TRIAD REGIONAL ITS SDP

CONSOLIDATED STRATEGIC DEPLOYMENT PLAN

Kimley»Horn

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List of Abbreviations

AADT	Annual Average Daily Traffic
ADA	Americans with Disabilities Act
ARC-IT	Architecture Reference for Cooperative and Intelligent Transportation
AVL	Automatic Vehicle Location
BC	Benefit to Cost Ratio
CAD	Computer Aided Dispatch
CAV	Connected and Autonomous Vehicle
CCTV	Closed Circuit Television
CFPS	Certified Fire Protection Specialist
CMAQ	Congestion Mitigation and Air Quality
CMM	Capability Matrix Model
CO	Carbon Monoxide
DMS	Dynamic Message Sign
EVP	Emergency Vehicle Pre-emption
FHWA	Federal Highway Administration
GTFS	General Transit Feed Specification
HSIP	Highway Safety Improvement Program
ICM	Integrated Corridor Management
IMAP	Incident Management Assistance Patrol
ITRE	Institute for Transportation Research and Education
ITS	Intelligent Transportation Systems
MPO	Metropolitan Planning Organization
NCDOT	North Carolina Department of Transportation
NOx	Nitrogen Oxides
O&M	Operations and Maintenance
PART	Piedmont Authority for Regional Transportation
PDA	Probe Data Analytics
PH	Potentially Hazardous
PMS	Portable Message Sign
RAD-IT	Regional Architecture Development for Intelligent Transportation
RITIS	Regional Integrated Transportation Information System
ROI	Return on Investment
RPO	Rural Planning Organization
SDP	Strategic Deployment Plan
SET-IT	Systems Engineering Tool for Intelligent Transportation
TIMS	Traffic Incident Management Software
TMC	Traffic Management Center
TOC	Traffic Operations Center
TSMO	Transportation Systems Management and Operations
TSOU	Traffic Systems Operations Unit
TTI	Travel Time Index
USDOT	United States Department of Transportation
VOC	Volatile Organic Compounds

USER GUIDE

The Triad Regional Intelligent Transportation Systems (ITS) Strategic Deployment Plan (SDP) provides stakeholder agencies with planning and assessment tools to identify, prioritize, and implement projects focused on addressing regional needs.

The document is structured into three main sections that align with the structure of the SDP development process. Section 1 establishes the foundation for the SDP through stakeholder engagement and a regional gap assessment. Section 2 follows the process into the project development, prioritization, and creation of the regional ITS architecture. Lastly, Section 3 consolidates the outputs of the SDP and provides details related to implementing a project, along with processes for maintaining and updating the SDP. All sections reference specific materials and user guides included within the Appendix.

Each section also references detailed information, previous deliverables, and user guides in the corresponding Appendix. The user guides are focused on facilitating stakeholders understanding related to referencing the SDP content, implementing projects, and maintaining an updated plan.

Section	Sub-Section	Contents	Appendix
Section 1: Plan Development Process	Stakeholder Identification and Engagement	Stakeholders	Stakeholder Involvement
		Meetings	
	Triad Regional Goals	Triad Regional Goals	
	Gap Assessment	Existing Conditions	Gap Assessment Document
		Capability Maturity Model	
		Gap Assessment Process	
		Best Practices Research	Best Practices List
Section 2: Project Identification and Prioritization	Action Plan Development	Action Plan Development Process	Action Plans
		How to Read Action Plans	
	Geographic Project Development	Project Development Process	Project Identification Data Sources
		Geographic Project Identification	
			Geographic Project Maps
		Geographic Project Prioritization	Project Prioritization Process
		Benefit/Cost Analysis	
		Prioritized Geographic Project List	
	Regional ITS Architecture	ARC-IT	Service Package Summary
		Regional ITS Architecture Development	
			Regional Architecture Visio Diagrams
Section 3: Project Implementation and SDP Maintenance	Implementation	Action Plan Implementation	Action Plan Implementation Guide
		Geographic Project Implementation	Geographic Project Implementation Guide
			Prioritization Tool User Guide
			Systems Engineering Documentation User Guide
			Architecture Conformance Guide
	Maintenance	As Needed Update	SDP Update Guide
		Administrative Update	
		Full Update	

TRIAD REGIONAL ITS SDP

1 – PLAN DEVELOPMENT PROCESS

1 Plan Development Process

The Triad Regional Intelligent Transportation Systems (ITS) Strategic Deployment Plan (SDP) provides stakeholders with the tools to identify, prioritize, and implement projects that address regional needs. In addition, the SDP includes the Triad Regional ITS Architecture which aligns with the National ITS Architecture Version 8.3. The SDP development defines regional goals for the Triad Region and applies the framework of a Capability Maturity Model (CMM) assessment to define gaps based on the existing conditions and the regional goals. National research was conducted based on the defined gaps and became the cornerstone of the project development. A technology-agnostic project development strategy was applied to accommodate future fiscal budgets without committing to a specifically prescribed technology solution.

1.1 Stakeholder Identification and Engagement

The Triad Region is in Central North Carolina and serves as a linkage between the Triangle and Metrolina metropolitan regions. It also provides a primary connection between the eastern and western portions of North Carolina. The Triad Region includes multiple Interstate and US Routes that are critical to transportation services and goods movement. The governmental jurisdictions within the Triad Region consists of five Metropolitan Planning Organizations (MPOs), one Rural Planning Organization (RPO), two NCDOT Divisions, 12 counties, and numerous municipalities. ***Figure 1*** presents the geographic and jurisdictional boundaries of the Triad Region. The agencies operating within these jurisdictional boundaries include numerous stakeholders that were identified for the SDP development.

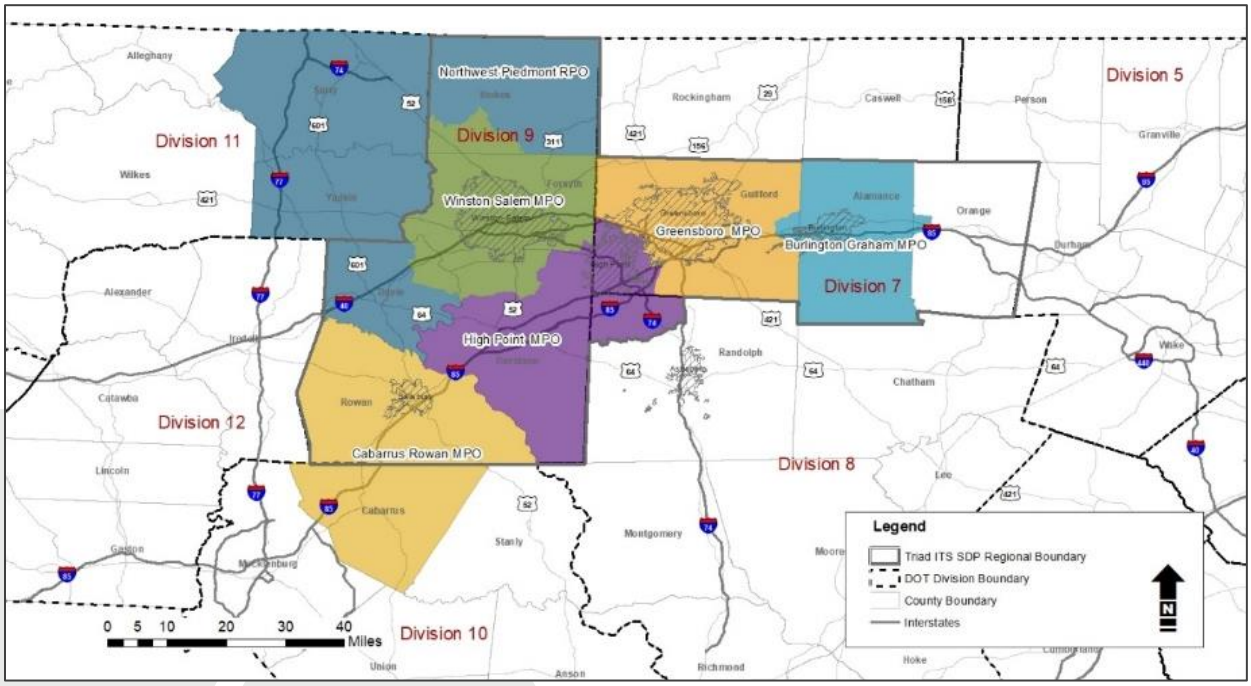


Figure 1 – Triad Regional Boundary

The stakeholder list incorporates three levels of participation. The administrative team includes NCDOT project managers, FHWA, and the Kimley-Horn project team. The administrative team worked together to manage the project schedule, engage with stakeholders, and oversee the development of the SDP. The Core Team is comprised of individuals from multiple departments within NCDOT, municipalities, and other governmental agencies in the Triad Region. The Core Team met regularly throughout the project development to provide guidance and feedback on the milestones of the SDP. ***Table 1*** provides a listing of the individuals involved in the Administrative and Core Teams and ***Table 2*** lists each of the participating agencies included in the development of the SDP and a complete list of the individual stakeholders is provide in ***Appendix A1.1***.

Table 1 – Triad SDP Involvement

Admin	Core Team Members			
Neil Avery	Auref Aslami	John Hanes	Mark McDonald	Todd Tuttle
Jeff Dale	Wendy Brindle	Rodney Harrison	Tyler Meyer	Greg Venable
Brett Gallagher	Matthew Carpenter	Heather Hildebrandt	Kai Monast	Mike Venable
Joe Geigle	Hanna Cockburn	Brian Isley	Mike Nunn	Steve Wardle
Amanda Good	Phil Conrad	Tom Kureczka	Jennifer Portanova	Pat Wilson
Jeron Monroe	Vickie Eddleman	Ed Lewis	Scott Rhine	Angela Wynes
Lee Neal	Jeffrey Fansler	Wannetta Mallette	John Rhyne	Skip Yearkel
Kenneth Smith	Hank Graham	Toneq McCullough	Chris Spencer	Yuan Zhou
	Kelly Garvin	Dominique McCullough	Alex Stone	
	Fred Haith	Meredith McDiarmid	Jason Toney	

Table 2 – Stakeholder Agencies

Participating Agencies			
Alamance County	City of Winston-Salem	Guilford Metro 911	NCDOT Division 9
Cabarrus-Rowan MPO	Davidson County	High Point MPO	Orange County
City of Burlington	Davie County	High Point Police Dept.	Rowan County
City of Graham	Federal Highway Administration	Kimley-Horn	Volvo Group North America
City of Greensboro	Forsyth County	NC State Highway Patrol	Western Piedmont Planning
City of High Point	Greensboro Transit Authority	NCDOT	Winston-Salem Transit Authority
City of Salisbury	Guilford County	NCDOT Division 7	Piedmont Authority for Regional Transportation

Seven Core Team Meetings and three Stakeholder Workshops were held throughout the SDP development process and are shown in ***Table 3.*** Attendance at each of the meetings is captured on sign-in sheets presented in ***Appendix A1.1***.

Table 3 – Stakeholder Engagement Schedule

Meeting	Objectives	Date
PM Kick-off	- Confirm Core Team Members - Confirm Schedule - Confirm Work Plan	3/27/2018
Core Team Meeting 1 Core Team Kick-off	- Confirm Structure of Core Team - Review Stakeholder List - Review Schedule and Commitment - Review Roles and Responsibilities	6/25/2018
Core Team Meeting 2 VGO and Gap	- Discuss Draft VGO - Discuss Existing Conditions - Stakeholder Workshop Prep	7/30/2018
STAKEHOLDER WORKSHOP 1	- Discuss Revised Regional VGO - Conduct Break-outs in Functional Areas to Discuss Challenges	10/16/2018
Core Team Meeting 3 Best Practices and Architecture Baseline	- Perform CMM Assessment - Develop Best Practices Mapped to Gaps - Review Draft Baseline Documentation of Regional ITS Architecture	11/19/2018
Core Team Meeting 4 Draft Architecture Review	- Review Visio Diagrams to Confirm Information Flows	1/28/2019
Core Team Meeting 5 Best Practices and Project Identification	- Present Best Practices and Alignment to Regional Gaps - Work Through Draft List of Projects	2/25/2019
STAKEHOLDER WORKSHOP 2	- Overview of Best Practices and Alignment with Gaps - Work Through Revised List of Projects	3/28/2019
Core team Meeting 6 Prioritized Projects and Architecture	- Priorities /Maintenance and Use	6/24/2019
STAKEHOLDER WORKSHOP 3	- Priorities /Maintenance and Use	8/8/2019
Core Team Meeting 7 Project Close-out	- Comment resolution on Draft Final Deliverables - Present Final Deliverables and way forward - Confirm Final Actions	*4/23/2020*
PM Close-out	- Final Actions - Confirm Final Deliverables	*5/20/2020*

1.2 Triad Regional Goals

At the first Stakeholder Workshop, the stakeholders determined that the region's ITS goals aligned well with the recently developed themes in the US Department of Transportation (USDOT) Strategic Plan for FY 2018-2022. The USDOT themes are shown are presented in ***Table 4*** and were used as a foundation in developing the projects and the prioritization process, which is discussed in ***Section 2.2.***

Table 4 – USDOT Strategic Plan Themes

Enhance Mobility by exploring methods and management strategies that increase system efficiency and improve individual mobility. This will be achieved through a variety of programs and applications, including improved traffic management, work zone and incident management, transit management, freight management, and road weather management, among others. It further leverages the full potential of CVs, travelers, and infrastructure to provide additional information and technologies that better facilitate mobility for all users of surface transportation systems
Enable Safer Vehicles and Roadways by developing better crash avoidance for all road vehicles, performance measures, and other notification mechanisms, as well as mechanisms to protect consumer privacy; commercial motor vehicle safety considerations; and infrastructure-based and cooperative safety systems. This strategic theme will include activities within the CV and automation areas, exploring how those technologies can help people avoid crashes through new safety advisories, warnings, messages, and ultimately, automated responses, in addition to exploring ways to enhance traffic incident management and responder safety when a crash does occur.
Limit Environmental Impacts by better managing traffic flow, speeds, and congestion and using technology to address other vehicle and roadway operational practices. This strategic theme explores how to reduce the environmental impacts of each trip by assisting system users and operators with "green" transportation alternatives and options such as avoiding congested routes, taking alternate routes, using public transit, or rescheduling a trip — all of which can make trips more fuel-efficient and eco-friendly
Support Transportation System Information Sharing through the development of standards and systems architecture, and the application of advanced wireless technologies that enable communications among and between vehicles of all types, the infrastructure, and portable devices. Those communications break down barriers through shared transportation processes, shared resources, and common rules of operation. This work will support connectivity among vehicles, infrastructure, organizations, systems, and people to support more efficient and effective transportation.
Promote Innovation by fostering technological advancement and innovation across the ITS Program; continuously pursuing a visionary/exploratory research agenda; and aligning the pace of technology development, adoption, and deployment to meet future transportation needs. This strategic theme further explores leveraging strategic partnerships with public and non-public entities to enable ongoing targeted outreach, engagement, and knowledge/technology transfer efforts. Promoting innovation will necessitate that the ITS Program focus on market scanning to increase awareness of new technology developments.

1.3 Gap Assessment

The Gap Assessment includes input from Core Team Meetings and a Stakeholder Workshop. This section provides a high-level summary of the Gap Assessment process, with references to relevant information contained within the full Gap Assessment document located in ***Appendix A1.2***.

Existing conditions information was gathered and used to identify strengths and challenges in the region. With this information, a Capability Maturity Model (CMM) self-assessment was conducted first at a municipal level and then at a regional level. The results of the CMM self-assessment were used to identify gaps in the region based on action items that support maturing each CMM dimension to the next level. Best practice research was focused on the best strategies that aligned with the identified regional gaps.

1.3.1 Existing Conditions

Existing conditions were documented on Information Sheets specific to each municipality. These were used as reference documents during discussion with each agency to identify existing systems and technology in the Triad Region. It included summaries of the existing systems and a geographic map summarizing some of the existing field infrastructure. The draft version of this data was sourced from planning documents and revised through conversations with local and regional agencies. ***Figure 2*** is an example of one of these Information Sheets, which are included in their entirety in ***Appendix A*** of the Gap Assessment Document (***Appendix A1.2***).

Click the links below to access specific Agency's Existing Conditions Information Sheets.

- Burlington
- Greensboro
- High Point
- Salisbury
- Winston-Salem
- Triad Region

ITS Information Sheet

BURLINGTON

The ITS Information Sheet identifies existing systems and technology in the city limits of Burlington.

Data Management

ITS Data Warehouse

- General Transit-Feed Specification (GTFS) data is archived and published for a range of analysis.

Performance Monitoring

Performance measures for:

- Travel Speed
- Traffic Demand
- Turning Movement Counts (loop detection)
- New Centracs software will allow for more performance measures

Maintenance and Construction

Roadway Maintenance and Construction

- Streets maintained by the Street Division of the Public Works Department
- Alamance County 911 Center

Work Zone Management

- Inspections Division monitors constructions projects within the City of Burlington's jurisdiction.

Public Safety

Emergency Call-Taking and Dispatch

- Burlington's Communication Center receives and dispatches calls for emergency and non-emergency assistance.

Emergency Vehicle Premption

- Two (2) signals equipped with Emergency Vehicle Preemption (EVP) equipment.

Wide-Area Alert

- Alamance County Emergency Alerts (ACE Alerts)- allows the public to receive official information from the County Emergency Management and other Public Safety agencies.
  - Messages delivered via email, text message, voice message, and over the web.

Early Warning System

- Included in ACE Alerts

Evacuation and Reentry Management

- Included in ACE Alerts

Disaster Traveler Information

- Included in ACE Alerts

Public Transportation

Transit Fixed-Route Operations

- Link Transit operates 5 routes between Burlington, Gibsonville, and Alamance Community College. Link also provides paratransit services. Discounted fare for students and elderly.
- Alamance County Transportation's paratransit door-to-door service is provided for elderly or disabled individuals (reservations at least 24-hour notice).
  - Application process takes up to 30-days.
  - Elderly/disabled can ride fixed-routes for free

Dynamic Transit Operations

- Users can set mobile alarm to indicate when the bus is 5-15 minutes away.

Transit Fare Collection Management

- Accepts cash or coins, regional fare cards, and day passes.
- Transfer passes are valid for the next connecting bus and expires 60 minutes from the time it is bought.
- Planned mobile ticketing technology (Delerrok) agreed regionally.
- Data storage using Microsoft Excel
- Link Transit accpets PART tickets

Transit Security

- Surveillance cameras are in use on every bus.

Transit Traveler Information

- Burlington uses TransLoc to provide real time information to passengers
- TransLoc (fixed routes) is accessible by mobile application, and online. Users may receive text messages or use the mobile web for route information.

Multi-Modal Coordination

- "NC By Train Last Mile" program gives the option to passengers on board the NC Amtrak a free bus pass to help reach their final destination of their trip.
- The "NC By Train Last Mile" transit pass is available at no additional charge to passengers on board the Piedmont and Carolinian trains in select cities.

Sustainable Travel

Roadside Lighting

- City street lights planned to be upgraded to LEDs by end of Feburary 2019

Electric Charging Stations Management

- Eight (8) EV charging stations
- 6-8 high power stations (Tesla supercharging station)

Traffic Management

Traffic Signal Control

- Signal system upgrade is currently under design.
  - Planned for construction in Fall of 2018
- Traffic Signal Division operates and maintains the Burlington/Graham Computerized System with approximately 201 traffic signals, 2 flashers, and control equipment.
  - 168 connected with fiber
- Computerized Traffic Signal System connects 160 intersections in the City of Burlington, City of Graham, and the County of Alamance.
- Computerized Traffic Signal System include equipment such as controllers, cabinets and detectors, microcomputers and peripheral devices, traffic control application software, a CCTV surveillance system, a fiber optic communications network, and other related equipment.
  - Fiber is connected to each signal and the system allows real-time communications.
  - All signals are intergrated into the new signal system

Railroad Operations Coordination

- Nine (9) railroad crossings
  - Two (2) located at a traffic signal intersection, 7 with flashing lights and gates.

Infrastructure-Based Traffic Surveillance

- Burlington own and operate 1 CCTV camera and NC-DOT own 40 (all IP cameras)

Following locations are used to monitor traffic:

- City of Burlington Public Works Building
  - Can access muncipcal, DOT, and pan-tilt-zoom (PTZ) cameras.
- City uses video wall to monitor traffic
- City Operations Center at the Signal Maintenance Shop is located in Burlington.
- Alamance County 911 Center (camera view only)
- Police Department (camera view only)
- STOC and TRTMC can access cameras

Traveler Information

Dynamic Ridesharing and Shared Use Transportation

- Three (3) Zipcar vehicles
- TNCs (Uber, Lyft, etc.)
- Piedmont Authority for Regional Transportation (PART) offers a free ride share matching service which matches individuals with similar commutes and work schedules together for potential van pools.
- "ShareTheRideNC" finds compatible carpoolers that match other commuters with similiar commuting schedules and destinations.

Other (Generators/Partners)

Hospitals

- Alamance Regional Medical Center

Airports

- Burlington-Alamance Regional Airport

Universities

- Elon University
- Alamance Community College

Convention Centers

- Alliance Convention Center

Major Shopping Malls

- Burlington Outlet Village

Figure 2 – Example Existing Conditions Sheet

- Alamance Crossings
- Holly Hill Mall

Rail Stations

- Burlington Station

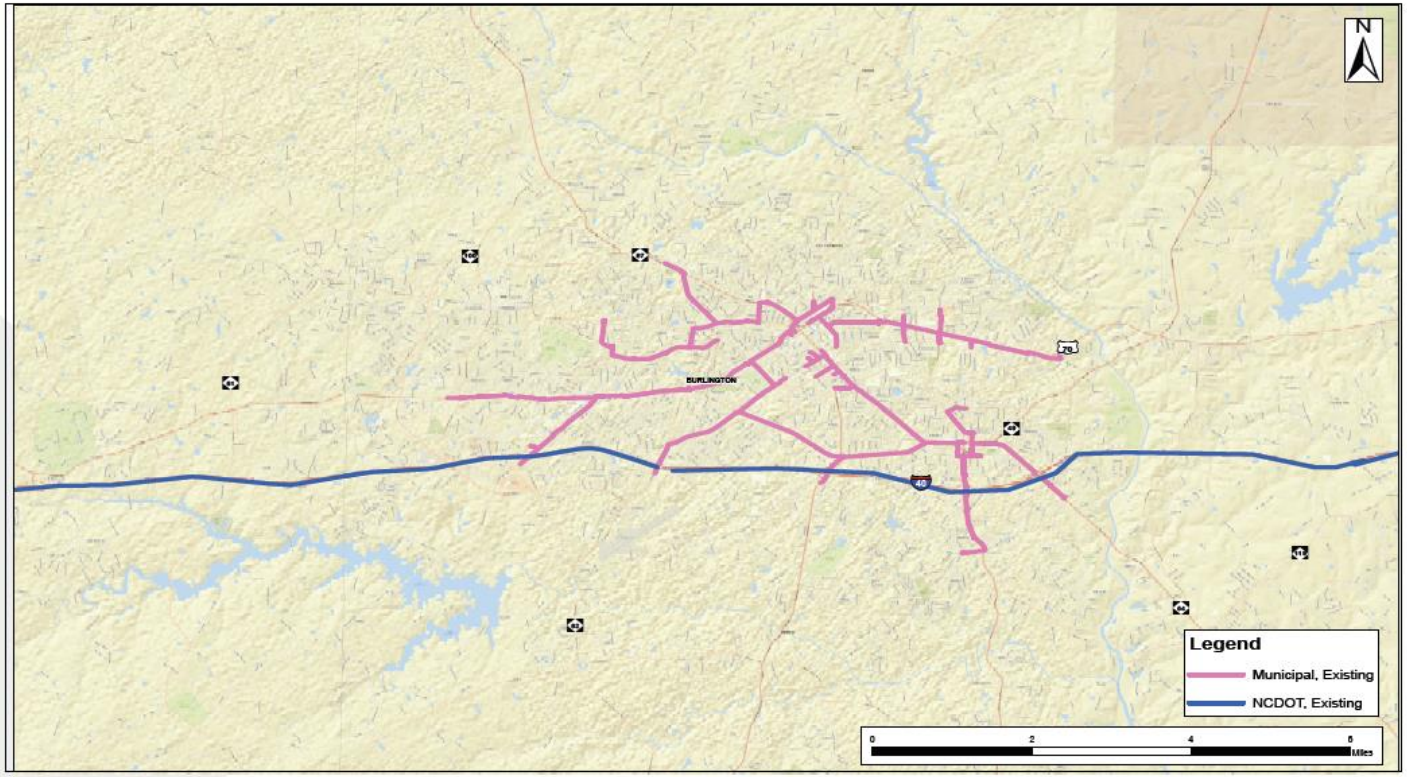


Figure 2 cont. – Example Existing Conditions Sheet

Regional Needs

Needs Information Sheets were created for each municipality to identify existing needs in traffic management, mobility, safety, and data management. The Needs Information Sheets utilized input from stakeholders and information from local and regional planning documents. An example Needs Information Sheet is shown in ***Figure 3*** and all Needs Information Sheets are included in ***Appendix B*** of the Gap Assessment Document (***Appendix A1.2***).

Click the links below to access the agency specific Needs Information Sheets.

- Burlington
- Greensboro
- High Point
- Salisbury
- Winston-Salem
- Triad Region

S.C.O.R.E Sheets

To further refine existing conditions and needs in the Triad Region, attendees of Stakeholder Workshop 1 were led through a S.C.O.R.E exercise to discuss the Strengths, Challenges, Opportunities, Risk, and Expectations with respect to seven focus areas. S.C.O.R.E. summary sheets were used to facilitate conversations during the workshop in each of those functional areas.

An example S.C.O.R.E sheet is shown in ***Figure 4*** and S.C.O.R.E sheets for each focus area are in ***Appendix C*** of the Gap Assessment Document (***Appendix A1.2***).

Click the links below to access the S.C.O.R.E Sheets specific to each functional area.

- Traffic Management
- Incident Management
- Multi-Modal
- Data Management and Traveler Information
- Funding and Project Delivery
- Interagency Coordination and Private Partnerships
- Public Safety

Needs Information Sheet

BURLINGTON

Plans referenced include:

Greenways & Bikeways Plan (2017)

Destination Burlington Comprehensive Plan (2015)

Burlington-Graham Metropolitan Transportation Plan (2015)

Pedestrian Master Plan (2012)

Downtown Parking Plan (2012)

Downtown Burlington Master Plan (2008)

Traffic Management

This focus area includes Traffic Management, Environmental, Weather, Traveler Information, Freight, Maintenance, and Construction needs.

- Improved signal timing and coordination
- Reduced truck travel times (especially on US 70, I-73/I-74, and I-40)
- Increased freight accessibility and mobility
- Improved detour plans
- Improved mobility along identified corridors (segments nearing capacity, segments at or over capacity, and identified facilities for social and environmental impacts)

Mobility

This focus area includes Public Transportation and Parking needs.

- Optimization of transit service
- Improved regional transit connections
- Parking demand management
- Geographically specified transit service needs
- Enhanced on-street parking and enforcement
- Enhanced CCTV in transit hub

Safety

This focus area includes Public Safety, Responder Safety, and Connected Vehicle needs.

- Improved pedestrian service on major arterials
- Increased pedestrian safety in downtown core

Data Management

This focus area includes Data Management and Traveler Information needs.

No needs identified.

Figure 3 – Example Needs Information Sheet

Multi-Modal

BREAK-OUT SESSION 2B

Public transportation, parking management, bicycle and pedestrian, ride sharing, and other mixed trip topics

Triad Region

Transit-Fixed Route Operations

- Piedmont Authority for Regional Transportation (PART) operates 12-fixed routes and provides express routes that serve the larger region

Dynamic Transit Operations

- The Triad Region transit agencies, including PART, use TransLoc and NextBus to provide real time information to passengers

Transit Fare Collection Management

- Planned mobile ticketing technology (Delerrok) agreed regionally

Multi Modal Coordination

- Google Transit Trip Planner integrates PART routes, train, and light rail schedules to help determine the best direct route through public transportation
- The "NC By Train Last Mile" transit pass is available at no additional charge to passengers on board the Piedmont and Carolinian trains at all train stations

Parking Electronic Payment

- Piedmont Triad International airport provides an option for online parking payments with the "Fast Pass" program

Regional Parking Management

- NCDOT deploy portable message signs (PMS) for wayfinding and use dynamic message signs (DMS) for special events on major routes

Dynamic Ridesharing and Shared Use Transportation

- "ShareTheRideNC" finds compatabile carpoolers that match other commuters with similiar commuting schedules and locations
- Bikeshare programs such as LimeBike, Zagster, Greenride and Spin are available in provided Triad cities
- Other rideshares include LimeScooter, Bird Scooter, Uber, Lyft, and Zipcar

Burlington

Transit Fixed-Route Operations

- Link Transit operates 5 routes between Burlington, Gibsonville, and Alamance Community College. Link Transit also provides paratransit services
- Alamance County Transportation's paratransit door-to-door service is provided for elderly or disabled individuals

Dynamic Transit Operations

- Users can set mobile alarm to indicate when the bus is 5-15 minutes away

Transit Fare Collection Management

- Burlington accepts Piedmont Authority for Regional Transportation (PART) tickets
- Transfer passes are valid for the next connecting bus and expires 60 minutes from the time it is bought
- Planned mobile ticketing technology (Delerrok) agreed regionally

Multi-Modal Coordination

- The "NC By Train Last Mile" transit pass is available at no additional charge to passengers on board the Piedmont and Carolinian trains at all train stations

Dynamic Ridesharing and Shared Use Transportation

- Three (3) Zipcar vehicles
- TNCs (Uber, Lyft, etc.)

Electric Charging Stations Management

- Eight (8) EV charging stations. 6-8 high power stations (Tesla supercharging station)

Greensboro

Transit Fixed-Route Operations

- Greensboro Transit Authority (GTA) operates 16 fixed routes. Specialized Community AREA Transportation (SCAT) is the Greensboro paratransit service
  - 4 diesel hybrid buses from Protran and 10 electric buses from Proterra with MobileEye Technology are planned
- Higher Educatioin Area Transit (HEAT) also operates 5 routes

Transit Fare Collection Management

- Planned mobile ticketing technology (Delerrok) agreed regionally

Multi-Modal Coordination

- The "NC By Train Last Mile" transit pass is available at no additional charge to passengers on board the Piedmont and Carolinian trains at all train stations

Parking Space Management

- Procurement for new parking system softwares in three (3) garages
- Parking applications such as ParkMe and ParkMobile are available for public use
- ParkMe provide daily off-street parking rates, occupancy numbers, available spaces, and parking time-limits
  - ParkMe data is generated from Inrix.
- Planned to integrate a parking reservation system to gather more accurate real time occupancy data

Parking Electronic Payment

- ParkMobile allows patrons to pay-by-phone to park at all metered parking and three City-owned surface lots
- NC A&T has a permit system using RFID (radio frequency identification) that allows electronic payment through the ParkMobile software

Dynamic Ridesharing and Shared Use Transportation

- Two (2) Zipcars vehicles
- Lime Bike - 800+ bikes, Bird and Lime Scooters
- TNCs (e.g. Uber, Lyft, etc)

Electric Charging Stations Management

- 8 High Power Stations (Tesla supercharging station)
- 11+ EV charging stations.

High Point

Transit Fixed-Route Operations

- High Point Transit operates 13 fixed routes, as well as a ADA paratransit service

Transit Fare Collection Management

- Planned mobile ticketing technology (Delerrok) agreed regionally

Transit Passenger Counting

- Riders can access real-time bus occupancy percentages for each bus route on Transloc

Multi-Modal Coordination

- The "NC By Train Last Mile" transit pass is available at no additional charge to passengers on board the Piedmont and Carolinian trains at all train stations

Regional Parking Management

- Eight (8) portable message boards are deployed for parking wayfinding during the Furniture Market Event

Dynamic Ridesharing and Shared Use Transportation

- Two (2) Zipcar vehicles
- TNCs (Uber, Lyft, etc)

Electric Charging Stations Management

- Three (3) EV charging stations

Salisbury

Transit Fixed-Route Operations

- Salisbury Transit has 5 operating routes. Rowan Transit operates both as a fixed route service and demand response
- Rowan Individual Transportation Assistance (RITA) provides an exclusive demand response service that is avaiable 1-day per week for each area of the county
  - Paratransit is provided by a contractor and uses Route Match Software

Transit Fare Collection Management

- Planned mobile ticketing technology (Delerrok) agreed regionally

Multi Modal Coordination

- The "NC By Train Last Mile" transit pass is available at no additional charge to passengers on board the Piedmont and Carolinian trains at all train stations

Dynamic Ridesharing and Shared Use Transportation

- Catawba College runs a self-run bikeshare program
- City of Salisbury is in midst of raising funds for a bikeshare program
- TNCs (e.g. Uber, Lyft, etc)

Electric Charging Stations Management

- Two (2) high power stations (Tesla supercharging station)
- Four (2) EV charging stations

Winston-Salem

Transit Fixed-Route Operations

- Winston-Salem Transit Authority (WSTA) operates 30 daytime bus routes, 15 of which provide night service. 16 routes operate from morning until midnight on Saturday and 7 Sunday routes. Trans-AID is WSTA's ride sharing transportation service

Transit Fare Collection Management

- Planned mobile ticketing technology (Delerrok) agreed regionally

Transit Fleet Management

- Trans-AID's trip scheduling, dispatching, and passenger accounting is done with computer-aided dispatching and a scheduling software system
- WSTA is planning on converting some transit vehicles to electric vehicles

Transit Signal Priority

- Signal system in Winston-Salem has the capability to provide signal priority to transit vehicles

Multi-Modal Coordination

- The "NC By Train Last Mile" transit pass is available at no additional charge to passengers on board the Piedmont and Carolinian trains at all train stations

Dynamic Ridesharing and Shared Use Transportation

- TNCs (e.g. Uber, Lyft, etc.)
- Four (4) Zipcar vehicles
- Bird Scooters, Lime Bike, Zagster (8) stations

Electric Charging Stations Management

- 19 Energy Vehicle (EV) charging stations, some locations
- One (1) supercharging station (Tesla High Power

Questions to think about...

WHAT MULTI-MODAL TECHNOLOGIES ARE IN PLACE?

WHAT CHALLENGES EXIST FOR MULTI-MODAL USERS?

WHAT TECHNOLOGIES CAN ENHANCE MULTI-MODAL NETWORKS?

Figure 4 – Example S.C.O.R.E Sheet

1.3.2 Capability Maturity Model

Building on the Existing Conditions information and preliminary needs identification, a Capability Maturity Model (CMM) assessment was facilitated with the Core Team with information captured for each municipality and for the region as a whole. As part of this process, Strengths and Challenges were identified in seven major focus areas.

Strengths and Challenges

Strengths and Challenges Information Sheets were created for each of the seven focus areas. ***Figure 4*** shows an example Strengths and Challenges Sheet and all seven sheets can be found in ***Appendix D*** of the Gap Assessment Document (***Appendix A1.2***).

Click the links below to access the Strengths and Challenges Sheets for each focus areas.

- Traffic Management
- Incident Management
- Multi-Modal
- Funding and Project Delivery
- Data Management and Traveler Information
- Interagency Coordination and Private Partnerships
- Public Safety

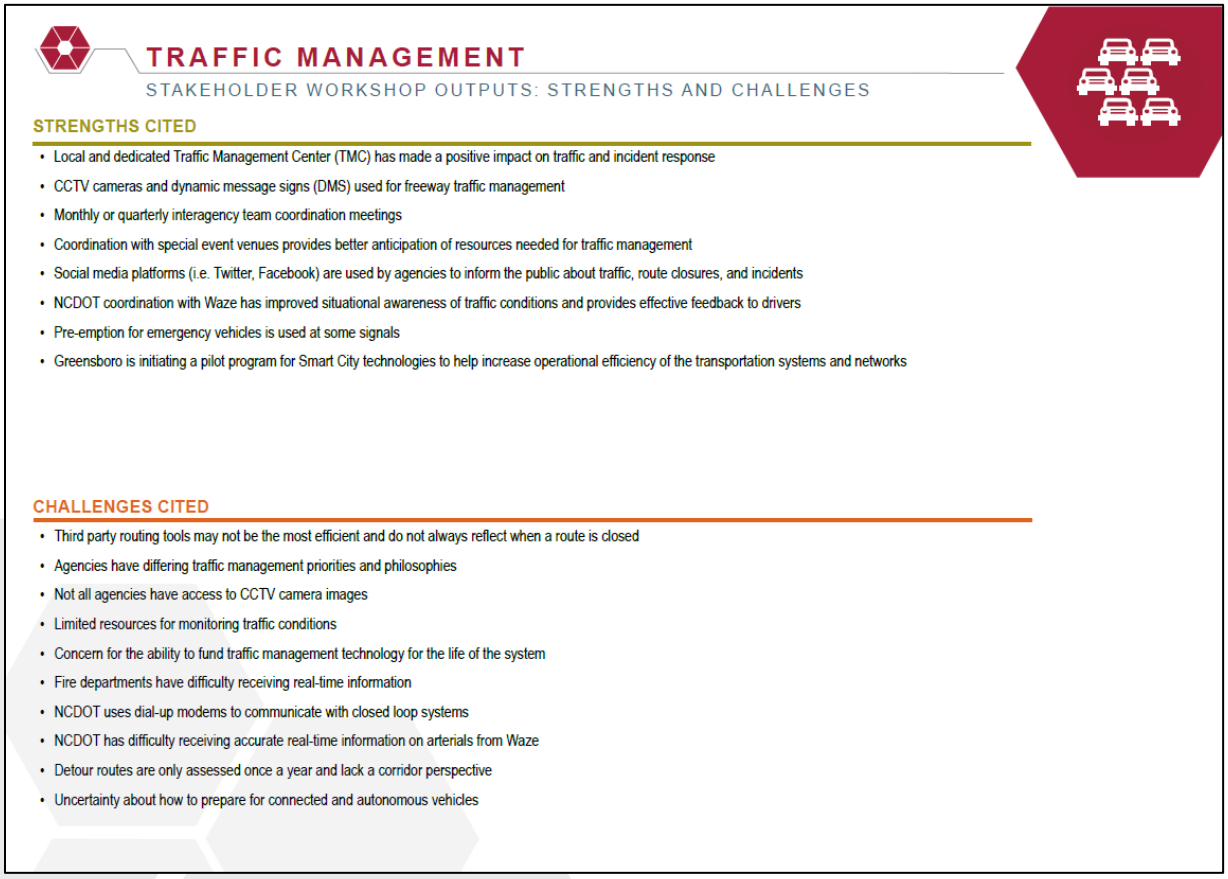


Figure 5 – Example Strengths and Challenges Sheet

Capability Maturity Model

As part of Core Team Meeting 2, participants completed a Capability Maturity Model (CMM) assessment exercise to evaluate the maturity of each municipality, NCDOT, and the region as a whole with respect to six dimensions as defined by the Federal Highway Administration CMM website (https://ops.fhwa.dot.gov/tsmoframeworktool/cmf_overview.htm, accessed April 28, 2020):

- **Business Processes** including formal scoping, planning, programming and budgeting
- **Systems and Technology** including use of systems engineering, systems architecture standards, interoperability, and standardization
- **Performance Measurement** including measures definition, data acquisition, and data utilization
- **Culture** including technical understanding, leadership, outreach, and program legal authority
- **Organization/Staffing** (or Organization and Workforce) including programmatic status, organizational structure, staff development, and recruitment and retention
- **Collaboration** including relationships with public safety agencies, local governments, metropolitan planning organizations (MPOs) and the private sector

Each agency was evaluated on a four-point scale for each of the six dimensions. The CMM structure is shown in ***Figure 6*** and the results of the self-assessment are shown in ***Figure 7***.

- **Level 1** – Activities and relationships largely ad hoc, informal and champion-driven, substantially outside the mainstream of other DOT activities
- **Level 2** – Basic strategy applications understood; key processes support requirements identified and key technology and core capacities under development, but limited internal accountability and uneven alignment with external partners
- **Level 3** – Standardized strategy applications implemented in priority contexts and managed for performance; technical and business processes developed, documented, and integrated into DOT; partnerships aligned
- **Level 4** – Full, sustainable core DOT program priority, established on the basis of continuous improvement with top level management status and formal partnerships

	CAPABILITY LEVEL CRITERIA			
DIMENSIONS	**LEVEL 1 PERFORMED**	**LEVEL 2 MANAGED**	**LEVEL 3 INTEGRATED**	**LEVEL 4 OPTIMIZING**
Business Processes	Each jurisdiction doing its own thing according to individual priorities and capabilities	Consensus regional approach developed regarding TSMO goals, deficiencies, B/C, networks, strategies and common priorities	Regional program integrated into jurisdictions' overall multimodal transportation plans with related staged program	TSMO integrated into jurisdictions' multi-sectoral plans and programs, based on formal continuing planning processes
Systems & Technology	Ad hoc approaches to system implementation without consideration of systems engineering and appropriate procurement processes	Regional ConOps and architectures developed and documented with costs included; appropriate procurement process employed	Systems and technology standardized and integrated on a regional basis (including arterial focus) with other related processes and training as appropriate	Architectures and technology routinely upgraded to improve performance; systems integration interoperability maintained on continuing basis
Performance Measurement	Some outputs measured and reported by some jurisdictions	Output data used directly for after-action debriefings and improvements; data easily available and dashboarded	Outcome measures identified (networks, modes, impacts) and routinely utilized for objective-based program improvements	Performance measures reported internally for utilization and externally for accountability and program justification
Culture	Individual staff member champions promote TSMO, varying among jurisdictions	Jurisdictions' senior management understands TSMO business case and educates decision makers/public	Jurisdictions mission identifies TSMO and benefits with formal program and achieves wide public visibility/understanding	Customer mobility service commitment accountability accepted as formal, top level core program of all jurisdictions
Organization /Staffing	TSMO added on to units within existing structure and staffing – dependent on technical champions	TSMO-specific organizational concept developed within among jurisdictions with core capacity needs identified, collaboration takes place	TSMO Managers have direct report to top management; Job specs, certification and training for core positions	TSMO senior managers at equivalent level with other jurisdiction services and staff professionalized
Collaboration	Relationships as hoc and personal (public-public, public-private)	Objectives, strategies, and performance measures aligned among major players (transportation and public safety agencies (PSAs) with after-action debriefing	Rationalization/sharing/ formalization of responsibilities among key players through co-training, formal agreements, and incentives	High level of TSMO coordination among owners/operators (State, local, private)

Figure 6 – CMM Self-Assessment Template

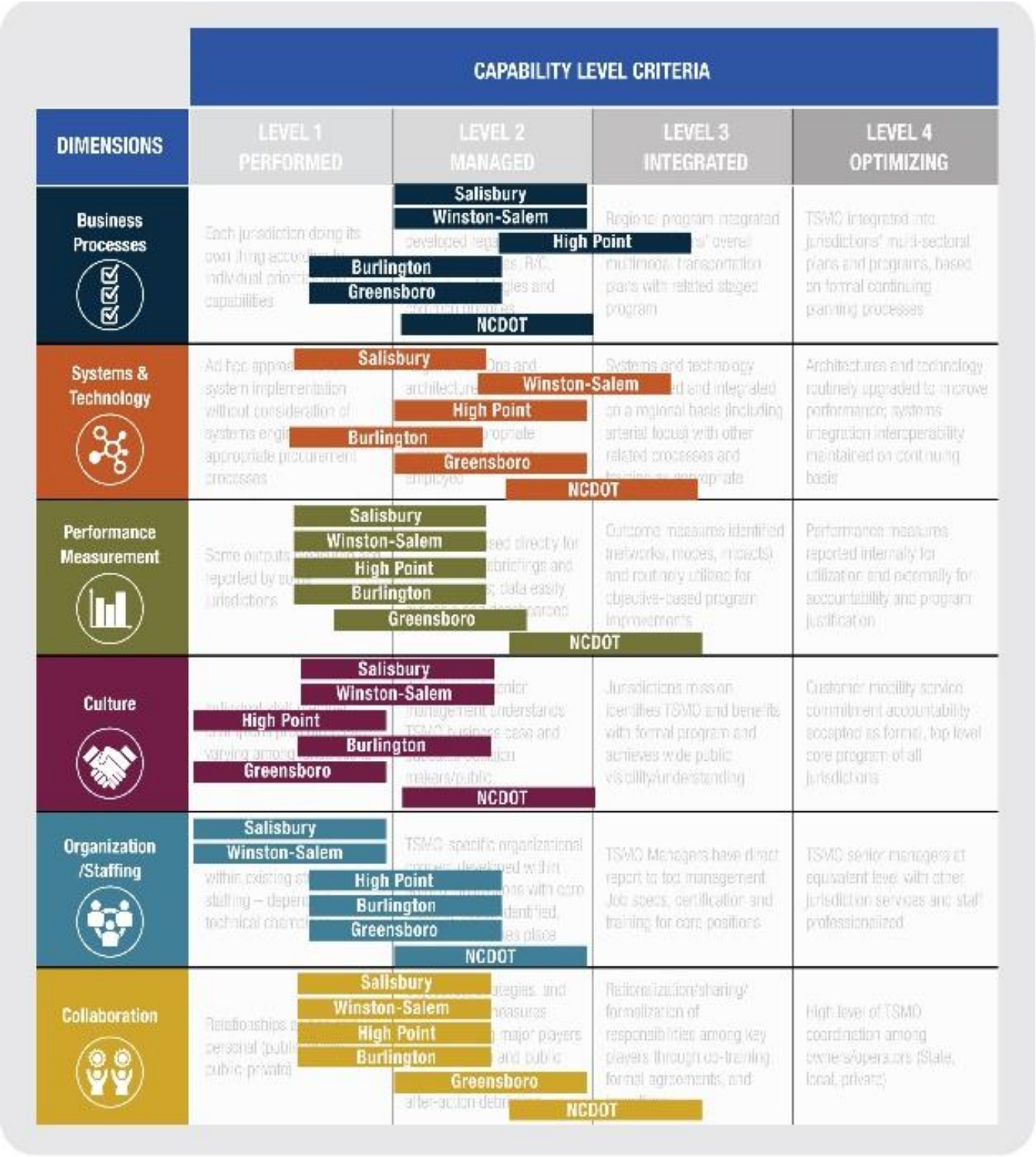


Figure 7 – CMM Self-Assessment Results

1.3.3 Gap Assessment Process

Utilizing the results of the agency level CMM self-assessment, a regional maturity assessment was created. ***Figure 8*** summarizes the maturity level of each of the six dimensions for the Triad Region as a whole. For each dimension, a Gap Assessment Hand-Out was created, which identifies the current level of maturity as well as action items to advance the maturity of the region for that specific dimension.

Figure 9 shows an example Gap Assessment Hand-Out and all six hand-outs can be found in ***Appendix E*** of the Gap Assessment Document (***Appendix A1.2***). The Gap Assessment Hand-Outs are the foundation for creating the Action Plans described in ***Section 2.1***.

Click the links below to access the Gap Assessment specific to each Dimension.

- Business Processes
- Systems and Technology
- Performance Measurement
- Culture
- Organization/Staffing
- Collaboration

Figure 8 – Regional CMM Assessment

HANDOUT 2 - GAP ASSESSMENT

BUSINESS PROCESSES

Level 1 - Performed	Level 2 - Managed	Level 3 - Integrated	Level 4 - Optimizing
Each jurisdiction doing its own thing according to individual priorities and capabilities	Consensus regional approach developed regarding TSMO goals, deficiencies, B/C, networks, strategies and common priorities *Some regional coordination between agencies on projects, but mostly independent within their jurisdictions*	Regional program integrated into jurisdictions' overall multi-modal transportation plans with related staged program	TSMO integrated into jurisdictions' multi-sectoral plans and programs, based on formal continuing planning processes

Action Items to Advance to Next Level

1. a Develop a CCTV Operations Guide and Procedures that identifies the priorities of competing CCTV needs from the local and regional level; specifically, who (agency) can control and view cameras, protocols for requesting control, and restrictions on control/use.
2. a Establish a regional strategic vision for how to approach and integrate emerging technology, specifically connected and autonomous vehicles. Engage and involve leadership in this strategic visioning process. Identify opportunities to partner and engage with technology industry.
3. a Develop a business case for operations in the Triad Region. Integrate cost-benefit, performance outcomes, efficiency, mobility and cost-effectiveness as key elements in the business case. Establish a supporting process to consistently document benefits of different operations projects to be able to show the return on investment (align with Performance Measurements).
4. a Develop a Data Management and Governance Plan that identifies data currently available from agencies, alternative data sources (private sector, crowd-sourced), data use and management strategies, data security requirements, data accreditation needs, data sharing protocols, and roles and responsibilities for data management/governance.
5. a Develop a plan or strategy to address growing need to balance Alternative Transportation Modes in the Triad Region, with a focus on increased demand for ride-sharing, mobility-on-demand (shared bikes and scooters) and last-mile connections with transit service. Consider impacts on land use, city ordinances, parking allocation, safety, and integrating multi-modal operations with operations on the broader transportation network
6. a Develop an Implementation Plan for Traffic Management Strategies for sustaining the maintenance of infrastructure systems (e.g. CCTV) and have upper management agree to maintenance and upgrades process.
7. a Understand what other agencies current technology and system life cycle costs are and how they are maintaining their infrastructure

Figure 9 – Example Gap Assessment Hand-Out

1.3.4 Best Practices Research

For each CMM dimension, best practices were evaluated from deployments by agencies around the country. The results of this research were presented at Core Team Meeting 5. Example slides from the presentation are shown in ***Figure 10*** and ***Figure 11***. The final deliverable for this task is included in ***Appendix A2.1***.

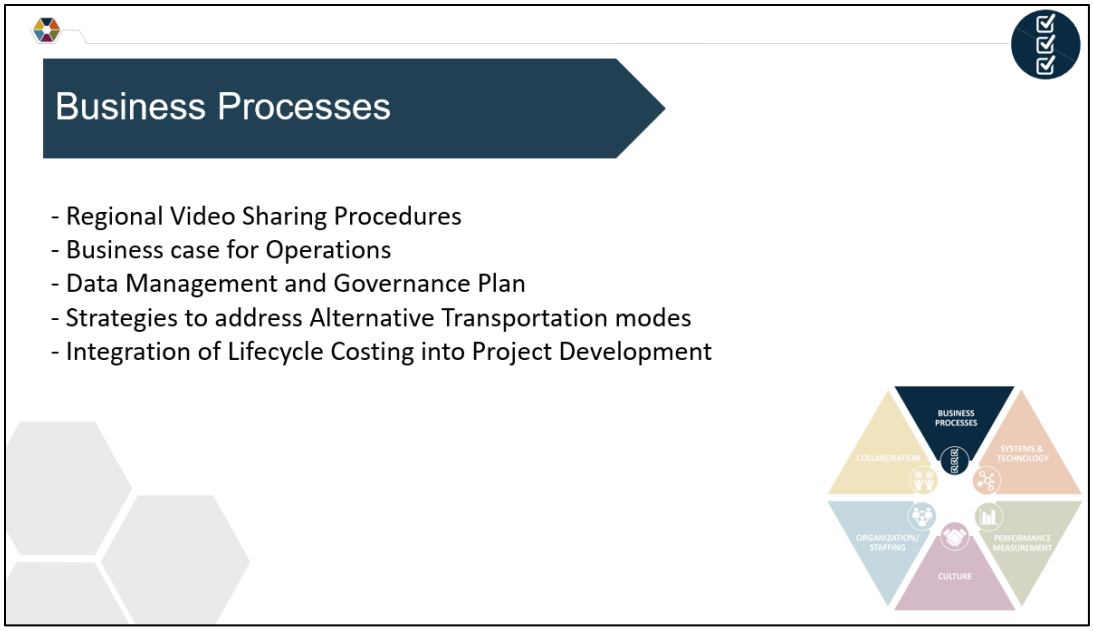


Figure 10 – Example Best Practices by Dimension

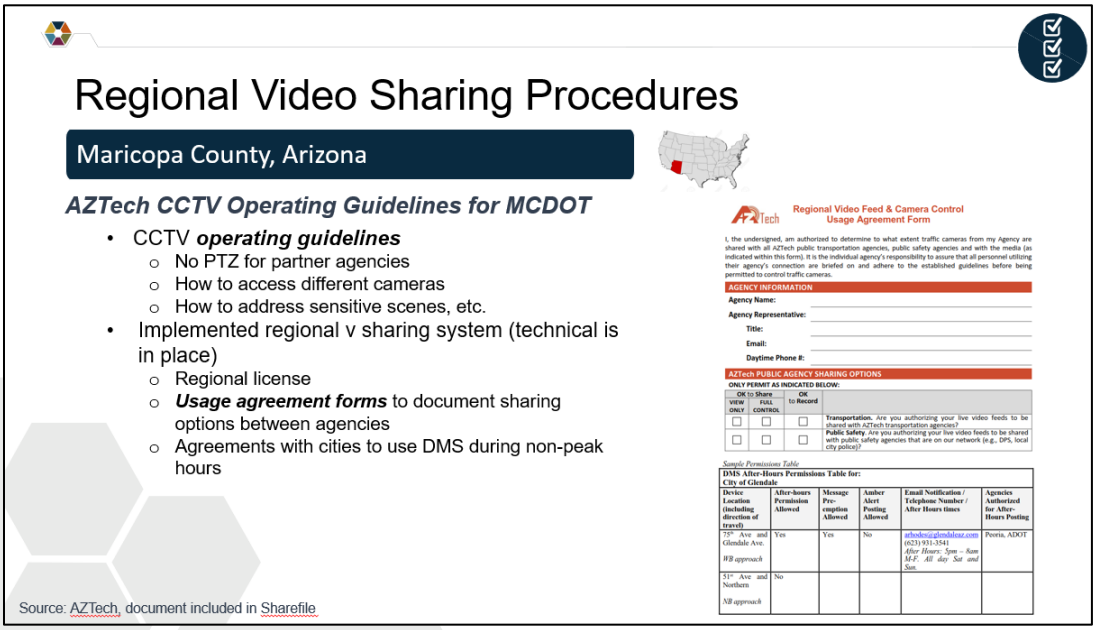


Figure 11 – Example Best Practice Research

TRIAD REGIONAL ITS SDP

2 – PROJECT IDENTIFICATION AND PRIORITIZATION

2 Project Identification and Prioritization

Section 2 describes the process for identifying action plans and geographic-projects based on the regional goals and the gaps identified in Section 1. Action Plans guide stakeholders through the development of supplemental tools and processes that focus on specifically identified gaps. Geographic projects apply physical technology treatments to corridors in the region that address local challenges. Section 2 also includes the process followed to prioritize the list of geographic projects.

2.1 Action Plan Development

The CMM Assessment process looks beyond physical technology applications or project implementations. This level of assessment can introduce non-traditional strategies that do not easily fit within the dynamics of existing project development and implementation protocols for an agency. To address the clearly identified needs, the Core Team chose to develop a set of Action Plans that could guide stakeholders through the development of additional planning documents or improved processes focused on addressing the identified gaps in the region. These are designed to guide agencies through implementing business practices and other programmatic strategies focused on maturing their programs with respect to one or more of the six CMM dimensions.

Figure 12 shows the process followed to develop the Action Plans. The Existing Conditions, Needs, Strengths, and Challenges identified during the Gap Assessment process fed the outcomes of the Regional CMM Assessment. Then, utilizing best practice research in each of the six dimensions, specific action items to advance maturity were identified in the Gap Assessment Hand-Outs. Lastly, stakeholder feedback was gathered and applied to the Action Plans.

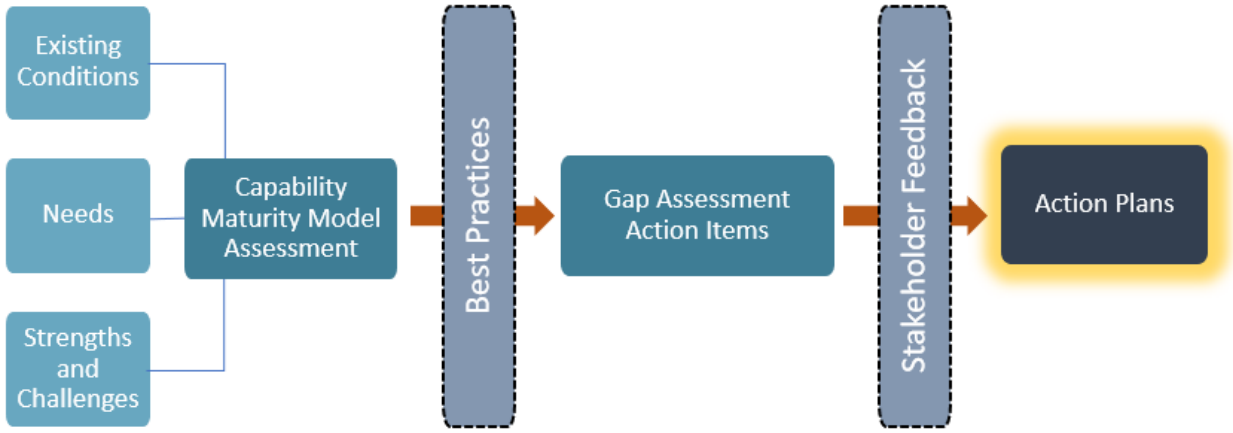


Figure 12 – Action Plan Development Process

A total of 25 action plans were developed across all six CMM dimensions and are presented in ***Table 5***.

Table 5 – Summary of Action Plans

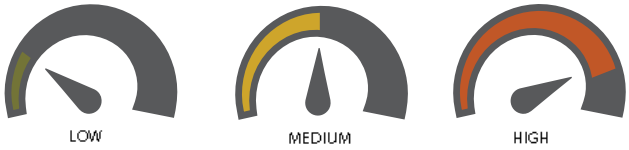
Business Processes
Regional Video Sharing Procedures
Business Case for Operations
Data Management and Governance Plan
Strategies to Evaluate Alternative Transportation Modes
Integration of Life Cycle Cost Analysis into Project Development
Integration of Asset Management
Systems & Technology
Guidelines for Integration of Emerging Technology
Implementation Plan for Traffic Management Strategies
Research Usage of Predictive Applications
Communications Redundancy for Network
Regional Strategy on Emergency Vehicle Preemption
Enhanced Geolocation of Incidents and 911 Calls
Performance Measurement
Best Practices to Share and Analyze Data between Agencies in a Region
Consistent Performance Measures for Project Evaluations
Single Application to Support Multimodal Regional Services
Location Strategies for Enhanced Response Times
Culture
Multimodal Connections to Strategic Hubs
Integration of Operations Strategies within Large Scale Projects
Transit Priority on Freeways and Arterials
Organization / Staffing
Guidelines for Succession Planning and Procedures for Technical Training
Identification of Technical Training Opportunities
Collaboration
Collaboration for Data and Technology Integration
Evaluation of Partnerships with Major Employers
Multi-Agency Partnership to Promote Integrated Dispatch Software
Promotion of Regional Forum Meetings

Each plan identifies high level activities required to achieve the Final Goal for each Action Plan. Each activity has a subset of specific achievement strategies to offer further guidance for implementation. References to best practices used to develop the action plan also are included within each Action Plan.

In addition to providing Activities and Achievement Strategies, each Action Plan includes the summary of a qualitative assessment based on the anticipated impact, resources, and duration of time required to complete the Final Goal. ***Table 6*** summarizes the qualitative assessment metrics.

An example action plan is shown in ***Figure 13.*** More detailed guidance on how to implement the Action Plans is provided in ***Section 3.1****.*

Table 6 – Action Plan Assessment Measures

Impact – highlights the anticipated benefits defined during the evaluation of the projects.	
Resources – approximates the resource requirements (financial / personnel) to complete the projects.	
Duration – the estimated timeframe to complete the Final Goal.	

Project: **Strategies to Evaluate Alternative Transportation Modes (5.a)**

Final Goal: Alternative Transportation Modes Assessment Toolbox

Impact	Resources	Duration
 HIGH	 HIGH	 1 - 3 years

Activities	Achievement Strategy
1. Assess gaps in multimodal transportation services.	1.1. Review local and regional multimodal transportation services, assets, and routes. 1.2. Determine gaps in multimodal transportation network, either geographically or through a lack of comprehensive services.
2. Identify potential solutions to address the gaps.	2.1. Invite partners interested in other transportation modes into the planning process. 2.2. Review partners' visions, policies, and plans to identify conflicts and improve mode connections. 2.3. Discuss how partner agencies can help fill in the gaps in the multimodal transportation network. 2.4. Consider walking and biking advocates, local health and planning departments, regional and state transportation agencies, transit agencies, and private transportation providers.
3. Establish a toolbox of solutions.	3.1. Outline potential solutions that may complete partners' vision and plan for the multimodal network. 3.2. Highlight specific challenges in filling out multimodal network tools and solutions for those challenges. 3.3. Develop guidance for effective application of solutions.
4. Identify partners needed to support multimodal solutions.	4.1. Develop list of partner agencies needed to support implementation of tools listed in Activity 3.
5. Adopt policies that support development of an existing, integrated multimodal network.	5.1. Engage the public and other stakeholders to develop goals and policies that support an integrated, multimodal network. 5.2. Support development of a network of walking and biking facilities that connect residential, employment, community, and regional destinations.
6. Select performance measures that balance available and planned modes and evaluate best investments across the network.	6.1. Identify a limited set of key measures to best support goals and objectives, guide investment decisions, and evaluate progress. 6.2. Engage the public to identify issues residents care about and ensure measures are understandable and resonate with the community. 6.3. Use models, maps, field surveys, and data tools to identify connection opportunities and gaps in the multimodal network.

References:

WSDOT Planning http://198.238.212.152/NR/rdonlyres/C27B3221-D611-48CD-8299-A4010A1B9CBE/0/HowcanCitiesandCountiesPlanforallTransportationModes.pdf

Figure 13 – Example Action Plan

2.2 Geographic Project Development

Geographic projects are location-specific projects with technology solutions to address challenges on the corridor. These projects were developed in parallel with the Action Plans and utilize the information gathered in the Gap Assessment. The Triad Regional goals described in ***Section 1.2*** provided the framework for identifying and then prioritizing the geographic projects.

2.2.1 Project Development Process

Figure 14 provides a high-level view of the process used to identify and prioritize the geographic projects. First, available data sources for the Triad Region were gathered and used to identify "hot spot locations" with respect to the Triad Regional Goals. For example, high crash locations were determined to quantify the Safety goal. Using best practices gathered in ***Section 1.3.4***, technology treatments were identified to address the challenges of the hot spot locations. Corridors where one or more treatments are applied became a draft project. These draft projects were presented to the stakeholders for feedback and then comments were incorporated to finalize the project list. The Triad Regional goals and additional stakeholder feedback then were used to develop a prioritization process and create a final prioritized list of projects.

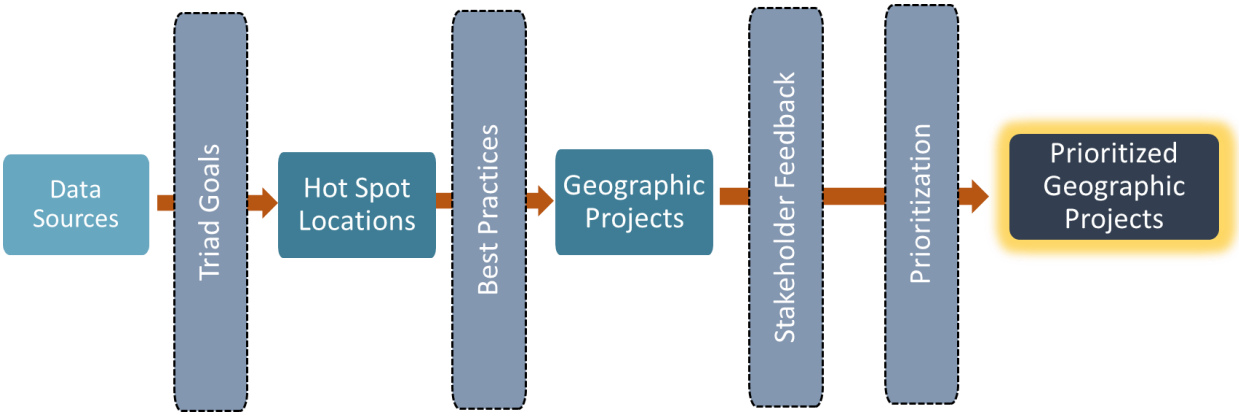


Figure 14 – Geographic Project Development Process

Data Sources

A listing of potential data sources was developed to support the analysis of location-specific needs within the Triad Region. These data sources are based on specific data types used in the analysis of network performance and are mapped back to the appropriate Regional Goals. Additionally, data sources were identified based on availability and reliability to support the analysis. The data listed in ***Table 7*** was assembled and transformed into spatial data and overlaid on the transportation network to identify challenges and performance gaps. The spatial data is shown in the example project map in ***Figure 15.*** Links for the data sources are included in ***Appendix A2.3.***

Table 7 – Data Categories Based on Regional Goals

Regional Goal	Data Type	Data Sources
Mobility	– Work Zone Impacts – Travel Time Reliability – Special Event Management	– Long Term Construction Zones (NCDOT) – Congestion Hotspots (NCDOT) – Long Range Transportation Plans – Special Event Locations and Access Routes
Safety	– Emergency Response Times – Crashes – CCTV Blind Spots	– High Frequency Crash Locations (NCDOT) – Major Incident Locations (NCDOT) – CCTV Blindspot Locations (NCDOT) – Existing ITS Device Locations (NCDOT)
Goods Movement	– Commercial Vehicle – Truck Routes	– Triad Freight Surveys and Nodes (Piedmont Triad Freight Study) – Permitted Truck Routes (NCDOT)
Transit and Alternative Modes	– Transit Service Reliability	– Regional Bus Routes (Piedmont Authority for Regional Transportation) – Local Bus Routes

Treatments

Treatments are ITS strategies that can be deployed on a corridor to address a specific challenge. Treatments were chosen based on best practices research, existing systems and technology, and the feasibility of deployment in the Triad region. ***Table 8*** shows the treatment symbols used on the project maps and descriptions of each treatment.

For most projects, multiple treatments were recommended along a corridor to create a single cohesive project that addresses each of the challenges identified for that corridor. In some cases, treatments are complimentary and generate further benefit from tandem implementation. For example, Enhanced Surveillance could identify crashes more quickly and then drivers could be more quickly notified using En Route Traveler Information. Treatments applied to each project can be seen in the example project map in ***Figure 15.***

Table 8 – Treatment Strategies

	**En-Route Traveler Information Improvements** Real time updates broadcast to the vehicle (e.g. Dynamic Message Signs (DMS), X2V communications).
	**Advanced Signal Technology** Optimized coordination for signal operations (e.g. ATSPM, adaptive signals).
	**Bus on Shoulder** Use of the shoulder as a travel lane by buses when mainline travel speeds drop below specific thresholds.
	**Hard Shoulder Running** Use of the shoulder as a travel lane by all vehicles during specific scenarios such as peak periods or during a major incident.
	**Ramp Metering** Traffic signals operated at freeway on-ramps to control the rate and impact of vehicles entering mainline traffic.
	**Transit Signal Priority** Operational improvements that can extend the green time of a traffic signal when transit vehicles are behind schedule.
	**Enhanced Surveillance** Increased surveillance coverage to provide continuous monitoring capabilities on a roadway. Includes both blind spot and new corridor coverage.
	**Integrated Corridor Management** Management of a corridor as a system rather than as individual transportation networks.
	**Communication Upgrades** Improved communication for resiliency and redundancy through either additional connections or expanded bandwidth.

2.2.2 Geographic Project Identification

A total of 25 geographic projects were identified for the Triad Region. The project maps were presented at Core Team Meeting 5 and Stakeholder Workshop 2 and the feedback was incorporated into the final list of projects. ***Figure 15*** shows an example project map and all project maps are included in ***Appendix A2.4.*** The final list of projects is shown in ***Table 9.***

Note: A project can have either Bus on Shoulder or Hard-Shoulder Running as both strategies utilize the shoulder and cannot run concurrently. Therefore, projects B1 and WS1 have been split into "a" and "b" components to evaluate Bus on Shoulder and Hard-Shoulder Running separately.

Triad Regional ITS Strategic Deployment Plan

Greensboro Projects

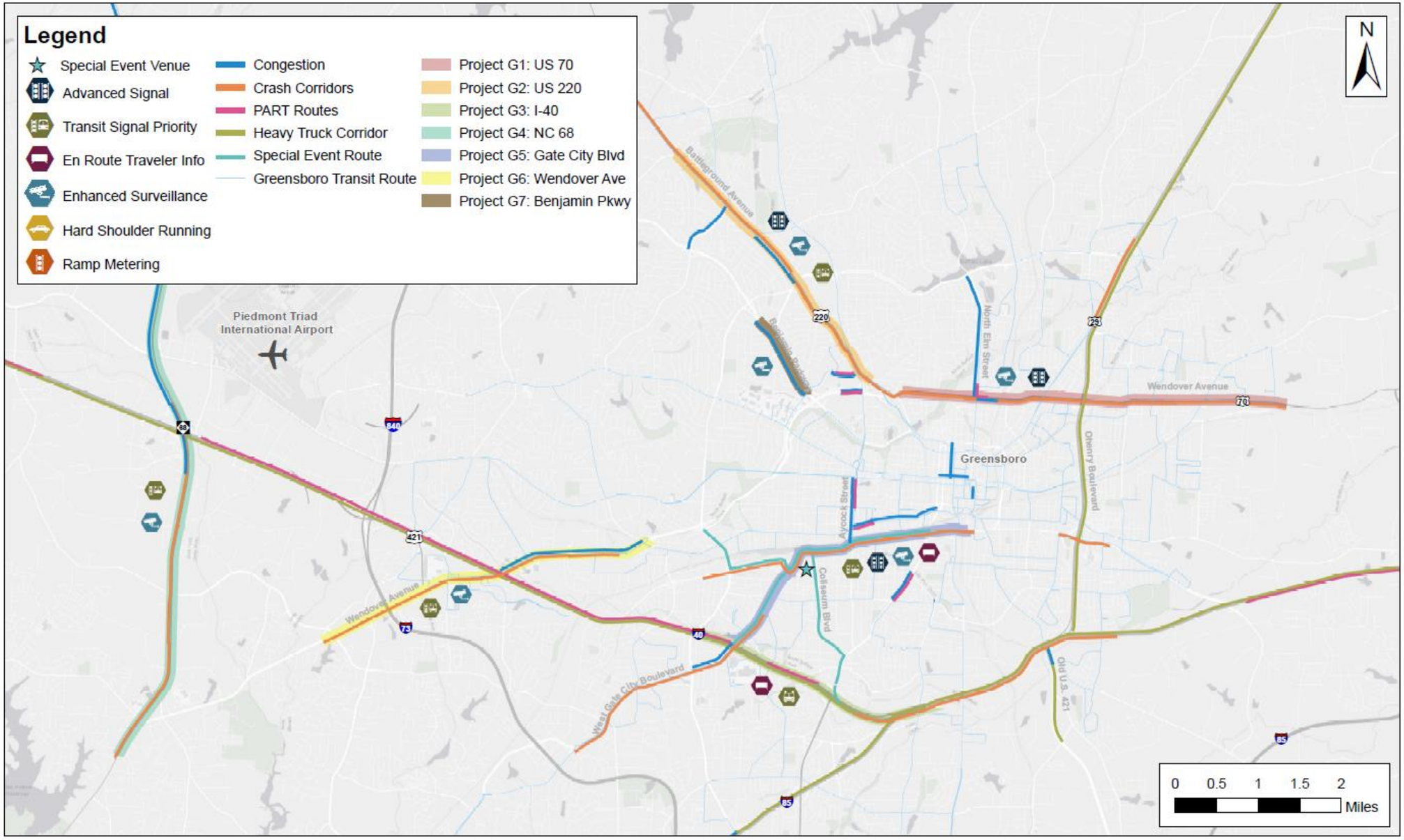


Figure 15 – Example Project Map

Table 9 – Geographic Project List

Project Number	Route	Corridor Description	En Route Traveler Information	Advanced Signal Technology	Bus on Shoulder	Hard Shoulder Running	Ramp Metering	Transit Signal Priority	Enhanced Surveillance	ICM	Fiber
B1-a	I-40	I-40 from Orange County line to Guilford County line (includes Bus-on-Shoulder)									
B1-b	I-40	I-40 from Orange County line to Guilford County line (includes Hard Shoulder Running)									
B2	US 70	US 70 from West Main Street to Guilford County line									
F1	I-85	Along I-85 from US 74 to I-85/I-85 BUS split									
G1	US 70	US 70 (Wendover Avenue) from US 220 to Perry Road									
G2	US 220	US 220 from New Garden Road to Wendover Avenue									
G3	I-40	I-40 from South Holden Road to Randleman Road									
G4	NC 68	NC 68 from Meadowlark Road to Cornerstone Drive									
G5	Gate City Blvd	Gate City Boulevard from I-40 to Freeman Mill Road									
G6	South Wendover Ave	Wendover Avenue from Piedmont Parkway to Spring Garden Street									
G7	Benjamin Pkwy	Benjamin Parkway from Green Valley Road to Joseph Bryan Blvd									
HP1	I-85 Business	I-85 BUS from NC 109 to Vickery Chapel Road									
HP2	Main Street	Main Street from West Hartley Drive to I-85 BUS									
HP3	NC 68	NC 68 from West Lexington Ave to Rivermeade Drive									
HP4	I-74	I-74 from Johnson Street to NC 62									
ICM1	I-40/Bus 40	I-40/BUS 40 in Winston-Salem									
ICM2	US 70/I-40	US 70/I-40 in Burlington									
ICM4	US 68 Bypass	NC 68 Bypass in High Point									
S1	Innes Street	West Innes Street from Statesville Blvd to US 29									
WS1-a	I-40	I-40 from US 421 to Oak Grove Church Road (includes Bus on Shoulder)									
WS1-b	I-40	I-40 from US 421 to Oak Grove Church Road (includes Hard Shoulder Running)									
WS2	Silas Creek Parkway	Silas Creek Parkway from Hanes Mall Blvd to Robinhood Road									
WS3	Business 40	BUS 40 from NC 68 to US 158									
WS4	US 52	US 52 from BUS 40 to Patterson Avenue									
WS5	I-74	I-74 from I-40 to High Point Road									

2.2.3 Geographic Project Prioritization

A Prioritization Tool spreadsheet was developed to rank all projects. The process evaluates projects by the same set of criteria, awards points to each project, and then ranks them. The prioritized list of projects is intended to assist local agencies in choosing projects to incorporate into their regional plans and submit into the STIP process. NCDOT can use the ranking to assess a project's priority within the Triad Region.

A detailed discussion of the prioritization process, including equations, data sources, and assumptions, can be found in ***Appendix A2.5***. A user guide for the Prioritization Tool spreadsheet can be found in ***Appendix A3.3***. This section provides a high-level overview of the prioritization process that was applied for the development of the SDP.

A prioritization rubric was created based on the USDOT Strategic Plan Themes, summarized in ***Section 1.2.*** These five themes became the rubric categories, which were weighted based on importance to the Triad Region's goals. Core Team and Stakeholder feedback was considered in creating the prioritization rubric. ***Figure 16*** shows the percentage breakdown of the rubric categories.

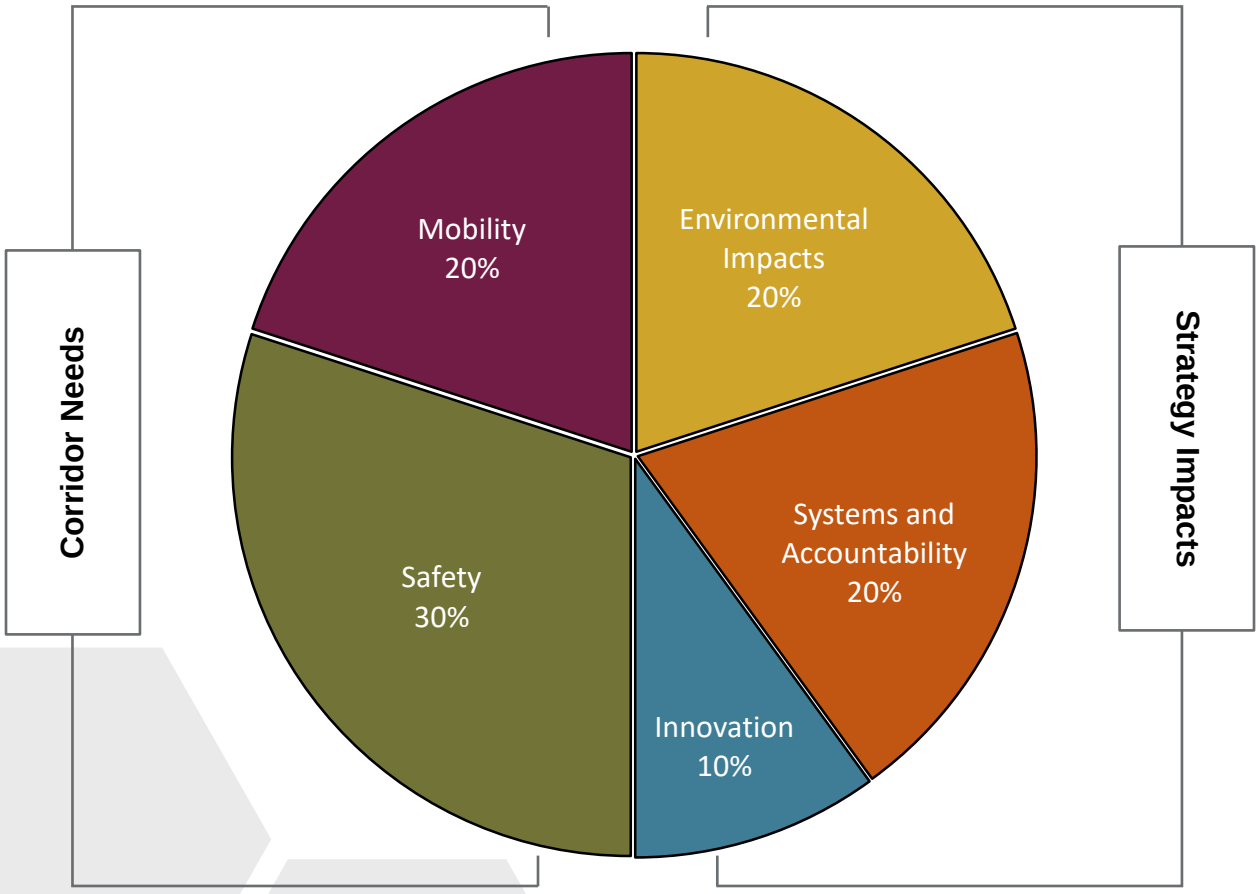


Figure 16 – Prioritization Rubric Breakdown

The rubric categorizes scoring into two groups – Corridor Needs and Strategy Impacts. For Corridor Needs, which includes Safety and Mobility, projects are evaluated based on existing corridor conditions. For example, a corridor with a higher crash rate is assigned more points because there is a greater need for a safety intervention. For Strategy Impacts, which includes Environmental Impacts, Systems and Accountability, and Innovation, projects are evaluated based on projected benefits of deployment. For example, a project that is projected to significantly reduce congestion and associated vehicle emissions would receive more points.

For each rubric category, a project is assigned 1-4 points based on criteria specific to the category. ***Figure 17*** shows the point ranking systems and how points are assigned. The results for each category can be found in ***Appendix A2.5***.

Safety

The Highway Safety Improvement Program (HSIP) analyzes statewide safety data and then creates a ranked list of Potential Hazardous (PH) locations. Projects were assigned safety points based on the number and statewide rank of PH locations on the project corridor. Rubric points were then assigned based on where the project falls within the list of Triad projects. For example, a project that is within the highest 10% of safety points received 4 rubric points.

Mobility

RITIS Probe Data Analytics Suite provides archived travel time data for corridors throughout the state. The Travel Time Index (TTI), which measures actual travel time versus expected travel time, was calculated for each project corridor. The TTI for each corridor was then compared to the national average TTI for similarly sized cities and assigned rubric points based on deviation from that average. For example, a project with a TTI that is 10% or more than the national average received four rubric points.

Environmental Impacts

Environmental impacts are calculated in terms of emissions reductions as a result of deploying the project. Idling vehicles result in three primary emissions: Nitrogen oxide (NOx), Volatile Organic Compounds (VOC), and Carbon Monoxide (CO). In the Benefit/Cost Analysis, described later in this section, the estimated reduction in vehicle-hours of delay are calculated. The reduction in emissions as a result of the project can then be calculated based on the reduced amount of idle time. For example, a project in the top 25% of projects for emissions reductions received 4 rubric points.

Systems and Accountability

This rubric category provides points for cost effective projects with a regional impact. This category is broken down into two parts: Benefit/Cost Ratio and Geographic Impact.

Benefit/Cost Ratio

The calculations for the Benefit/Cost Ratio are described later in this section. After a Benefit/Cost Ratio was calculated for each project, rubric points were assigned based on how the project falls within the list of Triad projects. For example, a project with a Benefit/Cost Ratio in the top 25% of all projects received 4 rubric points.

Geographic Impact

Geographic Impact is a qualitative assessment of a project's reach. Projects that only serve local needs, such as Advanced Signal Timing on a municipal arterial, were assigned fewer points. Projects that meet regional needs, such as an ICM implementation would receive more points and statewide needs, such as the fiber link between the Metrolina TMC and the Triad TMC, would receive the full 4 points.

Innovation

The Innovation category is a qualitative assessment of the technologies implemented by a project. Projects that implement multiple new technologies receive the highest rubric points. Projects that only extend existing technology receive the lowest. Projects can also receive more points for creating the framework for future innovative technologies, such as installing fiber.

	Corridor Needs				Strategy Impacts							
Evaluation Category	**Safety**		**Mobility**		**Environmental Impacts**		**Systems and Accountability**				**Innovation**	
Weighted Value	30%		20%		20%		15%		5%		10%	
Evaluation Criteria	HSIP	Pnts	Vehicles	Pnts	Emission Reduction	Pnts	B/C Ratio	Pnts	Geographic Impact	Pnts	Technology	Pnts
Evaluation Rubric	In top 25% of project safety points	4	TTI is 10% higher or more than the national average	4	In top 25% of project emissions reductions	4	In top 25% of project B/C ratios	4	This project meets statewide needs.	4	This project implements or supports multiple new technologies. This project lays the infrastructure for future technologies and is aligned with NCDOT innovation initiatives.	4
	In 50%-75% of project safety points	3	TTI is 0-10% higher than the national average	3	In 50%-75% of project emissions reductions	3	In 50%-75% of project B/C ratios	3	This project meets inter-regional needs.	3	This project implements a new technology and lays the infrastructure for future technologies. It is aligned with NCDOT innovation initiatives.	3
	In 25%-50% of project safety points	2	TTI is 0-10% lower than the national average	2	In 25%-50% of project emissions reductions	2	In 25%-50% of project B/C ratios	2	This project meets regional needs.	2	This project lays the infrastructure for future technologies and aligns with current NCDOT initiatives for future innovation.	2
	Bottom 25% of project safety points	1	TTI is 10% lower or more than the national average.	1	In bottom 25% of project emissions reductions	1	In bottom 25% of project B/C ratios	1	This project meets local needs.	1	This project extends existing technology.	1
Data Source	Highway Safety Improvement Program		National Travel Time Index		Total NOx, VOC, and CO emissions in kg		Benefit/Cost Ratio		Qualitative		Qualitative	

Figure 17 – Prioritization Rubric

2.2.4 Benefit Cost Analysis

The Benefit/Cost Analysis breaks down each project in the separate treatment components. The costs and benefits for each treatment are calculated for the project corridor and then summed together for a total project cost and project benefit. This method has two advantages: first, it provides a more conservative estimate of the benefits because it does not consider synergistic effects of multiple treatments deployed together; second, it provides greater flexibility during the implementation phase because treatments can easily be added or subtracted to the project.

A more detailed description on how the Prioritization Tool calculates the Benefit/Cost Ratio is included in ***Appendix A3.3***.

Cost Calculations

The cost estimate for each treatment is a high-level planning cost that includes the capital cost and one year of operations and maintenance (O&M). Capital costs are unit costs that are estimated using TOPS-BC from FHWA, ITS Costs from USDOT, and previous project experience. O&M Costs are estimated at 5-15% of the capital cost. An example of the costs calculated per treatment is shown in ***Table 10***. The summary of all project costs is shown in ***Table 11***. All costs and assumptions are documented in the Prioritization Tool.

Benefits Calculations

The benefits were calculated for each treatment with respect to Mobility, Safety, and Energy and Environment. Mobility measures the expected reduction in vehicle-hours of delay, Safety measures the expected reduction in crashes, and Energy and Environment measures the expected reduction in emissions and fuel consumption. An example calculation of the Safety benefit for Advanced Signal Technology is shown in ***Table 13***.

The benefit calculations rely heavily on research and case studies of previous deployments. The RITA Benefits Database maintained by FHWA provided significant portion of benefits information. All references and assumptions are documented in the Prioritization Tool.

Benefit/Cost Summary

The benefits and costs for each treatment on the project corridor were calculated and then summed together for the total project Benefit/Cost Ratio. Projects with the highest ratios were assigned the most rubric points. See ***Table 12*** for the Benefit/Cost Results.

2.2.5 Prioritized Geographic Project List

The final output of the weighted rubric is a fully prioritized project list. The ranked list of projects is shown in ***Table 14***. For instructions to add or modify projects in the prioritized list, see ***Appendix A3.3***.

Table 10 – Example Treatment Costs

Treatment	Treatment Elements	Cost Items	Unit Measure	Estimated Capital Unit Cost	Estimated O&M Annual Unit Cost	Assumptions
Advanced Signal Technology	Controller Upgrade	Signal Controller	per intersection	$ 10,000	$ 350	Assume controller will need to be reset/upgrade twice a year remotely (30 min at $70/hr) and once on-site (4 hours at $70/hr).
	Communications Deployment	Communication Line	per intersection	$ 770	$ 116	O&M: Assumes a 15% annual operation and maintenance cost.
	Detection	Detectors	per intersection	$ 9,000	$ 560	Capital Costs: $10 per linear foot. Assumes 900 linear feet of loops per arterial intersection. O&M: Assume monthly verification (remotely; 30 min at $70/hr). Assume one issue to resolve a year (2 hours at $70/hr).
	TMC Signal Control	Signal management, software	per intersection	$ 3,000	$ 150	O&M: Assume 5% of capital costs per year.
Enhanced Surveillance	Camera Coverage	CCTV Camera, Construction	per camera	$ 10,000	$ 1,500	Capital: Assumes camera will be mounted on existing pole. Costs assume camera assembly, design, and construction. O&M: Assumes a 15% annual operation and maintenance cost.
	Communications (Arterial Blindspot)	Fiber line and installation	per camera	$ 8,000	$ 400	Capital: Assumes camera will fill a blind spot, is currently on a corridor with fiber optics, and needs to only be connected to the fiber optic network rather than have new cabling laid. O&M: Assume monthly veritication cost at 5% of capital cost.
	Communications (Freeway Blindspot)	Fiber line and installation	per camera	$ 16,000	$ 800	Capital: Assumes camera will fill a blind spot, is currently on a corridor with fiber optics, and needs to only be connected to the fiber optic network rather than have new cabling laid. O&M: Assume monthly veritication cost at 5% of capital cost.
	Communications (Arterial Backhaul)	Fiber line and installation	per mile	$ 40,000	$ 420	Capital: Assumes design and construction of fiber optic cables overhead on an existing utility pole. O&M: Assume monthly verification cost at 5% of capital cost.
	Communications (Freeway Backhaul)	Fiber line and installation	per mile	$ 80,000	$ 420	Capital: Assumes design and construction for fiber optic cables in underground conduit. O&M: Assume monthly verification cost at 5% of capital cost.

Table 11 – Project Cost Summary

				Costs Summary														
				Advanced Signal Technology		Enhanced Surveillance		En Route Traveler Information		Bus on Shoulder	Hard Shoulder Running	Ramp Metering		Transit Signal Priority			ICM		Fiber	
Municipality	Project Number	Route	Length (mi)	Intersections (#)	Treatment Cost	Cameras (#)*	Treatment Cost	Dynamic Signs (#)	Treatment Cost	Treatment Cost	Treatment Cost	On-Ramps (#)	Treatment Cost	Buses (#)	Intersections (#)	Treatment Cost	Intersections (#)	Treatment Cost	Treatment Cost	Total Project Cost
Burlington	B1-a	I-40	16			3	$ 84,900			$ 1,214,400		16	$ 860,000							$ 2,159,300
Burlington	B1-b	I-40	16			3	$ 84,900				$ 2,961,984	16	$ 860,000							$ 3,906,884
Burlington	B2	US 70	16	43	$ 1,029,657	20	$ 1,516,720													$ 2,546,377
Burlington	ICM2	US 70/I-40	16														48	$ 778,880		$ 778,880
Greensboro	G1	US 70	4.5	10	$ 239,455	10	$ 476,890													$ 716,345
Greensboro	G2	US 220	3.5	15	$ 359,183	15	$ 453,970							60	16	$ 643,960				$ 1,457,113
Greensboro	G3	I-40	3					2	$ 390,240	$ 227,700										$ 617,940
Greensboro	G4	NC 68	6			2	$ 39,800							60	12	$ 561,720				$ 601,520
Greensboro	G5	Gate City Blvd	3.3	12	$ 287,346	6	$ 119,400	3	$ 585,360					90	11	$ 698,660				$ 1,690,766
Greensboro	G6	South Wendover Ave	4			2	$ 39,800							60	15	$ 623,400				$ 663,200
Greensboro	G7	Benjamin Pkwy	1			1	$ 19,900													$ 19,900
High Point	HP1	I-85 Business	15			8	$ 1,298,300	2	$ 390,240											$ 1,688,540
High Point	HP2	Main Street	4.5	24	$ 574,692									10	24	$ 545,940				$ 1,120,632
High Point	HP3	US 68	4	10	$ 239,455			1	$ 195,120					48	10					$ 434,575
High Point	HP4	US 74	10					2	$ 390,240											$ 390,240
High Point	ICM4	US 68 Bypass	10	20													20	$ 335,000		$ 335,000
High Point	F1	I-85	27																$ 2,171,340	$ 2,171,340
Salisbury	S1	Innes Street	1.5				$ 120,630							13	15	$ 376,650				$ 497,280
Winston Salem	WS1-a	I-40	13.5			11	$ 1,212,170			$ 1,024,650		16	$ 860,000							$ 3,096,820
Winston Salem	WS1-b	I-40	13.5			11	$ 1,212,170				$ 2,499,174	16	$ 860,000							$ 4,571,344
Winston Salem	WS2	Silas Creek Parkway	3	5	$ 119,728															$ 119,728
Winston Salem	WS3	Business 40	6.5			3	$ 84,900			$ 493,350										$ 578,250
Winston Salem	WS4	US 52	4							$ 303,600										$ 303,600
Winston Salem	WS5	I-74	5							$ 379,500										$ 379,500
Winston Salem	ICM1	I-40/Bus 40	18														0	$ 56,520		$ 56,520

Table 13 – Example Benefit Calculation

Advanced Signal Tech Benefits Calculations

	Burlington B2		
Safety	average reduction in collisions due to signal retiming (1)*=	31.0%	
	number of collisions occurring at project signalized intersections (5 years) (10) =	1254	crashes
	number of collisions occurring at project signalized intersections PDO (5 years) =	868	PDO crashes
	number of collisions occurring at project signalized intersections resulting in injuries (5 years) =	375	injury crashes (B/C)
	number of collisions occurring at project signalized intersections resulting in fatalities (5 years) =	11	fatalities (A)
	number of project intersections with proposed treatment =	43	intersections
	Property damage only (2) =	$ 7,400	
	average cost of a injury collision (2)** =	$ 79,000	
	average cost of a fatal collision (2) =	$ 4,008,900	
	Annual Safety Benefit =	$ 4,969,100	

Table 12 – Benefit/Cost Results

Benefits Summary

Municipality	Project Number	Route	Advanced Signal Technology	Enhanced Surveillance	En Route Traveler Information	Bus on Shoulder	Hard Shoulder Running	Ramp Metering	Transit Signal Priority	ICM	Fiber	Total Project Benefits	Total Project Costs	Benefit/Cost Ratio	Rubric Points
Burlington	B1-a	I-40		$ 1,765,500		$ 317,600		$ 631,502				$ 2,714,602	$ 2,159,300	1.26	2
Burlington	B1-b	I-40		$ 1,765,500			$ 3,717,869	$ 631,502				$ 6,114,872	$ 3,906,884	1.57	2
Burlington	B2	US 70	$ 5,067,200	$ 1,315,700								$ 6,382,900	$ 2,546,377	2.51	3
Burlington	ICM2	US 70/I-40								$ 1,156,525		$ 1,156,525	$ 778,880	1.48	2
Greensboro	G1	US 70	$ 3,263,200	$ 846,900								$ 4,110,100	$ 716,345	5.74	3
Greensboro	G2	US 220	$ 2,571,700	$ 663,400					$ 2,740,800			$ 5,975,900	$ 1,457,113	4.10	3
Greensboro	G3	I-40			$ 291,904	$ 55,800						$ 347,704	$ 617,940	0.56	2
Greensboro	G4	NC 68		$ 869,000					$ 2,740,800			$ 3,609,800	$ 601,520	6.00	4
Greensboro	G5	Gate City Blvd	$ 1,511,300	$ 400,600	$ 60,922				$ 4,111,200			$ 6,084,022	$ 1,690,766	3.60	3
Greensboro	G6	South Wendover Ave		$ 1,174,600					$ 2,740,800			$ 3,915,400	$ 663,200	5.90	4
Greensboro	G7	Benjamin Pkwy		$ 44,900								$ 44,900	$ 19,900	2.26	3
High Point	ICM4	NC 68 Bypass								$ 365,057		$ 365,057	$ 335,000	1.09	2
High Point	HP1	I-85 Business		$ 987,400	$ 66,024							$ 1,053,424	$ 1,688,540	0.62	2
High Point	HP2	Main Street	$ 3,007,300						$ 343,600			$ 3,350,900	$ 1,120,632	2.99	3
High Point	HP3	US 68	$ 2,101,900		$ 67,274				$ 1,799,300			$ 3,968,474	$ 434,575	9.13	4
High Point	HP4	US 74			$ 116,742							$ 116,742	$ 390,240	0.30	1
High Point	F1	I-85									$ 723,472	$ 723,472	$ 2,171,340	0.33	1
Salisbury	S1	Innes Street							$ 587,400			$ 587,400	$ 497,280	1.18	2
Winston Salem	WS1-a	I-40		$ 1,237,800		$ 210,800		$ 1,312,278				$ 2,760,878	$ 3,096,820	0.89	2
Winston Salem	WS1-b	I-40		$ 1,237,800			$ 2,286,783	$ 1,312,278				$ 4,836,861	$ 4,571,344	1.06	2
Winston Salem	WS2	Silas Creek Parkway	$ 500,500	$ 196,600								$ 697,100	$ 119,728	5.82	4
Winston Salem	WS3	Business 40				$ 101,500						$ 101,500	$ 578,250	0.18	1
Winston Salem	WS4	US 52				$ 62,500						$ 62,500	$ 303,600	0.21	1
Winston Salem	WS5	I-74				$ 78,100						$ 78,100	$ 379,500	0.21	1
Winston Salem	ICM1	I-40/Bus 40								$ 607,503		$ 607,503	$ 56,520	10.75	4

Table 14 – Prioritized List of Geographic Projects

Project Number	Route	Corridor Description	En Route Traveler Information	Advanced Signal Technology	Bus on Shoulder	Hard Shoulder Running	Ramp Metering	Transit Signal Priority	Enhanced Surveillance	ICM	Fiber	Total Points
F1	I-85	Along I-85 from US 74 to I-85/I-85 BUS split										95
ICM1	I-40/Bus 40	I-40/BUS 40 in Winston-Salem										84
ICM2	US 70/I-40	US 70/I-40 in Burlington										76
G6	South Wendover Ave	Wendover Avenue from Piedmont Parkway to Spring Garden Street										76
G2	US 220	US 220 from New Garden Road to Wendover Avenue										73
G1	US 70	US 70 (Wendover Avenue) from US 220 to Perry Road										66
HP3	NC 68	NC 68 from West Lexington Ave to Rivermeade Drive										68
G4	NC 68	NC 68 from Meadowlark Road to Cornerstone Drive										68
HP2	Main Street	Main Street from West Hartley Drive to I-85 BUS										68
WS2	Silas Creek Parkway	Silas Creek Parkway from Hanes Mall Blvd to Robinhood Road										66
B1-b	I-40	I-40 from Orange County line to Guilford County line (includes Hard Shoulder Running)										65
B1-a	I-40	I-40 from Orange County line to Guilford County line (includes Bus-on-Shoulder)										64
ICM4	US 68 Bypass	NC 68 Bypass in High Point										64
WS1-b	I-40	I-40 from US 421 to Oak Grove Church Road (includes Hard Shoulder Running)										63
WS1-a	I-40	I-40 from US 421 to Oak Grove Church Road (includes Bus on Shoulder)										61
B2	US 70	US 70 from West Main Street to Guilford County line										60
G5	Gate City Blvd	Gate City Boulevard from I-40 to Freeman Mill Road										60
WS3	Business 40	BUS 40 from NC 68 to US 158										55
HP1	I-85 Business	I-85 BUS from NC 109 to Vickery Chapel Road										56
G3	I-40	I-40 from South Holden Road to Randleman Road										49
S1	Innes Street	West Innes Street from Statesville Blvd to US 29										49
G7	Benjamin Pkwy	Benjamin Parkway from Green Valley Road to Joseph Bryan Blvd										45
WS4	US 52	US 52 from BUS 40 to Patterson Avenue										41
WS5	I-74	I-74 from I-40 to High Point Road										31
HP4	I 74	I 74 from Johnson Street to NC 62										29

2.3 Regional ITS Architecture

The Triad Regional ITS Architecture captures the existing and planned ITS technologies in the Triad Region. Creation of and maintenance of a regional ITS architecture is a federal requirement for funding eligibility for ITS projects. Proposed ITS projects do not need to be included in the SDP to qualify for federal funding; however, projects are required to show conformance to the regional ITS architecture. This federal requirement is mandated by both the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), therefore applies to all transportation projects using federal funds.

2.3.1 ARC-IT

The National ITS Architecture underwent a major update in 2017 to incorporate elements from the previous National ITS Architecture version (v7.1) and the Connected Vehicle Reference Implementation Architecture (CVRIA) (v2.2) into one tool. The new version is the **Architecture Reference for Cooperative and Intelligent Transportation** (ARC-IT) (v8). This update includes changes in terminology as well as additional service areas (increase from 8 to 12) and service packages (increase from 97 to 139) to account for both architectures.

The purpose of ARC-IT is to serve as a reference tool for planning, design, implementation, and testing new services. The ARC-IT database for the Triad Region was developed by gathering information from multiple inputs, as shown in ***Figure 18***.

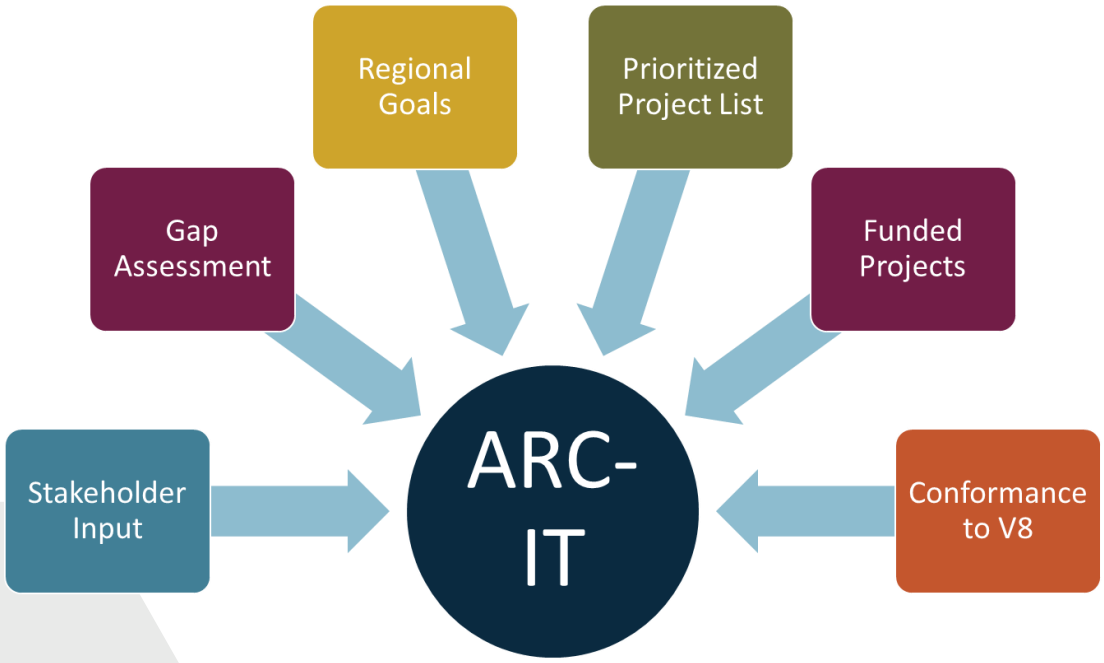


Figure 18 – ARC-IT Inputs

ARC-IT has two tools: Regional Architecture Development for Intelligent Transportation (RAD-IT) and Systems Engineering Tool for Intelligent Transportation (SET-IT). These tools are used for different parts of the systems engineering process, shown as the “V-Diagram” in ***Figure 19***.

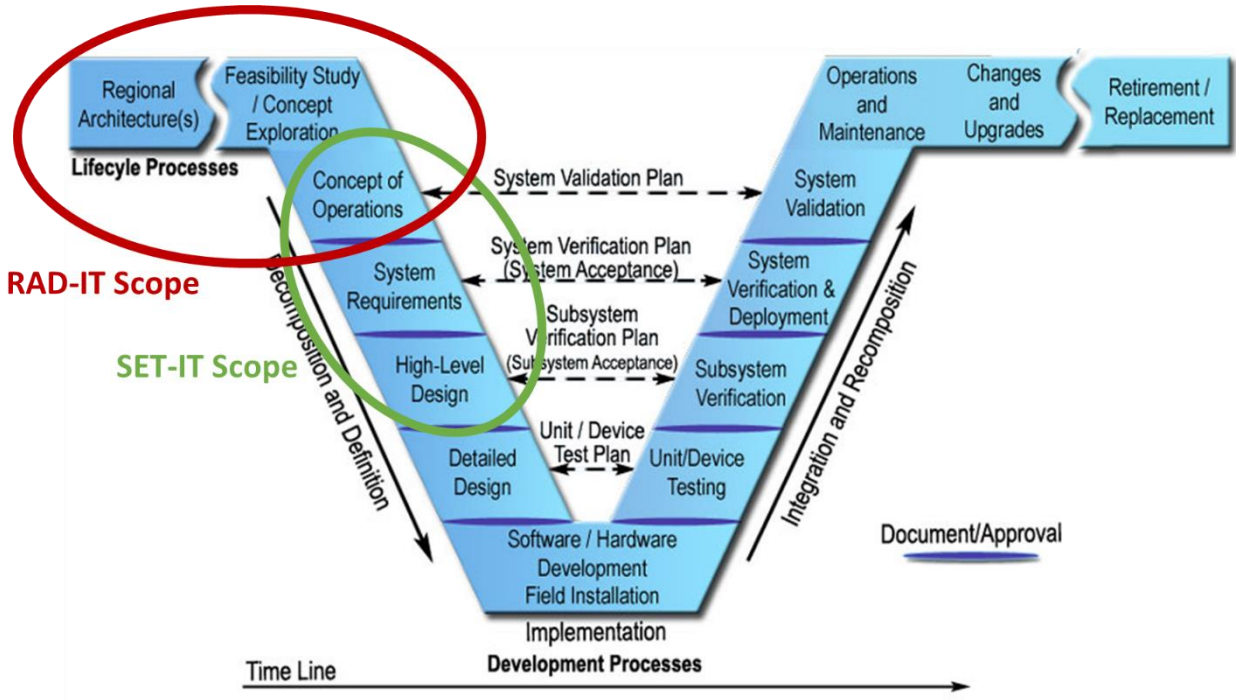


Figure 19 – Systems Engineering Diagram

RAD-IT replaced the Turbo database and maintains all previous functionalities. This tool focuses on the first two elements of the systems engineering process – architecture and concept. It defines the needs, stakeholders, services provided, communication connections, and other essential information.

An element defined in RAD-IT can be linked to more than one stakeholder (i.e. Agency A owns the element, but Agency B operates and maintains the element). Project architectures should be created within the Regional ITS architecture's RAD-IT, and then linked to SET-IT to create project diagrams and complete the systems engineering process.

SET-IT imports project architectures from RAD-IT and allows the user to manipulate service package diagrams. Inputs to SET-IT follow the systems engineering process. Any updates to the project architecture are updated in the Regional ITS Architecture. The SET-IT process is part of the concept of operations (ConOps), systems requirements, and high-level design processes.

A comparison of the two tools is summarized in ***Table 15***.

Table 15 – ARC-IT Summary

RAD-IT	SET-IT
Architecture (Maintenance)	Systems Engineering Process
Transportation Planning	Visio Diagrams
Region Specific	Project Specific
Raw Diagram Output	Document Output

2.3.2 Regional ITS Architecture Development

The Triad Regional ITS Architecture was developed in parallel with the Action Plans and Geographic Projects and utilized similar data sources and feedback from both the Core Team and Stakeholders. The process is outlined below.

Gather Data

The Regional ITS Architecture data was gathered during the Gap Assessment portion of the project, including Existing Conditions, Needs, and Gaps. In addition, further information was gathered from stakeholders about current and future projects.

Identify Services and Flows

With the data gathered in the first step, the necessary service packages and communication flows from the National ITS Architecture (v8.3) were identified. Service packages were identified for NCDOT and for each municipality (Burlington, Greensboro, Winston-Salem, Salisbury, and High Point).

Develop Visio Diagrams

Diagrams depicting the service packages and flows were created in Visio by adapting the National ITS Architecture (v8.3) to Triad existing and future conditions.

Stakeholder Feedback

Stakeholders from each municipality, NCDOT, and other regional agencies reviewed the service packages relevant to their agency and provided feedback on terminology, communication flows, and flows as defined as either “planned” or “existing.”

RAD-IT

Based on stakeholder comments, the regional ITS architecture was created in RAD-IT. All stakeholders, elements, and flows were defined within the program and added to the service packages. A summary of the service packages created for each stakeholder is in ***Appendix A2.6.*** Descriptions of each service package are located here:

https://local.iteris.com/arc-it/html/servicepackages/servicepackages-areaspsort.html

Project Architecture

The completed Triangle Regional ITS Architecture in the RAD-IT database can be used to create project architectures. Seven geographic projects from the prioritized project list were identified and created within the RAD-IT. Agencies that proceed with implementation will complete the final step by exporting the project architecture to SET-IT to complete the con-ops and systems requirements for the project. Instructions on how to create the project architecture is included in ***Appendix A3.4***.

TRIAD REGIONAL ITS SDP

3 – PROJECT IMPLEMENTATION AND SDP MAINTENANCE

3 Project Implementation and SDP Maintenance

Section 3 provides guidance on implementing an ITS project in the Triad, whether the project was identified in this SDP or if is a new project identified by a stakeholder agency.

3.1 Implementation

The Action Plans identified in ***Section 2.1*** have a different implementation process than the Geographic Projects identified in ***Section 2.2.*** Each Action Plan contains activities and strategies needed for implementation and rely primarily on changes in culture, business process, and relationships that do not necessarily require external funding sources. Geographic projects are more traditional projects that require capital improvements and will need to be included in State Transportation Improvement Program (STIP) or other planning processes to become eligible for federal funding.

The appendix for this section contains detailed user guides to walk a stakeholder through the implementation process. These documents are summarized in this section but can be used as standalone guides.

Click the links below to access the guides.

- Action Plan Implementation Guide
- Geographic Project Implementation Guide
- Prioritization Tool User Guide
- Systems Engineering Documentation User Guide
- Architecture Conformance Guide
- SDP Update Guide

3.1.1 Action Plan Implementation

Identify Action Plan(s) to Implement

Action Plans were developed based on the results of the Capability Maturity Model (CMM) Assessment conducted during the Gap Assessment portion of the SDP and as described in ***Section 1.3.3***. The Action Plans are organized by CMM dimension, so an agency can choose to advance itself or the region in any of the dimensions. Actions Plans can be found in ***Appendix A2.2***.

Within each dimension, an agency can use the qualitative assessment metrics of resources, impact, and duration to determine which action plans are expected to yield the largest impact relative to the investment.

Identify a Champion

For an Action Plan to be successfully implemented, a champion is needed to drive the process forward. Action plans require relationship building, culture changes, and adjustments to internal process that require a strong champion to continue motivating the individuals involved with the Action Plan.

Implement Activities and Achievement Strategies

Each Action Plan has a list of high-level activities with corresponding Achievement Strategies to guide the agency toward the Final Goal. These steps can be adjusted for the agency depending on the program's level of maturity and available resources.

3.1.2 Geographic Project Implementation

This section provides guidance on implementing projects in four different scenarios: whether NCDOT or a stakeholder wants to implement the project and whether the project has already been identified in the SDP. These processes assume that federal funds are required to implement the project.

NCDOT vs. Stakeholder

The primary difference between a project being implemented by a stakeholder versus NCDOT lies in the STIP Process. Local agencies must first incorporate projects into a Regional Transportation Plan before the project can be submitted in the STIP process.

Inclusion in the SDP

If a project has not already been identified in the SDP or an agency wishes to modify a project currently in the SDP, then the project needs to go through the Prioritization Process. This process will rank the project among all other projects in the region. The project's ranking can be used to justify including the project in a regional plan or the STIP.

Municipally Funded Projects

If a municipality or local agency does not require support from federal funding sources, the process described in this section does not need to be followed. However, to maintain accuracy of the Triad Regional ITS Architecture, it is requested that municipalities submit a Maintenance Change Request form to document needed revisions to the regional ITS architecture based on the implementation of the project.

Figure 20 and ***Figure 21*** show the implementation process for each scenario. Each step in the process is described in more detail below.

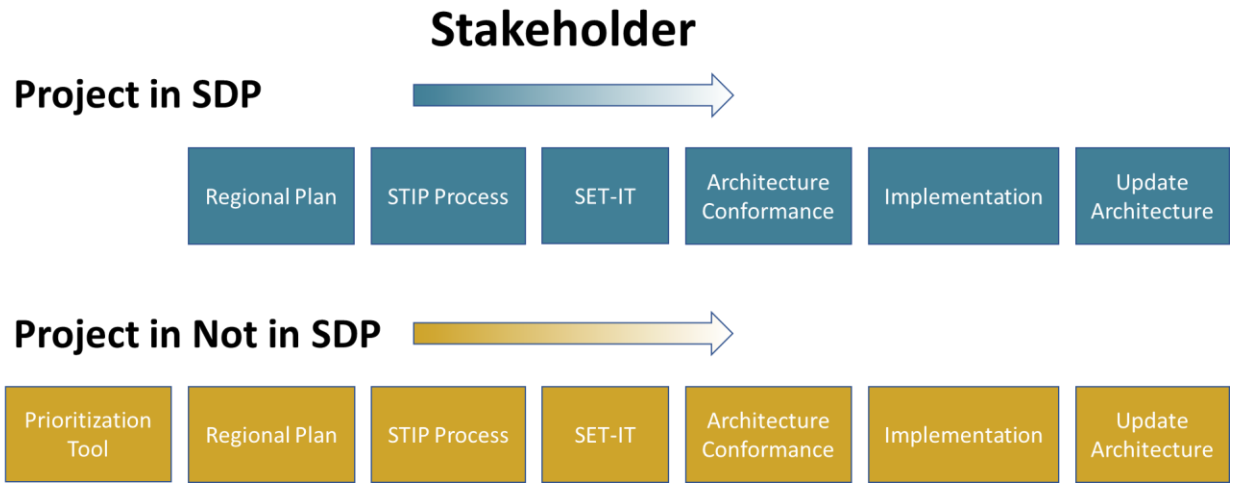


Figure 20 – Stakeholder Project Implementation Process

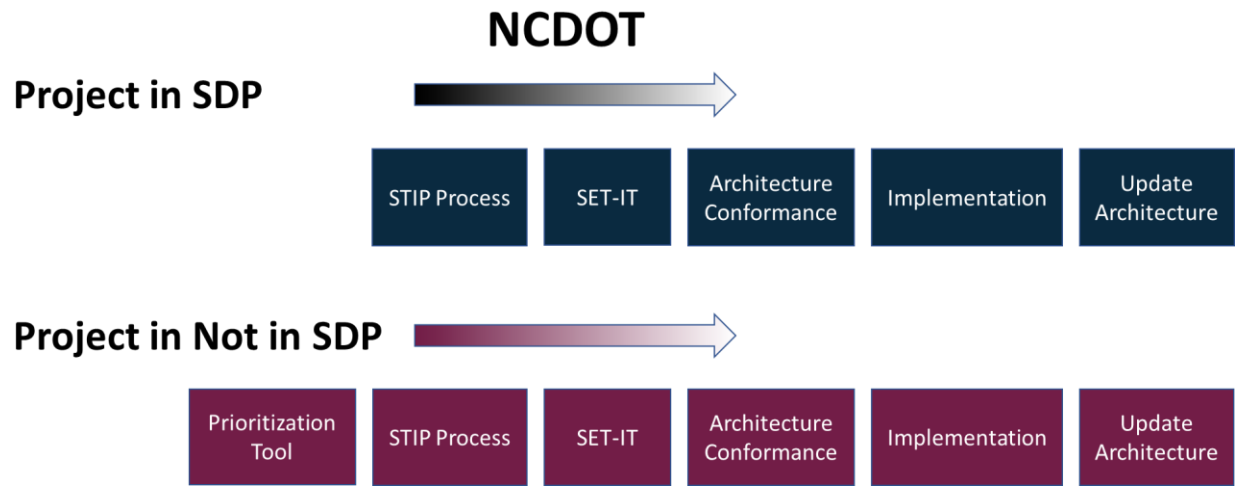


Figure 21 – NCDOT Project Implementation Process

Adding a Project to the Prioritization Tool

The Prioritization Tool can be used to evaluate proposed projects that have not been identified in the SDP or projects currently included in the SDP that are being modified. ***Appendix A3.3*** contains the Prioritization Tool User Guide which walks the user through the process of adding a project to the tool, evaluating the project by the five rubric categories, and then ranking it against projects already identified in the SDP. This guide also includes the Benefit/Cost Analysis process.

Regional Plan and STIP Process

Stakeholders must first add a project to their Metropolitan Transportation Plan (MTP) to be considered in the STIP Process and therefore eligible for federal funds.

NCDOT can directly submit projects into the STIP process. The Geographic Project Implementation Guide included in ***Appendix A3.1*** provides guidance on incorporating a project into an MTP and the STIP Process. This guide also includes instructions to create a project sheet by extracting information from the SDP and Prioritization Tool.

SET-IT

After a project has received funding, the agency can move forward with creating the project architecture and concept of operations in RAD-IT and SET-IT. The Systems Engineering Documentation User Guide in ***Appendix A3.4***. This guide starts with creating a project architecture in RAD-IT and walks the user through to the Concept of Operations output from SET-IT.

Architecture Conformance

Showing conformance with the Regional and National ITS Architecture is mandatory to receive federal funding. The Architecture Conformance Guide in ***Appendix A3.5*** guides the user through the process of requesting the regional ITS architecture and submitting an Architecture Maintenance Change Request (MCR) Form. The MCR form is included in the user guide. This user guide also provides guidance for the Architecture Maintenance Manger to review MCRs and keep the regional ITS architecture up to date.

Implementation

This stage of the process is the physical deployment of the project, following local and regional guidelines for project implementation.

Update Architecture

After the project has been implemented, a Maintenance Change Request Form (MCR) should be submitted to update flows from “planned” to “existing.”

3.2 Maintenance

The Triad Regional SDP and associated components require updates at regular time intervals as shown in ***Table 16***. There are three types of updates: As-Needed, Administrative, and Full Update.

As-Needed Update

As-Needed updates are not performed at a consistent interval, but rather are dependent on project implementation. The Prioritization Tool will be updated whenever an agency adds or modifies a project, but it is not required. The regional ITS architecture will be updated using Maintenance Change Request Forms submitted as part of the Architecture Conformance process during project implementation.

Administrative Update

An Administrative Update should be conducted every four years and includes updating the regional ITS architecture and a streamlined gap assessment. The streamlined gap assessment should focus on identifying and addressing changes in physical gaps, as opposed to gaps in culture and business practices.

Full Update

A Full Update should be conducted every eight years. This includes going through the process outlined in this document, from stakeholder engagement to identifying new projects. This document can be used as a guide for the full update.

Table 16 – SDP Update Timeline

	Update		
	As Needed	**Administrative**	**Full**
Frequency	--	Four Years	Eight Years
Triad Regional Goals			✓
Gap Assessment		✓*	✓
Best Practices			✓
Regional ITS Architecture	✓	✓	✓
Project Prioritization	✓	✓	✓

*Streamlined Update