



## NORTH CAROLINA

Department of Transportation



# Project ATLAS: Improving Project Development through GIS

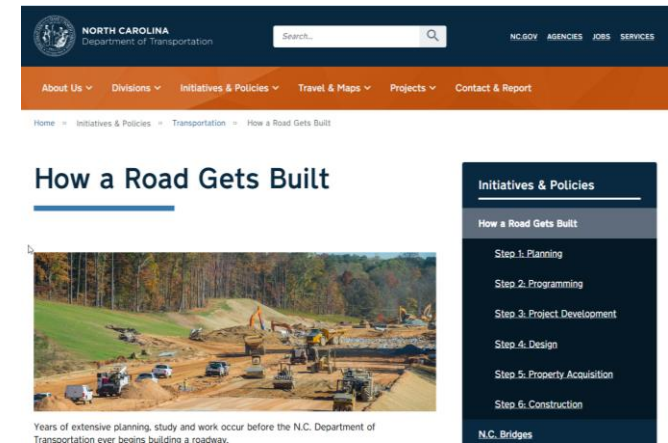
Ryan Arthur, NCDIT Transportation GIS Unit

Eric Wilson, GeoDecisions, GIS Technical Project Lead

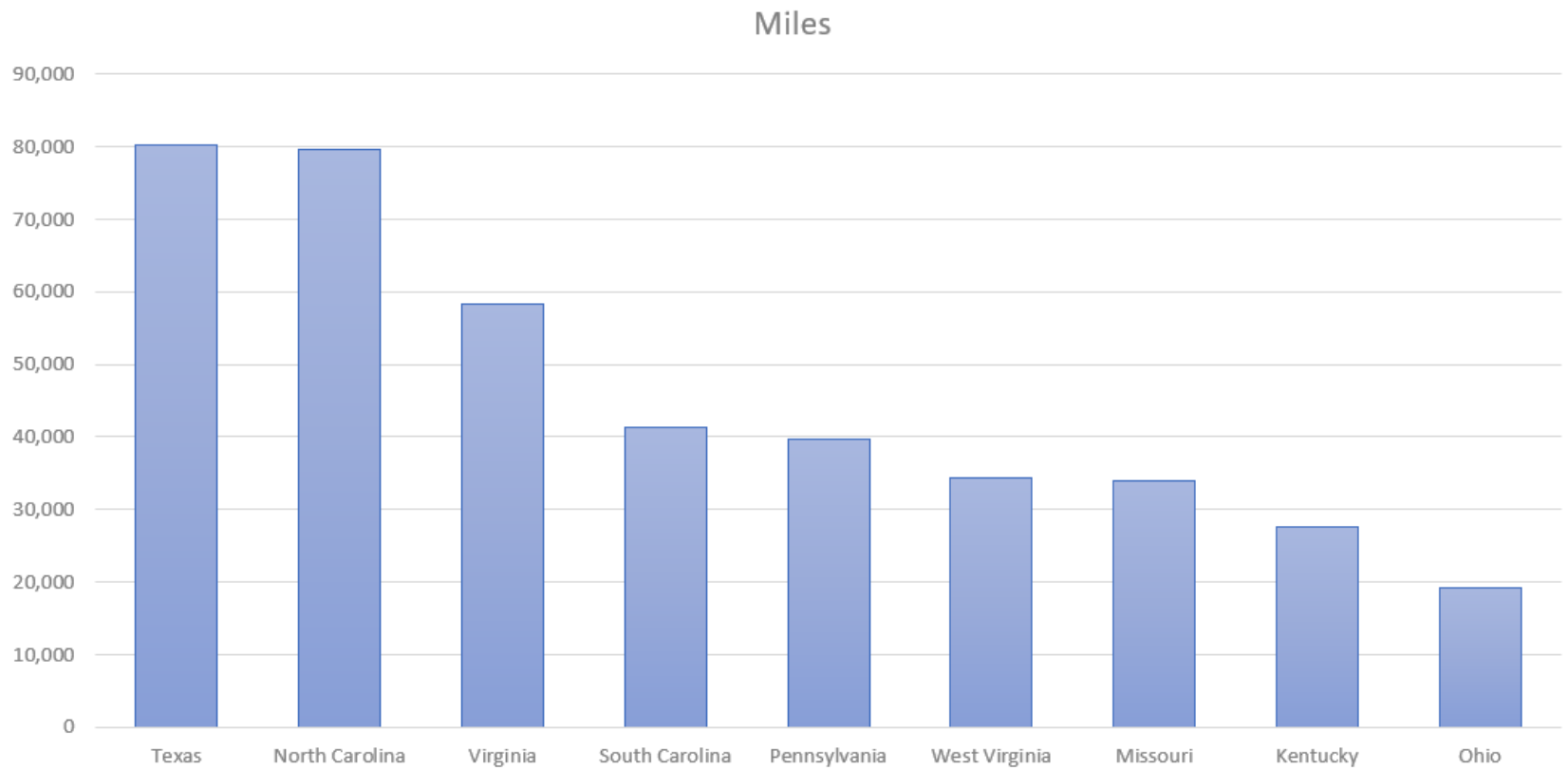
2/13/2019

# Project Delivery at NCDOT- The Process

- Step 1: Planning
  - Comprehensive Transportation Planning (20-25 years)
- Step 2: Prioritization and Programming
  - State Transportation Improvement Program (10 years)
- Step 3: Project Development and Env. Analysis
  - Project is funded and proposed project is evaluated for environmental impacts (NEPA/SEPA)
- Step 4: Design
- Step 5: Property Acquisition
- Step 6: Construction



# How does NCDOT measure up?

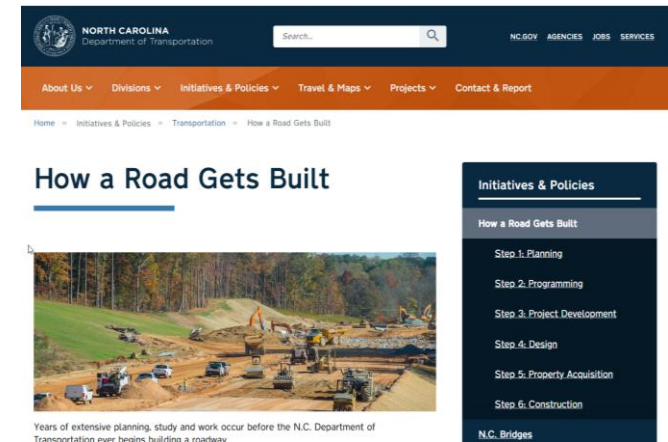


# How did ATLAS get started?

- August 2017, the Environmental Analysis Unit (EAU) here at NCDOT approached the GIS Unit to help them make project delivery more efficient.
- The EAU are heavy GIS users (predictive modeling, field verifications, impact maps)- they wanted to leverage this powerful tool to improve project delivery.

# Where does ATLAS fit into Project Delivery at NCDOT?

- Step 1: Planning
  - Comprehensive Transportation Planning (20-25 years)
- Step 2: Prioritization and Programming
  - State Transportation Improvement Program (10 years)
- **Step 3: Project Development and Env. Analysis**
  - **Project is funded and proposed project is evaluated for environmental impacts**
- Step 4: Design
- Step 5: Property Acquisition
- Step 6: Construction

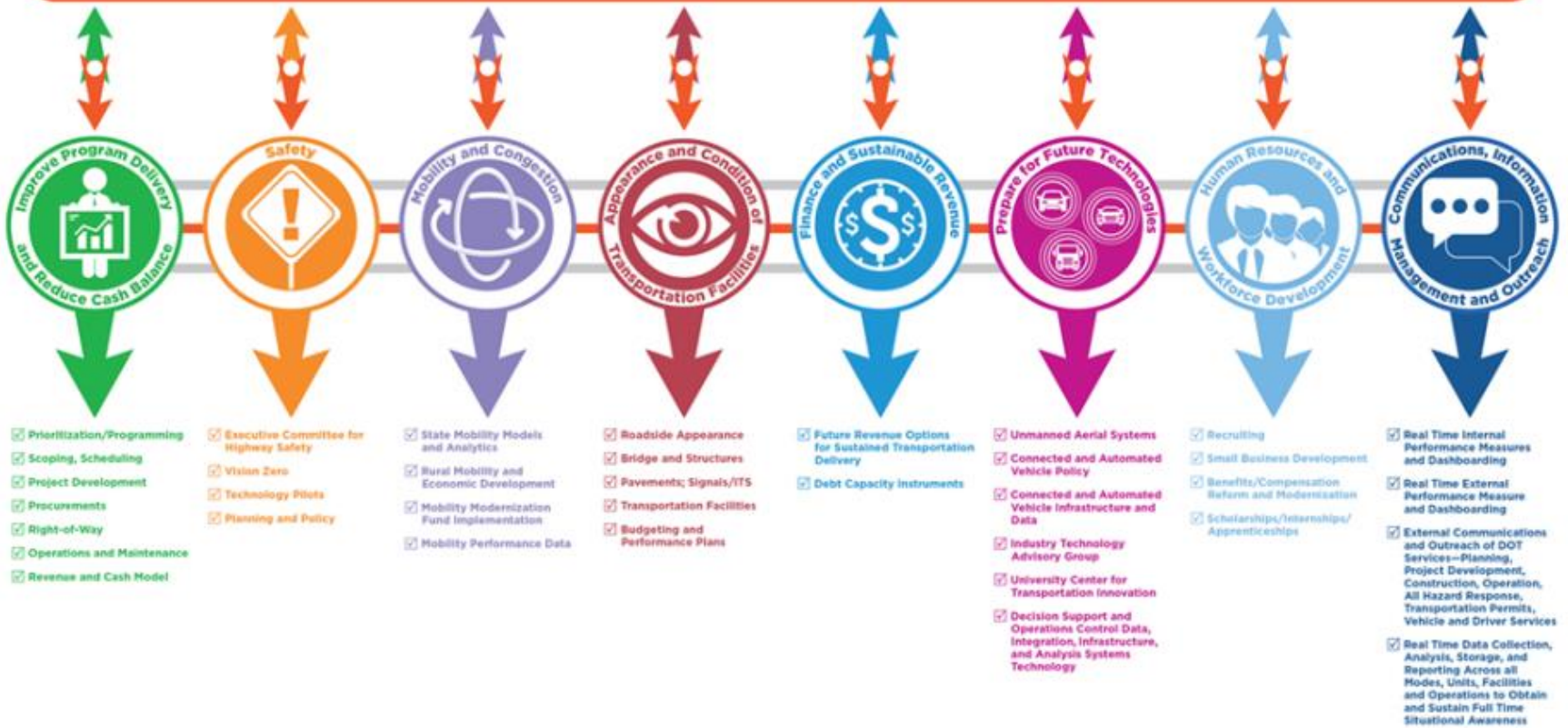




# Secretary's Priorities

## Better Transportation Service for North Carolina

*Our Mission: Connecting people, products and places safely and efficiently with customer focus, accountability and environmental sensitivity to enhance the economy and vitality of North Carolina.*





# NCDOT Project ATLAS



Advancing **T**ransportation through **L**inkages, **A**utomation, and **S**creening

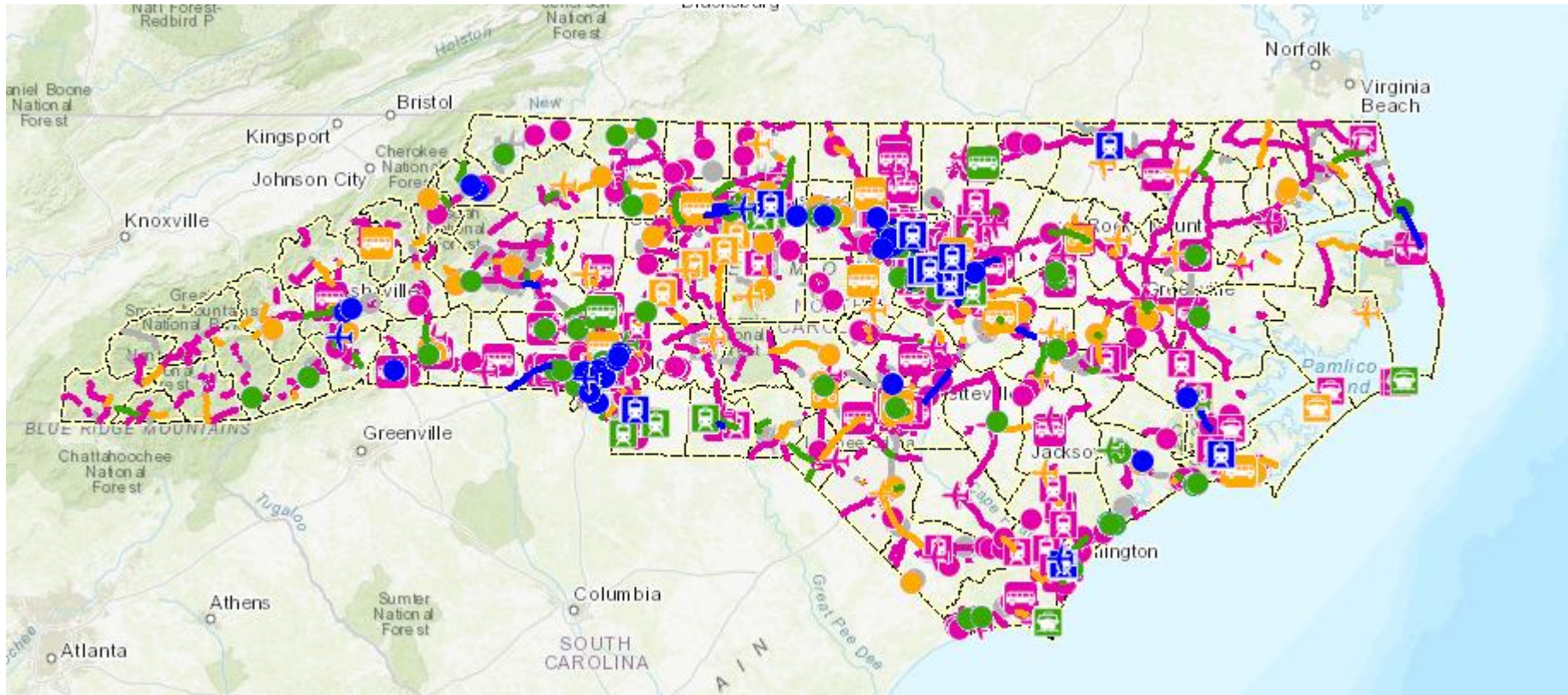
- Goal is to streamline project development by utilizing GIS tools, applications, and data
- Adheres to Secretary's Priorities for Improved Program Delivery
- Accelerated project delivery has strong economic impact and enhances NC's economic competitiveness



- Prioritization/Programming
- Scoping, Scheduling
- Project Development
- Procurements
- Right-of-Way
- Operations and Maintenance
- Revenue and Cash Model



# Current State of Project Development





# Future Projects

The [2020-2029 draft State Transportation Improvement Program](#) consists of 1,663 projects.

Transportation Mode	Total Projects
Aviation	86
Bicycle/Pedestrian	235
Ferry	6
Highway	1,266, including: - 181 bridge projects - 83 interstate maintenance projects - 37 safety projects
Public Transit	23
Rail	47
<b>Total</b>	<b>1,663</b>

# Starting Out

What does expediting project delivery really mean?

What have other DOT's done?

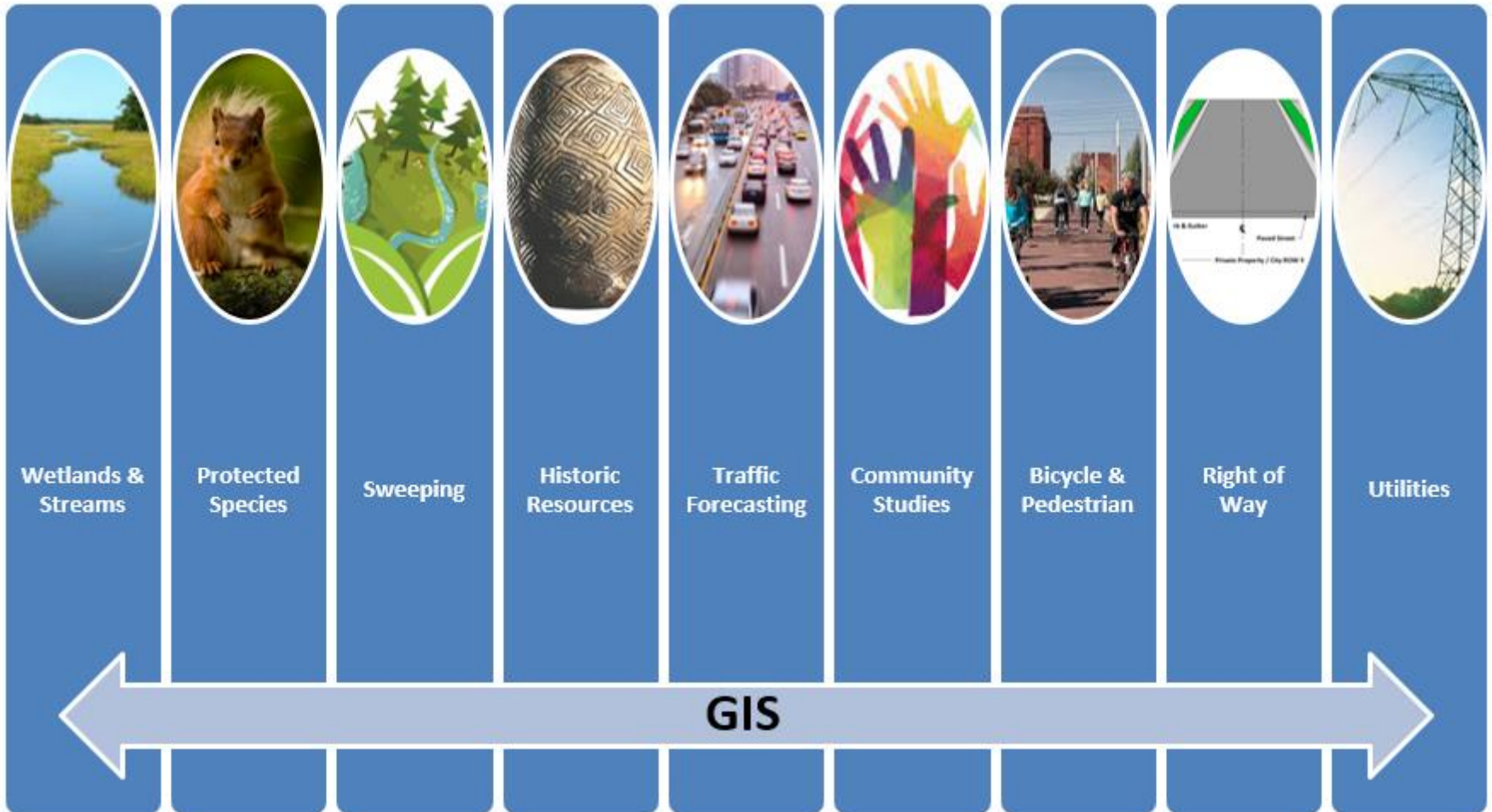
Isn't "everything" we do related to project delivery?

Who is involved in project delivery?

Where is the data to support this?



# Disciplines involved



# Current State of Project Development

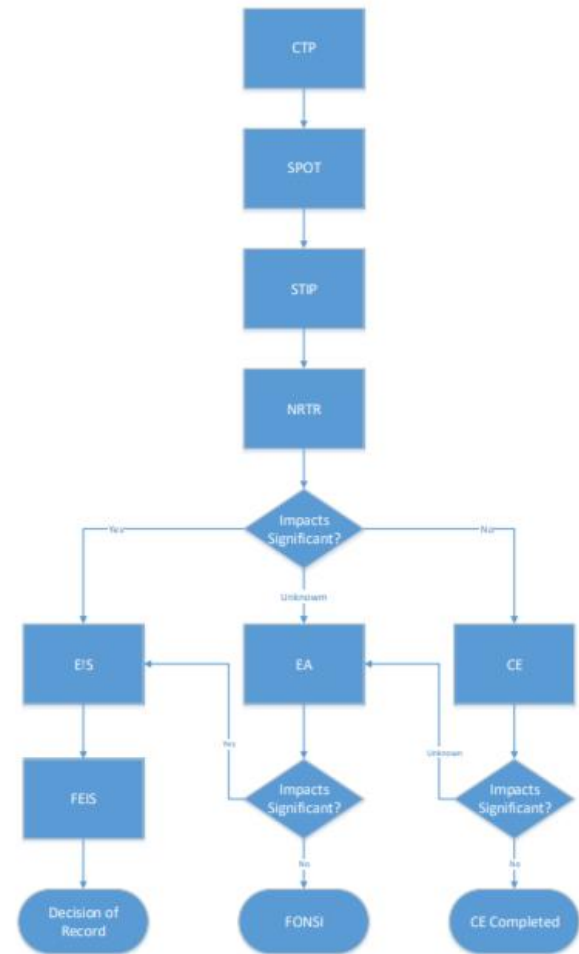
- No standards for required deliverables
- There is a central repository for project's and their associated non-spatial data (PDF's, Word Doc's etc.) (No spatial data is collected.)
- There is a business process, but it is mostly manual
- GIS data used to do reports is not standard across projects or firms working on projects.
  - Data is downloaded and worked on in ArcMap and becomes out of date
- There is no spatial context for a project or past projects and no central repository for related spatial data
- There are a series of enterprise applications that support different aspects project delivery but these applications are not integrated



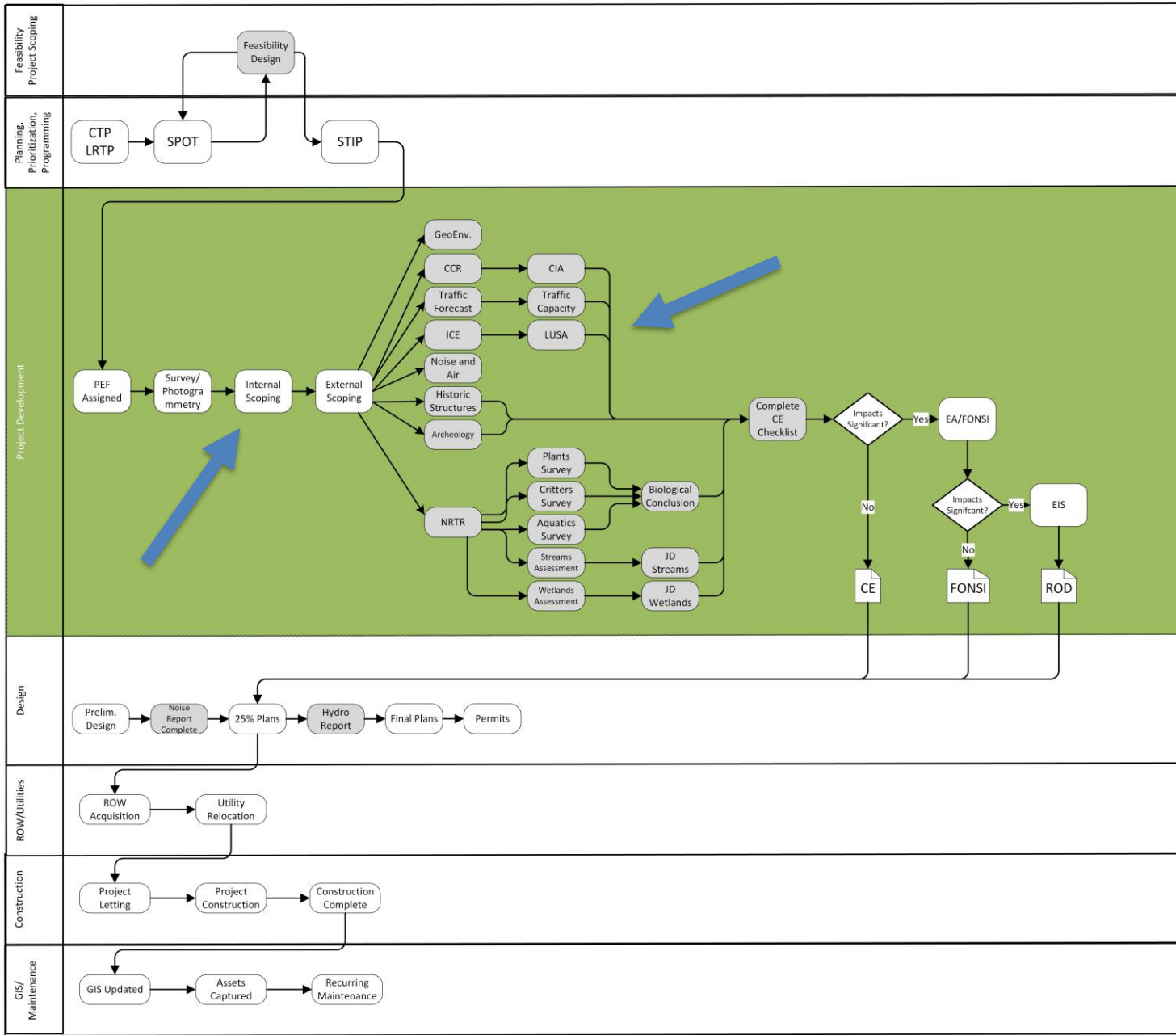


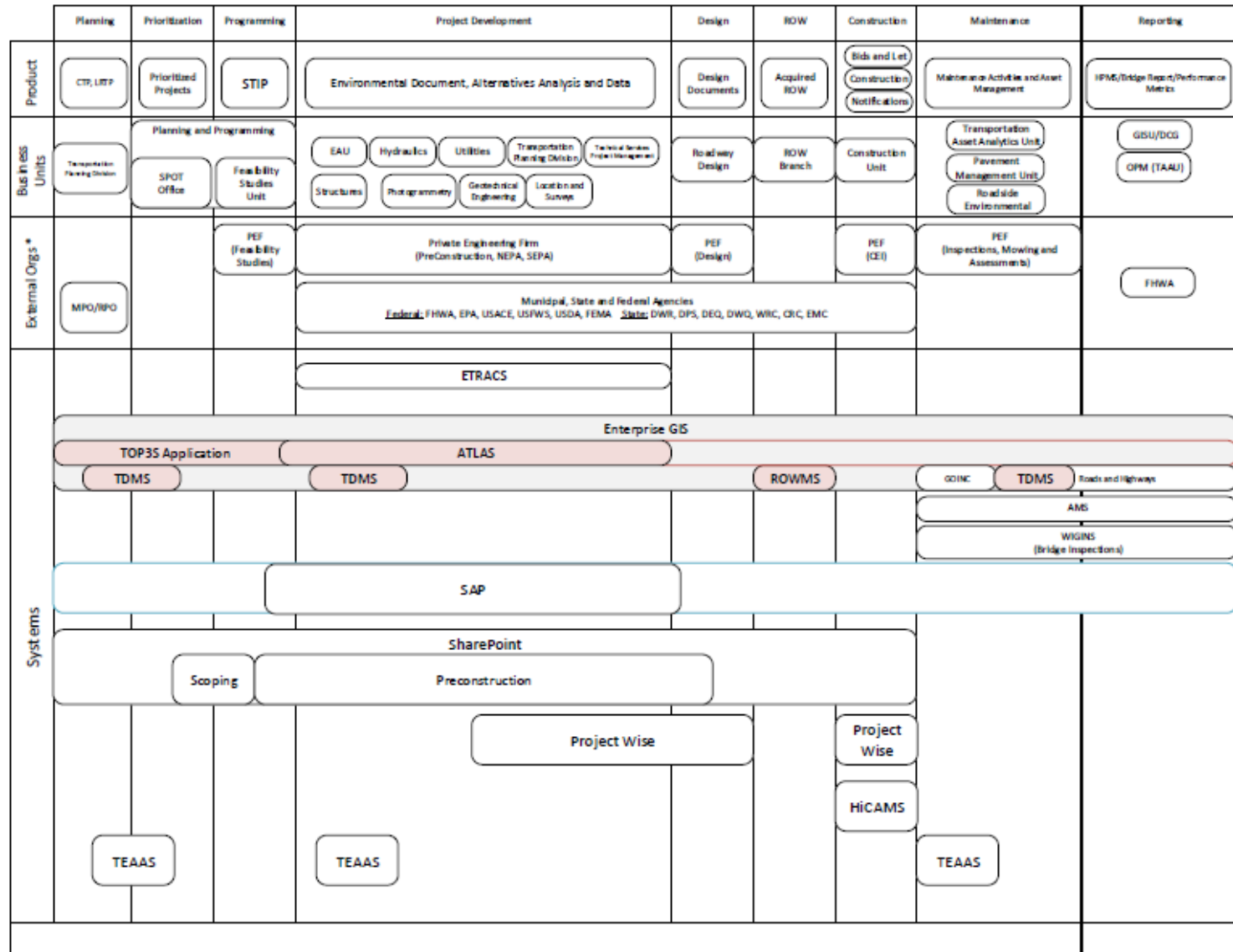
# Overall Picture Takes Shape

- Over 80 interviews with business units across the agency by October 2017.
- Understanding emerges that there are deficiencies with many aspects of the project development process- not just data itself
- The Project Managers need better information before a project begins...  
"An informed scoping meeting"



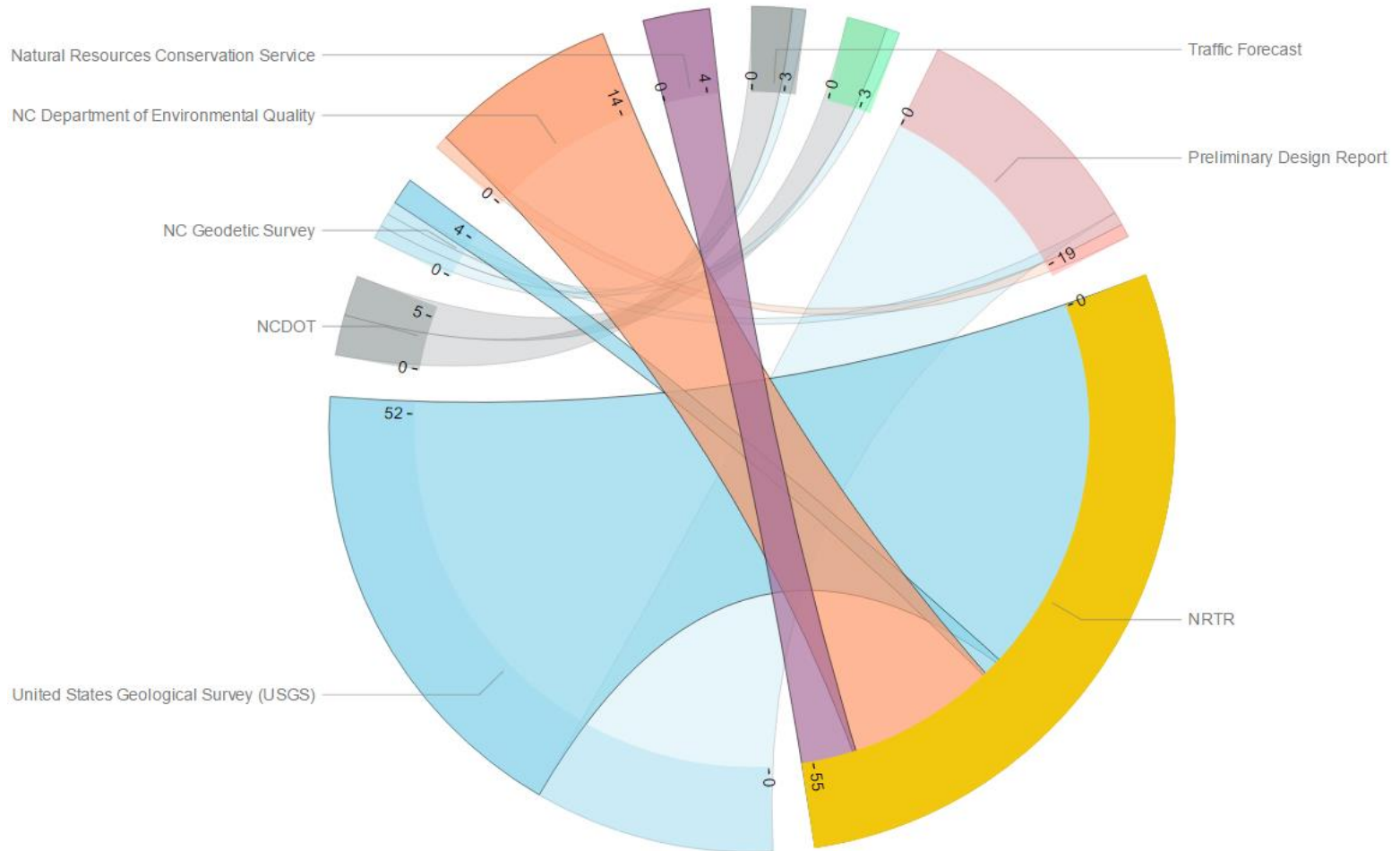
AS IS Flow





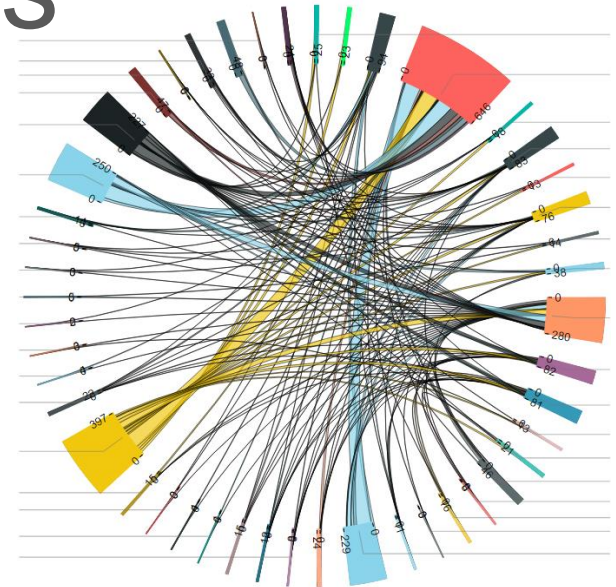


# Initial Cataloging of Data



# Data Facts

- 27 Parent Agencies
- 54 Root Web Service Locations
- 563 Total Layers
- 140 Used in Screening a project

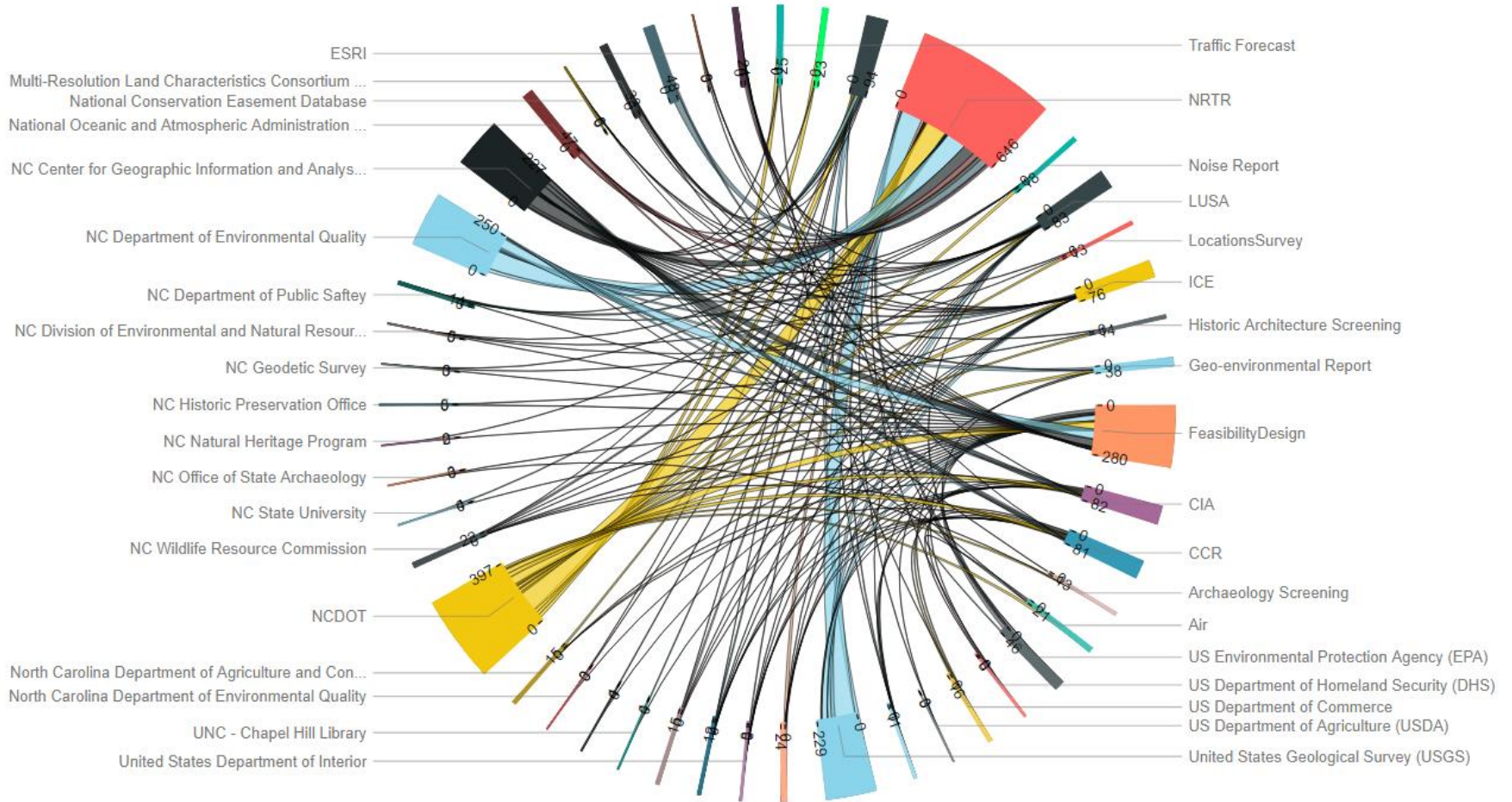


## Layers Top 5 Contributors

Organization	Count
NCDOT, GIS Unit	154
US Geological Survey (USGS)	75
NC Center for Geographic Information and Analysis (CGIA)	74
NC Department of Environmental Quality (DEQ)	60
US Department of Homeland Security (DHS)	33

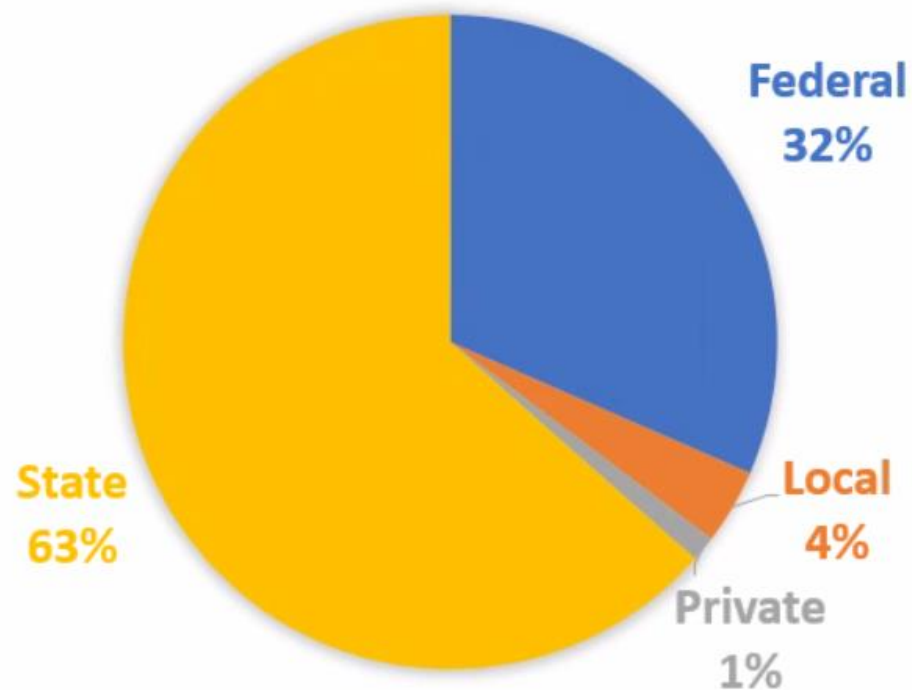
## Screening Layers Top 5 Contributors

Organization	Count
NC Department of Environmental Quality (DEQ)	30
NC Center for Geographic Information and Analysis (CGIA)	21
US Geological Survey (USGS)	18
NCDOT, GIS Unit	14
US Army Corps of Engineers (USACE)	10



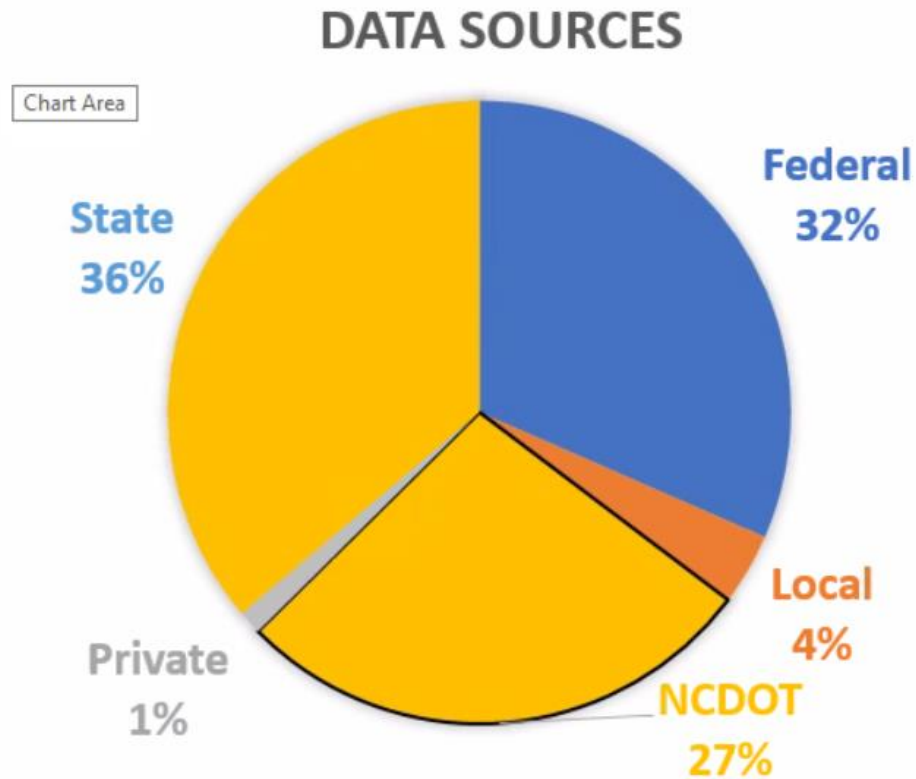
# Data Breakdown

DATA SOURCES



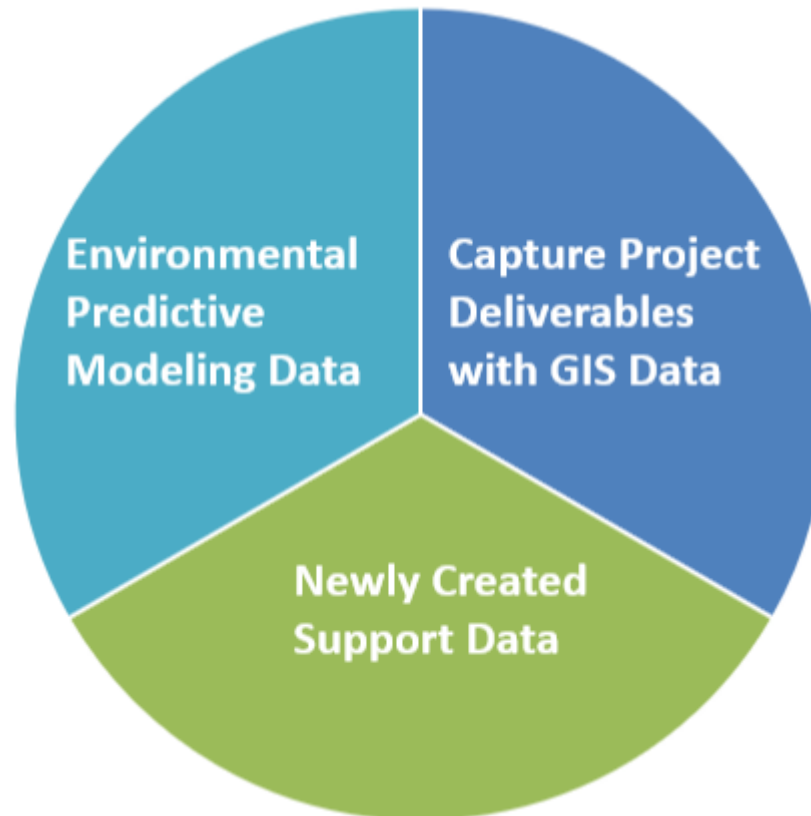


# Data Breakdown



# Data Developed through ATLAS

130 New Layers are being created



# GIS Specific Goals Developed

#	Business Goal
1.	Provide the transportation project community a searchable gateway to all spatial data used in project delivery at NCDOT.
2.	Create a tool that screens NCDOT STIP projects against spatial project data for significant impact areas.
3.	Provide a platform for project managers to view their project, their project's impacts, and other significant information related to managing that project.
4.	Stand-up an enterprise GIS SDE for NCDOT project data.
5.	Create enterprise GIS data for project delivery.

# From Goals to Tools

## Search Tool

**April 2019**

A gateway to search and retrieve verifiable, current and accurate project related data.

Addresses NCDOT's need to have consistent data available to Project Managers and Consultants.

## Screening Tool

**April 2019**

A powerful web-based tool to evaluate potential impacts to NCDOT projects using GIS data and predictive modeling.

Allows Project Managers and NCDOT Consultants to understand and coordinate earlier about challenges projects will encounter.

## ATLAS Workbench

**April 2019**

A unified toolset for Project Managers to assess and monitor their projects via the web.

Allows Project Managers and Consultants a common platform to access current project data, historic project data, current deliverable status, and visualize project progress.



Team is also supporting: Automation, Data Creation, and Post Deployment App Management Tool.



# Search Tool

- Key Functionality
  - Search for data by document type, DOT discipline, and keyword
  - Download data package in GBD and DGN formats
  - View data package on a map



# Search

## What Data Are You Searching For?

### Search By Document ⓘ

### Search By Organization ⓘ

### Search By Keyword ⓘ

237 Layers Found.

Select	Layer Name	Description	Owner
<input checked="" type="checkbox"/>	<a href="#">2012 Integrated Reporting Water Quality Assessments</a>	This data set contains the detailed water quality assessment for the 3,381 waterbodies in North Carolina where assessment data or information were available. The data assessed were from over 5,000 monitoring stations with data and information mostly collected in calendar years 2006-2010. This data set includes parameters assessed and water quality rating.	NC Department of Environmental Quality, Division of Water Resources
<input checked="" type="checkbox"/>	<a href="#">303d and 305b Streams (ESM Layer)</a>	303d and 305b Streams for ESM application hosted by NCDOT.	NCDOT, GIS Engineering Transportation Systems, GIS Unit
<input type="checkbox"/>	<a href="#">Albemarle - Pamlico National Estuary Partnership Map</a>	AP map is an interactive mapping application designed to provide geographic information about the Albemarle-Pamlico (A-P) watershed and APNEP.	NC Department of Environmental Quality, Albemarle-Pamlico National Estuary Partnership
<input checked="" type="checkbox"/>	<a href="#">Alluvial Fans</a>	Location and attributes of alluvial fan studies. Only the 1-percent-annual-chance flood is mapped for alluvial fans. The alluvial fan could be mapped as: Zone AO areas with depths and velocities; Zone AO areas with just depths; or Zone A, AE, or X. This information is needed for the Summary of Alluvial Fan Analyses and Results of Alluvial Fan Analyses tables in the FIS report.	Department of Homeland Security, Federal Emergency Management Agency
<input checked="" type="checkbox"/>	<a href="#">Anadromous Fish Spawning Areas</a>	NC DEQ maps here: <a href="http://portal.ncdenr.org/web/mf/afsa-maps">http://portal.ncdenr.org/web/mf/afsa-maps</a>	NC Department of Environmental Quality, Division of Marine Fisheries

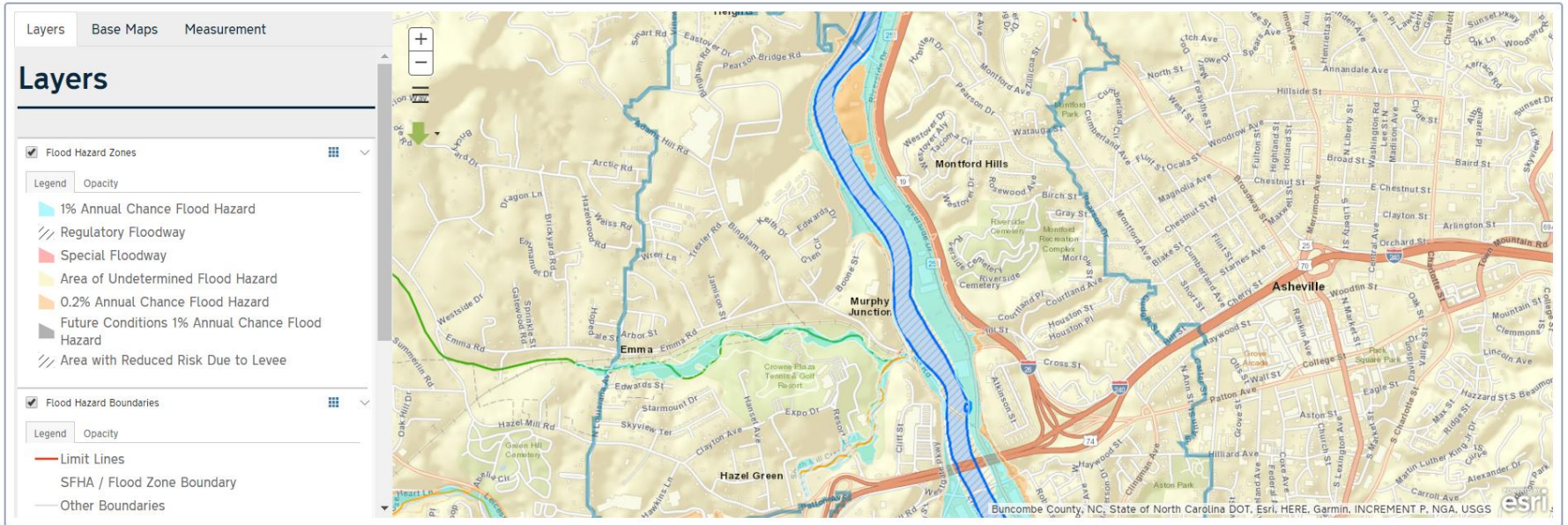
[Download or View On Map](#)

Use checkboxes to select data sets you would like to Download or View on Map, then hit Download or View on Map button. You will then be prompted to define your geographic area of interest.



About Additional Resources Help

Search Home » Area of Interest » Map View



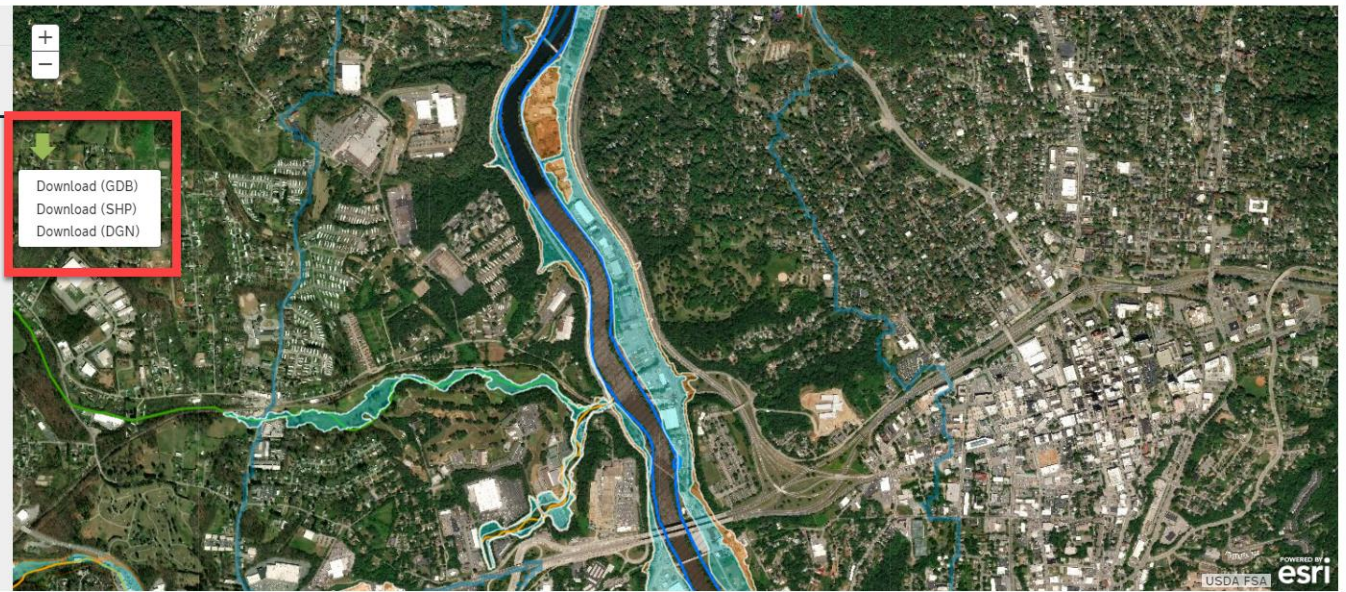
© 2018 - North Carolina Department of Transportation



Layers Base Maps Measurement

### Base Maps

- Imagery
- Imagery with Labels
- Streets
- Topographic
- Dark Gray Canvas
- Light Gray Canvas
- National Geographic
- Terrain with Labels
- Oceans
- OpenStreetN
- USA Topo Maps
- USGS National



# Screening Tool

- Key Functionality
  - Screen against 60+ key data layers for area impacts
  - Ability to screen STIP and SPOT projects, uploaded study area, or draw a study area
  - Produce screening report that measures impact totals by individual data set
  - Provide ability to download impacts data sets
  - View impact data on a map



## Welcome to the Project Development Screening Tool

---

In order to screen a project study area, you need to complete a few steps:

1. Build Your Study Area
2. Buffer Your Study Area (optional)
3. Select Data to Screen
4. View, Download, and/or Share Your Screening Report

To begin: How would you like to build your Project Study Area?

**1****By Project ID**

Select if you know your STIP or SPOT ID for the project you are screening.

**2****Upload Study Area**

Select if you have a study area boundary in .zip format.

**3****Draw Study Area**

Select if you would like to build your study area using draw tool.



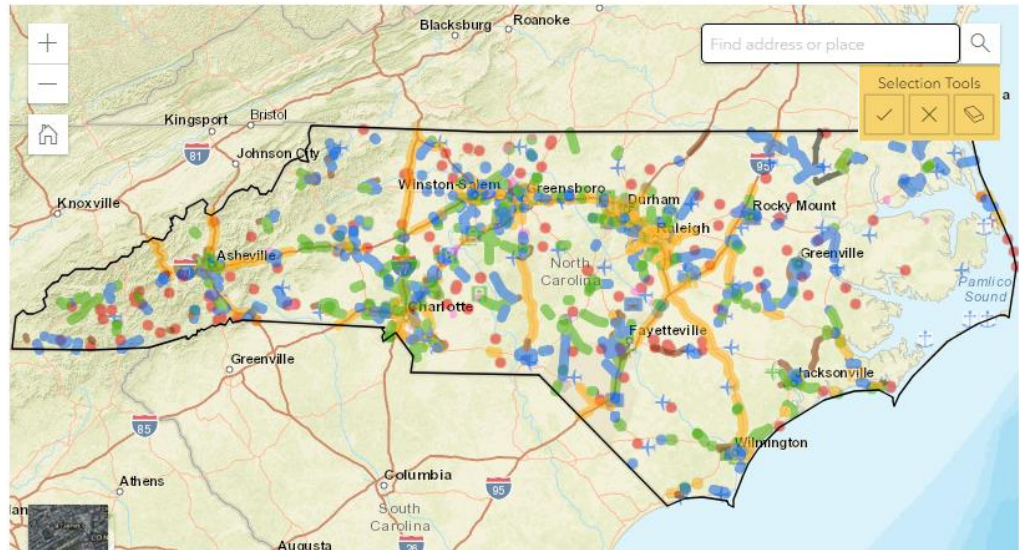
Screening Home » Screen By Project ID

# Screen By Project ID

Utilize the Project ID Search and/or select your project from the map with the map Selection Tools. Only projects highlighted on the map will be included in your Study Area when you click Next.

Enter STIP or SPOT ID

Ex. STIP ID: I-0914, Ex. SPOT ID: H141398



## Screen By Project ID

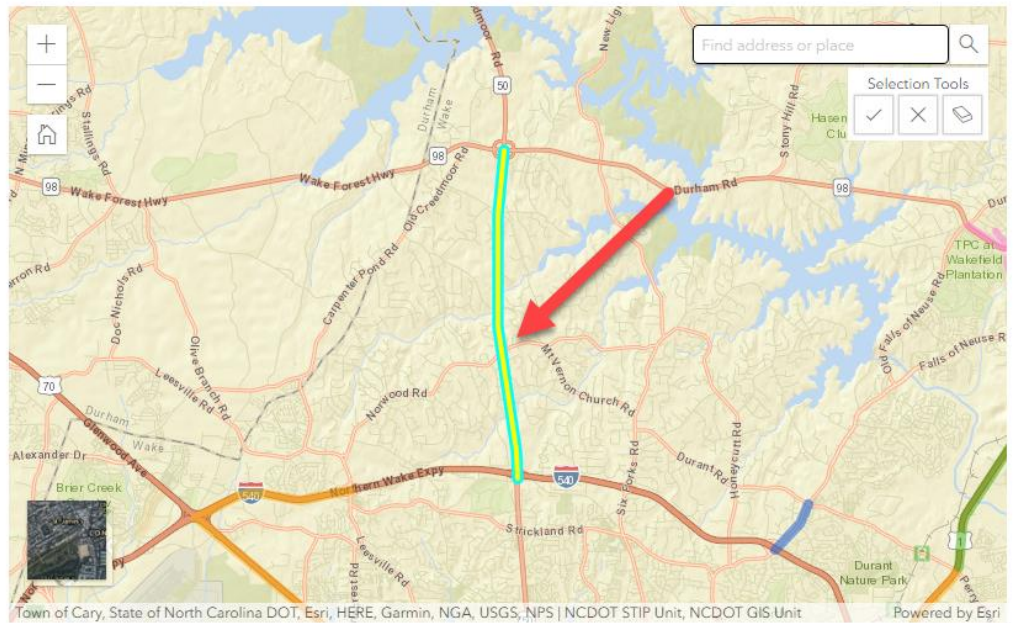
Utilize the Project ID Search and/or select your project from the map with the map Selection Tools. Only projects highlighted on the map will be included in your Study Area when you click Next.

Enter STIP or SPOT ID

Ex. STIP ID: I-0914, Ex. SPOT ID: H141398

- U-5891

Back



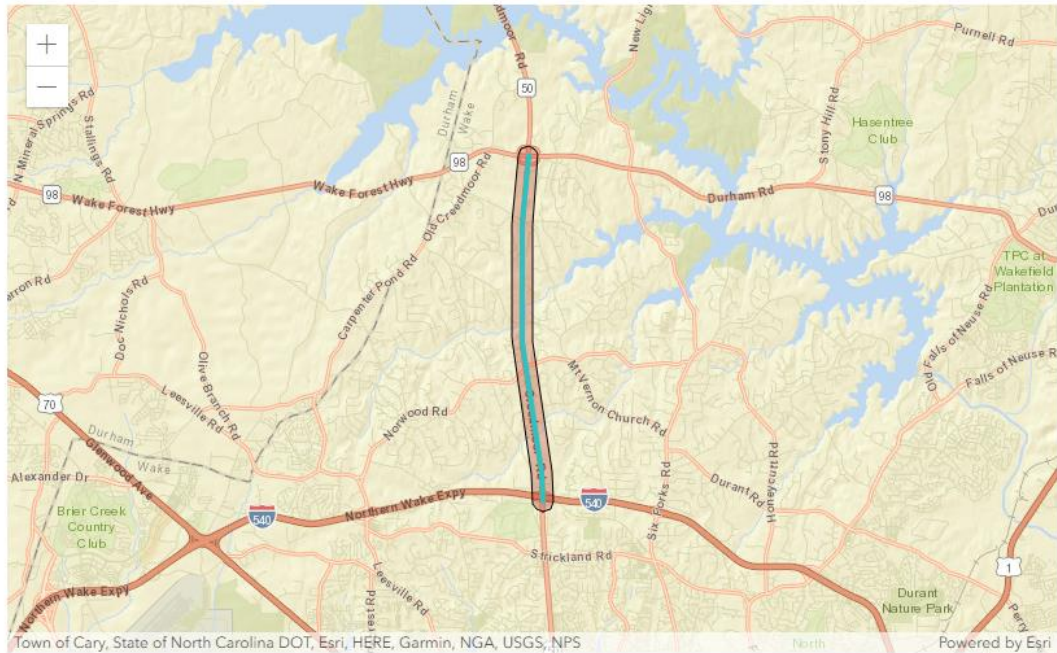
Next



Buffers are required to be:  
1. Applied for point and line features  
2. No more than 2 miles  
Buffers are optional for polygon features.

Distance

Unit



Select the data sets against which you would like to screen your project. Use check boxes to add layers to your screening. Click the layer name to preview the layer on the map, view layer information, or set sub-report fields for specific layers.

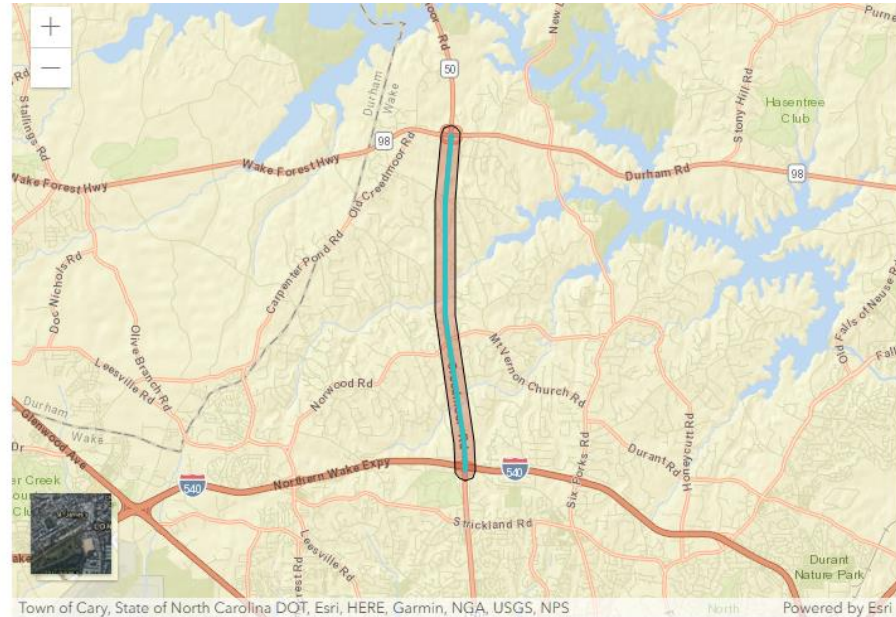
Layer Information ⓘ Set Field ⓘ

Search by layer name 🔍 ✕

- Human Environment
- Natural Environment
- Conservation Area
- Critical Areas (ESM Layer)
- National Conservation Easement Database
- National Wildlife Refuges (>3M)
- NC CAMA Counties (DCM List)
- NC DEQ DCM Coastal Reserve Boundary

Back

Next



information, or set sub-report fields for specific layers.

Layer Information

Search by layer name

- NC Geology
- NCDOT SSURGO Soils
- NRCS Hydric Soils
- NRCS Prime Farmland Soils
- US EPA Level III Ecoregions
- US EPA Level IV Ecoregions
- Threatened and Endangered
- Utilities

Back

Next

Set field for 'NCDOT SSURGO Soils'

- MUSYM
- MUKEY
- muname
- hydgrpdcd

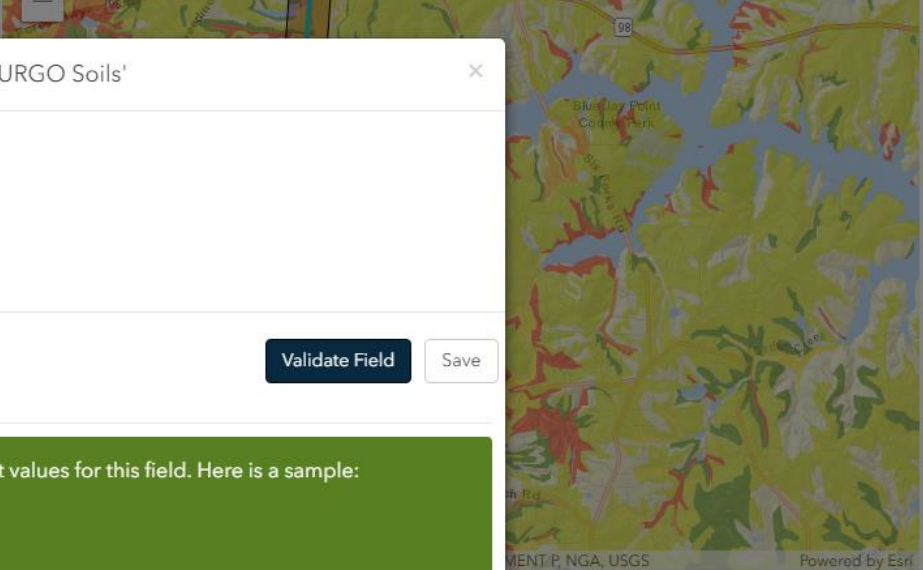
Clear Selection

Validate Field

Save

There are 8 distinct values for this field. Here is a sample:

- null
- A
- A/D
- B
- B/D



Blue Jay Point  
Cottrell Park

98

MENT P, NGA, USGS

Powered by Esri

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Screening Home » Screen By Project ID » Apply a Buffer » Select Layers to Screen » Build Your Screening Report

## Build Your Screening

Enter Report Name and Description of your choice

Screening Progress...

Calculating Impacts	<div style="width: 33%;"></div>	20 of 63
Generating Maps	<div style="width: 0%;"></div>	please wait...

**Report Name**

ACEC Presentation Screening - U-5891

**Report Description**

ATLAS screening for ACEC presentation for U-5891.

**STIP ID**

U-5891

**SPOT ID**

H090577

Back

Screen Your Project



Number of potential impacts: 14

Download Report

Download GDB

Download DGN

Show Layer Information

Submerged Aquatic Vegetation

NOAA Essential Fish Habitat

Hydrography

NC DEQ Draft 303d Category 5 Assessments

FEMA Stream Study Type (ESM Layer)

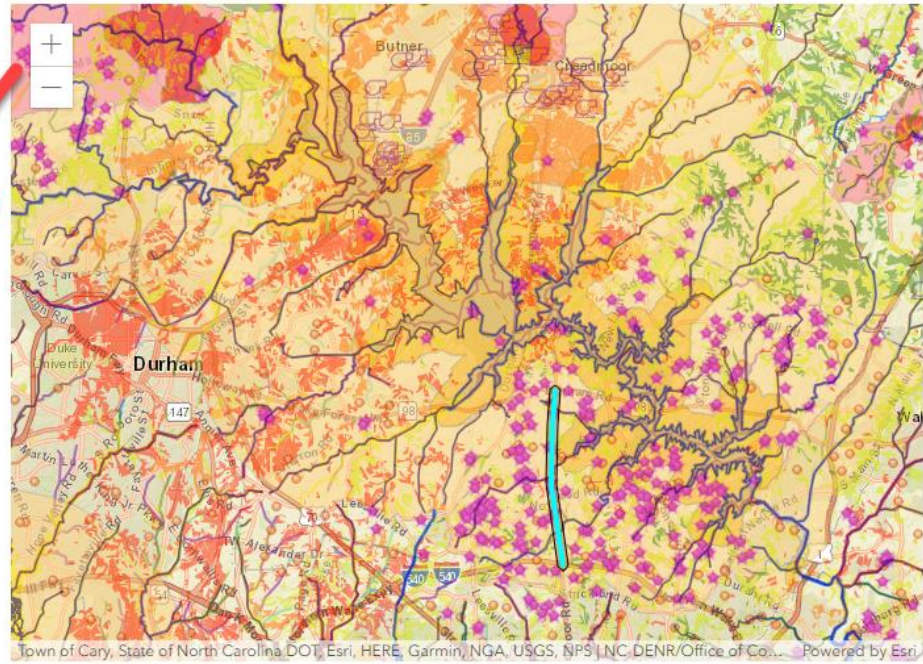
DWR Trout Waters 2014 (ESM Layer)

303d and 305b Streams (ESM Layer)

NC DEQ Outstanding Resource Waters in North Carolina

NC DEQ Water Supply Watershed III

NC DEQ High Quality Waters in North Carolina





The screenshot displays the ArcMap interface with the following components:

- Table Of Contents:** Lists several layers, with 'USGS\_24K\_Streams\_2014' selected. Other layers include 'NC\_Water\_Supply\_intakes', 'NC\_Public\_Water\_Supply\_Water\_Sources', 'T303d\_and\_305b\_Streams\_ESM\_Layer\_', 'NC\_Surface\_Water\_Quality\_classification', 'NC\_DEQ\_Water\_Supply\_Watershed\_IV', 'NC\_DEQ\_Draft\_303d\_Category\_5\_Assessments', 'FEMA\_Stream\_Study\_Type\_ESM\_Layer\_', 'Study\_Area', 'NCDOT\_SSURGO\_Soils', 'NC\_DEQ\_Water\_Supply\_Watersheds', and 'Critical\_Areas\_ESM\_Layer\_'.
- Map View:** Shows a vertical, elongated study area shaded in light green. A yellow line represents a stream network within the area. Several blue diamond symbols are scattered throughout the green area. A small 'Dr' icon is visible on the left side of the map.
- Catalog:** Shows a file tree for 'USGS\_24K\_Streams\_2014'. The tree includes folders for 'data.gdb' and 'readme.bt', with sub-items like 'Critical\_Areas\_ESM\_Layer', 'FEMA\_Stream\_Study\_Type', 'NC\_DEQ\_Draft\_303d\_Cate...', 'NC\_DEQ\_Water\_Supply\_W...', 'NC\_DEQ\_Water\_Supply\_W...', 'NC\_Public\_Water\_Supply\_', 'NC\_Surface\_Water\_Quality', 'NC\_Water\_Supply\_intakes', 'NCDOT\_SSURGO\_Soils', 'Study\_Area', and 'T303d\_and\_305b\_Streams\_...'.
- Scale:** The scale bar at the bottom right indicates a distance of 2102715.427 806193.425 Feet.

# Project Development Screening Report



## ACEC Presentation Screening - U-5891

Report Description:

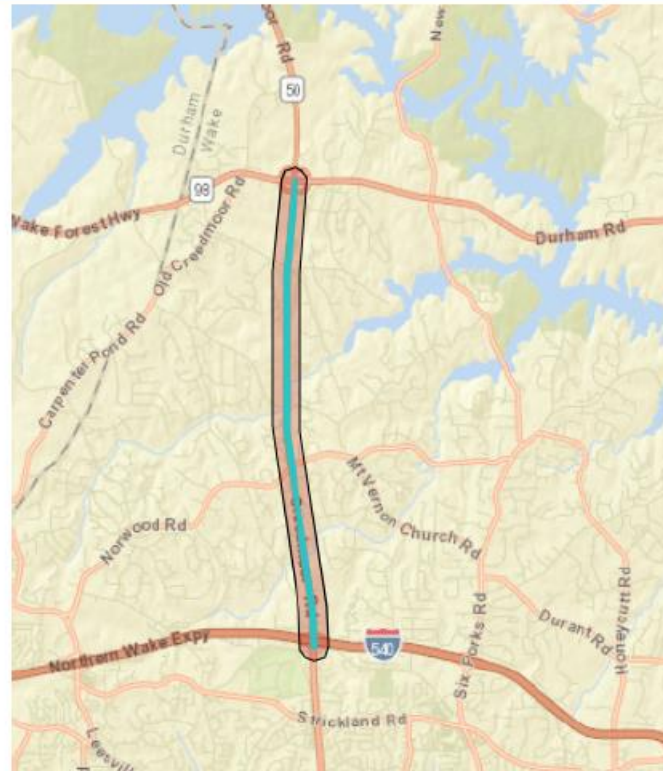
ATLAS screening for ACEC presentation for U-5891.

Buffer Size: 1000 Feet

STIP/SPOT ID: U-5891, H090577

STIP/SPOT Description:

U-5891: I-540 TO NORTH OF NC 98. WIDEN TO MULTILANE DIVIDED ROADWAY.



### Summary of Potential Impacts

Impact Type	Potential Impacts
Conservation Area	Yes
Fish and Aquatics	No
Hydrography	Yes

<b>Fish and Aquatics</b>	<b>Count</b>	<b>Total Coverage</b>	<b>Nearest</b>
<a href="#">NC Heritage Fishing Nursery Areas</a>	0	0 ac	0
<a href="#">NOAA Essential Fish Habitat</a>	0	0 ac	0
<a href="#">Submerged Aquatic Vegetation</a>	0	0 ac	0
<b>Hydrography</b>	<b>Count</b>	<b>Total Coverage</b>	<b>Nearest</b>
<a href="#">303d and 305b Streams (ESM Layer)</a>	7	8778.0 ft	529.7 ft
<a href="#">FEMA Stream Study Type (ESM Layer)</a>	5	11245.5 ft	476.9 ft
<a href="#">NC DEQ Water Supply Watershed IV</a>	4	10855.4 ft	529.7 ft
<a href="#">USGS 24K Streams 2014</a>	4	8778.0 ft	529.7 ft
<a href="#">NC DEQ Water Supply Watersheds</a>	2	1053.6 ac	N/A
<a href="#">NC DEQ Draft 303d Category 5 Assessments</a>	1	3834.1 ft	N/A
<a href="#">DWR Trout Waters 2014 (ESM Layer)</a>	0	0 ft	0
<a href="#">High Quality Water and Outstanding Resource Water Management Zones</a>	0	0 ac	0
<a href="#">NC Wild and Scenic Rivers</a>	0	0 ft	0
<a href="#">NOAA Designated Critical Resource Waters</a>	0	0 ac	0
<a href="#">USDA Forest Service Wild and Scenic Rivers</a>	0	0 ft	0
<a href="#">WRC Trout Waters</a>	0	0 ft	0
<b>Physiography</b>	<b>Count</b>	<b>Total Coverage</b>	<b>Nearest</b>
<a href="#">NCDOT SSURGO Soils</a>	144	1053.6 ac	17.5 ft
<a href="#">US EPA Level III Ecoregions</a>	1	1611.4 ac	N/A
<a href="#">US EPA Level IV Ecoregions</a>	1	1611.4 ac	N/A
<b>Utilities</b>	<b>Count</b>	<b>Total Coverage</b>	<b>Nearest</b>
<a href="#">NC Public Water Supply Water Sources</a>	5	N/A	461.6 ft
<a href="#">NC Water Supply intakes</a>	5	N/A	461.3 ft
<a href="#">NC Surface Water Intakes</a>	0	N/A	0
<a href="#">Sanitary Sewer Systems - Land Application Areas</a>	0	N/A	0
<a href="#">Sanitary Sewer Systems - Pumping Stations</a>	0	N/A	0
<a href="#">Water Distribution Systems - Water Pumping Stations</a>	0	N/A	0

# ATLAS Workbench

- Key Functionality
  - Flexible in conjunction with policy changes
  - Advanced Map Viewer
  - Integration with SharePoint (Scoping and PreConstruction)
  - Ingestion of standard deliverable data (PDF and spatial data deliverables)
  - View your project within the context of surrounding projects and data for those projects



## U-5834 ▶ U-5834

US 25 (Hendersonville Rd) to SR 3157 (Weston Rd). Upgrade existing roadway.  
Buncombe

Home 4 Division 13 Preconstruction 4 U-5834

### Project Site

- Preconstruction Home
- Grant Consulting Firm Access
- Lock/Unlock Plans or Provisions
- Key Documents
- Discipline Specific Links
- Preconstruction Help
- Project Commitments
- Project Contacts
- Email Project Contacts
- Project Structures
- Submittal Tracker
- Recently Modified

#### General

#### Disciplines

#### Collaboration

#### LET Preparation

#### ATLAS Tools

- ATLAS Workbench**  
Use the Workbench to monitor project status, submit your final project documents, and upload spatial deliverables.
- ATLAS Data Search Tool**  
Use the Data Search Tool to access GIS datasets from multiple sources in one single search interface.
- ATLAS Screening Tool**  
Use the Screening Tool to analyze a project study area for natural and human environment impacts based on key GIS datasets.

### Precon Project Map







Map Workbench

About Additional Resources Help

Layers Base Maps Tools

# Layers

WRC Trout Waters

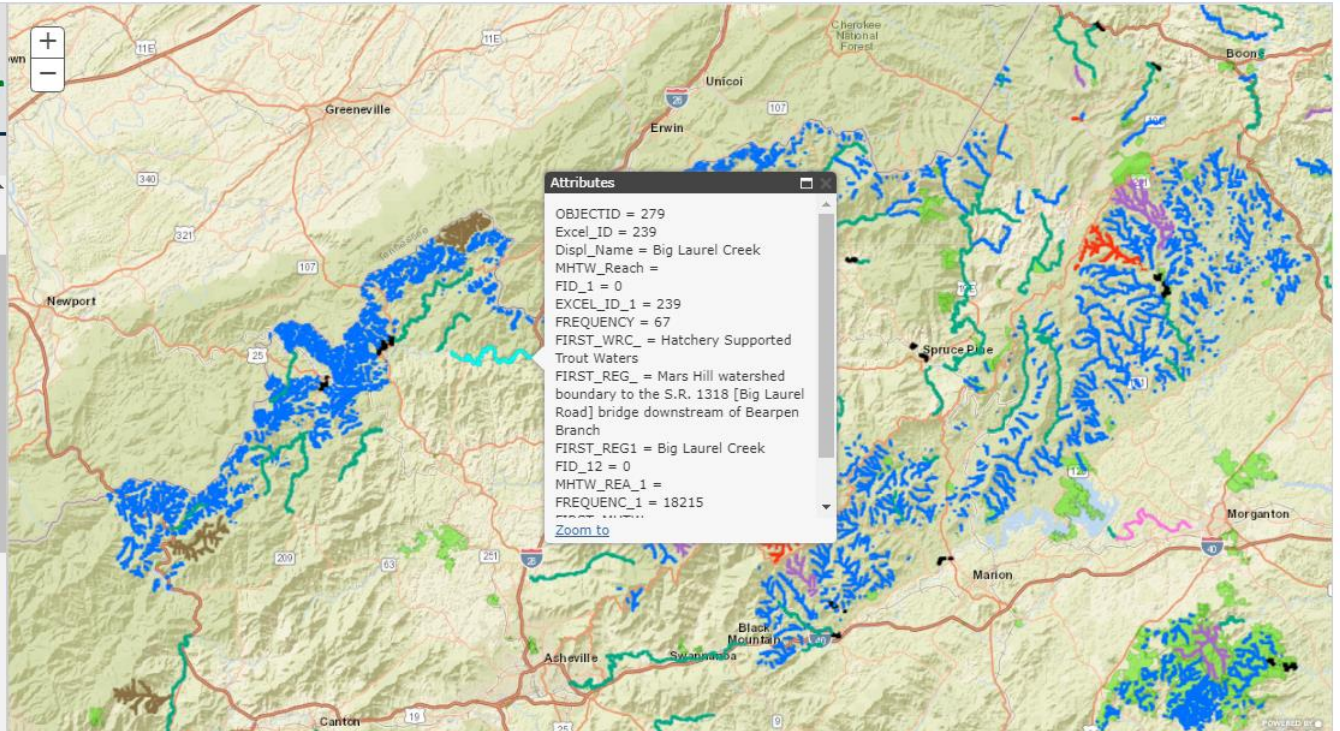
Legend Opacity

- Catch and Release/Artificial Flies Only Trout Waters
- Catch and Release/Artificial Lures Only Trout Waters
- Delayed Harvest Trout Waters
- Hatchery Supported Trout Waters
- Special Regulation Trout Waters
- Wild Trout Waters
- Wild Trout/Natural Bait Waters

Boating Access Areas

Legend Opacity

North Carolina State Parks



The screenshot displays the ATLAS web application interface. At the top left is the ATLAS logo. Below it are navigation tabs for 'Map' and 'Workbench'. A 'Layers' panel on the left shows 'North Carolina State Parks' selected. A central 'Add Layers' dialog box is open, containing a search field and a list of layer categories with sub-items. The background shows a map of a region including Cooleemee and Salisbury.

**ATLAS**

Map Workbench

Layers Base Maps Tools

**Layers**

North Carolina State Parks

Legend Opacity

**Add Layers**

Use checkboxes to select layer you would like to View on Map.

Search

- Public Property**
  - National Forests
  - North Carolina State Parks
  - Boating Access Areas
  - Paddle Trails - Lines
- Community**
  - North Carolina Public Schools
  - Hospitals
  - NC Colleges and Universities
  - NC DEQ DWR Animal Operation Permits
  - NC Paddle Trails - Points
- Hydrography**
  - Regulated Navigational Areas - Coast Guard
  - NC DEQ Draft 303d Category 5 Assessments
  - NOAA Designated Critical Resource Waters
  - NC DEQ Cool-cold-warm stream habitat
  - NC Wild and Scenic Rivers
  - High Quality Water and Outstanding Resource Water Management Zones
  - Trout Streams (DWQ)
  - USGS 24K Streams 2014

Cancel View On Map

Basic Project Info	
Scoping	✓
Public/Local Involvement	✓
Merger	✓
Survey & Photogrammetry	✓
Traffic	✓
Community Characteristic Report (CCR)	✓
Natural Resources	✓
Indirect & Cumulative Effects (ICE)	✓
Air Quality	✓
Noise Analysis	✓
Cultural Resources	✓
Geo-Environmental	✓
Land Use Scenario Assessment (LUSA)	✓
Community Impact Assessment (CIA)	✓
Project Conclusion	✓

## Natural Resources



Is Natural Resources required?

Yes  No

a. Natural Resources:

\* Was Jurisdictional Area Delineation completed?

Yes  No

\* Were T&E surveys completed?

Yes  No

\* What effect will the project have on Threatened and Endangered Species or their critical habitat?

\* Select species that are potentially impacted:

\* Are there any species for which biological conclusions are unresolved?

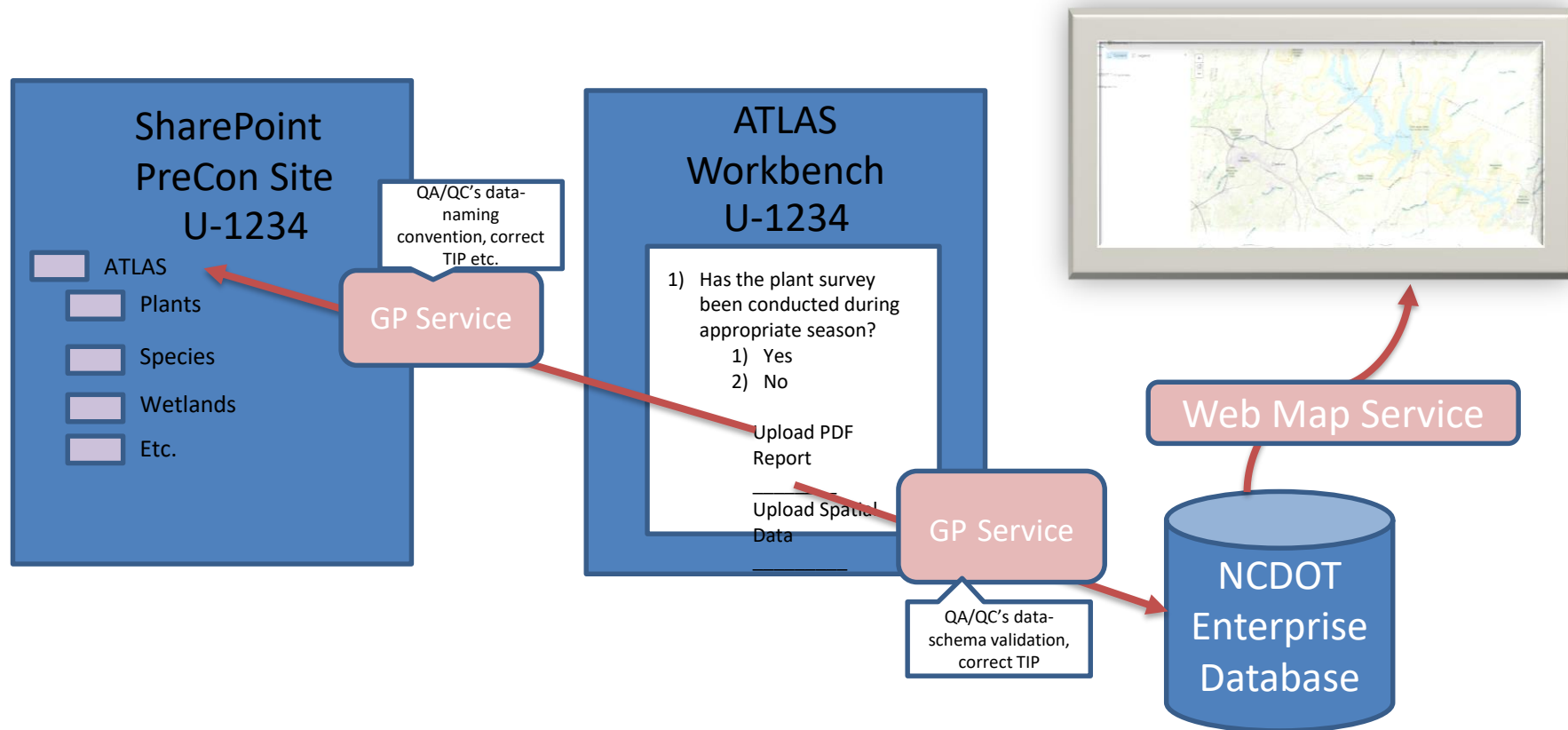
Yes  No

If so, which and why?

\* Has the USFWS requested a Biological Assessment during Section 7 consultation?

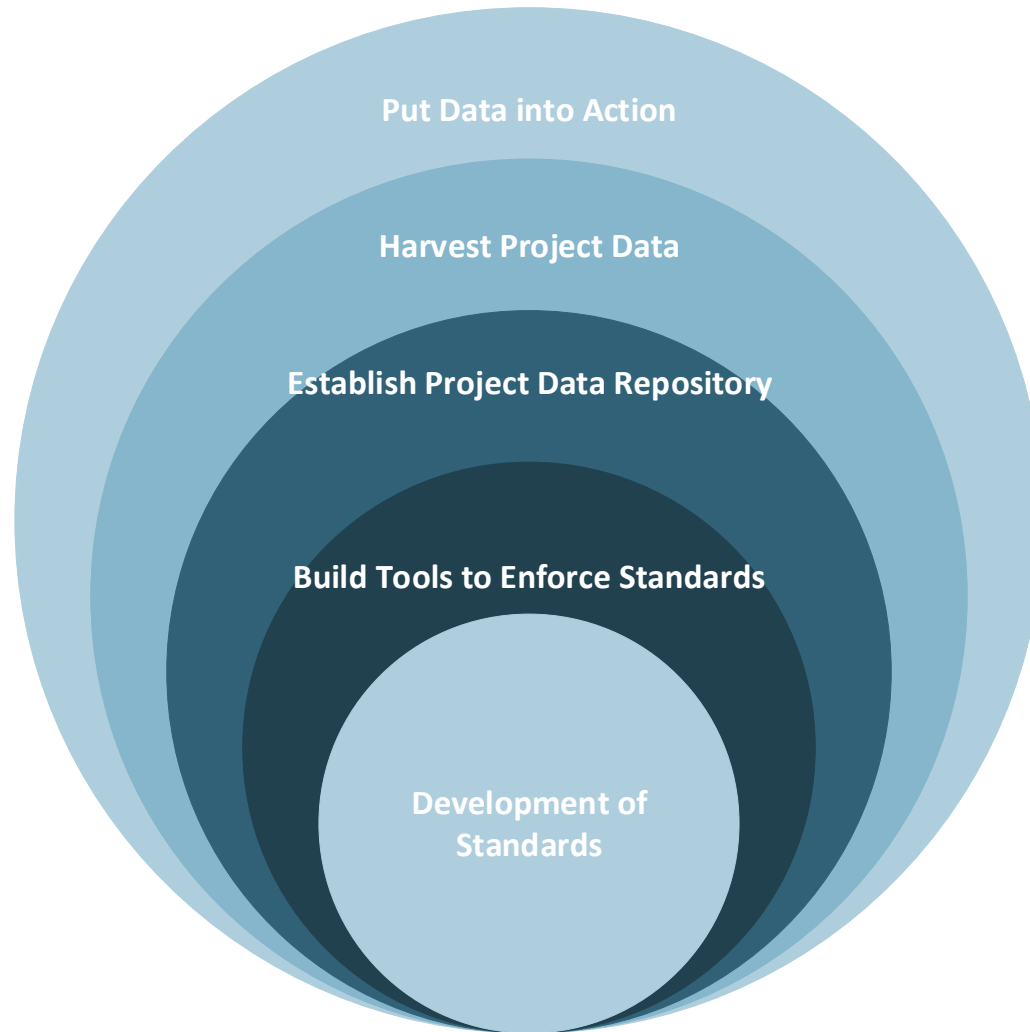
Yes  No

# Workbench: Data Flow





# Workbench – Snowball Effect





# Application Management Tool

- Key Functionality
  - Add/remove layers
  - Manage deliverables types
  - Manage workbench questions
  - Update About, Application Disclaimers, Additional Resources, and Help



ATLAS Application Management Portal

- [Manage ATLAS Search Tool](#)
- [Manage ATLAS Screening Tool](#)
- [Manage ATLAS Workbench](#)
- [Manage ATLAS Disclaimer](#)
- [Manage ATLAS About](#)
- [Manage ATLAS Additional Resources](#)
- [Manage ATLAS Help](#)



Layer Name	Linked Documents	Linked Categories
2012 Integrated Reporting Water Quality Assessments	NRTR , FeasibilityDesign ▾	Natural Environment ▾
2015RareRoadsidePopulations_pt_nodupl.shp	None selected ▾	None ▾
2016 Traffic Segments Primary	Traffic Forecast , Traffic... ▾	Congestion Management ▾
2016 Traffic Segments Secondary	Traffic Forecast , Traffic... ▾	Congestion Management ▾
303d and 305b Streams (ESM Layer)	5 selected ▾	Miscellaneous ▾
911 Response with Transport Capability	CCR ▾	Human Environment ▾
911 Response without Transport Capability	CCR ▾	Human Environment ▾
Air Medical/Specialty Care Transport	CCR ▾	Human Environment ▾

Cancel Apply Changes



Select a part of the decision tree to configure:

Categories

Groups

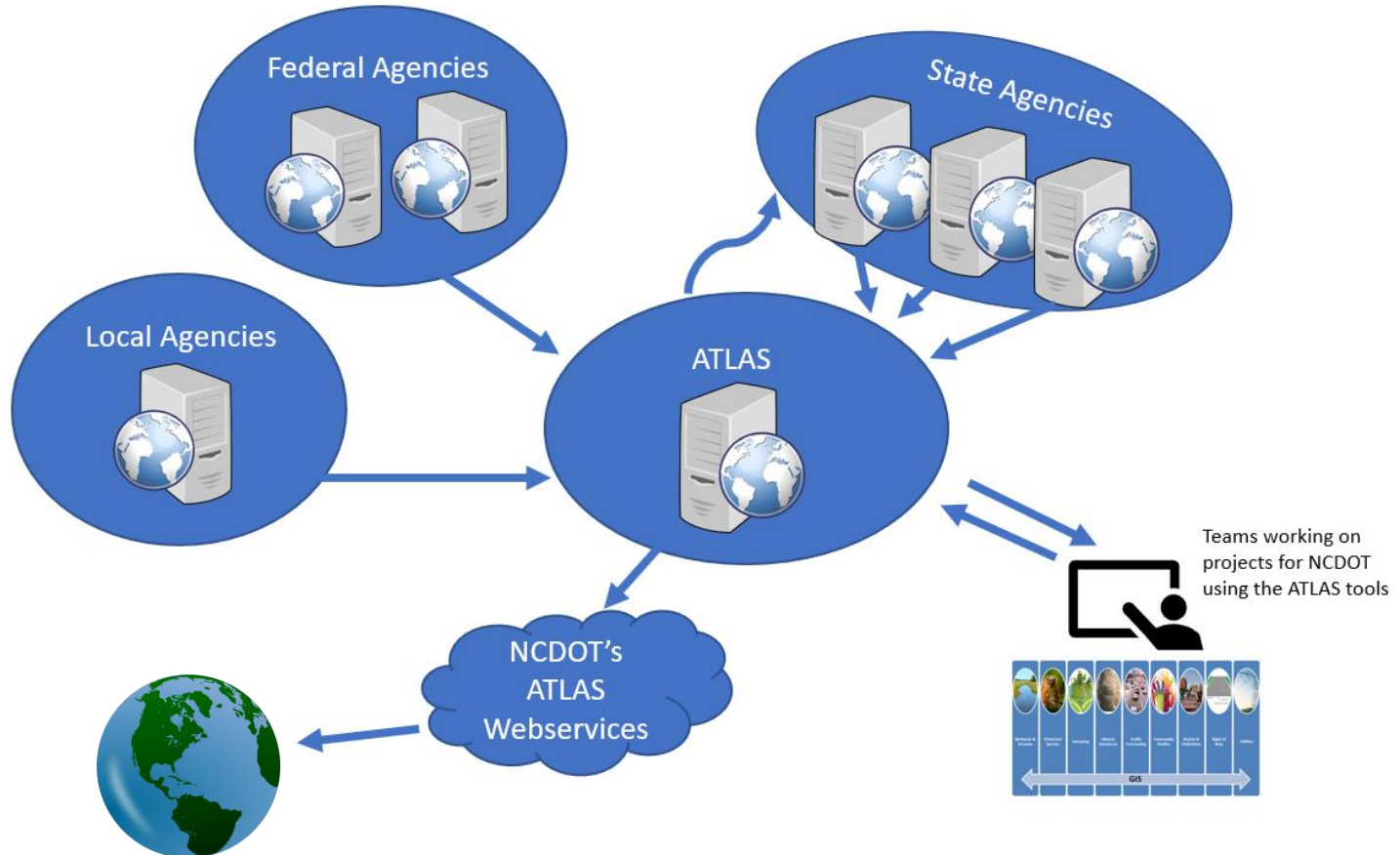
Controls

Configure Controls for Natural Resources

Add Control

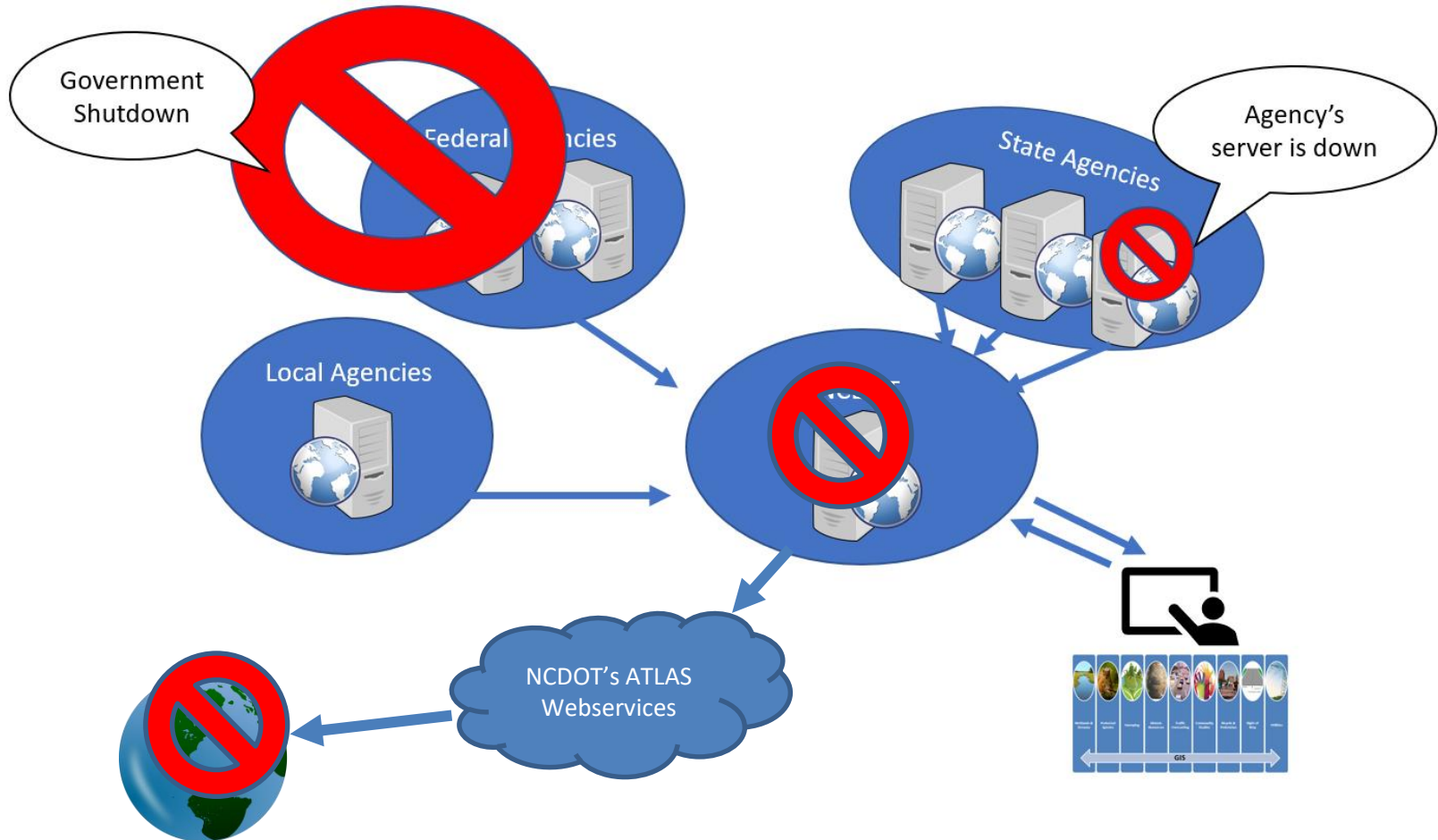
Order	Title	Control Type				
1	Was Jurisdictional Area Delineation completed?	Yes No	Edit	Delete	Up	Down
2	Were T&E surveys completed?	Yes No	Edit	Delete	Up	Down
3	What effect will the project have on Threatened and Endangered Species or their critical habitat?	Dropdown	Edit	Delete	Up	Down
4	Select species that are potentially impacted:	Multiple Select	Edit	Delete	Up	Down
5	Are there any species for which biological conclusions are unresolved?	Yes No	Edit	Delete	Up	Down
6	If so, which and why?	Text	Edit	Delete	Up	Down
7	Has the USFWS requested a Biological Assessment during Section 7 consultation?	Yes No	Edit	Delete	Up	Down

# ATLAS in the GIS Landscape





# Importance of continued data access



# Important Notes on ATLAS

- We are not eliminating field work
  - Field work is still a major component of all projects. For the first time we will be capturing this data for all projects undergoing environmental evaluation.
- We are not eliminating jobs
  - We are helping project teams do their jobs more effectively and efficiently.
- We are pushing more work earlier in the process to help scheduling, budgeting and scoping
- We are helping to deliver better projects within our program delivery goals by:
  - Improving GIS data and management
  - Improving processes

# Questions?

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