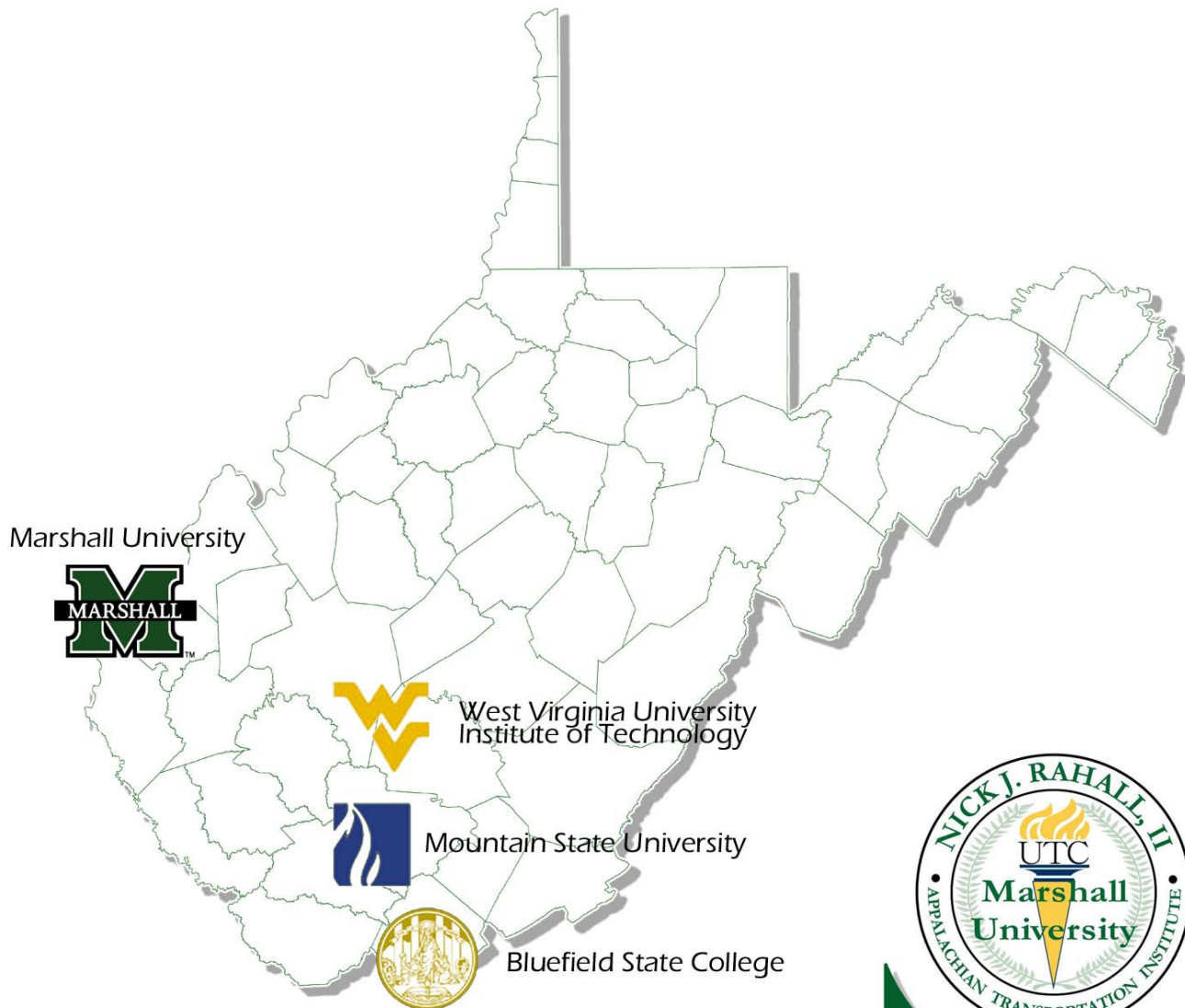


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Phase III – GIS for the Appalachian Development Highway System  
2007 Cost to Complete Estimate





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# **Phase III – GIS for Appalachian Development Highway System 2007 Cost to Complete Estimate**

*Rahall Transportation Institute  
Transportation Research Project RTI TTP0601*

*Prepared for  
Appalachian Regional Commission*

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## **Executive Summary**

This project was undertaken by the Appalachian Regional Commission (ARC) and The Nick J. Rahall Appalachian Transportation Institute (RTI) to facilitate 2007 Cost to Complete Estimate. The project created an ADHS GIS for integrating and disseminating GIS and transportation data that will increase the accuracy and efficiency associated with completing the 2007 ADHS Cost to Complete Estimate. It also created applications needed in order to facilitate improved methods of data collection and mapping utilizing the most advanced web-based techniques in GIS. This project will not only help the ARC but will provide a model for other federal and state agencies to follow for improved efficiencies with regards to updating and editing geospatial information.

## **Project Objectives**

Phase III will move the Appalachian Development Highway System (ADHS) GIS system to a production environment and make modifications that will allow it to be utilized for the 2007 Cost to Complete Estimate. This phase will build on the two previous phases to create improved and additional functions to the system that will improve efficiency for conducting 2007 ADHS Cost to Complete Estimate.

Based on recommendations from both the ADHS GIS User Group meeting and the ADHS Advisory Group meeting, the Phase III will focus on following functionality development and operations:

- Streamline cost estimate workflow by providing web-based table input;
- Automate table calculations for improving efficiency and accuracy;
- Improve mapping functions and cartography;
- Create appropriate printing functions for tables and maps;
- Develop necessary manuals and guidelines related to the software usage;
- Develop and integrate a web-based on-line accounting system for monitoring cost estimate efforts for each State;
- Develop a data utility tool for analyzing the cost estimate data;

- Optimize the system performance;
- Develop plans and processes for the operations in both testing and production phases.

Rahall Transportation Institute has been working on Phase III of ADHS GIS Project to facilitate 2007 ADHS Cost to Complete Estimate (CE) for State DOTs and FHWA Division offices since last year. Throughout the project implementation period, some tasks and works which were not in the originally identified scope of work have been added to the project as a result of emerging requirements to the CE by the ARC/FHWA CE management team (often in urgent needs as they arose). Other tasks/works are being proposed to add to the project because of the needs to enhancing the system towards producing sound CE final reports/booklets and for immediately needed functions of ADHS operations using the 2007 CE dataset.

This proposal and justification presents a task-by-task description, man-hour needed (or performed) and budget/cost incurred (or estimated) to carry out these tasks/works which were not in the Phase III original scope of work. This proposal will also ensure a continuous operation and maintenance of several existing tasks as a result of new CE schedules due to recent delay of the CE process. Over all, as we approach to the final stage of the CE effort, this proposed project extension/add-on will ensure improved and new functions to the system that will improve efficiency and quality for producing the final 2007 ADHS Cost to Complete Estimate products as well as to provide new utility functions towards immediate application to ADHS routine operations.

The proposed/performed extension/add-on works will focus on following functionality development and operations:

- Extend system maintain and operation as schedule changes;
- Extend technical support to State DOTs and FHWA division offices due to new schedule and newly required CE revisions;
- Provide more printing options (web, hard copy, and electronic copy) and more copies of final 2007 Cost to Complete Estimate booklets;
- Extensively and manually developed mapping labels and local street names from the scratch since several states could not provide automated labeling databases to their based maps;



- Develop new functionalities and expand existing data utility tools for analyzing the cost estimate data;
- Develop a brand new system utility function to directly update ADHS annual status via the system and to produce the state sheets from the system.

## **Project Abstract:**

The proposed research will create an ADHS GIS for integrating and disseminating GIS and transportation data that will increase the accuracy and efficiency associated with completing the 2007 ADHS Cost to Complete Estimate. This project will create applications needed in order to facilitate improved methods of data collection and mapping utilizing the most advanced web-based techniques in GIS. This project will not only help the ARC but will provide a model for other federal and state agencies to follow for improved efficiencies with regards to updating and editing geospatial information.

## **Task Descriptions:**

### **Phase I – Research & Development**

A function design review will take place after each italicized task. The review teams will be made up of ARC and FHWA representatives to insure a proper design before proceeding with the development of the task.

#### **1. Table A, C, D, E**

(This task will create web forms to view and edit table A, C, D, E in a similar format as seen in the existing Estimate Cost to Complete booklet)

1. *Design*
2. Development

#### **2. Table B Improvement**

1. Automating status coding

(This task will create a feature function to automatically update status of development using easily recognizable alias on Table B)

- a. *Design features and functions*
- b. Development

2. Zoom to Map function in Table B

(This task will create a function to zoom to map from table b section ID)

- a. *Design features and functions*
- b. Development

3. Table B 2005 update from 2004 data  
(This task is necessary to update yearly ADHS updates).
  - a. Update table B information to 2005
4. Typical X-Section reference update  
(This task is necessary to update yearly Typical X-Section reference updates).
  - a. *Update Typical X-Section reference information to 2005*
5. Table B Line 28  
(This task will let State DOT to input their construction engineering percentage based on the statewide cost but not to exceed 15 percent of the entry on line 27 on Table B)
  - a. *Design features and functions*
  - b. Development

### **3. Mapping improvement**

1. Automated Section ID labeling function  
(This task will develop automated labeling function when new section is created)
  - a. *Design features and functions*
  - b. Development
2. *Cartographic improvement* – update corridor & base maps  
(This task is necessary to update base mapping layers of ADHS region).

### **4. Printing of Tables & Maps**

- (This will develop print function for tables and maps of ADHS corridors)
1. Design and Development
    - a. *Design printing layout and functions.*
    - b. Development.

### **5. Manual & guideline development**

- (This task will develop manuals and guidelines of how to use ADHS Web-based GIS system to complete the Estimate Cost to Complete 2007)
1. Revise instruction manual
  2. Develop software manual and tutorial/training material
  3. Develop procedure for advance editing (alignment/project number update) & interaction between RTI and DOTs
  4. Develop procedure for technical support

### **6. Accounting System**

- (This task will create an accounting system to manage budgets. State DOTs will be able to electronically submit cost of Estimate Cost to Complete 2007)
1. Design and Development
    - Task 1 will include the following (b subtasks:
      - a. *Design features and functions.*
      - b. Development.

### **7. Update Notification**

- (This task will create an automated notification system for the document management system)
1. Design and Development
    - a. Design features and functions.
    - b. Development.

## **8. Utility Tool**

(This task will create a utility tool to analysis table B information)

1. Design and Development
  - a. *Design features and functions.*
  - b. Development.

## **Phase II – System Testing**

### **1. Optimizing the performance of the system**

(This task will optimize performance of the system)

### **2. Beta testing & debugging**

### **3. Ensuring Security**

(This will establish and test the system’s security and vulnerability)

### **4. Operation procedure testing**

### **5. Testing training and technical support operations**

## **Phase III – Production**

### **1. Updating & maintaining EADHS.org website**

(This task will be updating and managing EADHS.org website toward to ADHS for updates, training and FAQs).

### **2. Technical Support**

1. Telephone/email support
2. Advanced editing support
  - a. Updating alignment/project number
  - b. Draft Printing

### **3. Printing production**

(This will be used to print out forms of tables and maps of ADHS corridors)

1. Final Printing
2. PDF conversion

## **Extended Phase**

### **1. Cartographic Improvement**

*RTI has completed additional cartographic improvement of local road labels in several States caused by lacking or no road name from State DOT geospatial layers. This improvement is an addition to the originally identified mapping improvement in the contract.*

- a. Identify road layers with limited or no road name
- b. Place labels and convert to annotation

## **2. System Maintain and Operation**

*This task will insure continuous operation and maintenance of the system beyond the originally identified schedule to accommodate the new project schedule.*

## **3. Technical Support**

*This task will ensure the continuous technical support to State DOTs and FHWA division office for Cost Estimate beyond the originally identified schedule until new deadline*

1. Telephone/email support
2. Advanced editing support
  - a. Updating alignment/project number
  - b. Draft Printing

## **4. Printing production**

*This is to produce more copies of the CE products than originally identified copies such as cross section design, tables, and maps of States and ADHS corridors.*

1. Final Preparation
2. Printing – Hard & Electronic Copies
  - a. Develop a practical procedure to update frequent data changes
  - b. Final print QA & QC
  - c. PDF conversion
  - d. Web distribution

## **5. Utility Report**

*This task will develop additional utility reports for ARC and FHWA to analysis tables; Table B and D information, 2002 and 2007 Comparison, and on the fly report.*

1. Design and Development
  - a. Design features and functions.
    - 2002 Table D database conversion
    - 2007 Table D database creation
    - 2002 Utility report
    - Excel Export
    - On the fly report
  - b. Development.

## **6. Annual ADHS Status Report**

*This task will develop website to migrate Excel spreadsheet format annual ADHS status report to Web-Based form. It will help ARC eliminate any effort to duplicate spreadsheet every year and to keep track up-to-date ADHS status. ARC will also be avail to integrate and display multi-year data.*

1. Database
  - Database table & relationship Design
  - Multi-year data integration
  - 2012 cost estimate data feed
2. Web interface & function
  - a. Layout & user interface design
    - Web form design
    - Output design

- b. Function design
  - i. Annual status report
    - . Status (eligible and NP) by State
    - . Miles completed by corridor and state
    - . Status of corridor mileage
  - ii. Detail ADHS status annual report
    - . Excel form conversion
    - . Section split procedure
    - . Data integration

## Conclusion

RTI developed and deployed web-based ADHS GIS solution in collaboration with the ARC. This system provided all the necessary functionalities to facilitate 2007 ADHS Cost to Complete Estimate without installing any desktop application. User interface was carefully designed and developed based on suggestions from workshops. State DOTs are no longer needed to maintain ADHS phase I GIS software and geospatial data. RTI is operating and maintaining the web application and the centralized database to support continuous works. This project provided benefits to other projects by providing system architecture to develop customize future web-base GIS solution.