geographic Description	
Supplemental Information	
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject Thesaurus (http://www.thesaurus.gc.ca/recherche-search/thes-eng.html) Date: February 1, 2000 Keywords:Earth Science, Topography
Scope identification	series

3.2. Data product identification

3.2.1 AAFC Infrastructure Flood Mapping in Saskatchewan - Contours - 50 centimetre

Title	AAFC Infrastructure Flood Mapping in Saskatchewan - 50 centimetre (aafc_sk_structure_fld_map_contour_50cm)
Alternate Title	
Abstract	The AAFC Infrastructure Flood Mapping in Saskatchewan - 50 centimetres is the LiDAR contours with an interval of 0.5m of the capture area of Saskatchewan. The contours were modeled from the ground class at a maximum vertical distance of 0.5m and a horizontal distance of 20 m. Breaklines were not used around water features therefore a uniform height of water bodies is not necessarily present if overlapping data was collected on different days. Major contours were defined every 5m and minor contours every 0.5 m.
Purpose	LiDAR Data to be used by AAFC to assess whether additional land control should be pursued and other hydrological studies including potential dam break failure scenarios.
Topic Category	elevation

Spatial Reference Type	vector
Spatial Resolution	
Geographic Description	WEST LONGITUDE -110 EAST LONGITUDE -104 NORTH LATITUDE 50 SOUTH LATITUDE 49
Supplemental Information	LiDAR data was collected and processed by LiDAR Services International (LSI). The capture area was collected with LSI's Matrix System mounted in a Cessna 185 and flown at 600 m above ground level and 240kph. The contour data represented here was generated by the contractor cited above. Please refer to the metadata attachments for more information. extents - ground condition(temporal) - 04-17-2012 extents - vertical - 789.499977 to 904.999977
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject Thesaurus (http://www.thesaurus.gc.ca/recherche-search/thes-eng.html) Date: February 1, 2000 Keywords:Earth Science, Topography
Scope Identification	dataset
Feature Attribute Names	Elevation, Capture Area

3.2.2 Mosaic of the AAFC Infrastructure Flood Mapping in Saskatchewan 1 meter Bare Earth DEM

Title	Mosaic of the AAFC Infrastructure Flood Mapping in Saskatchewan 1 meter Bare Earth DEM (aafc_sk_structure fld_map_dem)
Alternate Title	
Abstract	The Mosaic of the AAFC Infrastructure Flood Mapping in Saskatchewan 1 meter Bare Earth DEM a mosaic dataset of the bare earth DEMs created at a 1 m interval for the capture area of Saskatchewan. The bare earth DEM elevations were derived from a TIN surface model of the combined DTM Key Point and Ground classes in the LiDAR point cloud tiles. It should be noted that the grid point elevations have been interpolated from the LiDAR points and may contain greater uncertainty depending on the amount of interpolation performed.
Purpose	LiDAR Data to be used by AAFC to assess whether additional land control should be pursued and other hydrological studies including potential dam break failure scenarios.
Topic Category	elevation
Spatial Reference Type	grid
Spatial Resolution	
Geographic Description	WEST LONGITUDE -110 EAST LONGITUDE -104 NORTH LATITUDE 50

	SOUTH LATITUDE 49
Supplemental Information	LiDAR data was collected and processed by LiDAR Services International (LSI). The capture area was collected with LSI's Matrix System mounted in a Cessna 185 and flown at 600 m above ground level and 240kph. extents- ground condition(temporal)- 04-17-2012
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject Thesaurus (http://www.thesaurus.gc.ca/recherche-search/thes-eng.html) Date: February 1, 2000 Keywords:Earth Science, Topography
Scope Identification	dataset
Feature Attribute Names	

3.2.3 Mosaic of the AAFC Infrastructure Flood Mapping in Saskatchewan 1 meter Full Feature DEM

Title	Mosaic of the AAFC Infrastructure Flood Mapping in Saskatchewan 1 meter Full Feature DEM (aafc_sk_structure fld_map_ff_dem)
Alternate Title	
Abstract	Mosaic of the AAFC Infrastructure Flood Mapping in Saskatchewan 1 meter Full Feature DEM a mosaic dataset of the full feature DEMs created at a 1 m interval for the capture area of Saskatchewan. The full feature grid point elevations were derived from the highest point in the High Vegetation class. At coordinates with no High Vegetation points the elevation of the corresponding bare earth grid point was applied.
Purpose	LiDAR Data to be used by AAFC to assess whether additional land control should be pursued and other hydrological studies including potential dam break failure scenarios.
Topic Category	elevation
Spatial Reference Type	grid
Spatial Resolution	
Geographic Description	WEST LONGITUDE -110 EAST LONGITUDE -104 NORTH LATITUDE 50 SOUTH LATITUDE 49
Supplemental Information	LiDAR data was collected and processed by LiDAR Services International (LSI). The capture area was collected with LSI's Matrix System mounted in a Cessna 185 and flown at 600 m above ground level and 240kph.The full feature data includes all features such as buildings and vegetation. extents - ground condition(temporal) - 04-17-2012
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject

	Thesaurus (http://www.thesaurus.gc.ca/recherche-search/thes-eng.html) Date: February 1, 2000 Keywords:Earth Science, Topography
Scope Identification	dataset
Feature Attribute Names	

3.2.4 Mosaic of the AAFC Infrastructure Flood Mapping in Saskatchewan 1 meter Full Feature Hillshade

Title	Mosaic of the AAFC Infrastructure Flood Mapping in Saskatchewan 1 meter Full Feature Hillshade (aafc_sk_structure_fld_map_ff_hillshd)
Alternate Title	
Abstract	The Mosaic of the AAFC Infrastructure Flood Mapping in Saskatchewan 1 meter Full Feature Hillshade is a mosaic dataset of the full feature hillshades created at a 1 m interval for the capture area of Saskatchewan. The full feature hillshade images were derived from the full feature DEM. The hillshades were created using a 315 degree sun azimuth and 45 degree sun angle.
Purpose	LiDAR Data to be used by AAFC to assess whether additional land control should be pursued and other hydrological studies including potential dam break failure scenarios.
Topic Category	elevation
Spatial Reference Type	grid
Spatial Resolution	
Geographic Description	WEST LONGITUDE -110 EAST LONGITUDE -104 NORTH LATITUDE 50 SOUTH LATITUDE 49
Supplemental Information	LiDAR data was collected and processed by LiDAR Services International (LSI). The capture area was collected with LSI's Matrix System mounted in a Cessna 185 and flown at 600 m above ground level and 240kph.The full feature data includes all features such as buildings and vegetation. extents - ground condition(temporal) - 04-17-2012
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject Thesaurus (http://www.thesaurus.gc.ca/recherche-search/thes-eng.html) Date: February 1, 2000 Keywords:Earth Science, Topography
Scope Identification	dataset
Feature Attribute Names	

3.2.5 Mosaic of the AAFC Infrastructure Flood Mapping in Saskatchewan 1 meter Bare Earth Hillshade

Title	Mosaic of the AAFC Infrastructure Flood Mapping in Saskatchewan 1 meter Bare Earth Hillshade (aafc_sk_structure_fld_map_hillshd)
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Alternate Title	
Abstract	The Mosaic of the AAFC Infrastructure Flood Mapping in Saskatchewan 1 meter Bare Earth Hillshade is a mosaic dataset of the bare earth hillshades created at a 1 m interval for the capture area of Saskatchewan. The bare earth hillshade images were derived from the bare earth DEM. The hillshades were created using a 315 degree sun azimuth and 45 degree sun angle.
Purpose	LiDAR Data to be used by AAFC to assess whether additional land control should be pursued and other hydrological studies including potential dam break failure scenarios.
Topic Category	elevation
Spatial Reference Type	grid
Spatial Resolution	
Geographic Description	WEST LONGITUDE -110 EAST LONGITUDE -104 NORTH LATITUDE 50 SOUTH LATITUDE 49
Supplemental Information	LiDAR data was collected and processed by LiDAR Services International (LSI). The capture area was collected with LSI's Matrix System mounted in a Cessna 185 and flown at 600 m above ground level and 240kph. extents- ground condition(temporal) - 04-17-2012
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject Thesaurus (http://www.thesaurus.gc.ca/recherche-search/thes-eng.html) Date: February 1, 2000 Keywords:Earth Science, Topography
Scope Identification	dataset
Feature Attribute Names	

3.2.6 Mosaic of the AAFC Infrastructure Flood Mapping in Saskatchewan 20 centimeter colour orthophotos

Title	Mosaic of the AAFC Infrastructure Flood Mapping in Saskatchewan 20 centimeter colour orthophotos (aafc_sk_structure_fld_map_ortho_20cm)
Alternate Title	
Abstract	The Mosaic of the AAFC Infrastructure Flood Mapping in Saskatchewan 20 centimeter colour orthophotos is a mosaic dataset of the georeferenced color digital orthophotos with 20 cm pixel size. The imagery was delivered in GeoTIF and ECW formats. The TIF and ECW mosaics were delivered in the same 1 km x 1 km tiles as the LiDAR data, and complete mosaics for each area in MrSID format were also provided. 17 The digital photos were orthorectified using the ground model created from the <i>DTM Key Points</i> . With orthorectification, only features on the surface of the ground are correctly positioned in the orthophotos. Objects above the surface of the ground, such as building rooftops and trees, may

	contain horizontal displacement due to image parallax experienced when the photos were captured. This is sometimes apparent along the cut lines between photos. For positioning of above-ground structures it is recommended to use the LiDAR point clouds for accurate horizontal placement.
Purpose	LiDAR Data to be used by AAFC to assess whether additional land control should be pursued and other hydrological studies including potential dam break failure scenarios.
Topic Category	basemapsEarthcoverImagery
Spatial Reference Type	grid
Spatial Resolution	50 CM
Geographic Description	WEST LONGITUDE -110 EAST LONGITUDE -104 NORTH LATITUDE 50 SOUTH LATITUDE 49
Supplemental Information	LiDAR data was collected and processed by LiDAR Services International (LSI). The capture area was collected with LSI's Matrix System mounted in a Cessna 185 and flown at 600 m above ground level and 240kph. The contour data represented here was generated by the contractor cited above. Please refer to the metadata attachments for more information. extents - ground condition(temporal) 11-19-2011 to 11-20-2011 extents - vertical - 831.499977 to 923.999977
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject Thesaurus (http://www.thesaurus.gc.ca/recherche-search/thes-eng.html) Date: February 1, 2000 Keywords:Earth Science, Topography, Remote sensing
Scope Identification	dataset
Feature Attribute Names	

3.2.3 AAFC Infrastructure Flood Mapping in Saskatchewan – Capture Area Footprint

Title	AAFC Infrastructure Flood Mapping in Saskatchewan – Capture Area Footprint (aafc_sk_structure_fld_map_footprint)
Alternate Title	
Abstract	The AAFC Infrastructure Flood Mapping in Saskatchewan – Capture Area Footprint shows the regions of Saskatchewan that were flown and in which corresponding LiDar and Orthorectified imagery data were capture.
Purpose	To display the capture area of the AAFC Infrastructure Flood Mapping in Saskatchewan project

Topic Category	elevation
Spatial Reference Type	vector
Spatial Resolution	50 CM
Geographic Description	WEST LONGITUDE -110 EAST LONGITUDE -104 NORTH LATITUDE 50 SOUTH LATITUDE 49
Supplemental Information	
Constraints	Data are subject to the Government of Canada Open Data License Agreement: http://www.data.gc.ca
Keywords	Thesaurus: Government of Canada Core Subject Thesaurus (http://www.thesaurus.gc.ca/recherche-search/thes-eng.html) Date: February 1, 2000 Keywords:Earth Science, Topography
Scope Identification	dataset
Feature Attribute Names	Capture Area

4. DATA CONTENT AND STRUCTURE

The AAFC Infrastructure Flood Mapping in Saskatchewan data series is structure by feature and ESRI mosaic datasets.

An application schema expressed in UML details the content of the features and an associated feature catalogue provides the semantics of the model elements.

4.1. Feature-based application schema

AAFC_SK_STRUCTURE_FLD_MAP_FOOTPRINT	
REGION_NAME	CHAR

AAFC_SK_STRUCTURE_FLD_MAP_CONTOUR_50CM	
ELEVATION_METER_NUM	NUMBER
REGION_NAME	CHAR

4.2. Feature catalogue – AAFC Infrastructure Flood Mapping in Saskatchewan

Title	AAFC Infrastructure Flood Mapping in Saskatchewan - Feature Catalogue
Scope	Elevation
Version Number	
Version Date	
Producer	Agri-Geomatics, Agriculture and Agri-Food Canada

System-generated attributes (for example, OBJECTID, Shape, Shape Length and Area) are not defined in the feature catalog.

4.2.1. Feature attributes

4.2.1.1. Elevation

Name	Elevation (ELEVATION_METER_NUM)		
Definition	Elevation in meters		
Aliases			
Producer	Agriculture and Agri-Food Canada, Government of Canada		
Value Data Type	integer		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

4.2.1.2. Capture Area

Name	Capture Area (REGION_NAME)		
Definition	Name of the area flown.		
Aliases			
Producer	Agriculture and Agri-Food Canada, Government of Canada		
Value Data Type	integer		
Value Domain Type	0 (not enumerated)		
Value Domain			
	Feature Attribute Value		
	Label	Code	Definition

5. REFERENCE SYSTEM

5.1. Spatial reference system

Horizontal coordinate reference system: WGS 84

Map projection: Web Mercator Auxiliary Sphere; EPSG: 3857

Horizontal coordinate reference system:NAD 83
 Map projection: EPSG 26913

5.2. Temporal reference system

Gregorian calendar

6. DATA QUALITY

6.1. Completeness

Measure not defined at this time.

6.2. Logical consistency

Measure not defined at this time.

6.3. Positional accuracy

Measure not defined at this time.

6.4. Temporal accuracy

Measure not defined at this time.

6.5. Thematic accuracy

Measure not defined at this time.

6.6. Lineage statement

Lineage Statement	Airborne LiDAR collection occurred October 25-November 20th, 2011 and April 13 th -18 th , 2012. LiDAR system installed in a Cessna 185 airplane owned and operated by CanWest Corporate Air Charters of Slave Lake, Alberta LiDAR data was collected at a flying height of 600 m above ground level and an air speed of 240 km/h. Riegl LMS-Q560 laser used pulsed at an approximate rate of 137 kHz resulting in a computed average of ground spacing equal to 0.70 m <u>Mosaicking derived products provided by the contractor revealed a 50 centimeter gap between tiles making it unusable for modeling and analysis. Therefore, LiDAR point files were processed by AAFC staff to create seamless DEM, Hillshade, and Contour products.</u>
Scope	series

7. DATA CAPTURE

All flight lines were planned and flown at 600 m above ground level and an approximate speed of 240 km/h. The parallel flight lines were collected with 400 m separation resulting in approximately 40% side overlap of the LiDAR and imagery data. In addition, for each area one or more perpendicular cross or tie lines were flown for quality control.

During data collection the Q560 laser pulsed at 137 kHz with full waveform multi-return capability resulting in an average point spacing of 0.70 m, or 2.0 points per square metre. The airborne GPS receiver logged at 1-second intervals simultaneously with the IMU recording the orientation and accelerations of the sensor plate every 0.005 seconds. Also, downward photos were collected with the Canon EOS-1D Mark III digital camera every 2.2 seconds for an average of 60% forward overlap between consecutive photos.

To ensure data accuracy and quality assurance of the LiDAR data, multiple ground check point data verification tests were performed. Independent, high accuracy GPS ground check points were collected on foot with a pole mounted GPS receiver and antenna as recommended in the *ASPRS Guidelines – Vertical Accuracy Reporting for LiDAR Data V1.0*.

LiDAR Services International (LSI), a Calgary-based LiDAR company completed an airborne LiDAR survey for Agriculture and Agri-Foods Canada (AAFC) in October-November 2011 and April 2012. The Fall 2011 portion of the project involved collection of LiDAR data for the Roughbark, Braddock, and Altawan project sites in southern Saskatchewan. The Spring 2012 portion of the project involved collection of LiDAR data for the Admiral, Lafleche, Russell Creek and Cadillac-Gouverneur project sites in southern Saskatchewan. LiDAR data was successfully collected, processed and delivered with the following conditions:

- LiDAR system installed in a Cessna 185 airplane owned and operated by CanWest Corporate Air Charters of Slave Lake, Alberta
- Airborne LiDAR collection occurred October 25-November 20th, 2011 and April 13th-18th, 2012.
- LiDAR data was collected at a flying height of 600 m above ground level and an air speed of 240 km/h.
- Riegl LMS-Q560 laser used pulsed at an approximate rate of 137 kHz resulting in a computed average of ground spacing equal to 0.70 m
- Horizontal Datum: NAD83 (CSRS)
- Vertical Datum: CGVD28 orthometric heights (HTv2.0 height transformation model)
- Map projection: UTM Zone 13 (Central meridian = 105 degrees west longitude)
- Deliverable included:
 - 1m bare earth and full feature grids in 1 km x 1 km tiles (ASCII XYZ format)
 - 1m bare earth and full feature greyscale hillshades for each project area (GeoTiff)
 - Classified LiDAR point clouds and ASCII extractor program in 1km x1km tiles (LAS v1.2 format)
 - Orthorectified imagery with 0.2m pixel size in 1 km x 1 km tiles (GeoTiff and ECW format) and 1 MrSID image for each project area
 - LiDAR contours 0.5m intervals (DWG and Shp format) in 1 km x 1 km tiles
 - LiDAR tile Index (ESRI shp format)
 - LiDAR survey report

8. DATA MAINTENANCE

asNeeded

9. PORTRAYAL

Not applicable.

10. DATA PRODUCT DELIVERY

Delivery format information:

File Geodatabase

format name: Esri Geodatabase (File-based)
 format version: 10.1
 specification: A collection of various types of GIS datasets held in a file system folder.
 (<http://arcgis.com>)
 languages: eng
 character set: utf8

TIF

format name: Tag Interleaved File:
 version: 6.0
 specification: GeoTIFF is format extension for storing georeference and geocoding information in a TIFF 6.0 compliant raster file by tying a raster image to a known model space or map projection.

languages: eng
character set: utf8

11. METADATA

The metadata requirements follow the Government of Canada's Treasury Board Standard on Geospatial Data (ISO 19115).