

MnModel Digital Terrain Model - Pits Removed, Minnesota

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Section 1: Overview

Originator: Minnesota Department of Transportation

Title: MnModel Digital Terrain Model - Pits Removed, Minnesota

Abstract: This dataset (DTM30CONDPR_A) was aggregated from a 10m digital terrain model that was developed for use in Mn/Model4 archaeological predictive model. The source DTM10COND raster feature dataset that was generated from existing statewide LiDAR elevation data, and processed to remove man-made features such as roads and ditches, to the greatest extent possible. Bathymetric data were used to replace level lake places for large lakes with existing bathymetric survey data. Topographic data from 1899, digitized by MGS were used to replace a portion of the Mesabi Iron Range, restoring the pit mine lands to a more natural surface. DTM10CONDPR is a pit-removed 32 bit floating point version of the DTM10COND, that was processed with the TauDEM (Terrain Analysis Using Digital Elevation Models) Pit Removal Tool to fill-in all sinks so that state wide surface hydrology calculations could be performed using other TauDEM Tools. TauDEM is a collection of surface hydrology processing tools available from Utah State University, created by David Tarboton. Version 5 of the software can be accessed

here: <http://hydrology.usu.edu/taudem/taudem5/index.html>

Purpose: The purpose of this dataset is to provide a generalized representation of the 32-bit floating point high resolution elevation data set that was suitable for surface hydrology analysis. The source data that this raster grid was aggregated from is a 10m model and is substantially more accurate in the vertical plane for Mn/Model, derived from modern LiDAR source datasets. Also, to minimize the negative effects man-made features have on Mn/Model, and provide bathymetric replacement elevation data for large lakes within the state's border.

For more information please visit MnModel's website: <https://www.dot.state.mn.us/mnmodel/index.html>

Time Period of Content Date:

Currentness Reference: 2011-2017

Progress: Complete

Maintenance and Update Frequency: None Planned

Spatial Extent of Data: Minnesota

Bounding Coordinates:-97.508970
-89.028990
49.652543
43.192405

Place Keywords: Minnesota with 15 mile buffer

Theme Keywords: elevation, Digital Terrain Model, LiDAR, TauDEM, Mn/Model4, MnModel

Theme Keyword Thesaurus: ISO 19115 Topic Category

Access Constraints: None

Use Constraints: This dataset is best suited for general reference only. It is not suitable for precise land measurements or ground surveys.

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Browse Graphic: [Click to view a data sample.](#)

Associated Data Sets: LiDAR, USGS NED, Bathymetric Contours (DNR), Mn/Model, MnModel, "One-hundred years of mining: alterations to the physical and cultural geography of the western half of the Mesabi Iron Range, northern Minnesota" (MGS).

Section 2: Data Quality

Attribute Accuracy:

Logical Consistency: All data were processed using as close to the same methods as possible.

Completeness: LiDAR source data were available for the entire state boundary extent. For the 15-mile buffer outstate, LiDAR data were used where available; if LiDAR was not available for an area, an older USGS NED 10 meter DEM data was used instead.

Horizontal Positional Accuracy: All of the data sources reviewed and the final dataset were within the National Map Accuracy Standards for 1:24,000-scale maps which is +/- 33 feet (11 meters). The dataset is not intended for legal land survey use, and is best suited for general reference.

Vertical Positional Accuracy: Surface elevation vertical accuracy estimated at +/- 2 feet

Lineage: This 30m digital terrain model was developed using a neighborhood analysis in a 3x3 focal mean aggregation window from the source DTM10CONDPR. All source data were down-sampled to 10 meters from original 3-meter resolution county LiDAR data. Additionally, all elevation values were converted from meters to feet, and all county datasets were mosaicked into a seamless statewide LiDAR dataset. At the county boundaries, small strips of 'NoData' cells were replaced with a 3x3 focal mean value. Bathymetric data were also used to replace level lake planes for large lakes with existing bathymetric survey data. Topographic data from 1899, digitized by MGS, were used to replace a portion of the Mesabi Iron Range, restoring the pit mines to a more natural surface. Additionally, man-made features were removed to the greatest extent possible by buffering existing features such as roads, ditches, gravel pits, railroads, airports, then merging together and dissolving the buffers, and using this composite buffer to clip the features out of the modern statewide LiDAR-based DTM.

A set of custom processing tools were developed in Python to search for 'NoData' cells and to replace those found with a dynamic cut-fill process that referenced the existing terrain using multiple, iterative passes to fill in the clipped areas one row of cells per pass starting along the outermost edge. The main methodology behind this approach was to raise ditches and lower road crowns based on calculating a local mean elevation to approximate the original terrain surface. Also, the secondary goal was to reduce the slopes within the replacement zones to less than 15 degrees since Mn/Model's terrain variables have sensitivity to slopes of 15 degrees or greater.

DTM10CONDPR was generated by simply running the TauDEM Pit Remove Tools on DTM10COND using the default settings. DTM10CONDPR was aggregated by a factor of 3 to produce this generalized representation of the digital terrain model at a smaller size. The original DTM10CONDPR data can be obtained by contacting Andra Mathews (andra.mathews@state.mn.us), GIS Analyst at the MnDOT Office of Environmental Stewardship.

Section 3: Spatial Data Organization (not used in this metadata)

Section 4: Coordinate System

Horizontal Coordinate Scheme: Universal Transverse Mercator

UTM Zone Number: 15

Horizontal Datum: NAD83

Horizontal Units: meters

Vertical Datum: not applicable

Vertical Units:

Depth Datum: not applicable

Depth Units:

Cell Width:10

Cell Height:10

Section 5: Attributes

Overview: Digital Terrain Model - 30m - Pits Removed

Detailed Citation:

Table Detail: Digital Terrain Model derived from LiDAR

Field Name	Valid Values	Definition
Value	0 to 2263	Elevation value derived from LiDAR, USGS NED, or extrapolated via systematic neighborhood focal analysis.

Section 6: Distribution

Publisher: Minnesota Department of Transportation

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Distributor's Data Set Identifier: Digital Terrain Model 30m Aggregate - Pits
Removed (DTMCONDPR_A)

Distribution Liability: The download file is a compressed folder that is over 1 GB in size due to the high resolution scale and statewide extent of the data.

USE OF THIS DOCUMENT IS SUBJECT TO MNDOT'S DISCLAIMERS, LEGAL NOTICES AND POLICIES FOUND at <http://www.dot.state.mn.us/information/disclaimer.html>

Ordering Instructions: Please visit the download page for this dataset on the Minnesota Geospatial Commons website using the web link below (Online Linkage).

The following citation is suggested for reference: Minnesota Department of Transportation. Mn/Model4: Digital Terrain Model Aggregate (Pits Removed). Saint Paul, MN.: Cultural Resources Unit, Office of Environmental Stewardship, 2018.

Online Linkage: [I AGREE](#) to the notice in "Distribution Liability" above. Clicking to agree will either begin the download process, link to a service, or provide more instructions. See "Ordering Instructions" above for details.

Section 7: Metadata Reference

Metadata Date:09/03/2019

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Metadata Standard Name: Minnesota Geographic Metadata Guidelines

Metadata Standard Version: 1.2

Metadata Standard Online

Linkage: <http://www.mngeo.state.mn.us/committee/standards/mgmg/metadata.htm>

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