



Anthropogenic surface disturbance mapping in the Yukon

Summary document
Version 1.2



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1 Introduction

1.1 Overview

The Government of Yukon has developed a model for the collection and storage of mapped anthropogenic (human-caused) surface disturbance in the Yukon. Surface disturbances include any linear or areal features caused by human activities that are detectable on the ground or visible in satellite or aerial imagery.

Surface disturbance data were originally sought as input to specific wildlife modeling and planning projects, but are now important inputs to many government planning, assessment, and operational activities. Surface disturbance mapping can be initiated and managed by any Government of Yukon program; however, this database is curated by the Fish and Wildlife Branch, Department of Environment.

1.2 Background

Since 2011, the Government of Yukon has issued contracts to map surface disturbance. Mapping contracts tendered prior to 2014 were issued to different contractors that followed “guidelines” rather than documented standards, granting contractors some latitude in the creation of deliverables. In September 2014, a surface disturbance data model was created that took into consideration work completed to date, departmental program needs, and mapping approaches. The data collected in previous years was then integrated into a single, centrally-managed geodatabase, compliant with the surface disturbance data model.

In January 2021, work began to update the data model to include historical surface disturbance data. This model facilitates the characterization of surface disturbance through time in areas that have been mapped at multiple time steps.

1.3 Scope

This document is intended to act as a reference for users of the surface disturbance database. It will provide information on the structure of the surface disturbance database and the data attributes.

A heads-up digitizing method was used to collect currently mapped features, though different methods may be explored in the future. National Road Network (NRN) and National Railway Network (NRWN) features have been adapted and included in this dataset.

2 Surface disturbance data model

The surface disturbance database was designed to use ArcGIS software as the platform. The format of the database is an ESRI file geodatabase; its structure is shown in Figure 1. Each feature class within the file geodatabase has metadata associated with it. The metadata includes the summary, description, credits, and ownership of the surface disturbance dataset. All feature classes are stored in NAD83 CSRS Yukon Albers projection.

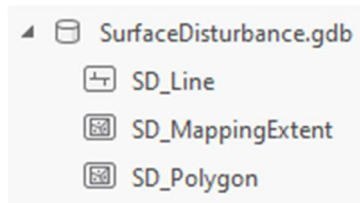


Figure 1: Structure of the Surface Disturbance Database

The surface disturbance features are stored based on their geometry type and are separated into lines and polygons (Figure 1). Point features were previously captured to represent small areal features such as individual buildings. All point features have been retired and re-digitized as polygons to more accurately capture the spatial extent of the surface feature. No new point data will be collected; moving forward, all surface disturbance data will be stored as either a polygon or line feature.

The polygon feature class entitled “SD_MappingExtent” captures the spatial extent of completed surface disturbance mapping projects. Within these polygons, features were digitized using high resolution satellite imagery and orthophotos; outside of these polygons, disturbance mapping is either incomplete or non-existent.

2.1 Database restructuring

The original database represented a static picture of the best available surface disturbance data across the Yukon. All features were digitized using the most recent and highest resolution imagery available at the time of mapping. Project areas were infrequently remapped to update the database. When updates occurred, out-of-date features were retired from the database and replaced with new features.

In response to the need to track surface disturbance through time, the database was restructured to accommodate the repeat characterization of surface disturbance features through time. The DATABASE field was created to separate features by their data quality and time stamp, as described in Table 1. Each feature must belong to one of these three database sections: Most Recent, Historic, or Retired.



Table 1: A description of each part of the database, as defined in the DATABASE attribute field

DATABASE	Description
Most Recent	The most up to date characterization of surface disturbance on the landscape
Historic	Characterizes surface disturbance observed in the past
Retired	Features that have been removed from the active database

Most Recent features represent the best available and most recent characterization of anthropogenic surface disturbance in the Yukon, digitized from imagery with the highest available resolution. There is no feature overlap permitted between Most Recent areal features. The original surface disturbance data model included only Most Recent features.

Historic features represent surface disturbance as it was observed in the past; these features are accurate for the associated image date, and are digitized from imagery with the highest available resolution at the time. Historic features may overlap each other and Most Recent features.

Retired features have been deprecated and removed from the public-facing database. There are a number of reasons why a feature may be retired, including digitization error, location error, and digitization from lower resolution imagery.

3 Disturbance data dictionary

The following sections outline the attributes and domains used to characterize surface disturbance within the current data model.

3.1 Interpretation dictionary for feature attributes

Line and polygon feature classes have essentially the same data model, except for a few fields that are unique to the line feature class.

Coded domains ensure consistency in feature naming and attribution, and also help increase the efficiency of data collection. The following sections identify the domains used for linear and areal disturbance types, and all other shared domains, including descriptions for each.

3.1.1 Polygon/areal features

The polygon feature class is best used to represent areal disturbances or clearings resulting from various industries or activities, such as agricultural fields, forestry cut blocks, oil and gas well pads, mining sites, industrial areas, etc.

The data dictionary of attributes used to describe areal features is shown in Table 2.

Table 2: Areal surface disturbance attributes, domains, and descriptions

Attribute	Data Type	Domains	Description
REF_ID	Text (20)		Unique feature reference ID
DATABASE	Text (20)	Historic, Most Recent, Retired	Sub-database to which the feature belongs
TYPE_INDUSTRY	Text (50)	Table 6	Major classification of disturbance feature by industry
TYPE_DISTURBANCE	Text (50)	Table 6	Sub classification of disturbance feature
SCALE_CAPTURED	Long		Scale at which the feature was digitized
DATA_SOURCE	Text (10)	Imagery, GPS, Other	Data source: digitized from imagery, captured by GPS, or obtained by other means
IMAGE_NAME	Text (100)		Filename of source imagery
IMAGE_DATE	Date		Date that imagery was captured
IMAGE_RESOLUTION	Double		Resolution of source imagery in metres
IMAGE_SENSOR	Text (35)		Name of sensor that captured source imagery

3.1.2 Polyline/linear features

The polyline feature class is best used to represent linear disturbance features visible on imagery or captured from GPS or other means. The following features should always be captured as a line regardless of width: trails, roads, cut lines, pipelines, utility corridors, etc. There could be exceptions for some pipeline, utility, or right of way corridors, especially if width varies greatly.

The data dictionary of attributes used to describe linear features is shown in Table 3.

Table 3: Linear surface disturbance attributes and descriptions.

Attribute	Data Type	Domains	Description
REF_ID	Text (20)		Unique feature reference ID
DATABASE	Text (20)	Historic, Most Recent, Retired	Sub-database to which the feature belongs
TYPE_INDUSTRY	Text (50)	Table 7	Major classification of disturbance feature by industry
TYPE_DISTURBANCE	Text (50)	Table 7	Sub classification of disturbance feature
WIDTH_M*	Double		Width of feature in metres
WIDTH_CLASS**	Text (5)	HIGH, MED, LOW	Width of feature by classification
SCALE_CAPTURED	Long		Scale at which the feature was digitized

Table 3 continued: Linear surface disturbance attributes and descriptions.

Attribute	Data Type	Domains	Description
DATA_SOURCE	Text (10)	Imagery, GPS, NRN, NRWN, Other	Data source: digitized from imagery, captured by GPS, adapted from the NRN or NRWN, or obtained by other means
IMAGE_NAME	Text (100)		Filename of source imagery
IMAGE_DATE	Date		Date that imagery was captured
IMAGE_RESOLUTION	Double		Resolution of source imagery in metres
IMAGE_SENSOR	Text (35)		Name of sensor that captured source imagery

*WIDTH_M: Linear features must be attributed with a width measurement. The width of the feature can be estimated in metres from the average of multiple measurements, and rounded to the nearest whole number.

**WIDTH_CLASS: This field employs a classification scheme used by previous contractors. The width values are shown in Table 4.

Table 4: Width classification breakdown

WIDTH_CLASS	Anticipated Value Range (metres)
LOW	<4
MED	4-8
HIGH	>8

3.2 Industry and disturbance types

In the surface disturbance database, industry and disturbance types are represented in the attribute fields TYPE_INDUSTRY and TYPE_DISTURBANCE respectively.

The disturbance type is intended to describe the feature on the ground (cutline, clearing) regardless of its cause, whereas the industry type further qualifies the disturbance and references who/what is responsible for creating the disturbance. The industry type is often interpreted, or derived from area knowledge or other ancillary data.

The disturbance type is not necessarily defined by the industry type. Disturbance type classifications can be associated with multiple industry type classifications. For example, the disturbance type “Gravel Pit / Quarry” may be associated with both the “Mining” and “Transportation” industry type classes.

3.2.1 Coded domains for industry and disturbance type attribute fields

The TYPE_INDUSTRY and TYPE_DISTURBANCE fields use coded domains to ensure consistency in naming and attribution. It is important to note that coded domain lists are not exhaustive for surface disturbances in the Yukon; classifications can be added as needed. The coded domain values for industry type are described in Table 5.

Table 5: Industry type coded values

TYPE_INDUSTRY	Description
Mining	Mining includes mineral exploration for quartz or placer: mine aggregates, pits, remote fuel caches, exploration roads, etc.
Oil and Gas	Seismic, well and pad, camps, pipelines, etc.
Rural	Disturbance typically caused by land ownership in rural areas
Transportation	Road and trails that are not obviously for resource access or extraction; gravel pit for road maintenance would also have this industry type
Unknown	Unknown industry type
Urban	Urban Disturbance, residential, commercial, towns, etc.
Utility	Power lines and telephone corridors
Agriculture (Polygon only)	Farms, ranches, fields, etc.
Forestry (Polygon only)	Cut blocks, resource roads, etc.

3.2.1.1 Areal features

Table 6 shows the different industry and disturbance classes used for areal features.

Table 6: Areal industry and disturbance type classifications

TYPE_INDUSTRY	TYPE_DISTURBANCE	DESCRIPTION
Agriculture	Agriculture	Farms, ranches, or other agricultural areas
Forestry	Forestry	Cut blocks or other forestry related activities
Mining	Building	A building footprint or the building and the surrounding land related to mining activities
	Drill Pad	Drill pad features related to mineral exploration activities
	Fuel Cache	Remote caches of fuel allowing for mineral exploration activities (will often have fuel tanks and barrels)
	Gravel Pit / Quarry	Pit or quarry for mining gravel or aggregate
	Laydown area	Areas used to store materials and equipment for mining operations
	Mining	Miscellaneous or unknown mining activities
	Placer Mining - Minor	Placer mining area with little disturbance
	Placer Mining - Significant	Placer mining area with greater disturbance
	Quartz Mining - Minor	Quartz mining area with little disturbance
	Quartz Mining - Significant	Quartz mining area with greater disturbance
	Tailing Pond	Tailing pond associated with mining activity
Camp	Mining camp	
Oil and Gas	Well Pad	Cleared area surrounding oil or gas well

Table 6 continued: Areal industry and disturbance type classifications

TYPE_INDUSTRY	TYPE_DISTURBANCE	DESCRIPTION
Rural	Camp	Any camp outside of mining areas, including fishing/hunting camps, ENV conservation officer cabins/camps, outfitters, etc.
	Homestead	Rural dwelling and associated land
Transportation	Airstrip	Airport or airstrip
	Clearing	Clearings that are related to transportation but could not be clearly attributed as a turn area, pullout, road cut and fill, etc.
	Gravel Pit / Quarry	Gravel pits related to transportation
	Pullout / Turn Area	An area associated with transportation and is intended as a vehicle pullout or turn area
	Road Cut and Fill	Cut slopes and moved earth for road construction purposes
Unknown	Clearing	A tract of land devoid (or nearly devoid) of natural land cover and suspected to be anthropogenic in nature
	Gravel Pit / Quarry	A gravel pit with unknown related industry
	Unknown	Unable to identify from imagery, but suspected to be anthropogenic
Urban	Building	Visible building or structure
	Cemetery	Cemetery
	Clearing	Miscellaneous urban clearings
	Cul-de-sac / Turn Area	A turn area associated with transportation or road cul-de-sac
	Dam	Barrier impounding water or stream
	Golf Course	Recreational golfing area
	Industrial	Areas that are designated for industrial uses: factories, tank farm, transportation area
	Institutional	Any institutional buildings and immediate cleared area: School, government, etc.
	Landfill	Site used for disposal of waste materials
	Pond	Standing body of water, created anthropogenically; includes sewage lagoons, wastewater facilities, and artificial bodies of water
	Recreation Area	Visible disturbance in Urban / Rural parks and recreation areas
	Rural Residential	Land use in which housing predominates in an urban or community setting
	Tower	A tall structure, possibly used for communications or forestry
Urban	Miscellaneous or unknown urban features	

3.2.1.2 Linear features

Table 7 shows the different industry and disturbance classes used for linear features.

Table 7: Linear disturbance industry and disturbance type classifications

TYPE_INDUSTRY	TYPE_DISTURBANCE	DESCRIPTION
Mining	Diversion Channel	An engineered linear bypass feature that redirects a watercourse around a mining feature such as a tailings pond
	Survey / Cutline	A linear cleared area through undeveloped land, used for line-of-sight surveying; impossible to distinguish whether associated with quartz or placer mining (overlapping or unclear claims information)
	Survey / Cutline - Placer	A linear cleared area through undeveloped land, used for line-of-sight surveying; associated with placer mining (identified using claims information and/or other indicators)
	Survey / Cutline - Quartz	A linear cleared area through undeveloped land, used for line-of-sight surveying; associated with quartz mining (identified using claims information and/or other indicators)
	Trench	A long, narrow excavation dug to expose vein or ore structure
	Unknown	Unknown linear mining disturbance
Oil and Gas	Pipeline	Visible pipeline or pipeline right-of-way (above- or below-ground)
	Seismic Line	Seismic lines
Rural	Driveway	A driveway in a rural area
	Fence	A fence in a rural area
Transportation	Access Assumed	A linear feature that is assumed to be an access road, but could also be a trail
	Access Road	A road or narrow passage whose primary function is to provide access for resource extraction (i.e. mining, forestry) and may also have served in providing public access to the backcountry
	Arterial Road	A major thoroughfare with medium to large traffic capacity
	Local Road	A low-speed thoroughfare, provides access to front of properties, including those with potential public restrictions such as trailer parks, First Nations land, private estate, seasonal residences, gravel pits (NRN definition for Local Street/Local Strata/Local Unknown). Shows signs of regular use.
	Right of Way	For Road Rights as attributed in the land parcels ancillary data

Table 7 continued: Linear disturbance industry and disturbance type classifications

TYPE_INDUSTRY	TYPE_DISTURBANCE	DESCRIPTION
Transportation	Trail	Path or track (often, but not always, <1.5 m wide) used for walking, cycling, ORV, or other backcountry activities (trails used for mining activities are Access Roads)
	Unpaved Road	Dirt or gravel road that does not necessarily access remote resources; usually wider than trails
Unknown	Right of Way	A right of way with unknown industry type
	Survey / Cutline	A linear cleared area through undeveloped land, used for line-of-sight surveying. A cutline may not always be associated with mineral exploration, therefore, Industry Type: Unknown was used to differentiate all cutlines that were outside of mineral exploration
	Unknown	Unclassified, or unable to identify type based on imagery, but suspected to be anthropogenic
Utility	Electric Utility Corridor	Corridor usually running parallel to highway, where transmission lines or other utilities are visible
	Unknown	Unknown linear feature assumed to be a utility corridor; ancillary data is unclear.

