Executive Bridge Maintenance Management System: A Web Portal

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| 16. Abstract | This project conceptualized, designed, constructed and deployed a state-wide bridge reporting system for the Alabama Department of Transportation that extends the capabilities and user community for the existing Alabama Bridge Information Management System (ABIMS). The intranet-based application enables users to identify and retrieve selected bridge records in ABIMS and display the results in standard engineering terms rather than using screen numbers and a short mnemonic for values found in traditional IBM mainframe computer applications. Thus, users of this bridge information portal are able to readily interpret attributes, values and reports. This greatly enhances their ability to analyze bridge inspection and maintenance needs. Usage requirements incorporated into this portal design and deployment came from state bridge engineers, maintenance engineers, division engineers, department leadership, county engineers and Federal Highway Administration (FHWA). To assist them with information retrieval, pre-defined, standard reports were developed along with functionality to create customized on-demand reports to view bridge condition and structural information. The value realized from this project includes:
- extending the use of centrally-located bridge information for occasional high-impact users by improving the ease of use,
- reducing misidentification of variables previously appearing in a coded format,
- reducing user training time,
- reducing the time required for central information systems personnel to develop custom reports, and
- enhancing the shared access of bridge data among bureaus, districts, divisions, FHWA staff and county bridge engineers.

This project also developed the IT architecture and standards for future ALDOT-wide web portals and integrated this application with a new web-enabled bridge mapping application to enhance the ease of information access for a broader range of users. |
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Executive Summary

This project conceptualized, designed, constructed and deployed a state-wide bridge reporting system for the Alabama Department of Transportation that extends the capabilities and user community for the existing Alabama Bridge Information Management System (ABIMS). The intranet-based application enables users to identify and retrieve selected bridge records in ABIMS and display the results in standard engineering terms rather than using screen numbers and a short mnemonic for values found in traditional IBM mainframe computer applications. Thus, users of this bridge information portal are able to readily interpret attributes, values and reports. This greatly enhances their ability to analyze bridge inspection and maintenance needs.

Usage requirements incorporated into this portal design and deployment came from state bridge engineers, maintenance engineers, division engineers, department leadership, county engineers and Federal Highway Administration (FHWA). To assist them with information retrieval, pre-defined, standard reports were developed along with functionality to create customized and on-demand reports to view bridge condition and structural information.

For the Alabama Department of Transportation, the delivery of the Executive Bridge Web Portal provides:

- Detailed goal-based workflows used for the bridge maintenance;
- Intuitive, civil and transportation engineering standard descriptions of translated ABIMS BI-6 codes;
- A new set of standard bridge maintenance reports;
- User-defined, on-demand reporting capabilities;
- Seamless access to the Bridge Card information system for members of the Bridge Design and Bridge Maintenance Bureaus;
- Integration with a new web-enabled mapping application; and
- Web portal architecture and standards to facilitate the building of a web portal for ABIMS.

The value realized from this project includes:

- extending the use of centrally-located bridge information for occasional high-impact users by improving the ease of use,
- reducing misidentification of variables previously appearing in a coded format,
- reducing user training time,
- reducing the time required for central information systems personnel to develop custom reports, and
- enhancing the shared access of bridge data among bureaus, districts, divisions, FHWA staff and county bridge engineers.
Introduction

The Alabama Department of Transportation (ALDOT) is charged with the effective management of the state’s transportation assets. In addition, ALDOT must allocate funding in accordance with federal guidelines and increasingly formalized multi-criteria decision factors. Information about a bridge’s eligibility for funding is currently contained in the BI-6 module of the Alabama Bridge Information Management System (ABIMS) in a manner that is not intuitive to ALDOT executives, Emergency Bridge Inspection Team (EBIT) members, Management/Transportation Planning personnel, Bridge and County Transportation Bureau personnel, and members of the Bridge Design Bureau.

Prior to this project, bridge sufficiency rating and funding eligibility information were only available through ABIMS in a mainframe green-screen format. In ABIMS, key variables are presented in a coded numeric and mnemonic format making these values difficult to interpret. The information is difficult to access and retrieval is time consuming. Although some standard reports were available, nonstandard reports required professional programmers to develop, process, and maintain custom-coded necessary output.

Bridge System Maintenance

The maintenance requirements on municipal, county, and state bridges continue to increase with road utilization throughout the state along with the average age of these bridges. Consequently, there is an increased emphasis on maintenance, management, and reconstruction of existing infrastructure while continuing to effectively manage user costs and the flow of traffic. Timely access to data about these bridge structures presented in an intuitive manner enhances the decision making capabilities of ALDOT user groups.

Funding Constraints

Federal and state budget pressures are placing constraints on the availability of funds, and an increasing emphasis on the accountability for the effective utilization of these funds. Consequently, ALDOT must now do more with less and require tools with the capability to articulate the trade-offs between alternative investment strategies and assist in the effective communication of alternatives to various stakeholders.

Integration of Data Resources

The combination of data from the bridge design, maintenance, and project management systems provides a more efficient and effective means of supporting transportation-planning decisions and influencing comprehensive funding decisions. Therefore, this proposal also intends to combine these disparate resources into one portal with integrated web architecture and standards which can be used in current and future projects. The
The proposed web-enabled portal will provide necessary access to information for project stakeholders, thus making this an essential piece for enhanced future capabilities.

**Project Deliverables**

**Executive Bridge Maintenance Management Web Portal Deliverables**
The University of Alabama’s Aging Infrastructure Systems Center of Excellence has delivered new bridge maintenance management capabilities, including:
- goal-based system definition specifications,
- bridge maintenance management application components, and a
- web-enabled management portal for bridge maintenance.

The system definition specifications served as necessary input for construction of both the bridge maintenance management application components and the web-enabled management portal. These deliverables are compliant with the GASB 34 directive and provide a means to achieve the longer-term goals of ALDOT’s Asset Management Steering Committee. This is accomplished through the completion of the following deliverables:

1. **Detailed Requirements for Initial Bridge Executive Maintenance Management Module**
   - Defined the bridge maintenance decision-making process for primary and secondary stakeholders (users) (See Appendix A: Stakeholder Identification)
   - Detailed required decision data
   - Evaluated the availability and accessibility of needed data in ABIMS
   - Detailed system requirements (See Appendix B: Sample Requirements)
   - Gained ALDOT approval to proceed

2. **Translated ABIMS BI-6 Report Data Codes**
   - Determined the fields to be translated for each report that will be constructed
   - Delivered a copy of the code definitions to ALDOT for review
   - Evaluated definitions across key stakeholder groups to ensure that intuitive definitions are developed (See Appendix C: Sample BI-6 Translated Codes)

3. **Standard Bridge Maintenance Reports**
   - Identified a core set of standard reports and report contents based on essential work requirements by members of the Primary Stakeholder group
   - Created the structure and format of specific instances of the BI-6 Reports, Route Reports (HDRD) and Eligibility Reports (HBRRP) using the intuitive descriptions (See Appendix D: Sample Standard Reports)

4. **On-Demand Reporting Capabilities**
   - Identified bridge information components to include in reporting
   - Selected data filter conditions
• Defined ordering and sorting capabilities for report customization (See Appendix E: Sample On-Demand Reports; Appendix F: Executive Bridge Portal Custom Report User Documentation)

5. **Seamless Access to Bridge Card Information**
   • Integrated shared information related to bridge maintenance across the Bridge Design and Bridge Maintenance bureaus
   • Enhanced the maintainability and consistency of the bridge card information (See Appendix G: Bridge Card Component)

6. **Integration with Web-Enabled Mapping Application**
   • Enabled user to access details of a specific bridge via selection from a graphical, web-enabled external mapping application
   • Provides mapping application users with standard and on-demand reporting capabilities with translated BI-6 codes

7. **Web Portal Architecture, Standards, and Development**
   • Created web portal development, usage, and maintenance standards (See Appendix H: Web Portal Architecture, Standards, and Development; Appendix H.1: ALDOT Web Portal Group Architecture)
   • Verified standards through a walkthrough and the validation of standards through web portal construction
Project Value

In summary, this project has created value by completing the following objectives:

- Integrated data from bridge design, maintenance, and project management systems into one web portal;
- Created a web-based architecture and standards that can be used in current and future projects; and
- Enhanced reporting capabilities for executives and non-inspector personnel by creating standard reports and adding ad-hoc reporting capabilities.

Thus, the delivered system:

- Translates ABIMS BI-6 Report Data Codes for inspectors and engineers so that they may better comprehend the report fields;
- Standardizes bridge maintenance reports for primary stakeholders;
- Provides filtering capabilities for on-demand reporting;
- Provides seamless access to bridge card information for Design Bureau, cities and counties; and
- Provides access to necessary data in a uniform manner across maintenance management modules and facilitates uniform access for stakeholders through the web-enabled portal application and a web-enabled mapping application.

Thus, the value derived from this project is expressed as broadened use of automated bridge information, reduced training time, enhanced ease of use by casual users, reduced misidentification of variables, and enhanced the shared access of bridge data among bureaus, field divisions Federal Highway Administration staff and county bridge engineers.

Users who are not familiar with bridge inspection operational terminology or condition rating codes can use components developed as part of the Executive Bridge Portal to quickly access bridge information. This will provide value by allowing executive management find and compare bridges to determine funding eligibility and attributes concerning bridges during periods in which time is critical. Of particular interest to bridge portal executive users is the systematic translation of technical nomenclature to precise, standardized terms that are easily recognized.
ALDOT Deployment

During the spring of 2007, final deployment included movement of the Executive Bridge Management System from The University of Alabama labs to the Alabama Department of Transportation. The system was deployed and connections made to existing ALDOT systems. To aid in the deployment, The University of Alabama project team provide a series of training sessions for all 9 Alabama divisions, FHWA-Alabama Division staff and the maintenance bureau staff.

ALDOT Requested Out-of-Scope Changes & Additions

Upon completion of the delivered system, ALDOT made the following change and upgrade requests for the system which were determined to be outside the scope of this project. In many cases, the requested change has potential to increase the value of the delivered system to ALDOT, and for that reason these requests are documented for potential incorporation into a later phase of the Executive Bridge Maintenance Management System: A Web Portal.

- Integration of ALDOT’s Bridge Photo Library into the Web Portal
- The ability to search for and return multiple BINs simultaneously
- Inclusion in the General BI-6 of the following Item Numbers in addition to Item 254F: Load Limit – School Bus:
  - Item 254A: Load Limit - M Vehicle
  - Item 254B: Load Limit - 2 Axle
  - Item 254C: Load Limit - 3 Axle
  - Item 254D: Load Limit - Concrete Truck
  - Item 254E: Load Limit - 18 Wheeler
  - Item 254G: Load Limit - 6 Axle
- Inclusion of an “Email to…” link for sending created reports to other ALDOT employees
- The ability to define a Custom Report by the following item numbers
  - Item 49: Structure Length
  - Item 52: Deck Width
- The ability to download both Standard and Custom Web Portal reports into Microsoft Excel
- The ability to save Custom Report queries for future reporting needs
- The inclusion of the following Item Number to the General BI-6 Report:
  - Item 58 – Deck Condition
Appendix A: Stakeholder Identification

To ensure a realization of value upon deployment of the Executive Bridge Maintenance Web Portal, users of the portal application within ALDOT and external to ALDOT were identified.

Primary stakeholders were categorized as those whose requirements were to be met if technologically and economically feasible.

Primary User Group(s) / Stakeholders and Assumed Role
- Senior ALDOT Management uses reports to categorize and prioritize the funding for the bridges that require work.
- Bridge Maintenance Engineers use reports to locate bridges in certain counties/divisions prioritize the list of bridges to be worked on and identify special equipment needs.
- Inspectors use reports to locate general information about a bridge by looking at previous inspector’s entry as well as obtaining specific information about a certain bridge.

Secondary stakeholders provide context information, help set priorities when primary stakeholders are indifferent to order, and provide robustness to the portal by ensuring that functionality is as broad as is economically and technologically feasible.

Secondary User Group(s) / Stakeholders and Assumed Role
- Emergency Bridge Inspection Team (EBIT) members generate user-defined time-urgent reports to examine bridge characteristics.
- IT and Computer Services personnel use the portal to connect to bridge information along with other programs on the portal.
- Management/Transportation Planning personnel use the reports to look at planning of bridge work.
- Bridge and County Transportation Bureau personnel use the portal to look at bridge cards and bridge information for planning and maintenance purposes.
Appendix B: Sample Requirements

The initial systems analysis directly focused on required system outcomes necessary for Central Office bridge maintenance decision-making needs; the decision-making needs of Division Maintenance Engineers and County and Local Engineers were also evaluated for desired system capabilities.

The system definition focused on providing information search capabilities to:
- identify specific bridges or related sets of bridges
- code translations that allow for better explanation and understanding of bridge funding eligibility and bridge maintenance needs
- develop a prescribed set of standard reports and
- provide the capabilities for users to generate their own customized reports.

The two sample requirements noted below illustrate the detail required to properly specify the application system requirements to satisfy the data, workflow and decision algorithm needs of the primary and secondary stakeholders. The requirement steps provide additional detail related to the translation of user needs to application system requirements. The executive bridge maintenance management web portal application is comprised of several hundred detailed requirements.
<table>
<thead>
<tr>
<th><strong>Project Name:</strong></th>
<th>ALDOT Executive Portal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use Case Number:</strong></td>
<td>UC001</td>
</tr>
<tr>
<td><strong>Use Case Name:</strong></td>
<td>BIN is Identified</td>
</tr>
<tr>
<td><strong>Business Goal:</strong></td>
<td>UCO01 Bridge Identification Number is Identified</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>The goal of this use case is to identify the Bridge Identification Number. The use case is completed once the BIN number is identified and delivered to the screen.</td>
</tr>
<tr>
<td><strong>Pre-Condition</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Use Case Begins When:</strong></td>
<td>User enters portal</td>
</tr>
<tr>
<td><strong>What Actors Play a Role in the Process:</strong></td>
<td>User, Bridge Executive Management System</td>
</tr>
<tr>
<td><strong>Post-Condition:</strong></td>
<td>BIN or List of BINs are identified</td>
</tr>
</tbody>
</table>

Figure B.1: Sample executive bridge management requirement (identify BIN)
<table>
<thead>
<tr>
<th>Step Number</th>
<th>BIN is Identified Use Case Steps</th>
<th>Responsible Participant</th>
<th>Information Algorithm</th>
<th>Information Required</th>
<th>Information Required Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>User Enters Bridge Identification Number</td>
<td>User</td>
<td>User enters BIN</td>
<td>Bridge Identification Number is entered</td>
<td>Yes</td>
</tr>
<tr>
<td>1.2</td>
<td>Valid BIN number is checked</td>
<td>System</td>
<td>System checks BIN number entered</td>
<td>BIN Number</td>
<td>must be a numerical value</td>
</tr>
<tr>
<td>1.2.1</td>
<td>System checks for valid characters</td>
<td>System</td>
<td>System checks BIN number entered</td>
<td>BIN Number</td>
<td>must be greater than 0</td>
</tr>
<tr>
<td>1.3</td>
<td>Valid BIN number is checked</td>
<td>System</td>
<td>System checks BIN number entered</td>
<td>BIN Number</td>
<td>must be greater than 0</td>
</tr>
<tr>
<td>1.4</td>
<td>Retrieve Valid BIN Number</td>
<td>System</td>
<td>System retrieves valid BIN Number</td>
<td>BIN Number</td>
<td>must be a valid BIN</td>
</tr>
<tr>
<td>1.5</td>
<td>Identification Fields Are Retrieved</td>
<td>System</td>
<td>System retrieves values of report fields</td>
<td>BIN Number</td>
<td>must be a valid BIN</td>
</tr>
<tr>
<td>1.6</td>
<td>BIN is Verified</td>
<td>User</td>
<td>User accepts BIN returned</td>
<td>BIN Number</td>
<td>valid BIN number</td>
</tr>
<tr>
<td>1.7</td>
<td>BIN is Identified</td>
<td>User</td>
<td>User accepts BIN number</td>
<td>BIN Number</td>
<td>valid BIN number</td>
</tr>
</tbody>
</table>

*Figure B.2: Sample executive bridge management requirement steps (identify BIN)*
### Project Name:
ALDOT Executive Bridge Portal

### Use Case Number:
UC007

### Use Case Name:
Deliver AdHoc report to User

### Business Goal:
Deliver custom Report to User

### Description:
The goal of this use case is to deliver a user-defined custom report to meet the user’s specific decision making needs. The use case is completed once the user has entered the search criteria, defined the constraints on the data to appear in the report.

### Pre-Condition
User needs to search for bridges base on certain attributes and needs a unique set of information about these particular bridges.

### Use Case Begins When:
The user moves to the choose geographic location Screen.

### What Actors Play a Role in the Process:
User, Executive Bridge Portal

### Post-Condition:
The report is displayed to the screen and/or the user prints the report on printer.

---

**Figure B.3: Sample executive bridge management requirement (create ad-hoc report)**
<table>
<thead>
<tr>
<th>Step Number</th>
<th>Use Case Steps</th>
<th>Responsible Participant</th>
<th>Information Algorithm</th>
<th>Information Required</th>
<th>Information Required Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S001</td>
<td>Bridge Access Role is Identified</td>
<td>System</td>
<td>System identifies user</td>
<td>Division (item 2)</td>
<td>Number: Valid District (1 - 9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>County (item 204)</td>
<td>Number: Valid County (1 - 67)</td>
</tr>
<tr>
<td>S002.010</td>
<td>Field Boundaries Are Retrieved</td>
<td>System</td>
<td>System defines fields: Congressional Districts, Alabama Senate District, Alabama House District/Divisions, Counties, BIN(s)</td>
<td>Division (item 2)</td>
<td>Number: Valid District (1 - 9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>County (item 204)</td>
<td>Number: Valid County (1 - 67)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Congressional District (item 206)</td>
<td>Number: Valid Congressional District (01 - 35)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Alabama Senate District (item 207)</td>
<td>Number: Valid Alabama Senate District (001 - 105)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Alabama House District (item 208)</td>
<td>Number: Valid BIN (90002 - 19298)</td>
</tr>
<tr>
<td>S002.020</td>
<td>Geographic Filter Is Identified</td>
<td>User</td>
<td>User selects Division</td>
<td>Division (item 2)</td>
<td>Number: Valid District (1 - 9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>County (item 204)</td>
<td>Number: Valid County (1 - 67)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Congressional District (item 206)</td>
<td>Number: Valid Congressional District (01 - 35)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Alabama Senate District (item 207)</td>
<td>Number: Valid Alabama Senate District (001 - 105)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Alabama House District (item 208)</td>
<td>Number: Valid BIN (90002 - 19298)</td>
</tr>
<tr>
<td>S002.030</td>
<td>Geographic Filter Is Defined</td>
<td>System</td>
<td>System defines filter</td>
<td>BIN</td>
<td></td>
</tr>
<tr>
<td>S002.040</td>
<td>Geographic Filter Restrictions are applied</td>
<td>System</td>
<td>System filters</td>
<td>BIN</td>
<td></td>
</tr>
<tr>
<td>S003.010</td>
<td>Attributes available to be included in Report are Displayed</td>
<td>System</td>
<td>System defines fields: BIN CPMS Reference # Structure Number Location Route City Division Alabama House District County Alabama Senate District Congressional District Beginning Milepoint/Ending Milepoint Structure Length Year Built Deck Width</td>
<td>BIN CPMS Reference # (item 210)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Structure Number Location (item 9)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Route (item 13) City (item 4) Division (item 2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Alabama House District (item 208) County (item 204)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Alabama Senate District (item 207) Congressional District (item 206)</td>
<td></td>
</tr>
<tr>
<td>S003.020</td>
<td>Attributes to be included in Report are Identified</td>
<td>User</td>
<td>User selects attributes to include in report and to search by including: BIN CPMS Reference # Structure Number Location Route City Division Alabama House District County Alabama Senate District Congressional District Beginning Milepoint/Ending Milepoint Structure Length Year Built Deck Width</td>
<td>BIN CPMS Reference # (item 210)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Structure Number Location (item 9)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Route (item 13) City (item 4) Division (item 2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Alabama House District (item 208) County (item 204)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Alabama Senate District (item 207) Congressional District (item 206)</td>
<td></td>
</tr>
<tr>
<td>S003.030</td>
<td>Attributes to Search by and Included in Report are Defined</td>
<td>System</td>
<td>System defines filter</td>
<td>BIN</td>
<td></td>
</tr>
<tr>
<td>S004.010</td>
<td>Limits are placed on attributes to search by</td>
<td>User</td>
<td>User limits values of attributes to search by Attributes selected by the user to be included on the report and that can be searched by BIN CPMS Reference # (0 - 62200999) Structure Number Location Route (AL0006 - US0431) City Division (01 - 06) Alabama House District (001 - 105) County (1 - 67) Alabama Senate District (001 - 105) Congressional District (01 - 07) Beginning Milepoint</td>
<td>BIN CPMS Reference # (0 - 62200999)</td>
<td></td>
</tr>
</tbody>
</table>

Figure B.4: Sample executive bridge management requirement steps (create ad-hoc report)
Appendix C: Sample BI-6 Translated Codes

As stated in the objectives of this project, a diverse set of stakeholders needs to be able to quickly understand existing bridge information. To enable this comprehension, existing codified information is translated into more easily understood descriptions that enable timely, informed decisions to be made about bridge maintenance and funding allocations. By eliminating the time it takes to determine what the code for a particular bridge attribute means, this application enhances the efficiency in identifying needed information about a bridge, increases the consistency in communicating the important attributes that lead to a bridge’s rating, and reduces the time taken to interpret bridge details.

This Web Portal application allows the primary and secondary stakeholder groups to gain a greater understanding of bridge ratings by providing them with a translation of individual variables. The example below illustrates the codified information for a single item, which is currently displayed within ABIMS. The example also illustrates the corresponding translated item description displayed for users within the web portal application. The application provides translated descriptions for over 290 items (e.g. Item 26—Functional Classification) from the ALDOT Bridge Inspection Manual and the specific values for each item (e.g. Item 26 = 9).

<table>
<thead>
<tr>
<th>Item 26 – Functional Classification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Arterials – Interstates, Freeways, or Expressways</td>
<td>Other Principal &amp; Minor Arterials, and Major Collectors</td>
</tr>
<tr>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

Figure C.1: Example BI-6 translated codes
Appendix D: Sample Standard Reports

This project provides a set of standard reports constructed to meet the workflow needs of Primary Stakeholders, which includes a full BI-6 report, a general, condensed BI-6 report tailored to stakeholder decision-making needs, an inspection BI-6 report tailored to meet the needs of maintenance engineers and inspectors, route (HDRD) reports, and eligibility (HBRRP) reports. Where appropriate, the standard codes for reference items used in ABIMS are substituted with the translated descriptions to provide more interpretable reports.

The following are examples of the reports generated by the system:
# General Bridge BI6 Report

**BIN:** 000262

This structure is currently in service.

## Identification Information

<table>
<thead>
<tr>
<th>Owner:</th>
<th>01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility Carried:</td>
<td>US 43</td>
</tr>
<tr>
<td>District:</td>
<td>01</td>
</tr>
<tr>
<td>Main Structure Type Code:</td>
<td>10 - Truss-Thru</td>
</tr>
<tr>
<td>Milepoint:</td>
<td>39.8060 - Miles</td>
</tr>
<tr>
<td>Longitude:</td>
<td>087.94:13.70000 - DMS</td>
</tr>
<tr>
<td>U.S. Congressional District:</td>
<td>05</td>
</tr>
<tr>
<td>Alabama House District:</td>
<td>003</td>
</tr>
</tbody>
</table>

| Location: | 11 KM W JCT US 43 |
| County Code: | 39 - Lauderdale County |
| Features Intersected: | SHOAL CREEK |
| Local Identifier: | NNKN |
| Latitude: | 34:51.03.80000 - DMS |
| Structure Number: | O AL 0002 39 39 8060-1 |

## General Information

| Year Built: | 1925 |
| Annual Average Daily Traffic (AADT): | 14995 Vehicles |
| Parallel Bridge Number: | 006540 |
| Relative Position: | -1 - Parallel structure, left side |
| Place Code: | 00000 |

| Year Reconstructed: | 0 |
| Structure Length: | 803.10 Feet |
| Parallel Bridge: | L - Left structure of parallel structures, carrying traffic in the opposite direction of the inventory route |
| Inventory Route: | AL 0002 |
| MPO Code: | 00 - Not within any MPO jurisdiction |

## Condition Information

| Sufficiency Rating: | 18.50 |
| HBRRP Eligibility Status: | 1 - Eligible for replacement funding |
| Ranking: | 2 locally |
| School Bus: | 31.70 |
| Operational Status: | O - Operational - structure record currently active |

| Status: | 1 |
| Deficiency Points: | 75 Points |
| Posting Status: | D - Open, would be posted or closed except for temporary shoring |
| Reason Posted: | B0 - Superstructure |

## Inspection Information

| Maintenance Responsibility: | 01 - State Highway Agency |
| Next Inspection Date: | 10, 2006 |
| Next Interim Inspection Date: | 9, 1997 |

| Inspection Date: | 10, 2004 |
| Interim Inspection Date: | 9, 1995 |

| Inspection Frequency: | 24 Months |

---

*Report ran on Tuesday, February 13, 2007 at 5:20:08 PM*

**Figure D.1: Sample general bridge BI-6 report**
**Inspection BI6 Report**

**BIN: 000262**

This structure is currently in service.

<table>
<thead>
<tr>
<th>Identification Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Division: 02</td>
</tr>
<tr>
<td>County Code: 39</td>
</tr>
<tr>
<td>Structure Number: 0 AL0002 39 398060.1</td>
</tr>
<tr>
<td>Main Structure Type Code: 10</td>
</tr>
<tr>
<td>Approach Structure Type Code: 00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inspection Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspection Agency: 01 - State Highway Agency</td>
</tr>
<tr>
<td>Last Routine Inspection Date: 10, 2004</td>
</tr>
<tr>
<td>Special Equipment Used: 1, 4, 5, 9 - Snooper - Aerial basket - Any type of boat - Traffic control</td>
</tr>
<tr>
<td>Critical Feature Inspection Frequency: 24 Months</td>
</tr>
<tr>
<td>Under Water Inspection Frequency: 24 Months</td>
</tr>
<tr>
<td>Special Inspection Frequency: 0 Months</td>
</tr>
<tr>
<td>Snooper Inspection Frequency: 24 Months</td>
</tr>
<tr>
<td>Scour Inspection Frequency: 24 Months</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach roadway condition: 6 - Satisfactory</td>
</tr>
<tr>
<td>Superstructure Condition: 4 - Poor condition</td>
</tr>
<tr>
<td>Channel Condition: 7 - Bank protection is in need of minor repairs</td>
</tr>
<tr>
<td>Overall Paint Condition: 4 - Poor need for painting is urgent</td>
</tr>
<tr>
<td>Total Deficiency Points: 75 Points - Operational - structure record currently active</td>
</tr>
<tr>
<td>Status: 1</td>
</tr>
<tr>
<td>Reason Posted: B - Superstructure</td>
</tr>
</tbody>
</table>

Report ran on: Tuesday, February 13, 2007 at 5:12:28 PM

Figure D.2: Sample inspection BI-6 report
### Search Criteria Selected:

- **Division:** 01  
- **City:** [ALL]  
- **Route Number:** 1N0065  
- **County:** 22 - Callahan County  
- **Route Type:** 1 - Interstate Highway  
- **Beginning Milepoint:**  
- **Ending Milepoint:**

#### 23 BINs were returned.

<table>
<thead>
<tr>
<th>DIV</th>
<th>CNTY</th>
<th>BIN</th>
<th>REG. MP</th>
<th>END. MP</th>
<th>MULT. REC.</th>
<th>LOCATION</th>
<th>FACILITY</th>
<th>DIR. OF TRAFF.</th>
<th>LVL. OF SERVICE</th>
<th>FEAT. INT.</th>
<th>DESIGN LOAD</th>
<th>VERT. CLR.</th>
<th>LOCAL IDENT</th>
<th>OP. STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>22</td>
<td>006475</td>
<td>291.85</td>
<td>291.88</td>
<td>2</td>
<td>JCT 165 &amp; SR 91</td>
<td>I65</td>
<td>S</td>
<td>1</td>
<td>SR 91</td>
<td>5</td>
<td>99.99</td>
<td>NNNN</td>
<td>O</td>
</tr>
<tr>
<td>01</td>
<td>22</td>
<td>006476</td>
<td>291.85</td>
<td>291.88</td>
<td>2</td>
<td>JCT 165 &amp; SR 91</td>
<td>I65</td>
<td>N</td>
<td>1</td>
<td>SR 91</td>
<td>5</td>
<td>99.99</td>
<td>NNNN</td>
<td>O</td>
</tr>
<tr>
<td>01</td>
<td>22</td>
<td>006408</td>
<td>294.07</td>
<td>294.07</td>
<td>2</td>
<td>2 MI N JCT SR 91</td>
<td>I65</td>
<td>NS</td>
<td>1</td>
<td>BRANCH</td>
<td>5</td>
<td>99.99</td>
<td>NNNN</td>
<td>O</td>
</tr>
<tr>
<td>01</td>
<td>22</td>
<td>006477</td>
<td>294.29</td>
<td>294.33</td>
<td>2</td>
<td>2 MI N JCT 165 &amp; SR 91</td>
<td>CO RT 100</td>
<td>1</td>
<td>165</td>
<td>4</td>
<td>99.99</td>
<td>NNNN</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>22</td>
<td>006407</td>
<td>292.52</td>
<td>292.54</td>
<td>2</td>
<td>4 MI N JCT SR 91</td>
<td>I65</td>
<td>NS</td>
<td>1</td>
<td>MARIOT CREEK</td>
<td>5</td>
<td>99.99</td>
<td>NNNN</td>
<td>O</td>
</tr>
<tr>
<td>01</td>
<td>22</td>
<td>006414</td>
<td>297.97</td>
<td>297.99</td>
<td>2</td>
<td>6 MI N JCT SR 91</td>
<td>I65</td>
<td>NS</td>
<td>1</td>
<td>MARIOT CREEK</td>
<td>5</td>
<td>99.99</td>
<td>NNNN</td>
<td>O</td>
</tr>
<tr>
<td>01</td>
<td>22</td>
<td>007084</td>
<td>299.45</td>
<td>299.51</td>
<td>2</td>
<td>S JCT 165 &amp; SR 69</td>
<td>SR 69</td>
<td>1</td>
<td>SR 69</td>
<td>5</td>
<td>99.99</td>
<td>NNNN</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>22</td>
<td>015061</td>
<td>300.81</td>
<td>300.86</td>
<td>2</td>
<td>1 MI N JCT SR69 S &amp; 165</td>
<td>REST AREA</td>
<td>NS</td>
<td>7</td>
<td>I-65</td>
<td>5</td>
<td>99.99</td>
<td>NNNN</td>
<td>O</td>
</tr>
<tr>
<td>01</td>
<td>22</td>
<td>006818</td>
<td>301.81</td>
<td>301.82</td>
<td>2</td>
<td>6 MI S JCT US 278</td>
<td>I65</td>
<td>NS</td>
<td>1</td>
<td>BAVERS CREEK</td>
<td>5</td>
<td>99.99</td>
<td>NNNN</td>
<td>O</td>
</tr>
<tr>
<td>01</td>
<td>22</td>
<td>006816</td>
<td>302.20</td>
<td>302.25</td>
<td>2</td>
<td>5 MI S JCT US 278 &amp; 165</td>
<td>CO RT 18</td>
<td>1</td>
<td>CO RT 16</td>
<td>5</td>
<td>99.99</td>
<td>NNNN</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>22</td>
<td>007085</td>
<td>303.46</td>
<td>303.52</td>
<td>2</td>
<td>N JCT 165 &amp; SR 69</td>
<td>SR 69</td>
<td>1</td>
<td>SR 69</td>
<td>5</td>
<td>99.99</td>
<td>NNNN</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>22</td>
<td>006817</td>
<td>303.72</td>
<td>303.72</td>
<td>2</td>
<td>3 MI S JCT US 278</td>
<td>I65</td>
<td>NS</td>
<td>1</td>
<td>BRANCH</td>
<td>5</td>
<td>99.99</td>
<td>NNNN</td>
<td>O</td>
</tr>
<tr>
<td>01</td>
<td>22</td>
<td>006818</td>
<td>304.66</td>
<td>304.71</td>
<td>2</td>
<td>3 MI S JCT US 278 &amp; 165</td>
<td>CO RT 222</td>
<td>1</td>
<td>165</td>
<td>4</td>
<td>99.99</td>
<td>NNNN</td>
<td>O</td>
<td></td>
</tr>
<tr>
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<td>304.88</td>
<td>304.89</td>
<td>2</td>
<td>3 MI S JCT US 278</td>
<td>I-65</td>
<td>NS</td>
<td>1</td>
<td>BRANCH</td>
<td>5</td>
<td>99.99</td>
<td>NNNN</td>
<td>O</td>
</tr>
<tr>
<td>01</td>
<td>22</td>
<td>006813</td>
<td>305.90</td>
<td>305.95</td>
<td>2</td>
<td>2 MI S JCT US 278 &amp; 165</td>
<td>CO RT 36</td>
<td>1</td>
<td>165</td>
<td>4</td>
<td>99.99</td>
<td>NNNN</td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

**Figure D.3:** Sample HDRD report
Figure D.4: Sample HBRRP eligibility report
Appendix E: Sample On-Demand Reports

The ability to generate on-demand, user-defined reports stems from the need to locate multiple bridges or isolate specific bridges based on a user’s defined set of criteria, such as location, sufficiency rating, or date of funding eligibility. The major system capability is a set of fields, field ranges and data selection operators that the primary stakeholder groups can use to develop a query in order to return specific sets of bridge information. Consequently, the on-demand, user-defined querying capability allows the user to reduce or filter the entire set of bridges to view a single bridge or group of related bridges based on a finite set of constraints in order to make a previously unspecified decision. The finite set of constraints used to develop a view of resulting bridges meeting these constraints forms the basis of the on-demand queries. The system also enables the user to select the specific attributes, the order of attributes and sorted order of records to appear on the user-generated report. The attributes are organized into identification, location, structural and inspection-related attribute categories.

Figure E.1: On-demand filtering options
**Figure E.2: On-demand report attribute options**
<table>
<thead>
<tr>
<th>BIN</th>
<th>Division</th>
<th>County</th>
<th>Route Number</th>
<th>Route Type</th>
<th>MilePoint</th>
<th>Date Last Inspected</th>
<th>Next Inspection Date</th>
<th>Special Equipment Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>4568</td>
<td>01</td>
<td>Cullman County</td>
<td>00014</td>
<td>4 -- County Highway</td>
<td>.00621</td>
<td>04/1995</td>
<td>04/1995</td>
<td>9 :: 9 -- Traffic control</td>
</tr>
<tr>
<td>1430</td>
<td>01</td>
<td>Cullman County</td>
<td>00014</td>
<td>4 -- County Highway</td>
<td>.00621</td>
<td>02/1997</td>
<td>02/1997</td>
<td>9 :: 9 -- Traffic control</td>
</tr>
<tr>
<td>10974</td>
<td>01</td>
<td>Cullman County</td>
<td>00047</td>
<td>4 -- County Highway</td>
<td>.00621</td>
<td>02/1997</td>
<td>02/1997</td>
<td>39 :: 3 -- Special ladder, 9 -- Traffic control</td>
</tr>
<tr>
<td>16883</td>
<td>01</td>
<td>Cullman County</td>
<td>00000</td>
<td>5 -- City Street</td>
<td>.00621</td>
<td>02/1997</td>
<td>02/1997</td>
<td>36 :: 3 -- Special ladder, 6 -- Camera</td>
</tr>
<tr>
<td>8000</td>
<td>01</td>
<td>Cullman County</td>
<td>00047</td>
<td>4 -- County Highway</td>
<td>.00621</td>
<td>02/1997</td>
<td>02/1997</td>
<td>9 :: 9 -- Traffic control</td>
</tr>
<tr>
<td>2725</td>
<td>01</td>
<td>Cullman County</td>
<td>00091</td>
<td>3 -- State Highway</td>
<td>8.70913</td>
<td>10/1997</td>
<td>10/1997</td>
<td>0 :: 0 -- No special equipment is needed</td>
</tr>
<tr>
<td>2726</td>
<td>01</td>
<td>Cullman County</td>
<td>00091</td>
<td>3 -- State Highway</td>
<td>9.10495</td>
<td>10/1997</td>
<td>10/1997</td>
<td>0 :: 0 -- No special equipment is needed</td>
</tr>
<tr>
<td>5400</td>
<td>01</td>
<td>Cullman County</td>
<td>00000</td>
<td>4 -- County Highway</td>
<td>.006</td>
<td>02/1999</td>
<td>02/1999</td>
<td>9 :: 9 -- Traffic control</td>
</tr>
<tr>
<td>3384</td>
<td>01</td>
<td>Cullman County</td>
<td>00000</td>
<td>4 -- County Highway</td>
<td>.00621</td>
<td>03/1999</td>
<td>03/1999</td>
<td>9 :: 9 -- Traffic control</td>
</tr>
</tbody>
</table>

Figure E.3: Sample on-demand report
Appendix F: Custom Report User Documentation

The Executive Bridge Maintenance Web Portal provides users with the ability to generate customized, non-standard reports without requiring professional programmers to develop, process, and maintain custom-coded reports and output for a multitude of users. This section outlines the steps for generating a user-defined, custom report.

There are five pages on the Custom Report Generation piece of the application that guide the users through the generation of Custom Reports.

1. The first step is the Search page where the user can search for an individual bridge or a set of bridges based on any number of geographic constraints.

There are four types of searches that can be conducted on the Custom Report Generation Search page:
- One is to enter in the BIN number for information on the bridge corresponding to that BIN.
- The second type of search is to select a county and enter in the local identifier for information on the bridge corresponding to the local identifier.
- The third type of search is to query on all bridges in the state by selecting all divisions, selecting an individual division, selecting an individual county or even selecting an individual city. If a search is conducted on all bridges in the state the number of items displayed will be limited to 20 or less per page.
- The fourth and final type of search is to select a United States Congressional district, Alabama Senate district, or Alabama Congressional district.

2. Once the user has identified a bridge or set of bridges, the next page is the Select page. The user may further restrict the selection of bridges by using the Define check box to identify items (bridge attributes) that will have a specific value or value range set on the Define page. For example, a user may have previously selected all bridges in Jefferson County and may now select the Inspection Date Define check box. On the following Define page, the user will enter an Inspection Date range such as a last inspection date prior to two years ago this month, thus returning all bridges that need to be inspected in Jefferson County.

The second set of check boxes on the Select page is the Display check boxes, which allows the user to identify items to Display on the Custom Report from the 51 available items. Continuing with the example, the user may want to Display on the Custom Report the special equipment needed for an inspection of the Jefferson County bridges that are due for an inspection this month.

Once the user has Defined the items to further restrict the bridge set and identified the items to be Displayed on the Custom Report, the user should click the Submit button to continue to the Define page.
Note: if the initial geographic Search resulted in an individual bridge or the desired subset of bridges, there is no reason to select any items using the Define option. In this case, the user would select the items to be displayed on the Custom Report for the individual bridge or subset of bridges.

3. On the Define page the user can define the constraints for each item chosen. The user can also enter a name he/she would like to title the report. Click the Submit button to continue to the Order page.

4. On the Order page the user can select up to five items, from the list of items selected to Display or Define search constraints, to order the results on the report in ascending or descending order. For instance, if the user has selected to display the last inspection date for all bridges in Jefferson County, he/she can order the results on the report by the last inspection date in ascending or descending order. Click the Submit button to generate the report.

5. The final page is the Custom Report. On this page all bridges that fit the constraints the user has placed on the search are returned. The BIN for each bridge is displayed along with each item selected to Display on the report. Note: the BIN is a link to a menu of the static pre-defined reports of the application. Click on any one of the static pre-defined reports (Full BI-6, General BI-6, Inspection BI-6, HDRD and HBRRP) available to see that report for the BIN you have selected. From the static report view, the user may click the Back button to return to the Custom Report view to select another BIN.
Appendix G: Bridge Card Component

To integrate shared information related to bridge maintenance across the Bridge Design and Bridge Maintenance bureaus, the information on bridge cards currently available in hard copy form through the Design bureau was made available online as portable document format (PDF) files. The bridge cards contain graphic (plots, maps and pictures) and text material for all ALDOT-maintained bridges. The integration of this information enhances the maintainability and consistency of the bridge card information.

The Bridge Card portion of the Executive Bridge Portal depends on the availability of files external to the system. The Bridge Portal provides a means of accessing the Bridge Cards once this server is in place. The following information provides background and instructions on how to set up the folder structure on the server hosting the Bridge Cards, as well as how to configure the Web Portal to interface with this server.

The application reads the location of the Bridge Cards from a Microsoft Access Database. The structure of the database consists of nine (9) columns of information that allow Bridge Cards to be matched to the appropriate BIN number. The columns are: ID, DOCSERVER_LOC, BRIDGE_PROFILE_PATH, BRIDGE_COMPONENTS_PATH, BIN_NBR, STATUS, FEDERALROUTE, COUNTY, and PROJECTNBR.

Of interest in rebuilding the structure of the server hosting these cards are the columns DOCSERVER_LOC and BRIDGE_PROFILE_PATH. The DOCSERVER_LOC column contains the name of the machine on which the documents will be hosted, as well as the first level folder in which they reside. In the Access Database delivered to ALDOT, all the rows of the DOCSERVER_LOC column contain the following: “\CSNTS003\TEMPDOCS”, where CSNTS003 is the computer name and TEMPDOCS is the top-level shared folder. The next column, BRIDGE_PROFILE_PATH contains subsequent folders to be navigated through. In the Access Database delivered to ALDOT, each of the rows of the BRIDGE_PROFILE_PATH contains the following: “\BRIDGE\DOCSFUSI\”.

These two portions of the file path combine to provide the path to the folder containing all of the Bridge Cards. Each bridge card is formatted in PDF. The individual filename for the card is contained in the BRIDGE_COMPONENTS_PATH column. It is assumed that these filenames will be the same when the server for the Bridge Cards is made available.

In order to configure the Access Database to work on a new server, the DOCSERVER_LOC and BRIDGE_PROFILE_PATH columns will have to be modified to reflect the new path to the folder containing the Bridge Cards. An example of a possible change would be if the server hosting the cards’ name were to change from CSNTS003 to CSNTS009. In the original case of CSNTS003, if BIN 6375 were selected in the application then the file path the application would attempt to access would be //csnts003/TEMPDOCS/BRIDGE/DOCSFUSI/16T701!.PDF. If the name were to change
to CSNTS009, then the application would need to access the location file://csnts009/TEMPDOCS/BRIDGE/DOCSFUSI/16T701!.PDF. To facilitate this change, simply update all the rows of the DOCSERVER_LOC column in the Access Database to read \CSNTS009\TEMPDOCS. This will allow the application to navigate to the correct location of the Bridge Cards. Permissions for this folder will have to be configured to allow the application read access.

Abbreviated Instructions:
1.) On the new server, create a shared folder named “TEMPDOCS”
2.) Under this folder, create another folder named “BRIDGE”
3.) Under the BRIDGE folder, create a folder named “DOCSFUSI”
4.) Place the Bridge Card files in the DOCSFUSI folder (these files are assumed to have the same filenames corresponding to an individual BIN as those in the Access Database)
5.) Ensure the application has proper permissions to access these folders
6.) In the Access Database file, update the server name “CSNTS003” to the name of the new server
Figure G.1: Sample bridge card
Appendix H: Architecture, Standards, and Development

The ALDOT Executive Bridge Portal required that multiple users be able to access a common system of applications and data from varied locations over various network connection methods (ranging from high-speed DSL connections and local intranet connections, and to home dial-up connections). It was also required that the ALDOT Executive Bridge Portal is centrally maintainable and administrated. The data used by the ALDOT Executive Bridge Portal systems was to be centrally stored in a reporting database. To meet these requirements, it was determined that a new system architecture, a three-tier architecture, be implemented at ALDOT for these systems.

A three-tier architecture consists of three tiers, or layers; a client-side layer (including calculations and processing done by the system user’s personal workstation), a business-logic layer (including calculations and processing relating to the enforcement of business rules, procedures, and processes), and a data layer (including calculations and processing done to access, store, and manipulate data). A three-tier architecture provides segregation of responsibilities and tasks within a system; this facilitates the centralization of maintenance and administration for each of the main functional tasks within a major system.

One of the main drivers behind the implementation of a three-tier architecture at ALDOT is the desire for the multiple users (with varying network connection methods, connection speeds, and workstation configurations) to be able to access and interact with the same systems (same system version, same data, same ability to generate output, etc.) concurrently in real time. Previous system architectures at ALDOT required that the maintenance and administration of the business-logic and data functions be performed (at least to some extent) on the system user’s personal workstation. When systems were used by a multiple users, this created unnecessary maintenance and administration complexity; several different versions of a system with various administrative settings would be deployed and supported at the same time. The three-tier architecture implemented at ALDOT as part of the Executive Bridge Portal eliminated these problems by centralizing the client-side, business-logic, and data functions.

A three-tier architecture means that if ALDOT needs to implement a change in the business-logic of a system within the Executive Bridge Portal, ALDOT would have to update only the business rule in one location (the business-logic layer), and the update would be mitigated to all the system users the next time they used the system. The same concept holds true for updates in the data of a system. Since all data is centrally stored within the data layer, an update to the data will immediately be seen by all system users the next time they access the system.

The three-tier architecture, as deployed at ALDOT for the Executive Bridge Portal, can be fully explored in Appendix H.1.
Appendix H.1: ALDOT Web Portal Group Architecture

Introduction

The purpose of this document is to provide architecture standards for Executive Web Portal. A three-tier architecture defines the division of any web based application that will be located in the portal into three layers. This three-tier model will consist of user interface (UI), business services/rules, and data. The UI will be written in HTML and ASP.NET. Data will be pulled from an Oracle 9i database that is replicated with a DB2 database. Data is entered in the DB2 database from ABIMS (Alabama Bridge Information Management System) which is currently used to enter in all bridge information. The Web Portal in no way will save data back to the Database but only retrieve information for viewing or client-side manipulation purposes. The Web Portal will be located in the demilitarized zone (DMZ) of the firewall and will go through port 8080.

The end-users of the Web Portal will be connecting at different speeds. Fifty percent or more of the users will connect at the speed of digital subscriber line (DSL) at 1 mbps and above. The other portion of the users will be using a dial-up connection at 56 kbps. The dial-up users will be mostly in the county offices and ALDOT employees dial in when out of town. All data and applications available by the portal are open to all Intranet users as “read only”. Everyone that logs on to the Intranet will have equal access, because no data will be saved back on the database. All security measures will take place outside the Web Portal with the Intranet login.

The main benefit of having a three-tier architecture is easy management of the contents of the application. Each major piece of functionality is isolated from the others. The UI is independent of the business services, which is in turn isolated from the data piece. This architecture will reduce maintenance costs and greatly increase flexibility over the life of the system.

System Requirements (Client-Side)

The following minimum client specifications are required to connect to the Web Portal:

<table>
<thead>
<tr>
<th>Client System Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min Operating System</td>
</tr>
<tr>
<td>Internet Explorer</td>
</tr>
<tr>
<td>Screen Resolution</td>
</tr>
<tr>
<td>Internet Connection</td>
</tr>
</tbody>
</table>

All users will have to connect to the ALDOT intranet to connect to the Web Portal; therefore a username and password is required from the ALDOT intranet account designee.
Server Requirements
The Web Portal will be coded and tested under the operating conditions provided in the tables below. These specifications were gathered from ALDOT and its GIS group and then replicated in the University of Alabama AIME lab. The web server and the database server are physically two separate servers.

Web Server Requirements
The following specifications are to which the Web Portal is coded:

<table>
<thead>
<tr>
<th>Web Server Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Operating System</td>
</tr>
<tr>
<td>IIS</td>
</tr>
</tbody>
</table>

Database Server Requirements
The following specifications are to which the Web Portal is coded:

<table>
<thead>
<tr>
<th>Database Server Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB Application</td>
</tr>
<tr>
<td>Block Size</td>
</tr>
</tbody>
</table>
Three-tier Architecture

A three-tier architecture is used for all applications located in the Web Portal. The model below shows the flow of how the different pieces (UI, Business Services, Data) fit together. It is important to follow this model to keep the logic of the application in blocks for readability and maintainability. The model below illustrates how the Web Portal will work in a three-tier architecture environment.

![Three-tier Architecture Diagram]

Figure H.1.1: Three-tier architecture
User Interface

The User Interface provides a way for users to interact with the application. User interfaces consist of Windows Forms, Microsoft ASP.NET pages, buttons controls, or any other technology used to render and format data for users’ view. Users will be able to select searching criteria and save files will reside in this layer of the architecture. The Internet Explorer 5.5 web browser will be used on each client machine to perform rendering for the display of the UI pieces. Style Sheet validation will also be performed.

Business Services

The business services layer will contain all of the calculations after data is pulled from the database. Data will be passed though business services from the data layer to the user interface. This layer contains all business tasks (queried reports for decision making: Does the bridge need painted?; Does the bridge need to be in the budget for next year?; Will the bridge be federally inspected?) needed to be performed by the user. ASP.NET code will be used in this layer to perform business logic.

Data

This layer will contain all code that accesses the database. Data retrievals will be found in this layer of the architecture. We will not have any updates because information retrieved via the Web Portal will be read-only. All data will be pulled from two external database systems. The first external system is an Oracle Reporting database which will pull information from the ABIMS DB2 production database and the second is CPMS which is stored in a separate Oracle database. Source: http://msdn.microsoft.com/architecture/application/default.aspx?pull=/library/en-us/dnbda/html/AppArchCh2.asp
GIS Architecture Recommendations

Geographic Information Systems (GIS) provided the following architecture specifications and diagram to go by for the Web Portal and the production all future projects. Our architecture for the Web Portal is inline with the recommendations set by the GIS group.

- **Data tier**
  - The database is being stored in Oracle 9i.
  - Spatial data is being stored in Open Spatial Format (oracle spatial)
  - Data can be accessed via a standard ole db client with ANSI SQL
  - Spatial data may also be accessed via ESRI Arc SDE API.

- **Middleware**
  - Consists of a mix of products and technologies, including Arc IMS, Arc Objects, and functionality implemented via .Net code objects, callable via web services (soap/xml requests)

- **Application tier**
  - Web Server
  - Arc Map
  - Map Objects/ Custom Product
  - Geomedia

![Recommended GIS architecture diagram](image-url)

**Figure H.1.3: Recommended GIS architecture**
Appendix I: System Workflow

Figure I.1: Work flow diagram
Appendix J: Web Portal Item Number References

Each screen and report in the Executive Bridge Maintenance Management Web Portal references specific item numbers from the Bridge Inspection Manual provided by the Maintenance Bureau. The following section outlines the item numbers used in the Executive Bridge Maintenance Management Web Portal application. The application is essentially divided into a “Search for a Bridge or Set of Bridges” section and a “Report Selection/Generation” section. The section below details the items referenced in the Search section and items referenced in the Reporting section for a Full BI-6 report. The items and their corresponding ABIMS screens (1A-13) are illustrated in the following section. In addition, the definitions of each of the items are detailed for screen 1A as an example of the detailed information required to fully define each attribute appearing in the various static and user-defined reports.

Section: Search and Pre-Defined Reports
Item numbers related to search screen (report item numbers are in last section)

http://hostname/executive_bridge_portal/BinSearch.aspx:
BIN:
County: Item 204
  The County in which the bridge resides is entered in this field, right justified with blanks filled with zeros.

Local Identifier: Item 201
  This is a 4-digit field available to local government agencies to develop their own structure numbering/identification schemes.

Division: Item 2
  This item is two digits in length. It is coded by entering the number corresponding to one of the nine field divisions of the Alabama Department of Transportation. Valid codes for this item are 01 through 09. When the bridge falls at the boundary between divisions, it is identified as being in (and assigned to) the county or division to the west or south of the boundary. As a general rule, even numbered routes are understood to run from west to east and odd numbered routes are understood to run from south to north.

City: Item 4
  FIPS Place Code. This number is placed by the city name in this program. Cities, towns, townships, villages, and other census-designated places are identified by entering their Federal Information Processing Standards (FIPS) code. The number is right justified in this five-digit field with blanks filled with zeros.

Route Type: Item 13A, Sub Item 5B - ALXXXX
Route Number: Item 13A, Sub Item 5D – XX0059

Beginning Milepost: Item 11

Ending Milepost: Item 11

Maintenance Responsibility: Item 21
   This 2-digit field represents the type of agency that has primary responsibility for maintaining the structure.

Eligible for Replacement (Item 281 = 1)

Eligible for Rehabilitation (Item 281 = 2)

Section Custom Search and Report
Item numbers related to search page only (Report item numbers are in last section)
http://hostname/executive_bridge_portal/AdHoc_Geo.aspx

Division: Item 2
   This item is two digits in length. It is coded by entering the number corresponding to one of the nine field divisions of the Alabama Department of Transportation. Valid codes for this item are 01 through 09. When the bridge falls at the boundary between divisions, it is identified as being in (and assigned to) the county or division to the west or south of the boundary. As a general rule, even numbered routes are understood to run from west to east and odd numbered routes are understood to run from south to north.

County Code: Item 204 Indicates County where structure resides
   The County in which the bridge resides is entered in this field, right justified with blanks filled with zeros.

City ID: Item 4
   FIPS Place Code. This number is placed by the city name in this program. Cities, towns, townships, villages, and other census-designated places are identified by entering their Federal Information Processing Standards (FIPS) code. The number is right justified in this five-digit field with blanks filled with zeros.

U.S. Congressional District: Item 206
   Enter the 2-digit number (right justified) to indicate the U.S. Congressional District in which the bridge is located. If the bridge crosses a boundary between two congressional districts, record the number of the district to the south or to the west of the bridge.

Alabama Senate District: Item 207
   Enter the 2-digit number (right justified) to indicate the Alabama Senate District in which the bridge is located. If the bridge crosses a boundary between two
districts, record the number of the district to the south or to the west of the structure. Valid codes for this item are 01 through 35.

Alabama House District: Item 208
Enter the 3-digit number (right justified) to indicate the Alabama House of Representatives District in which the bridge is located. If the bridge crosses a boundary between two districts, record the number of the district to the south or to the west of the structure. Valid codes for this item are 001 through 105.

Local Identifier: Item 201
This is a 4-digit field available to local government agencies to develop their own structure numbering/identification schemes.
**Full Item Listing from BI-6 report:**

**Screen 1A**

Item 200: Operational Statue

1-digit code describing the operational status of the structure. Valid codes are:

- **P** – Structure not yet in service
- **I** – Structure not in service
- **O** – Structure currently in service

Item 201: Local Identifier

4-digit field available to local government agencies to develop their own structure numbering/identification schemes.

Item 5A: Record Type

There are two distinct types of records in the SI&A file. The first of these is for “on” records, and the second is for “under” records. The first subfield in the inventory route is a single digit reserved to distinguish between “on” and “under” records.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Route carried “on” the structure</td>
</tr>
<tr>
<td>2</td>
<td>Single route goes “under” the structure</td>
</tr>
<tr>
<td>A-Z</td>
<td>Multiple routes go “under” the structure</td>
</tr>
</tbody>
</table>

   - A signifies the first of multiple routes “under” the structure
   - B signifies the second of multiple routes “under” the structure
   - Z signifies the twenty sixth of multiple routes “under” the structure

Item 5B: Route Prefix

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Interstate highway</td>
</tr>
<tr>
<td>2</td>
<td>U.S. numbered highway</td>
</tr>
<tr>
<td>3</td>
<td>State highway</td>
</tr>
<tr>
<td>4</td>
<td>County highway</td>
</tr>
<tr>
<td>5</td>
<td>City street</td>
</tr>
<tr>
<td>6</td>
<td>Federal lands road</td>
</tr>
<tr>
<td>7</td>
<td>State lands road</td>
</tr>
<tr>
<td>8</td>
<td>Other (toll roads not otherwise indicated/identified above)</td>
</tr>
</tbody>
</table>

Item 5C: Level of Service

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None of the below</td>
</tr>
<tr>
<td>1</td>
<td>Mainline</td>
</tr>
<tr>
<td>2</td>
<td>Alternate</td>
</tr>
<tr>
<td>3</td>
<td>Bypass</td>
</tr>
<tr>
<td>4</td>
<td>Spur</td>
</tr>
<tr>
<td>6</td>
<td>Business</td>
</tr>
<tr>
<td>7</td>
<td>Ramp, Connector, etc.</td>
</tr>
<tr>
<td>8</td>
<td>Service and/or unclassified frontage road</td>
</tr>
</tbody>
</table>

36
**Full Item Listing from BI-6 report** Screen 1A (continued):

**Item 5D: FHWA Route ID**
Code the inventory route number in the next 5 positions, right justified in the field with leading zeros filled in. The route number in this subfield must agree with the route signing prefix coded in subfield 5B.

**Item 5E: FHWA Direction Code**
1 digit field for the directional suffix of the inventory route number, when it is part of the route number.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Not applicable</td>
</tr>
<tr>
<td>1</td>
<td>North</td>
</tr>
<tr>
<td>2</td>
<td>East</td>
</tr>
<tr>
<td>3</td>
<td>South</td>
</tr>
<tr>
<td>4</td>
<td>West</td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

**Item 2: ALDOT Division**
2 digit field corresponding to one of the nine ALDOT field divisions. Valid codes for this item are 01 through 09. If a bridge is located at the boundary between divisions, it is identified as being in (and assigned to) the county or division to the west or south of the boundary. As a general rule, even numbered routes are understood to run from west to east and odd numbered routes are understood to run from south to north.

**Item 202: ALDOT District**
2-digit field indicating the district in which the bridge is located.

**Item 203: MPO Code**
2-digit field indicating if a bridge is located in a MPO (Metropolitan Planning Organization) jurisdiction. Valid codes are 00 through 12.

<table>
<thead>
<tr>
<th>Code</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Not within any MPO jurisdiction</td>
</tr>
<tr>
<td>01</td>
<td>Auburn-Opelika Area</td>
</tr>
<tr>
<td>02</td>
<td>Birmingham Area</td>
</tr>
<tr>
<td>03</td>
<td>Calhoun Area</td>
</tr>
<tr>
<td>04</td>
<td>Columbus-Phoenix City Area</td>
</tr>
<tr>
<td>05</td>
<td>Decatur Area</td>
</tr>
<tr>
<td>06</td>
<td>Dothan Area</td>
</tr>
<tr>
<td>07</td>
<td>Etowah Area</td>
</tr>
<tr>
<td>08</td>
<td>Huntsville Area</td>
</tr>
<tr>
<td>09</td>
<td>Mobile Area</td>
</tr>
<tr>
<td>10</td>
<td>Montgomery Area</td>
</tr>
<tr>
<td>11</td>
<td>Shoals Area</td>
</tr>
<tr>
<td>12</td>
<td>Tuscaloosa Area</td>
</tr>
</tbody>
</table>
Full Item Listing from BI-6 report  Screen 1A (continued):

Item 204: Numeric County Code
   The county in which the bridge resides is entered in this 2-digit field, right justified with blanks filled with zeros.

Item 4: City Place Code
   FIPS Place Code. This number is placed by the city name in this program. Cities, towns, townships, villages, and other census-designated places are identified by entering their Federal Information Processing Standards (FIPS) code. The number is right justified in this five-digit field with blanks filled with zeros.

Item 6A: Features Intersected
   24 digit number

Item 6B: Critical Facility Indicator
   1 digit number

Item 7: Facility Carried
   The facility being carried by the structure is recorded and coded. In all situations, this item describes the use “on” the structure, even when item 5A indicates an “under” record.

Item 9: Location
   25-digit descriptive narrative indicating where the bridge is located.

Item 205: Relative Position Indicator
   2-digit used to indicate a structure’s relative position to other structures which may overlap any particular kilometer point on the inventory route.

Item 11: Kilometer Point

Item 13: LRS Inventory Route
   12-digit field used to record the LSR inventory route number and the sub-route number.

Item 16: Latitude
   For bridges on STRAHNET and STRAHNET connect highways and on the NHS, record and code the latitude of each bridge in degrees, minutes, and seconds to the nearest hundred thousandth of a second.
**Full Item Listing from BI-6 report**  Screen 1A (continued):

Item 17: Longitude
For bridges on STRAHNET and STRAHNET connector highways and on the NHS, record and code the longitude of each structure in degrees, minutes, and seconds

Item 27: Year Built
4 digits of the year (ex 1999)

Item 106: Year Reconstructed
4 digit of the year (ex 1999)

Item 294A: Bridge Name

Item 294B: Bridge Name Assigned By
Full Item Listing from BI-6 report (continued):

Screen 1B

Item 206: Congressional District
Item 207: Senate District
Item 208: House District
Item 209A: Contract Drawings Available
Item 209B: Contract Drawings Location
Item 210: CPMS Reference Number
Item 292: Old Project Number
Item 211A: Microfilm Plans Available
Item 211B: Microfilm Plans Location
Item 212A: Shop Drawings Available
Item 212B: Shop Drawings Location
Item 213A: CAD Files Available
Item 213B: CAD Files Location
Item 214: Adjacent Mainline Bin
Item 215: Previous Structure Bin
Item 98A: Border State Code
Item 98B: Border State Perc. Resp.
Item 216: General Narrative Info Ind

Screen 2

Item 112: NBIS Bridge Length
Item 104: National Highway System
Item 12: Base Highway Network Indicator
Item 105: Federal Lands Highways
Item 26: Functional Classification Code
Item 100: Strahnet Highway Designation
Item 101: Parallel Str. Designation
Item 102: Direction of Traffic
Item 103: Temporary Structure Designation
Item 110: National Truck Network
Item 20: Toll Status
Item 21: Maintenance Responsibility
Item 293: Inspection Responsibility Code
Item 22: Owner
Item 37: Historical Significance
**Full Item Listing from BI-6 report (continued):**

**Screen 3**

- Item 42A: Type of Service On Structure
- Item 42B: Type of Service Under Structure
- Item 28A: Lanes On Structure
- Item 28B: Lanes Under Structure
- Item 29: Average Annual Daily Traffic
- Item 109: Average Daily Truck Traffic
- Item 30: Year of AADT
- Item 19: Detour Length
- Item 38: Navigation Control
- Item 111: Pier Protection
- Item 116: Vertical Lift Bridge Vertical. Clear
- Item 40: Navigation Horizontal Clear

**Screen 4**

- Item 90: Routine Inspection Date
- Item 217: Interim Inspection Date
- Item 91: Inspection Frequency
- Item 92A: Critical Feature Insp. Required/Rate
- Item 92B: Under Water Insp. Required/Rate
- Item 92C: Special Inspection Required/Rate
- Item 93A: Critical Feature Insp. Date
- Item 93B: Under Water Inspection Date
- Item 93C: Special Inspection Date
- Item 218: Under Water Inspection Hours
- Item 219A: Snooper Inspection Required
- Item 219B: Snooper Inspection Frequency
- Item 220: Snooper Inspection Date
- Item 221: Snooper Inspection Hours
- Item 222: Special Equipment Used
- Item 223: Last Inspection Hours
- Item 224A: Scour Monitoring Required
- Item 224B: Scour Monitoring Frequency
- Item 224C: Scour Monitoring Indicator
- Item 224D: Scour Monitoring Freq. Date
- Item 225A: Counter Measures Required
- Item 225B: Counter Measures Date
- Item 225C: Counter Measures Completed Date
Full Item Listing from BI-6 report (continued):

Screen 5A
Item 49: Structure Length
Item 48: Maximum Span Length
Item 226A: Superstructure Steel Length
Item 226B: Superstructure Concrete Length
Item 226C: Superstructure Timber Length
Item 50A: Left Curb/Sidewalk Width
Item 50B: Right Curb/Sidewalk Width
Item 32: Approach Roadway Width
Item 227: Approach Travel Way Width
Item 51: Bridge Roadway Width
Item 52: Deck Width
Item 228: Deck Thickness
Item 229: Overlay Thickness
Item 33: Bridge Median
Item 34: Skew

Screen 5B
Item 35: Structure Flared
Item 10: Minimum Vertical Clearance
Item 47: Horizontal Clearance
Item 53: Minimum Vertical Clearance
Item 54A: Vertical Under Clearance Ref.
Item 54B: Vertical Under Clearance
Item 230: Vertical Clearance Signing
Item 231: Vertical Clearance Sign Legend
Item 55A: Lateral Under Clearance Ref.
Item 55B: Right Lateral Under Clearance
Item 56: Left Lateral Under Clearance
Item 232: Horizontal/Vertical Curve
Item 233A: Number of Barrels
Item 233B: Barrel Length
Item 233C: Barrel Span
Item 233D: Barrel Height
Item 233E: Depth of Fill
**Full Item Listing from BI-6 report (continued):**

**Screen 6A**
- Item 43A: Main Span Kind
- Item 43B: Main Span Type
- Item 45: Number of Main Spans
- Item 44A: Approach Span Kind
- Item 44B: Approach Span Type
- Item 46: Number of Approach Spans
- Item 234: Approach Road/Slab Type
- Item 107: Deck Structure Type
- Item 108A: Wearing Surface Type
- Item 108B: Membrane Type
- Item 108C: Deck Protection
- Item 235A: Expansion Joint Type
- Item 235B: Expansion Joint Filler/Seal
- Item 235C: Expansion Joint Movement
- Item 236: Bearing Types
- Item 237: Culvert Type

**Screen 6B**
- Item 238: Field Splice Type
- Item 239A: Bridge Rail Type
- Item 239B: Transition Rail Type
- Item 239C: Approach Rail Type
- Item 239D: End Treatment Rail Type
- Item 240A: Fracture Critical Group Type
- Item 240B: Fracture Critical Support
- Item 241A: Fracture Critical Span Type
- Item 241B: Fracture Critical Span Number
- Item 242: Fracture Critical Member
- Item 243: Fracture Critical Detail
Full Item Listing from BI-6 report (continued):

Screen 7
- Item 244A: Beg. Abut Type
- Item 244B: Beg. Abut Cap Material Type
- Item 244C: Beg. Abut Cap Structure Type
- Item 244D: Beg. Abut Foundation Type
- Item 245A: End Abut Type
- Item 245B: End Abut Cap Material Type
- Item 245C: End Abut Cap Structure Type
- Item 245D: End Abut Foundation Type
- Item 246A: Main Pier Material Primary/Secondary
- Item 246B: Main Pier Type Primary/Secondary
- Item 246C: Main Pier Cap Material Primary/Secondary
- Item 246D: Main Pier Cap Structure Primary/Secondary
- Item 246E: Main Pier Foundation Primary/Secondary
- Item 247A: Appr Pier Material Primary/Secondary
- Item 247B: Appr Pier Type Primary/Secondary
- Item 247C: Appr Pier Cap Material Primary/Secondary
- Item 247D: Appr Pier Cap Structure Primary/Secondary
- Item 247E: Appr Pier Foundation Primary/Secondary

Screen 8A
- Item 248: Special Information Indicator
- Item 64: Operating Rating
- Item 66: Inventory Rating
- Item 63: Operating Rating Method
- Item 65: Inventory Rating Method
- Item 249: Rating Specification Used
- Item 250A: Major Rating Analysis Done
- Item 250B: Minor Rating Analysis Done
- Item 251: Rating Agency
- Item 252: Rating Date
- Item 253A: Rating Published
- Item 253B: Primary Rating Status
- Item 253C: Secondary Rating Status
- Item 254A: Load Limit - M Vehicle
- Item 254B: Load Limit - 2 Axle
- Item 254C: Load Limit - 3 Axle
- Item 254D: Load Limit - Concrete Truck
- Item 254E: Load Limit - 18 Wheeler
- Item 254F: Load Limit - School Bus
- Item 254G: Load Limit - 6 Axle
- Item 31: Design Load
- Item 255: Design Method
- Item 256: Year of AASHTO Specifications
Full Item Listing from BI-6 report (continued):
Screen 8B
  Item 41: Posting Status
  Item 70: Posting Level
  Item 257A: Members Controlling Posting
  Item 257B: Damage Members
  Item 258A: Last Posting Change Reason
  Item 258B: Last Posting Change Date
  Item 259: Posting Chart Indicator
  Item 260A: Posting Signs Present
  Item 260B: Posting Signs Visible
  Item 260C: Posting Signs Legible
  Item 261: Temporary Strengthening Date
  Item 262A: Temporary Strengthened Element
  Item 262B: Type of Temporary Strengthening
  Item 263A: Controlling Member Type
  Item 263B: Controlling Member Fatigue Rel
  Item 264A: EBIT Recommendation Member Type
  Item 264B: EBIT Recommended Action
  Item 265A: Main Span Standard Draw Name
  Item 265B: Main Span Rating Screen Flag
  Item 266A: Appr Span Standard Draw Name
  Item 266B: Appr Span Rating Screen Flag

Screen 9
  Item 267: Last Date Painted
  Item 268: Paintable Surface Area
  Item 269: Paint Color
  Item 270: Type Cleaning
  Item 271A: Paint Primer Coat
  Item 271B: Paint Intermediate Coat
  Item 271C: Paint Finish Coat
  Item 271D: Paint Undercoat
  Item 272A: Primer Coat Thickness
  Item 272B: Intermediate Coat Thickness
  Item 272C: Finish Coat Thickness
  Item 272D: Undercoat Thickness
  Item 273: Paint Extent
  Item 274: Undercoat Thickness
Full Item Listing from BI-6 report (continued):
Screen 10
   Item 58: Deck Condition
   Item 59: Superstructure Condition
   Item 60: Substructure Condition
   Item 61: Channel Condition
   Item 62: Culvert Condition
   Item 275: Approach Roadway Condition
   Item 276: Total Paint Condition
   Item 277: Air Temperature
   Item 278: Expansion Joint Opening
   Item 279: Horizontal Misalignment at Joint
   Item 280: Vertical Misalignment at Joint

Screen 11
   Item 67: Structural Evaluation
   Item 68: Deck Evaluation
   Item 69: Under Clearance Evaluation
   Item 71: Waterway Evaluation
   Item 72: Approach Roadway Evaluation
   Item 36A: Bridge Rail Indicator
   Item 36B: Transitions Indicator
   Item 36C: Approach Rail Indicator
   Item 36D: Approach Rail End Indicator
   Item 113A: Scour Critical Evaluation
   Item 113B: Scour Calculation Code

Screen 12
   Item 281: HBRRP Eligibility Status
   Item 282: Special Consideration Flag
   Item 283: Special Condition Deficiency Points
   Item 284: Load Deficiency Points
   Item 285: Width Deficiency Points
   Item 286: Vertical Clearance Deficiency Points
   Item 287: Condition Deficiency Points
   Item 288: Total Deficiency Points
   Item 289A: Local Deficiency Rank
   Item 289B: Statewide Deficiency Rank
   Item N/A: Sufficiency Rating
   Item N/A: Functional Status
Full Item Listing from BI-6 report (continued):

Screen 13

Item 75A: Type of Work Proposed
Item 75B: Work Done By
Item 76: Improvement Length
Item 94: Improvement Cost
Item 95: Roadway Improvement Cost
Item 290: Incidental Cost
Item 96: Total Improvement Cost
Item 97: Year of Improvement Cost
Item 114: Future AADT
Item 115: Year of Future AADT
Item 291A: State and Non-State Cost/S.Q.M. of Deck Area
Item 291B: Culvert Cost/S.Q.M. of Top Slab
Item 291C: Approach Cost Factor Percent
Item 291D: Total Project Cost Factor Percent
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