Identification_Information:
    Citation:
        Citation_Information:
            Originator: EarthData International of Maryland, LLC
            Publication_Date: 20020900
            Publication_Time: Unknown
            Title: Digital Land Base Mapping of the Town of Union, Door County, WI
            Edition: 1st Edition
            Geospatial_Data_Presentation_Form: map
            Series_Information:
            Publication_Information:
            Larger_Work_Citation:
                Citation_Information:
                    Series_Information:
                    Publication_Information:
    Description:
        Abstract:
            This metadata document describes the collection and
            processing of Light Detection and Ranging (LIDAR) data
            of the Town of Union in Door County, Wisconsin.
            The resulting data are a bare ground elevation model
            generated from LIDAR data and topographic mapping with
            a 2' contour interval produced for the United States
            Army Corps of Engineers.
        Purpose:
            This dataset is intended for use by the United States Army
            Corps of Engineers for base mapping.
    Time_Period_of_Content:
        Time_Period_Information:
            Single_Date/Time:
                Calendar_Date: 20020900
            Range_of_Dates/Times:
            Multiple_Dates/Times:
        Currentness_Reference: Publication Date
    Status:
        Progress: Complete
        Maintenance_and_Update_Frequency: None planned
    Spatial_Domain:
        Bounding_Coordinates:
            West_Bounding_Coordinate: -087.741524
            East_Bounding_Coordinate: -087.622211
            North_Bounding_Coordinate: 44.763106
            South_Bounding_Coordinate: 44.666748
    Keywords:
        Theme:
            Theme_Keyword_Thesaurus: None
            Theme_Keyword: Digital Land Base Mapping
            Theme_Keyword: Light Detection and Ranging (LIDAR)
            Theme_Keyword: Topographic Map
        Place:
            Place_Keyword_Thesaurus: None
            Place_Keyword: United States of America (USA)
            Place_Keyword: Wisconsin (WI)
            Place_Keyword: Door County (55029)
            Place_Keyword: Town of Union
        Stratum:
        Temporal:
    Access_Constraints: None
    Use_Constraints: None

Point_of_Contact:
    Contact_Information:
        Contact_Person_Primary:
        Contact_Organization_Primary:
            Contact_Organization: EarthData International of Maryland
        Contact_Address:
            Address_Type: mailing and physical address
            Address: 45 West Watkins Mill Rd
            City: Gaithersburg
            State_or_Province: MD
            Postal_Code: 20878
            Country: USA
        Contact_Voice_Telephone: 301-948-8550
        Contact_Facsimile_Telephone: 301-963-2064
        Contact_Electronic_Mail_Address: metadata@earthdata.com
        Hours_of_Service: 9:00-5:00 M-F
Security_Information:
Cross_Reference:
    Citation_Information:
        Series_Information:
        Publication_Information:
Data_Quality_Information:
    Attribute_Accuracy:
    Logical_Consistency_Report:
        Height values between individual LIDAR points within a 3.5
        meter radius were differentiated against surveyed control
        points. A statistical result was determined and indicated
        that the vertical RMSE was +/- 0.15 meters (1 sigma) over the
        project area.
        The resultant map products are fully compliant with National
        Map Accuracy Standards.
    Completeness_Report:
        Differences between individual LIDAR points within a 3.5
        meter radius were calculated against surveyed control
        points. A statistical result was determined and indicated
        that the vertical RMSE was +/- 0.15 meters (1 sigma) for the
        entire project.
        The following software was used for the validation.
        1. Bentley - Microstation
        2. Terrasolid - Terrscan
        3. Trimble - Terramodel
        4. Esri - ArcInfo
        5. EarthData Proprietary software
    Positional_Accuracy:
        Horizontal_Positional_Accuracy:
        Vertical_Positional_Accuracy:
    Lineage:
        Source_Information:
            Source_Citation:
                Citation_Information:
                    Originator: Towill
                    Publication_Date: 20020400
                    Publication_Time: Unknown
                    Title: Ground Control Survey of Door County, WI
                    Geospatial_Data_Presentation_Form: model
                    Series_Information:
                    Publication_Information:
                        Publication_Place: Towill, Inc, San Francisco, CA
                        Publisher: Towill

                    Larger_Work_Citation:
                            Citation_Information:
                                    Series_Information:
                                    Publication_Information:
            Source_Scale_Denominator: 14,400
            Type_of_Source_Media: electronic mail system
            Source_Time_Period_of_Content:
                    Time_Period_Information:
                            Single_Date/Time:
                                    Calendar_Date: 20020400
                            Range_of_Dates/Times:
                            Multiple_Dates/Times:
                    Source_Currentness_Reference: Publication Date
            Source_Citation_Abbreviation: GPS Ground Control
            Source_Contribution:
                    Ground control was established prior to the acquisition of
                    aerial data acquisition.The ground control points were
                    established using GPS for vertical and horizontal
                    coordinate values. Ground control references the
                    Wisconsin Central State Plane NAD83, NAVD29, US
                    Survey Feet.
    Source_Information:
            Source_Citation:
                    Citation_Information:
                            Originator: EarthData Aviation
                            Publication_Date: 20020417
                            Publication_Time: Unknown
                            Title: LIDAR Coverage of Door County, WI
                            Geospatial_Data_Presentation_Form: model
                            Series_Information:
                            Publication_Information:
                                    Publication_Place: Hagerstown, MD
                                    Publisher: EarthData Aviation
                            Larger_Work_Citation:
                                    Citation_Information:
                                            Series_Information:
                                            Publication_Information:
            Type_of_Source_Media: CD-ROM
            Source_Time_Period_of_Content:
                    Time_Period_Information:
                            Single_Date/Time:
                                    Calendar_Date: 20020300
                                    Time_of_Day: Unknown
                            Range_of_Dates/Times:
                            Multiple_Dates/Times:
                    Source_Currentness_Reference: Publication Date
            Source_Citation_Abbreviation: Earthdata Aviation
            Source_Contribution:
                    The project area was flown using EarthData Aviation's
                    Navajo Chieftain aircraft equipped with an AeroScan
                    LIDAR system, an Inertial Measurement Unit (IMU), and
                    dual frequency GPS receiver and antennae. The position
                    and orientation (omega, phi, and kappa) of the aircraft were
                    determined using a GPS receiver located at an existing
                    NGS control point.
                    The LIDAR, IMU, and GPS data were correlated using
                    GPS time and processed using LIDAR post-processing
                    software to determine the coordinate of each point on the
                    ground. A reflective surface DEM of the project area

was delivered with a relative accuracy of +/- 0.15 meters.

Process_Step:

Process_Description:

EarthData has developed a unique method for processing LIDAR data to identify and remove elevation points falling on vegetation, buildings, and other above-ground structures. The algorithms for filtering data were utilized within EarthData's proprietary software and commercial software written by TerraSolid. This software suite of tools provides efficient processing for small to large-scale projects and has been incorporated into ISO 9001 compliant production work flows. The following is a step-by-step breakdown of the process.

1. Using the LIDAR data set provided by EarthData Aviation, the technician performed a visual inspection of the data to verify that the flight lines overlap correctly. The technician also verified that there were no voids, and that the data covered the project limits. The technician then selected a series of areas from the dataset and inspected them where adjacent flight lines overlapped. These overlapping areas were merged and a process which utilizes 3-D Analyst and EarthData's proprietary software was run to detect and color code the differences in elevation values and profiles. The technician reviewed these plots and located the areas that contained systematic errors or distortions that were introduced by the LIDAR sensor.

2. Systematic distortions highlighted in step 1 were removed and the data were re-inspected. Corrections and adjustments can involve the application of angular deflection or compensation for curvature of the ground surface that can be introduced by crossing from one type of land cover to another.

3.The LIDAR data for each flight line were trimmed in batch for the removal of the overlap areas between flight lines. The data were checked against a control network to ensure that vertical requirements were maintained. Conversion to the client-specified datum and projections were then completed. The LIDAR flight line data sets were then segmented into adjoining tiles for batch processing and data management.

4. The initial batch-processing run removed 95% of points falling on vegetation. The algorithm also removed the points that fell on the edge of hard features such as structures, elevated roadways and bridges. In addition, points not classified as ground are coded as intermediate canopy, top of canopy, building, etc. Thus the LIDAR data was classified into thematic layers that can be analyzed separately or together.

5. The data were processed interactively by the operator using LIDAR editing tools. During this final phase the operator generated a TIN based on a desired thematic layers to evaluate the automated classification performed in step 4. This allowed the operator to quickly re-classify points from one layer to another and recreate the TIN surface to see the effects of edits. The use of geo-referenced images were toggled on or off to aid the operator in identifying problem areas. The data was also examined with an automated profiling tool to aid the

operator in the reclassification.
6.The data were separated into a bare-earth DEM. A grid
fill program was used to fill data voids caused from
reflective objects such as buildings and vegetation. The
final DEM was written as an ASCII file (comma & space
delimited), ESRI Shape file, and an ESRI TIN file to a
CDROM.
Source_Used_Citation_Abbreviation: EarthData International
Process_Date: 20020900
Process_Contact:
      Contact_Information:
            Contact_Person_Primary:
                  Contact_Person: Raquel Charrois
                  Contact_Organization: EarthData International
            Contact_Organization_Primary:
            Contact_Address:
                  Address_Type: mailing and physical address
                  Address: 45 West Walkins Mill Road
                  City: Gaithersburg
                  State_or_Province: Maryland
                  Postal_Code: 20878
                  Country: USA
            Contact_Voice_Telephone: 1-301-948-8550
            Contact_Facsimile_Telephone: 1-301-963-2064
            Contact_Electronic_Mail_Address: international-md@earthdata.com
            Hours_of_Service: 9 AM - 5 PM Mon. - Fri.
Cloud_Cover: 0
Spatial_Data_Organization_Information:
    Spatial_Reference_Information:
        Horizontal_Coordinate_System_Definition:
            Planar:
                Grid_Coordinate_System:
                    Grid_Coordinate_System_Name: State Plane Coordinate System 1983
                    Universal_Transverse_Mercator:
                        Transverse_Mercator:
                    Universal_Polar_Stereographic:
                        Polar_Stereographic:
                    State_Plane_Coordinate_System:
                        SPCS_Zone_Identifier: Wisconsin Central (4802)
                        Lambert_Conformal_Conic:
                            Standard_Parallel: 44 15 0.0
                            Standard_Parallel: 45 30 0.0
                            Longitude_of_Central_Meridian: -090.000000
                            Latitude_of_Projection_Origin: +43.833333
                            False_Easting: 600000.0
                            False_Northing: 0.0
                      Transverse_Mercator:
                      Oblique_Mercator:
                        Oblique_Line_Point:
                      Polyconic:
                  ARC_Coordinate_System:
                    Equirectangular:
                    Azimuthal_Equidistant:
                Planar_Coordinate_Information:
                  Planar_Coordinate_Encoding_Method: coordinate pair
                  Coordinate_Representation:
                      Abscissa_Resolution: 2
                      Ordinate_Resolution: 2
                  Distance_and_Bearing_Representation:

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                    Planar_Distance_Units: Survey Feet
                Geodetic_Model:
            Vertical_Coordinate_System_Definition:
                Altitude_System_Definition:
                    Altitude_Datum_Name: National Geodetic Vertical Datum of 1929
                    Altitude_Resolution: 0.15
                    Altitude_Distance_Units: Meters
                    Altitude_Encoding_Method: Explicit elevation coordinate included with horizontal coordinates
                Depth_System_Definition:
Entity_and_Attribute_Information:
    Detailed_Description:
        Entity_Type:
        Attribute:
            Attribute_Domain_Values:
            Attribute_Value_Accuracy_Information:
    Overview_Description:
Distribution_Information:
    Distributor:
        Contact_Information:
            Contact_Person_Primary:
            Contact_Organization_Primary:
                Contact_Organization: United States Army Corps of Engineers - Detroit District
            Contact_Address:
                Address_Type: mailing and physical address
                Address: 477 Michigan Avenue
                City: Detroit
                State_or_Province: MI
                Postal_Code: 48226
                Country: USA
            Contact_Voice_Telephone: 313-226-6751
    Distribution_Liability: None.
    Standard_Order_Process:
        Digital_Form:
            Digital_Transfer_Information:
            Digital_Transfer_Option:
                Online_Option:
                    Computer_Contact_Information:
                        Network_Address:
                        Dialup_Instructions:
                OffLine_Option:
                    Recording_Capacity:
    Available_Time_Period:
        Time_Period_Information:
            Single_Date/Time:
            Range_of_Dates/Times:
            Multiple_Dates/Times:
Metadata_Reference_Information:
    Metadata_Date: 20021000
    Metadata_Contact:
        Contact_Information:
            Contact_Person_Primary:
            Contact_Organization_Primary:
                Contact_Organization: EarthData International of Maryland, LLC
            Contact_Address:
                Address_Type: mailing and physical address
                Address: 45 West Watkins Mill Road
                City: Gaithersburg
                State_or_Province: MD
                Postal_Code: 20878
```

        Country: USA
      Contact_Voice_Telephone: 301-948-8550
      Contact_Facsimile_Telephone: 301-963-2064
      Contact_Electronic_Mail_Address: metadata@earthdata.com
      Hours_of_Service: 9:00 AM - 5:00 PM (ET) M-F
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Security_Information: