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| CoverLogo | Oregon Department of Transportation |
| Asset Management Integration Program |
| TransInfo Signs Asset Data Integration |

P261S System Requirement Specifications

Version v1b10

Gwynn Coffman

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# Purpose of This Document

To describe the users' requirements at a level detailed enough to support the creation of sign assets with TransInfo and the design, development, configuration, data conversion, testing, and transition planning for a data exchanging process between Field Sign Maintenance data stored in an Access database on ODOT District laptop Toughbooks and the TransInfo system

‘The System Requirement Specification (SRS) precisely states the functions and capabilities that a software system must provide and the constraints that it must respect…It should describe the intended external, user-visible behaviors of the system.’

Wiegers, Karl E., Software Requirements, 1999

# Introduction to the Systems Requirement Specifications (SRS)

This section presents a brief overview of the System Requirements Specification (SRS) to help the reader understand how the document is organized and how to interpret it.

## Document Overview

This SRS contains the requirements that will be used to:

* Communicate the intended business process and related requirements in support of business implementation planning and training
* Communicate the software and technical requirements in support of software design, development, configuration, implementation, and system testing
* Provide reference to specification documents for more detailed reporting, data, interface, and conversion specifications

The document is organized based on the business process that the TransInfo and Field Sign Data Maintenance systems will support. Business processes are represented by subsystems where the system component is logically separate and can be developed by separate work groups. The subsystems must work together, but must also be self-contained enough that each project work unit (Bentley, TAD, Access DBA) can complete their own portion of the system.

## Overall Requirements strategy

Requirements are documented in the SRS and are supported by detailed specifications located in certain design deliverables.

These documents all include both specifications and design.

***Data Dictionary***

The specifications in the data dictionary will map the data in the access database to that in TI and will provide detailed data validation and domain rules.

***Data Conversion Strategy***

The conversion strategy contains specifications that show any expected conversions between the Access database and TI both on initial data load, and at the time of regular synchronization.

Unit and system testing will be done by Bentley and ODOT.

The SRS will be updated to include a trace to requirements and specifications during the design phase.

## Document Conventions

* High-level requirements are designated by "HL" followed by a unique number and are in **bold** type. HL requirements are a categorization and may not be individually measurable or testable
* Detailed requirements in this document are designated by a "D" followed by a unique number. Detailed requirements are listed under their associated high-level requirement. These requirements must be specific, measurable and testable.
* All requirement numbers are assigned sequentially, as they are discovered. There is no hierarchy implied between a high-level requirement number and its associated detail requirement numbers. In addition, the relative value of detailed requirement numbers does not imply any level of importance.
* All requirements that state the system shall "support" or "allow" certain functionality, should be assumed to mean that the functionality will be implemented at the end of the implementation.
* Requirements Status (REQ STATUS in the requirements tables) is used as follows:
  + Mandatory: Originally assigned as a mandatory requirement.
  + Desirable: Originally assigned as a desirable requirement.
  + Scope: Needs review and approval by Steering Committee due to being out of scope of original project deliverables.
  + Modified: The requirement was changed to be more detailed or to limit the scope according to what the software can support
  + Split: Detailed requirement, that with others, replaces a requirement that was not detailed enough to support implementation and testing.

## System Actors

An actor is an individual, group, entity, event or system with a certain responsibility as it pertains to the System. Each actor on these maps represents several roles (e.g. the TransInfo Data Manager actor represents administrators, users, super users, etc). Additionally, a given party may fall under multiple actors. Thus one person may act as both the Asset Data Manager and Spatial Data Manager. The key is which “hat” they are wearing when they perform the activity.

#### TransInfo Asset Data Manager

The Asset Data Manager is the primary user type within the system. This user has the responsibility to maintain and conduct research on asset data within the system. Any given user may have responsibility for only a subset of the assets, but will have authority within the system to query any asset data necessary.

#### TransInfo Spatial Data Manager/Network Editor

The TransInfo Spatial Data Manager is responsible for the management of the linework and boundaries in the system. This actor has access to additional tools and hardware including Bentley Spatial Manager and ESRI tools, as well as access to custom-built PCs.

#### GIS Data Manager (RICS and GIS)

The GIS Data Manager is responsible for managing polygon data in tools external to TransInfo.

#### TransInfo Systems Administrator

The TransInfo Systems Administrator is responsible for: 1) administration of users and user security; 2) administration of attributes and attribute domains; 3) administration of business rules built into the system; 4) Configuration of TransInfo settings; and 5) Configuration of TransInfo metadata.  
 **District Sign Maintenance Crew Person**  
The Sign Maintenance Crew Person is responsible for visiting assigned signs or installations and performing various duties: 1) add or update information about an installation, support or sign into an Access database –based application residing on an ODOT Toughbook laptop; 2) take pictures of custom signs and manage the photograph image file(s) on the Toughbook; 3) make notes about an installation or a sign if a Toughbook is not available and enter the information into a Toughbook at a later time; 4) initiate a Sync process on the Toughbook once the Toughbook is connected to the ODOT LAN (preferably at the end of any day data was entered or changed in the Access database, or when notified to perform a sync); 5) reconcile any errors or application warnings they receive from the application.  **District Coordinator**

District Coordinators receive change requests from the District’s crew(s) and communicates the requested changes to the Access DBA/Programmer.

**Access Data Base Administrator (DBA) / Programmer**The Access DBA and Programmer is responsible for: 1) submitting requests to the TransInfo Change Control Board to coordinate and schedule needed Access database and TransInfo changes.2) administering the Access database schema on the Toughbooks; 3) creating/changing the design/layout/content of the screens the crew person uses to lookup, enter or update sign and installation data into the Access database; 4) administer what fields on the crew person screens are displayed and which Require valid data on the data lookup/input/edit screens; 5) create and manage an Excel/VisualBasic-based tool that creates and administers the programmed script(s) that transfer support files to the Toughbook during the Sync; 6) create and administer the programmed script(s) that update photograph files on the District Server and the Toughbook and remove photograph files determined to no longer be associated with a sign in the Access database (orphaned photo files); 7) Coordinate the correction of any data that fails to load or is reported to be inconsistent/incorrect; 8) provide support for issues and questions from the crews related to the Toughbook or Sync process.

## Document Network Folder Location

Unless otherwise specified, documents to which this document refers are located in the following system folder during the development phase of those documents:

[\\bd0442a\tadscmmaster\RFW\_Project\Active\Transinfo\TransInfo Phase II\signs\04specifications\TO-BE\261s](file:///\\Bd0442a\tadscmmaster\RFW_Project\Transinfo\TransInfo%20Phase%20II\signs\04specifications\TO-BE\261s)

## Definitions, Acronyms, and Abbreviations

#### Asset

Assets can be continuous or point. A continuous asset is located over a section of highway (from milepoint a to milepoint b), while a point asset is located at a specific milepoint (potentially down to the .001 of a mile)

#### Attribute

An attribute is typically representative of a characteristic or descriptive data element specifically related to an asset or segment.

#### Bentley

The COTS (TransInfo) software vendor that will design and program the new Access-to-TransInfo Sync process for the TransInfo Signs project

**Central Server**A server owned by Traffic and Roadway Asset Management that is used to stage some support files that are accessed and copied to Toughbooks during the sync process’s file management steps. Additionally the Central Server is used as storage for backup files.

**Datum**

A datum is the line segment within the TransInfo system represented by the piece of highway between two nodes. Nodes occur at road intersections, county lines, and distance breaks (milepoint equations).

**District Server (Server)**A server that houses District’s Photograph files and other support files which are copied to the Toughbook during the Sync’s file updating steps.

#### Domain (see also List of Values)

A domain is a managed list of valid values for an attribute in TransInfo. This list restricts both what values can be entered via TransInfo screens and what data can be loaded into domain controlled fields.

#### Features Inventory

Depending on the context, this term can refer to either: (1) the annual inventory of specific network features and assets by crew to support the budgeting process; or (2) the system that currently tracks several types of features (assets), and records the quantity of those features (assets) that occur within a segment of road.

#### List of Values (LOV) (see also Domain)

A managed list of choices a crew person can choose from for various fields in the Toughbook Access database data lookup/entry/edit screens. The LOV enforces data quality by limiting the user to a controlled set of choices. These may come from TransInfo Domains (such as standard sign type) or a distinct listing of valid values from TransInfo data (such as valid highways).

#### LRM/LRS

A location referencing method in which a location is specified as occurring on a uniquely identified linear feature at a set distance and direction from another point with a known linear measure. (FHWA Linear Referencing Practitioners Handbook) ODOT’s standard Linear Reference Method is the Road ID/Milepoint, which makes use of an LRM key and applicable milepoint(s). There is only one active LRM in TransInfo and this is the state Highway mile point system.

#### Network/Linework

These terms are used synonymously to refer to the group of datum that make up the spatial representation of the state highway. (Centerline line work.).

#### ODBC

ODBC (Open Data Base Connectivity) is a standard for relational databases, which comply with an ODBC specification and protocol level to ensure the portability of data.

#### Reporting Region (or Region)

A reporting region represents the non-geographical breakdown of the state into regions for crew reporting. This divide is driven by the reporting hierarchy of section crews to districts and districts to reporting region. (A crew can reside in one Region, but report to another.) For the purposes of TransInfo, if documentation specifies only region it is referring to the reporting region.

#### Section

A piece of the highway that is covered by a continuous asset (e.g. an inventory section, a count section, a construction plan section)

**Sync**

A process initiated by a District field crew person after connecting a Toughbook to an ODOT LAN connection. The process executes a program that will do the following;   
a) updates TransInfo with data that has been updated in the Toughbook’s Access database since the last Sync;  
b) update data in the Toughbook Access database from TransInfo data that was updated in TransInfo since the last Sync;  
c) update the District Server with new and updated photographs from the Toughbook;  
d) load updated support files such as DVL files, MUTCD, and SOI files onto the Toughbook which are used by the crews.

#### Toughbook A specific brand of laptop in use by the Sign crews. Toughbook’s are designed for rugged mobile use (See Appendix A for project Toughbook specifications.)

# Project History

ODOT staff and program managers have long had a need for a statewide ODOT Signs database. This need is currently being addressed via a combination of approximately 63 Access databases plus a data warehouse project for quality assurance and reporting. The Sign Asset Management team, made up of region and headquarters staff, unanimously opted for a path to TransInfo, a corporate platform, as opposed to a Region/District databases in SQL. They have steadfastly maintained their efforts to be ready for such a project for at least the past five years. Therefore, the object of this project is to have the Signs data integrated into TransInfo.

Sign data is currently collected and stored in independent Access databases for each District and it can be difficult to get a statewide view of sign data. There is a need to have Field Sign data updates flow into the existing TransInfo enterprise asset management system.

This project’s initiative is to have sign data flow back and forth between Toughbooks and the TransInfo system so sign data will be managed as an asset while preserving maintenance District Toughbook maintenance workflow maintenance processes. The field Toughbook databases will remain in Access but will be synchronized with the centralized Sign information in TransInfo.

# Project Context

**System Name/Acronym:**

TransInfo Sign Asset Data Integration (TSADI)

**System Owner Information:**

Luci Moore, Maintenance/Operations

# System Context

The TransInfo system is the corporate data source for much of the agency's highway network and asset data. TransInfo houses all of the state network data and much of the asset data (including detailed attribution where known, and summary counts where detail is not available).

This project will incorporate sign field maintenance data into TransInfo, thereby allowing signs data to be used for agency data management and reporting, such as 1R reporting, and annual field inventory budget reporting.

Additionally, the sign maintenance crew’s Toughbook Access-based sign data maintenance process will remain as unchanged as possible as staff are already familiar with the Access database and data management screens’ functionality.



### Information Source

The following descriptions are a basic explanation of the purpose and source of the collected sign data and related files.

#### Sign Maintenance (District sign crews)

Sign crews manage sign data for the signs in their assigned District. This may include signs where the sign is physically located in an adjacent District. The sign crew updates data within the field access database whenever work is done to a sign. Data is stored regarding the location of the sign (the installation), the characteristics of the sign, the characteristics of the support, and the history of work done at an Installation.

There are two types of signs in the database:   
a) Standard signs (such as speed limit signs, caution signs etc.);   
b) Custom signs (e.g. Sylvia’s Restaurant .5 Mi).

#### Central Sign and Highway Network Data Maintenance

Sign data will typically be managed by the crews on the Toughbook. However, TransInfo will provide the ability to add, retire, and update sign asset data.

RICS will modify highway data in TransInfo that will impact sign location details.

Features Inventory will modify EA and crew data that will change the group of signs data a district is responsible for.

#### Straightline Charts, DVL files, Photographs

StraightLine Chart files and DVL files are used as reference material by the maintenance personnel while in the field. They are copied to the Toughbook during the sync tool’s file sync steps. These files are District-specific and will continue to be copied by the Access DBA/ Programmer to the District Servers.   
  
Custom sign Photograph files are also District specific. Photos are predominantly created on the Toughbook and saved during the crew person’s sign maintenance work and Access database updates. The photograph files receive their file name using a third-party product called AccessImagine ActiveX. The files will continue to be assigned a file name the AccessImagine tool using data from the installation and the custom sign asset. The file’s name will continue to be stored in the Access database, and will continue to be managed by the Sync tool.   
  
Custom sign photograph files are occasionally created on the District Server and then are either copied to the Toughbook by the sync process, or are replaced on the District Server with a file from the Toughbook, based on programmed rules within the Sync tool.

### System Maintenance

The following descriptions are a basic explanation of how requested changes will be managed in the new system.

#### District Coordinators

District Coordinators will continue to receive Access change or enhancement requests from the District’s crew(s) and communicate requested changes to the Access DBA/Programmer, who will in turn work with the TransInfo Change Control Board to coordinate changes. Some examples of requests are:   
a) changes to the screen forms which the crews use to add and update data in the Toughbook Access database;   
b) updates to the dropdown list of value choices that exist for some database fields in the screen forms, such as types of Standard signs.

#### Access Data Base Administrator and Programming

The Access Data Base Administrator and Programmer (Access DBA / Programmer) will continue to be responsible for:

* the file naming process and sync process for photographs
* the sync process for support files that are exchanged between the Toughbook and Servers
* the screen forms crews use to add /delete /update data in the Access database
* programmed data enforcement rules in Access on the data entered by a crew person
* maintaining the existing VisualBasic-based query / screen report writer tool for data mining in the Toughbook Access database
* coordinating with the TransInfo Change Control Board to get additional values added to a list of values or to get changes made to the synchronization process
* working with the TAD DBA and TransInfo support to troubleshoot any issues or changes with regard to the synchronization process between the Toughbook Access database and TransInfo.
* The Access DBA/Programmer will manage some LOV’s within TransInfo.???validate???
* Coordinate with the TransInfo admin and/or TransInfo Change Control Board *before* any changes to the Access database, related data sync or list of values/domains are done. ???validate???

# Subsystem Overview

The System is broken down into logical sub-systems to help the organization of requirements and process descriptions. This organization represents categories of work expected to facilitate field sign maintenance, synchronization, and integration into TransInfo.

### Collecting and Storing Sign Maintenance Data on Toughbook

*Purpose:*

To enter, update or delete sign maintenance data in an Access database located on a Toughbook laptop using customized Access screen forms.

*Functions:*

6.2.1 Conduct a maintenance visit to an Installation(s)/sign(s) and track work done in the Toughbook’s Access database.

6.2.2 Add, update or delete (remove) installation or sign information in the Toughbook’s access database (either during visit, or after visit if Toughbook is not with crew).

6.2.3 Initiate the sync process to have updated Access database and custom sign photograph files on Toughbook update TransInfo.

Initiate the sync process to update support files?

6.2.4 Allow the Toughbook to receive new or updated support files.

6.2.5 Use an existing Visual Basic-based query / screen report writer tool for data mining in the Toughbook Access database.

### Synchronization Process – Support files

*Purpose:*

To replace the support files on the Toughbook with those on the central server. All Toughbooks receive the same support files and synchronization is one direction – from the central server to the Toughbook.

*Functions:*

6.2.1 Copy District-specific files that have been placed directly on the District server from the District Server to the Toughbook, including the following files;   
a) StraightLine chart files;   
b) DVL files;   
c) Photograph files

6.2.2 Copy non-District specific support files from the Sign Asset team’s managed server that Jason manages to the Toughbook, including the following files;  
a) Sign Policy;   
b) MULTCD

### Synchronization Process – Custom Sign Photograph Files

*Purpose:*

To add or replace the photograph files on the District server with new photograph files from the Toughbook. The synchronization is two way. It will:  
a) add new custom sign photograph files to the District server.  
b) replace updated photograph files on the server with those on the Toughbook.   
c) Photograph files on the District server must continue to be backed up on a regular basis with a process owned and managed by the Access DBA/Programmer.

*Functions:*

6.2.1 Use the AccessImagine tool to capture the Toughbook’s Camera image file and name the file according to the AccessImagine tool’s concatenating of the InstallationID and the Custom Sign Legend ID. The file name is stored in the sign’s data.

6.2.3 Copy new Photograph files from the Toughbook to the District Server, copy new photograph files that are on the server to the Toughbook, and delete any Toughbook photograph file that is orphaned based on filename where there is no longer a sign in the database that corresponds with the photograph filename’s InstallationID plus Custom LegendID.

### Synchronization Process – Sign Asset Data

*Purpose:*

To synchronize changes to sign related asset data, associated list of values (domains) and highway data between a field access database on a Toughbook and the central TransInfo Oracle database.

*Functions:*

6.4.1 Identify changed asset records and write the new/updated information to TransInfo.

6.4.2 Identify any sign asset-related data changes in TransInfo and write the new/updated information to TransInfo

6.4.3 Resolve a duplicate Installation ID during data loading into TransInfo that resulted because the same Installation ID was created in two or more Toughbooks owned by the same District prior to those Toughbooks being synced. Duplicate Installation ID’s can on rare occasions occur in the as-is Access application. They are currently resolved by the Sync tool’s Access sync steps that are being replaced within this project.???

6.4.4 ???Reconcile primary and foreign keys in the Access database if a duplicate Installation ID is encountered during sync.???

6.4.5 Log the Installation ID correction made in TransInfo so the Access DBA/Programmer can resolve the file naming of any affected custom sign photograph files.

6.4.6 ??? Reconcile conflicting changes???

6.4.7 ??? Identify changed list of values (domains)

6.4.8 ???What do we do with records that use a retired domain???

6.4.9 Identify highway/network changes

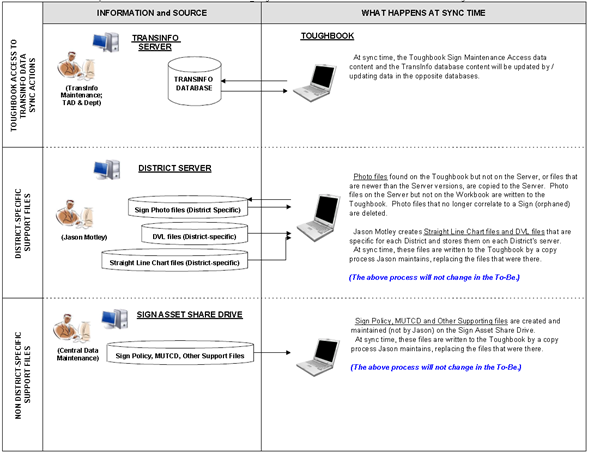
6.4.10 ???What do we do with records located on removed/changed highway???

6.4.11 Load synchronized data onto the Toughbook

6.4.12 ???produce an exception report???

6.4.13 ???Other???

Steps for correcting errors?

**Figure 6.3a**

### Make Sign Data Available for External Purposes

***Purpose:***

Make sign data available for ad-hoc reporting and for the 1R process..

*Functions:*

6.5.1 Use TransInfo data to support Traffic and Roadway Asset Management’s need to create statewide, single District or multiple District-specific ad-hoc reports.

6.5.2 Make data available to support 1R needs. ??? reference/more detail

# System Assumptions and Dependencies

**Assumptions and Dependencies**

1. The existing TransInfo Production system will be used by this project.
2. The Production system is backed up daily to ensure recoverability of data for Field Sign Maintenance use.
3. A test system, including a Toughbook, will be available for Bentley to use for testing via network connection.

# System and Data Requirements

See “Requirements Spreadsheet.xls” (Appendix xxx)

# Scope Limitations

This section contains a set of non-requirements, representing topics discussed and determined either undesirable or unnecessary for this release of the software. These are included only as a means of capturing decisions made that limit the scope of the implementation, they do not need to be tested.

|  |  |
| --- | --- |
| **Related Function** | **Scope limitation** |
| AccessImagine ActiveX | No effort to replace this tool will occur. If a suitable replacement is found, it can be pursued independently by the Access DBA/ Programmer. |
| Crew/District person entering field sign maintenance directly into TransInfo | Sign maintenance data will only be loaded into TransInfo via the new Sync process being created by Bentley.  No provisions will be made for a field or District person to enter sign maintenance data directly into TransInfo using a TransInfo GUI interface. |
| Extract Signs data from TransInfo into the Data Warehouse for Reporting . | This will tentatively be addressed in a Warehouse project in early 2015. |
| Transferring photograph files to the TransInfo database. | Photograph files will not be loaded into TransInfo or some other server. District Sign photograph files will continue to be stored on District servers and managed with minimal / no changes to existing District procedures. |

# Open Issues

1. ???

# Retired, Deferred and Replaced Requirements

The following requirements have been retired, deferred or replaced. A retired requirement is no longer desirable for current or future implementation. A deferred requirement is no longer in scope of this effort, but will be considered in future phases of TransInfo. A replaced requirement has been altered significantly from the original wording or has been into multiple, more detailed requirements.

| Req # | Requirement | Req Status | Design Comments |
| --- | --- | --- | --- |
|  |  |  |  |

# Appendix A – Requirement Change Log

The following change log represents all of the changes to the requirements set in this document. User acceptance testing is based on the requirements defined in this document as by the following change log.

| **SRS Section** | **Req #** | **Current Requirement Text** | **Requested Change** | **Change Request Status** | **Changed Requirement Text** |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |

# Appendix B – Toughbook Configuration

**Panasonic Toughbook Model CF-19**

Processor: Intel® Core™ i5-3320M CPU @ 2.60Ghz

Installed Memory (RAM): 4.00GB

Hard Drive: 500GB

System Type: 64-bit Operating System

Operating System: Windows 7

Office/Access: Office 2010

# Appendix C – Detail Requirements