Project ATLAS: Improving Project Development at NCDOT using GIS

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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
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
How does NCDOT measure up?

Miles

- Texas: 80,000 miles
- North Carolina: 60,000 miles
- Virginia: 50,000 miles
- South Carolina: 40,000 miles
- Pennsylvania: 30,000 miles
- West Virginia: 25,000 miles
- Missouri: 20,000 miles
- Kentucky: 15,000 miles
- Ohio: 10,000 miles
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, data collecting in the field with GPS, impact maps)- they wanted to leverage this powerful tool to improve project delivery.
Why did we start ATLAS?

- NCDOT was not meeting expectations for project development timeframes

- Management expects to meet the goal of “3,2,1”
  - 3 years to complete and Environmental Impact Statement
  - 2 years to complete a Environmental Assessment
  - 1 year to complete a Categorical Exclusion

- This goal was communicated effectively to everyone throughout the agency (this will come into play later….)

Improving NCDOT Project Delivery With GIS
Setting the stage

- Categorical Exclusion: 1.0
- Environmental Assessment: 2.0
- Environmental Impact Statement: 3.0 (green), 2.67 (red)
Meanwhile…
Decentralization
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.
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
A Confluence

Agency Reorganization
+
3,2,1 Mandate
+
Secretary’s Priorities
Current State of Project Development
# Future Projects

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

<table>
<thead>
<tr>
<th>Transportation Mode</th>
<th>Total Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aviation</td>
<td>86</td>
</tr>
<tr>
<td>Bicycle/Pedestrian</td>
<td>235</td>
</tr>
<tr>
<td>Ferry</td>
<td>6</td>
</tr>
<tr>
<td>Highway</td>
<td>1,266, including:</td>
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<tr>
<td></td>
<td>- 181 bridge projects</td>
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<tr>
<td></td>
<td>- 83 interstate maintenance projects</td>
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<tr>
<td></td>
<td>- 37 safety projects</td>
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<tr>
<td>Public Transit</td>
<td>23</td>
</tr>
<tr>
<td>Rail</td>
<td>47</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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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

- Wetlands & Streams
- Protected Species
- Sweeping
- Historic Resources
- Traffic Forecasting
- Community Studies
- Bicycle & Pedestrian
- Right of Way
- Utilities

GIS
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
Drawings to Diagrams
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"
Data Facts

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

Layers Top 5 Contributors

<table>
<thead>
<tr>
<th>Organization</th>
<th>Count</th>
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</thead>
<tbody>
<tr>
<td>NCDOT, GIS Unit</td>
<td>154</td>
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<tr>
<td>US Geological Survey (USGS)</td>
<td>75</td>
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<tr>
<td>NC Center for Geographic Information and Analysis (CGIA)</td>
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<td>NC Department of Environmental Quality (DEQ)</td>
<td>60</td>
</tr>
<tr>
<td>US Department of Homeland Security (DHS)</td>
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Screening Layers Top 5 Contributors

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<td>US Geological Survey (USGS)</td>
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<td>NCDOT, GIS Unit</td>
<td>14</td>
</tr>
<tr>
<td>US Army Corps of Engineers (USACE)</td>
<td>10</td>
</tr>
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</table>
Data Breakdown

DATA SOURCES

- State: 63%
- Federal: 32%
- Local: 4%
- Private: 1%
Data Breakdown

DATA SOURCES

- Federal: 32%
- State: 36%
- Local: 4%
- NCDOT: 27%
- Private: 1%
Data Developed through ATLAS

130 New Layers are being created
# 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**

*May 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**

*May 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**

*May 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.
Application Technology

• N-Tier Architecture
• ASP.NET
• Razor Pages, Bootstrap, JQuery
• Esri JavaScript 4.11
• Portal for ArcGIS/SQL Server/SDE
• Python Geoprocessing
  – Deployed as Rest Endpoints
  – Print
  – Data download within study area
    • (GDB, Shapefile, DGN)
Search Tool

• Key Functionality
  – Search for data by document type, Data Owner, and/or keyword
  – Download data in Shapefile, GDB and DGN formats
  – View selected data on a web map
  – Demo
Screening Tool

• Key Functionality
  – Screen against 120+ 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
  – Demo
Machine Learning and Modeling

- Predictive Models
  - R, SAS
  - Wetlands
  - Streams
  - Protected Species
    - Aquatics
    - Critters
    - Plants
- Expert Models
  - ArcGIS Model Builder, Python
Workbench – Snowball Effect
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
  – Demo
ATLAS in the GIS Landscape

- Federal Agencies
- State Agencies
- Local Agencies
- ATLAS
- NCDOT’s ATLAS Webservices

Teams working on projects for NCDOT using the ATLAS tools

ncdot.gov
Importance of continued data access
The Future for ATLAS

• ATLAS 1.0 and 1.1 address immediate needs in Project Development

• ATLAS 2.X increases support for Business Units contributing to Project Development and begins to tie together enterprise systems such as SAP and Agile Assets

• ATLAS 3.X broadens scope to assist enterprise integration across the agency
Questions?

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