The SEWRPC 2015 LiDAR project called for the Planning, Acquisition, processing and derivative products of LiDAR data to be collected at a nominal pulse spacing (NPS) of 0.7 meters. Project specifications are based on the U.S. Geological Survey National Geospatial Program Base LiDAR Specification, Version 1.2. The primary set of deliverable data was developed based on the following two horizontal projection/datum systems as specified in the contract:

NAD27 State Plane Wisconsin South Zone, US survey feet; NGVD29, US survey feet for Milwaukee, Ozaukee, and Walworth Counties

LiDAR data was delivered in RAW flight line swath format, and processed to create Classified LAS 1.2 Files formatted to individual 10,000-foot x 10,000-foot tiles. Tile counts are listed below:
- Milwaukee: 89 tiles in NAD27
- Ozaukee: 85 tiles
- Walworth: 192 tiles
- Washington: 146 tiles in NAD83 (2011)
- Waukesha: 187 tiles

Corresponding hydro-flattened Digital Terrain Model (DTM) files were created in Esri file geodatabase format. 1-foot contours were created from the hydro-flattened digital terrain model data and delivered in Esri file geodatabase format.

Additionally, a secondary set of unclassified and classified lidar data was developed for the following counties:
- Washington County: 154 tiles in NAD27 State Plane Wisconsin South Zone, US survey feet; NGVD29, US survey feet

Ground Conditions:
LiDAR collection began in Spring 2015, while no snow was on the ground and rivers were at or below normal levels. In order to post process the LiDAR data to meet task order specifications, Quantum Spatial established a total of 127 QC points that were used to calibrate the LIDAR to known ground locations established throughout the project area.

Purpose:
Classified LAS files are used to show the manually reviewed bare earth surface. This allows the user to create Breaklines and DTMs.
The purpose of these lidar data was to produce high accuracy contours.
These raw lidar point cloud data were used to create classified lidar LAS files, 3D breaklines, and hydro-flattened DTMs, and contours as necessary.

Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
  Beginning_Date: 20150324
  Ending_Date: 20150507
Currentness_Reference: ground condition

Status:
Progress: Complete
Maintenance_and_Update_Frequency: None planned

Spatial_Domain:
Bounding_Coordinates:
  West_Bounding_Coordinate: -88.7954451566949
  East_Bounding_Coordinate: -87.7552048758465
  North_Bounding_Coordinate: 43.5669587735573
  South_Bounding_Coordinate: 42.4669599815093

Keywords:
Theme:
  Theme_Keyword_Thesaurus: None
  Theme_Keyword: Elevation data
  Theme_Keyword: Lidar
  Theme_Keyword: Hydrology
Place:
  Place_Keyword_Thesaurus: None
  Place_Keyword: Wisconsin
  Place_Keyword: Milwaukee
  Place_Keyword: Ozaukee
  Place_Keyword: Walworth
  Place_Keyword: Washington
  Place_Keyword: Waukesha

Access_Constraints: No restrictions apply to this data.
Use_Constraints: None. However, users should be aware that temporal changes may have occurred since this dataset was collected and that some parts of these data may no longer represent actual surface conditions. Users should not use these data for critical applications without a full awareness of its limitations.

Point_of_Contact:
Contact_Information:
  Contact_Organization_Primary:
    Contact_Organization: Quantum Spatial, Data Acquisition Department
    Contact_Person: John DiGiovanni
Contact_Address:
  Address_Type: mailing and physical
  Address: 523 Wellington Way
  City: Lexington
  State_or_Province: KY
  Postal_Code: 40503
  Country: USA
Contact_Voice_Telephone: 859-277-8700
Contact_Facsimile_Telephone: 859-277-8901
Contact_Electronic_Mail_Address: jdigiovanni@quantumspatial.com
Hours_of_Service: Monday through Friday 8:00 AM to 5:00 PM
  (Eastern Time)
Contact_Instructions: If unable to reach the contact by telephone, please send an email. You should get a response within 24 hours.
Native_Data_Set_Environment:
  MicroStation Version 8; TerraScan Version 15; TerraModeler Version 15; GeoCue Version 2014.1.21.1; Global Mapper 16; Leica Cloud Pro 1.2; Windows 7 Operating System \PSIHQ\NX3200\Projects\Projects\26119_SEWRPC 38.0 GB and \matrix\matrix\LIDAR\26119_SEWRPC 1.65 TB
Data_Quality_Information:
  Logical_Consistency_Report: Data cover the entire area specified for this project.
  Completeness_Report:
    These raw LAS data files include all data points collected.
    No points have been removed or excluded.
    A visual qualitative assessment was performed to ensure data completeness.
    No void areas or missing data exist. The raw point cloud is of good quality and data passes Nonvegetated Vertical Accuracy specifications.
Positional_Accuracy:
  Vertical_Positional_Accuracy:
    Vertical_Positional_Accuracy_Report:
      The specifications require that only Fundamental Vertical Accuracy (FVA) be computed for raw lidar point cloud swath files.
      The vertical accuracy was tested with 37 independent survey located in open terrain. These check points were not used in the calibration or post processing of the lidar point cloud data. The survey checkpoints were distributed throughout the project area. Specifications for this project require that the RMSEz be 0.5 feet or better.
    Quantitative_Vertical_Positional_Accuracy_Assessment:
      Vertical_Positional_Accuracy_Value: 0.041
      Vertical_Positional_Accuracy_Explanation: The FVA was tested using 37 independent survey located in open terrain. The survey checkpoints were distributed throughout the project area. The 37 independent check points were surveyed using GPS techniques. See survey report for additional survey methodologies. Elevations from the unclassified lidar surface were measured for the x,y location of each check point. Elevations interpolated from the lidar surface were then compared to the elevation values of the surveyed control. The RMSEz was computed to be 0.041 meters (0.135 feet) and AccuracyZ to be 0.080 meters (0.264 feet). RMSEz has been tested to 0.5 feet or better per the task order specifications. AccuracyZ has been tested to meet 18.13 cm
Fundamental Vertical Accuracy at 95 Percent confidence level using
RMSE(z) x 1.9600 as defined by the National Standards for Spatial Data
Accuracy (NSSDA); assessed and reported using National Digital Elevation
Program (NDEP)/ASRPS Guidelines.

Lineage:
  Source_Information:
  Citation_Information:
    Originator: Quantum Spatial
    Publication_Date: 2015
    Title: Control Survey Report of LiDAR Ground Control Points
  Publication_Information:
    Publication_Place: Lexington, KY
    Publisher: Quantum Spatial
  Type_of_Source_Media: online
  Source_Time_Period_of_Content:
  Time_Period_Information:
    Range_of_Dates/Times:
      Beginning_Date: 20150422
      Ending_Date: 20150508
    Source_Currentness_Reference: ground condition
  Source_Citation_Abbreviation: SEWRPC_QL2_2015_LiDAR_gnd_ctrl
  Source_Contribution: This data source was used (along with the
  airborne GPS/IMU Data) to aid in the georeferencing of the lidar point
  cloud data.

Source_Information:
  Citation_Information:
    Originator: Quantum Spatial
    Publication_Date: 2015
    Title: Lidar RAW Data for SEWRPC QL2 2015
    Geospatial_Data_Presentation_FORM: lidar data
  Publication_Information:
    Publication_Place: Quantum Spatial
    Publisher: 2015
  Type_of_Source_Media: online
  Source_Time_Period_of_Content:
  Time_Period_Information:
    Range_of_Dates/Times:
      Beginning_Date: 20150324
      Ending_Date: 20150507
    Source_Currentness_Reference: ground condition
  Source_Citation_Abbreviation: SEWRPC_QL2_2015_LiDAR_Data
  Source_Contribution: This data source was used to populate the
  lidar point cloud data.

Source_Information:
  Citation_Information:
    Originator: Quantum Spatial
    Publication_Date: 2015
    Title: Control Survey Report of LiDAR Quality Control Points
  Publication_Information:
    Publication_Place: Lexington, KY
    Publisher: Quantum Spatial
Type_of_Source_Media: online

Source_Time_Period_of_Content:
  Time_Period_Information:
    Range_of_Dates/Times:
      Beginning_Date: 20150422
      Ending_Date: 20150508
  Source_Currentness_Reference: ground condition
Source_Citation_Abbreviation: SEWRPC_QL2_2015_LiDAR_qc_ctrl
Source_Contribution: This data source was used to QC and vertically adjust the lidar point cloud data.

Process_Step:
  Process_Description:
    Classified LAS Processing:
    The bare earth surface is then manually reviewed to ensure correct classification on the Class 2 (Ground) points. After the bare-earth surface is finalized, it is then used to generate all hydro-breaklines through heads-up digitization.

    All ground (ASPRS Class 2) LiDAR data inside of the Lake Pond and Double Line Drain hydro flattened breaklines were then classified to water (ASPRS Class 9) using TerraScan macro functionality. A buffer of 3 feet was also used around each hydro-flattened feature to classify these ground (ASPRS Class 2) points to Ignored ground (ASPRS Class 10). All Lake Pond Island and Double Line Drain Island features were checked to ensure that the ground (ASPRS Class 2) points were reclassified to the correct classification after the automated classification was completed. All bridge decks were classified to Class 14.

    All overlap data was processed through automated functionality provided by TerraScan to classify the overlapping flight line data to approved classes by USGS. The overlap data was identified using the Overlap Flag, per LAS 1.2 specifications.

    All data was manually reviewed and any remaining artifacts removed using functionality provided by TerraScan and TerraModeler. Global Mapper was used as a final check of the bare earth dataset. GeoCue was then used to create the deliverable industry-standard LAS files for both the All Point Cloud Data and the Bare Earth. Quantum Spatial proprietary software was used to perform final statistical analysis of the classes in the LAS files, on a per tile level to verify final classification metrics and full LAS header information.

Source_Used_Citation_Abbreviation: SEWRPC_QL2_2015_LiDAR_qc_ctrl
Source_Used_Citation_Abbreviation: SEWRPC_QL2_2015_LiDAR_Data
Process_Date: 2016
Source_Produced_Citation_Abbreviation: Classified LAS

Process_Contact:
  Contact_Information:
    Contact.Organization_Primary:
      Contact_Organization: Quantum Spatial
      Contact_Person: Paul Bishop
    Contact_Address:
      Address_Type: mailing and physical
      Address: 523 Wellington Way
      City: Lexington
State or Province: KY
Postal Code: 40503
Country: USA
Contact Voice Telephone: 859-277-8700
Contact Facsimile Telephone: 859-277-8901
Contact Electronic Mail Address: pbishop@quantumspatial.com
Hours of Service: Monday through Friday 8:00 AM to 5:00 PM (Eastern Time)

Contact Instructions: If unable to reach the contact by telephone, please send an email. You should get a response within 24 hours.

Spatial Data Organization Information:
  Direct Spatial Reference Method: Point
  Point and Vector Object Information:
    SDTS Terms Description:
      SDTS Point and Vector Object Type: Point
  Spatial Reference Information:
    Horizontal Coordinate System Definition:
      Planar:
        Grid Coordinate System:
          Grid Coordinate System Name: State Plane Coordinate System 1927
          State Plane Coordinate System:
            SPCS Zone Identifier: 4803
            Lambert Conformal Conic:
              Standard Parallel: 42.73333333333333
              Standard Parallel: 44.06666666666667
              Longitude of Central Meridian: ~90.0
              Latitude of Projection Origin: 42.0
              False Easting: 2000000.0
              False Northing: 0.0
      Planar Coordinate Information:
        Planar Coordinate Encoding Method: coordinate pair
        Coordinate Representation:
          Abscissa Resolution: 0.01
          Ordinate Resolution: 0.01
        Planar Distance Units: survey feet
  Geodetic Model:
    Horizontal Datum Name: North American Datum of 1927
    Ellipsoid Name: Clarke 1866
    Semi-major Axis: 6378206.4
    Denominator of Flattening Ratio: 294.9786982
  Vertical Coordinate System Definition:
    Altitude System Definition:
      Altitude Datum Name: National Geodetic Vertical Datum of 1929
      Altitude Resolution: 0.01
      Altitude Distance Units: feet
      Altitude Encoding Method: Explicit elevation coordinate included

Metadata Reference Information:
  Metadata Date: 20160511
  Metadata Contact:
    Contact Information:
      Contact Organization Primary:
        Contact Organization: Quantum Spatial
Contact Person: Sarah Zibart
Contact Address:
  Address Type: mailing and physical
  Address: 523 Wellington Way
  City: Lexington
  State or Province: KY
  Postal Code: 40503
  Country: USA
Contact Voice Telephone: 859-277-8700
Contact Facsimile Telephone: 859-277-8901
Contact Electronic Mail Address: szibart@quantumspatial.com
Hours of Service: Monday through Friday 8:00 AM to 5:00 PM (Eastern Time)
Contact Instructions: If unable to reach the contact by telephone, please send an email. You should get a response within 24 hours.
Metadata Standard Name: FGDC Content Standard for Digital Geospatial Metadata
Metadata Access Constraints: None.
Metadata Use Constraints: None.
Metadata Security Information:
  Metadata Security Classification System: None.
  Metadata Security Classification: Unclassified
  Metadata Security Handling Description: NONE