Tidal Extent - Mean Higher High Water (MHHW), October 2022 - NC Department of Transportation

File Geodatabase Feature Class

Tags

Tides, tidal, Mean Higher High Water, MHHW, high tide, astronomical tide, lunisolar tide, wind tide, wind-driven water, National Oceanographic and Atmospheric Administration, NOAA, Office of Coastal Management, OCM, QL2, LiDAR, Digital Elevation Model, US Geological Survey, USGS, Hydrologic Unit, HU, fresh water, salt water, flooding, Oceans, Transportation, NCDOT, Environment, Location, North Carolina, ATLAS

Summary

This dataset was originally created in July 2019 and updated in July 2022 as part of the Project ATLAS initiative at NCDOT to support the Sweeping Environmental Group with project delivery in the development phase.

Areas represented in this layer are the extents of astronomical tides in the coastal regions of NC.

These data are used in the following workflows:
- NRTR
- PCE
- Mitigation
- Permitting
    - o Section 10, 401, 404 Permit Type
    - o Nationwide
    - o General,
    - o Individual,
    - o Water Quality Certifications
- US Coast Guard
- CAMA AECs
- CAMA Consistency,
- CAMA Major

Description

The Tidal Extent Mean Higher High Water (MHHW) dataset is a polygon layer depicting the average level of the higher daily high tides.

While tidal action is composed of many constituents, the most prevalent components are the gravitational forces of the sun and moon, which form the foundation of the semidiurnal tidal cycle. These are generally termed astronomical tides. Tidal elevations are recorded throughout numerous tidal data stations operated by the National Oceanic and Atmospheric Administration (NOAA). Elevations are measured relative to the Mean Lower Low Water (MLLW) level at the station, which is established as the average of the lower of the two daily low tides, measured over the most recent 19-year Tidal Datum Epoch (TDE). The TDE was established to account for all significant variations in the distances to the moon and sun that cause slowly varying changes in the range of tide; a period of 18.6 years. The Mean Higher High Water (MHHW) level is the average of the higher daily high tides and is separated from the elevation of the MLLW level by the mean tidal amplitude at that location. For the purposes of this project, the MHHW level was selected as the defining water level with the greatest effect on vegetation communities and the hydrologic function of tidal wetlands.

Datasets developed under Project ATLAS do not replace any Sweeping Environmental field work for future projects and may not be used as a replacement for site visits / field surveys by licensed professionals and hence should be used only as a supporting platform for decision making. Use of this dataset for project scoping or screening is merely pre-decisional.

Credits

The ATLAS Sweeping Environmental Group within NCDOT was tasked to create this dataset. Annual maintenance of this dataset is handled by the Sweeping Environmental Group. Support and maintenance of the enterprise spatial database where this data resides is handled by NCDIT's Transportation GIS Unit.

Use limitations

The North Carolina Department of Transportation shall not be held liable for any errors in this data. This includes errors of omission, commission, errors concerning the content of the data, and relative and positional accuracy of the data. This data cannot be construed to be a legal document. Primary sources from which this data was compiled must be consulted for verification of information contained in this data.

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Extent

West -78.575501 **East** -75.417422
North 36.588982 **South** 33.795245

Scale Range

Maximum (zoomed in) 1:5,000
Minimum (zoomed out) 1:625,000

ArcGIS Metadata ►

Topics and Keywords ►

THEMES OR CATEGORIES OF THE RESOURCE oceans, boundaries, elevation, inlandWaters, location, transportation, environment

* CONTENT TYPE Downloadable Data
EXPORT TO FGDC CSDGM XML FORMAT AS RESOURCE DESCRIPTION No

PLACE KEYWORDS North Carolina

THESAURUS ►
TITLE User
CREATION DATE 2019-07-23 00:00:00
PUBLICATION DATE 2022-10-06 00:00:00

Hide Thesaurus ▲

THEME KEYWORDS Tides, tidal, Mean Higher High Water, MHHW, high tide, astronomical tide, lunisolar tide, wind tide, wind-driven water, National Oceanographic and Atmospheric Administration, NOAA, Office of Coastal Management, OCM, QL2, LiDAR, Digital Elevation Model, US Geological Survey, USGS, Hydrologic Unit, HU, fresh water, salt water, flooding, Oceans, Transportation, NCDOT, Environment, Location, North Carolina, ATLAS

THESAURUS ►
TITLE User
CREATION DATE 2019-07-23 00:00:00

PUBLICATION DATE 2022-10-06 00:00:00

Hide Thesaurus ▲

Hide Topics and Keywords ▲

Citation ►

TITLE Tidal Extent - Mean Higher High Water (MHHW), October 2022 - NC Department of Transportation
CREATION DATE 2019-07-23 00:00:00
PUBLICATION DATE 2022-10-06 00:00:00

PRESENTATION FORMATS digital map
FGDC GEOSPATIAL PRESENTATION FORMAT vector digital data

Hide Citation ▲

Citation Contacts ►

RESPONSIBLE PARTY
ORGANIZATION'S NAME North Carolina Department of Transportation - EAU Mitigation and Modeling Unit
CONTACT'S POSITION Environmental Program Consultant
CONTACT'S ROLE resource provider

CONTACT INFORMATION ►
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VOICE 919-707-6136

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DELIVERY POINT Century Center Building B, 1020 Birch Ridge Drive
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ADMINISTRATIVE AREA NC
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COUNTRY US
E-MAIL ADDRESS ATLAS@ncdot.gov

HOURS OF SERVICE
9:00am – 5:00pm Monday - Friday

CONTACT INSTRUCTIONS
Please send an email with any issues, questions or comments regarding the ATLAS Data Search Tool, ATLAS Screening Tool or ATLAS Workbench. If it is an immediate need, please call the contact number or indicate as such in the subject line in an email.

Hide Contact information ▲

RESPONSIBLE PARTY
ORGANIZATION'S NAME North Carolina Department of Transportation - Sweeping Environmental Group
CONTACT'S POSITION Environmental Program Consultant
CONTACT'S ROLE originator

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Hide Contact information ▲

Hide Citation Contacts ▲

Resource Details ►

DATASET LANGUAGES English (UNITED STATES)
DATASET CHARACTER SET utf8 - 8 bit UCS Transfer Format

STATUS completed
SPATIAL REPRESENTATION TYPE vector

* PROCESSING ENVIRONMENT Version 6.2 (Build 9200) ; Esri ArcGIS 10.8.1.14362

CREDITS
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maintenance of the enterprise spatial database where this data resides is handled by NCDIT's Transportation GIS Unit.

Hide Resource Details ▲

Extents ►

EXTENT
DESCRIPTION
Data collection is complete.

GEOGRAPHIC EXTENT
BOUNDING RECTANGLE
WEST LONGITUDE -84.422111
EAST LONGITUDE -75.416034
SOUTH LATITUDE 33.730557
NORTH LATITUDE 36.617257
EXTENT CONTAINS THE RESOURCE Yes

TEMPORAL EXTENT
BEGINNING DATE 2022-10-06 00:00:00
ENDING DATE 2022-10-06 00:00:00

EXTENT
GEOGRAPHIC EXTENT
BOUNDING RECTANGLE
EXTENT TYPE Extent used for searching
* WEST LONGITUDE -78.575501
* EAST LONGITUDE -75.417422
* NORTH LATITUDE 36.588982
* SOUTH LATITUDE 33.795245
* EXTENT CONTAINS THE RESOURCE Yes

EXTENT IN THE ITEM'S COORDINATE SYSTEM
* WEST LONGITUDE 2128920.188441
* EAST LONGITUDE 3052432.861753
* SOUTH LATITUDE 34832.019113
* NORTH LATITUDE 1033615.027449
* EXTENT CONTAINS THE RESOURCE Yes

Hide Extents ▲

Resource Points of Contact ►

POINT OF CONTACT
ORGANIZATION'S NAME North Carolina Department of Transportation - Sweeping Environmental Group
CONTACT'S POSITION Environmental Program Consultant
CONTACT'S ROLE originator

CONTACT INFORMATION ►
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Hide Resource Points of Contact ▲

Resource Maintenance ►

RESOURCE MAINTENANCE
UPDATE FREQUENCY annually

SCOPE OF THE UPDATES dataset

OTHER MAINTENANCE REQUIREMENTS
Annual maintenance of this dataset is handled by the Sweeping Environmental Group. Support and maintenance of the enterprise spatial database where this data resides is handled by NCDIT's Transportation GIS Unit.

This dataset should be updated on a regular cycle as:
1. Better data and models are developed (ongoing),
2. Input from natural resource agencies refines specific water elevations,
3. better input data becomes available in the form of LiDAR or other data to refine model accuracy (anticipated to be part of the regular 5-year collection cycle

MAINTENANCE CONTACT
ORGANIZATION'S NAME North Carolina Department of Transportation - Sweeping Environmental Group
CONTACT'S POSITION Environmental Program Consultant
CONTACT'S ROLE originator

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Hide Resource Maintenance ▲

Resource Constraints ►

LEGAL CONSTRAINTS
LIMITATIONS OF USE

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SECURITY CONSTRAINTS
CLASSIFICATION unclassified
CLASSIFICATION SYSTEM None

LIMITATIONS OF USE

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Hide Resource Constraints ▲

Spatial Reference ►

ARCGIS COORDINATE SYSTEM
* TYPE Projected
* GEOGRAPHIC COORDINATE REFERENCE GCS_North_American_1983
* PROJECTION NAD_1983_StatePlane_North_Carolina_FIPS_3200_Feet
* COORDINATE REFERENCE DETAILS
PROJECTED COORDINATE SYSTEM
WELL-KNOWN IDENTIFIER 102719
X ORIGIN -121841900
Y ORIGIN -93659000
XY SCALE 3048.0060960121928
Z ORIGIN -100000
Z SCALE 10000
M ORIGIN -100000
M SCALE 10000
XY TOLERANCE 0.0032808333333333331
Z TOLERANCE 0.001

M TOLERANCE 0.001
HIGH PRECISION true
LATEST WELL-KNOWN IDENTIFIER 2264
VCSWKID 105703
LATESTVCSWKID 6360
WELL-KNOWN TEXT
PROJCS["NAD_1983_StatePlane_North_Carolina_FIPS_3200_Feet",GEOGCS["GCS_North_American_1983",DATUM["D_North_American_1983",SPHEROID["GRS_1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT["Degree",0.0174532925199433]],PROJECTION["Lambert_Conformal_Conic"],PARAMETER["False_Easting",2000000.002616666],PARAMETER["False_Northing",0.0],PARAMETER["Central_Meridian",-79.0],PARAMETER["Standard_Parallel_1",34.33333333333334],PARAMETER["Standard_Parallel_2",36.16666666666666],PARAMETER["Latitude_Of_Origin",33.75],UNIT["Foot_US",0.3048006096012192]],VERTCS["NAVD88_height_(ftUS)",VDATUM["North_American_Vertical_Datum_1988"],PARAMETER["Vertical_Shift",0.0],PARAMETER["Direction",1.0],UNIT["Foot_US",0.3048006096012192]]

REFERENCE SYSTEM IDENTIFIER
VALUE 2264
* CODESPACE EPSG
* VERSION 6.12(9.0.0)

Hide Spatial Reference ▲

Spatial Data Properties ►

VECTOR ►
* LEVEL OF TOPOLOGY FOR THIS DATASET geometry only

GEOMETRIC OBJECTS
FEATURE CLASS NAME MeanHigherHighWater
* OBJECT TYPE composite
* OBJECT COUNT 3894

Hide Vector ▲

ARCGIS FEATURE CLASS PROPERTIES ►
FEATURE CLASS NAME MeanHigherHighWater
* FEATURE TYPE Simple
* GEOMETRY TYPE Polygon
* HAS TOPOLOGY FALSE
* FEATURE COUNT 3894
* SPATIAL INDEX TRUE
* LINEAR REFERENCING FALSE

Hide ArcGIS Feature Class Properties ▲

Hide Spatial Data Properties ▲

Data Quality ►

SCOPE OF QUALITY INFORMATION ►
RESOURCE LEVEL dataset

Hide Scope of quality information ▲

DATA QUALITY REPORT - COMPLETENESS OMISSION ▶

MEASURE DESCRIPTION

After processing, the dataset is checked for drawing display and number of records and file sizes compared with source materials.

CONFORMANCE TEST RESULTS

TEST PASSED Yes

RESULT EXPLANATION

Pass

PRODUCT SPECIFICATION ▶

TITLE NCDOT Geospatial Data Specifications

CREATION DATE 2019-07-23 00:00:00

PUBLICATION DATE 2019-08-28 00:00:00

Hide Product specification ▲

Hide Data quality report - Completeness omission ▲

DATA QUALITY REPORT - CONCEPTUAL CONSISTENCY ▶

MEASURE DESCRIPTION

The dataset is converted to file geodatabase (FGDB) format using tools in ArcGIS. The geometry is checked, and if needed repaired.

CONFORMANCE TEST RESULTS

TEST PASSED Yes

RESULT EXPLANATION

Pass

PRODUCT SPECIFICATION ▶

TITLE NCDOT Geospatial Data Specifications

CREATION DATE 2019-07-23 00:00:00

PUBLICATION DATE 2019-08-28 00:00:00

Hide Product specification ▲

Hide Data quality report - Conceptual consistency ▲

DATA QUALITY REPORT - QUANTITATIVE ATTRIBUTE ACCURACY ▶

MEASURE DESCRIPTION

Geometry checks were conducted using ESRI's Data Reviewer tool.

CONFORMANCE TEST RESULTS
TEST PASSED Yes
RESULT EXPLANATION
Pass

PRODUCT SPECIFICATION ►
TITLE NCDOT Geospatial Data Specifications
CREATION DATE 2019-07-23 00:00:00
PUBLICATION DATE 2019-08-28 00:00:00

Hide Product specification ▲

Hide Data quality report - Quantitative attribute accuracy ▲

Hide Data Quality ▲

Lineage ►

LINEAGE STATEMENT

Tidal models are notably complex, and mapping the inland extent of tidal effects requires an accurate tidal model in conjunction with detailed topographic data. NOAA tidal prediction models utilize 37 constituent variables to predict water levels. The NOAA Office for Coastal Management (OCM) has generated a tidal model to predict the effects of rising water levels on coastal communities. The current MHHW level provided by this model was selected as a base datum for generating water elevations. These data were retrieved from the NOAA OCM and were analyzed in conjunction with QL2 LiDAR data for flooding extent and amplitude. After initiation of the project, water elevation data was refined by NOAA and presented to reflect agency confidence in inundation. Flooding extent models and confidence data are provided at: https://coast.noaa.gov/slrdata.

July 2022 Update: Updated water levels and increased the number of catchments used for analysis from 314 to 9924, allowing production of water level depictions with 0.1-foot (1.2 inches). Marsh models were developed for all portions of the state, with the exception of the Oregon Inlet Tidal Basin (generally the Albemarle Sound) and the Atlantic Ocean seashore. The Oregon Inlet Tidal Basin and the Atlantic Ocean water elevations are replicated from Tidal Influence Zone version 1 data. All attribute fields were dropped.

PROCESS STEP ►
DESCRIPTION

The NOAA OCM SLR0 dataset was downloaded as a raster image and divided into five areas encompassing the twenty-one tidal basins, or watersheds draining or proximate to, expected tidal waters. Original raster data used for calculations consisted of 30-foot cells that depict the approximate extent of flooding during lunisolar tides and contained approximate values of flooding depth. The geographic flooding extent was analyzed for local similarities within the bounds of 9924 USGS StreamCat catchments within the tidal basins.

Dominant MHHW elevations specific to each StreamCAT catchment were then calculated as described in the steps below, and it was determined that due to the range of values within each 15-digit HU and the reported accuracy of the NOAA dataset, areas covered by calculated MHHW elevations would be calculated to the nearest 0.1 foot (1.2 inches). Elevations relative to the NAVD88 datum were calculated for each StreamCAT Catchment by several methods:

1. The NOAA OCM SLR0 raster dataset was resampled to a 10-foot cell size for processing with a 10-foot cell-size, bare-earth Digital Elevation Model (set) generated from QL2 data, and approximate water depths were converted from units of meters to feet. To establish water elevations relative to the NAVD88 datum, elevation values of the bare-earth DEM were added to the water depth elevations of the SLR0 raster, resulting in a raster with cell values containing an approximate water level

elevations relative to the NAVD88 datum. The flood elevation raster was then converted to a point file, on which an analysis was performed to determine the mean water level within each catchment.

2. NOAA raster data indicates that it is based on the 1983 to 2001 National Tidal Datum. To update these data to current water levels, NOAA sea-level rise averages were identified (https://tidesandcurrents.noaa.gov/sltrends/), and a twenty (20) -year average yearly rise was interpolated between gauge locations, and added to identified catchment flood elevations.

3. Within each tidal basin, adjusted elevation data was extracted from 5-foot Digital Elevation Models generated by combining tiles produced by the NC Division of Emergency Management, and processed to generate polygon shapes representing areas at or below the identified high water elevation. Known tidal marshes consistently fell outside tidal boundaries due to the underlying LiDAR capabilities, and a separate method of identification was identified to collect tidal marshes. LAS files containing LiDAR point cloud data were processed into 10-foot rasters representing elevation, dominant LiDAR classification, and intensity. Marshes were generally identified as the intersection of open, non-forested land cover, elevations between one (1) and two (2) feet above the adjusted high water elevation, and low-range intensity levels. Within each tidal basin, the resultant elevation data, marsh elevation data, and the adjacent LiDAR-derived open waters were then combined, checked for errors, and merged into a seamless shape.

4. Elevations within the Oregon Inlet Tidal Basin (including the Albemarle Sound) matched Tidal Influence Zone version 1 elevations and were maintained. Marsh models were not developed with specificity to limit tidal limits within this basin. The Oregon Inlet Tidal Basin and the Atlantic Ocean water elevations are replicated from Tidal Influence Zone version 1 data.

PROCESS CONTACT
ORGANIZATION'S NAME North Carolina Department of Transportation - Sweeping Environmental Group
CONTACT'S POSITION Environmental Program Consultant
CONTACT'S ROLE originator

CONTACT INFORMATION ►
PHONE
VOICE 919-707-6136

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TYPE
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HOURS OF SERVICE
9:00am – 5:00pm Monday - Friday

CONTACT INSTRUCTIONS
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Hide Contact information ▲

Hide Process step ▲

PROCESS STEP ►
DESCRIPTION

Data was reviewed in ESRI's Data Reviewer tool to verify geometry.

PROCESS CONTACT
ORGANIZATION'S NAME North Carolina Department of Transportation - Sweeping Environmental Group
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CONTACT'S ROLE originator

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Hide Process step ▲

PROCESS STEP ►
DESCRIPTION
Geodatabase was forwarded on to the GIS Unit for publishing as part of data for project ATLAS.

PROCESS CONTACT
ORGANIZATION'S NAME North Carolina Department of Transportation - Sweeping Environmental Group
CONTACT'S POSITION Environmental Program Consultant
CONTACT'S ROLE originator

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Hide Contact information ▲

Hide Process step ▲

Hide Lineage ▲

Distribution ►

DISTRIBUTOR ►
CONTACT INFORMATION
ORGANIZATION'S NAME North Carolina Department of Transportation - EAU Mitigation and Modeling Unit
CONTACT'S POSITION Environmental Program Consultant
CONTACT'S ROLE distributor

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Hide Contact information ▲

Hide Distributor ▲

DISTRIBUTION FORMAT
* NAME File Geodatabase Feature Class
VERSION 10.5

Hide Distribution ▲

Fields ►

DETAILS FOR OBJECT MeanHigherHighWater ►
* TYPE Feature Class
* ROW COUNT 3894

DEFINITION
Extents of the daily average of the higher high tide.

DEFINITION SOURCE
NCDOT

FIELD OBJECTID ►
* ALIAS OBJECTID
* DATA TYPE OID
* WIDTH 4
* PRECISION 0
* SCALE 0
* FIELD DESCRIPTION
Internal feature number.

* DESCRIPTION SOURCE
Esri

* DESCRIPTION OF VALUES
Sequential unique whole numbers that are automatically generated.

Hide Field OBJECTID ▲

FIELD Shape ►
* ALIAS Shape
* DATA TYPE Geometry
* WIDTH 0
* PRECISION 0
* SCALE 0
* FIELD DESCRIPTION
Feature geometry.

* DESCRIPTION SOURCE
Esri

* DESCRIPTION OF VALUES
Coordinates defining the features.

Hide Field Shape ▲

FIELD Shape_Length ►
* ALIAS Shape_Length
* DATA TYPE Double
* WIDTH 8
* PRECISION 0
* SCALE 0
* FIELD DESCRIPTION
Length of feature in internal units.

* DESCRIPTION SOURCE
Esri

* DESCRIPTION OF VALUES
Positive real numbers that are automatically generated.

Hide Field Shape_Length ▲

FIELD Shape_Area ►
* ALIAS Shape_Area
* DATA TYPE Double
* WIDTH 8
* PRECISION 0
* SCALE 0
* FIELD DESCRIPTION
Area of feature in internal units squared.

* DESCRIPTION SOURCE
Esri

* DESCRIPTION OF VALUES
Positive real numbers that are automatically generated.

Hide Field Shape_Area ▲

Hide Details for object MeanHigherHighWater ▲

Hide Fields ▲

Metadata Details ►

METADATA LANGUAGE English (UNITED STATES)
METADATA CHARACTER SET utf8 - 8 bit UCS Transfer Format

SCOPE OF THE DATA DESCRIBED BY THE METADATA dataset
SCOPE NAME * dataset

* LAST UPDATE 2024-02-12

ARCGIS METADATA PROPERTIES
METADATA FORMAT ArcGIS 1.0
METADATA STYLE ISO 19139 Metadata Implementation Specification
STANDARD OR PROFILE USED TO EDIT METADATA ISO19139

CREATED IN ARCGIS FOR THE ITEM 2024-02-01 16:06:15
LAST MODIFIED IN ARCGIS FOR THE ITEM 2024-02-12 23:16:12

AUTOMATIC UPDATES
HAVE BEEN PERFORMED Yes
LAST UPDATE 2024-02-12 23:16:12

Hide Metadata Details ▲

Metadata Contacts ►

METADATA CONTACT
ORGANIZATION'S NAME North Carolina Department of Transportation - EAU Mitigation and Modeling Unit
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CONTACT'S ROLE point of contact

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Hide Metadata Contacts ▲

Metadata Maintenance ►

MAINTENANCE
UPDATE FREQUENCY as needed

OTHER MAINTENANCE REQUIREMENTS
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HOURS OF SERVICE
9:00am – 5:00pm Monday - Friday

CONTACT INSTRUCTIONS
Please send an email with any issues, questions or comments regarding the ATLAS Data Search Tool, ATLAS Screening Tool or ATLAS Workbench. If it is an immediate need, please call the contact number or indicate as such in the subject line in an email.

Hide Contact information ▲

Hide Metadata Maintenance ▲

Metadata Constraints ►

SECURITY CONSTRAINTS
CLASSIFICATION unclassified
CLASSIFICATION SYSTEM None

LIMITATIONS OF USE
The North Carolina Department of Transportation shall not be held liable for any errors in this metadata. This includes errors of omission, commission, errors concerning the content of the data, and relative and positional accuracy of the data. This data cannot be construed to be a legal document. Primary sources from which this data was compiled must be consulted for verification of information contained in this data. Datasets developed under Project ATLAS do not replace any Sweeping Environmental field work for future projects and may not be used as a replacement for site visits / field surveys by licensed professionals and hence should be used only as a supporting platform for decision making. Use of this dataset for project scoping or screening is merely pre-decisional.

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Hide Metadata Constraints ▲