Submitted to:

Klamath County, Oregon

Klamath
County

Klamath Basin Watershed Information Portal – Decision Support System

Draft Functional/Technical Requirements Document

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1.0 Introduction

1.1 Document Organization

This Functional and Technical Requirements Document (i.e., Requirements Document) contains nine sections:

- 1.0 Introduction – provides document purpose and version information.
- 2.0 Application Overview – provides a general description of the project background and scope of the application being developed.
- 3.0 Requirements Gathering Procedures – describes the activities conducted to collect requirements for the application.
- 4.0 Business Requirements – describes the business requirements of the application and high-level use cases for the primary users.
- 5.0 Functional Application Requirements – describes the detailed level requirements, including detailed use cases for each user interaction.
- 6.0 Technical Environment – describes the hardware, software, and network requirements.
- 7.0 Data Requirements – describes the data sources used for the application and the data process flow.
- 8.0 Deployment Requirements – describes the application development and deployment requirements.

1.2 Document Purpose

The Requirements Document reflects an unambiguous, complete, maintainable, and verifiable document that is delivered to Klamath County. The purpose of the Requirements Document is to synthesize the requirements phase into a comprehensive document. More specifically, it documents the business analysis, infrastructure definition, and functional specifications delineated in the requirements phase. The objectives of the Requirements Document are to:

- **Specify external behavior only** – The requirements should specify only the external behavior of a system without implying a particular implementation, unless specific guidelines or standards are identified by Klamath County for the implementation.
- **Specify constraints on the implementation** – In addition to defining correct program behavior, the requirements should describe the constraints placed on the implementation, especially the details of the hardware interface.
- **Be easy to change** – Because requirements change, the Requirements Documentation should be easy to modify.

- **Serve as a reference tool** – The primary function of the Requirements Document is to answer specific questions quickly, rather than to explain in general what the application will do. Precision and conciseness are valued. Indispensable reference aids include a detailed table of contents, process diagrams, and use cases.

- **Consider maintenance activities over the life of the application** – The long-term maintenance of the application will be managed by Klamath County staff. Currently, no future maintenance agreement exists between Houston Engineering and Klamath County.

1.3 Version Information

Version Num.	Edit Date	Edited By	Comments
0.1	8/07/2009	Mark Deutschman, Brian Fischer, Dan Keppen	Initial draft for Klamath County review
0.2	8/10/2009	Mark Deutschman, Brian Fischer, Dan Keppen	Final draft for Klamath County approval incorporating County comments

2.0 Application Overview

Klamath County retained Houston Engineering in association with Dan Keppen, Associates (i.e., the Team) to develop an interactive Web mapping application that provides access to water and resource information for the Klamath Basin. The Klamath Basin is located in southern Oregon and northern California. Challenging water, agricultural and natural resource management issues are characteristic of the Klamath Basin.

The Klamath County Board of Commissioners retained the Team to develop a concept and implement a prototype Watershed Information Portal (WIP) and Decision Support System (DSS) for the basin and Klamath County, which would be available via the internet. The purpose of the DSS is to provide public access to commonly requested geospatial data (i.e., data related to location) developed and maintained by various entities which is commonly requested by the public, for the basin including Klamath County. An additional purpose for the DSS is to serve as an initial platform for information, data and resources specific to water and natural resources within the Klamath Basin.

The intent of the County Board of Commissioners is to develop a prototype, demonstration DSS which: 1) illustrates the DSS concept of providing common and consistent data and information to the public; 2) serves as the foundation for a more advanced DSS capable of providing common and consistent data to facilitate decision-making and understanding the relationship between the management of water in the Klamath basin and the social, natural resources, and economic implications; and 3) to make available common (local) data specific to the County.

Development of the DSS is expected to occur in phases. The initial phase is focused on completing this Functional Requirements Document and developing a prototype interactive DSS application for water and resource geospatial data within Klamath County and select information within the Klamath Basin.

Although this project stems from the initial efforts of the County, the County Board of Commissioners anticipates participation by a broad range of Stakeholders with the intent of broad participation and potentially. Six phases are anticipated with the County providing funding for the first two phases:

- Phase 1 - DSS Needs Assessment/Design Document
- Phase 2 – Initial Development and Deployment of the Klamath Basin DSS
- Phase 3 - Integration of Hydrologic Forecasting and Water Balance Tools
- Phase 4 - Integration of Irrigation District Features, Structures and Automated Reporting
- Phase 5 - Integration of Ecologic, Social and Economic Data and Metrics for Decision Making
- Phase 6 – Ongoing Maintenance

The residents of Klamath County and Klamath Basin, government officials, water managers, and resource managers, will be the primary users of the Web mapping application. Because the residents generally have little experience with GIS applications, the application is intended to be user-friendly, minimize tools and Website "clutter", and present the data in a concise manner that is cartographically appealing. The most common GIS applications used by the general

public are Google Maps, MapQuest, and Bing Maps. Because of this, the Klamath Basin Information Portal is expected to have a similar look and feel to these popular Web mapping sites. The site will use some of the same tools and techniques found in these Web mapping applications, including map caching, fixed zoom in/out slider bar, and a full-page map that minimizes map legends and toolbars. The application will be built using the most appropriate technology and will be hosted initially by Houston Engineering. Ideally, the maintenance and hosting will ultimately be transferred to a non-profit entity, provided the costs are equal to or less than can be achieved within the private sector.

3.0 Requirements Gathering

3.1 Procedures

The purpose of the Requirements Phase is to gather customer requirements and synthesize the results into the Requirements Document. The Requirements Gathering phase focuses on three procedures necessary to collect the functional and technical requirements of the Klamath Basin WIP-DSS. The three processes are business analysis, infrastructure design, and functional specifications.

- **The business analysis process** reviews high-level use cases, identifies desired business functionality, and develops high-level workflow descriptions and diagrams.

- **The infrastructure definition** reviews the hardware, software, and network environment requirements. The hardware requirements will be specified for development, test, stage, and production environments. The software requirements definition will include third-party software and development tools. The network environment requirements review will detail the necessary bandwidth, physical access, and authentication requirements.

- **The functional specification** portion defines the requirements of the use cases, data, functionality, user interfaces, cyclical functions, and security. It develops use case functionality with activity and sequence diagrams. It details data requirements, including sources, updates, relationships, and maintenance issues. Post- and pre-conditions, as well as dependencies of functionality, are addressed; and user interface mockups of functionality are developed. The functional specification process also reviews necessary cyclical functions and identifies the data affected. Finally, it addresses security issues, including roles and associated privileges and permission assignment and modification.

The gathering procedures were implemented through on-site meetings with County staff and potential stakeholders, through the use of questionnaires, on-line meetings, and through telephone calls. **Table 1** lists the events and participants involved in the meetings and contacts.

Table 1: County Participants in Requirements Gathering

Attendee	Organization	County Staff 11/20/08	Kick-off 12/2-2008 through 12/4/2008	Advisory Committee Conf. Call 1/26/2009	County Commissioner's Briefing 6/11/2009
Mark Deutschman	Houston Engineering, Inc.	√	√	√	
Brian Fischer	Houston Engineering, Inc.	√	√	√	√
Dan Keppen	Dan Keppen and Associates, Inc	√	√	√	√

Attendee	Organization	County Staff 11/20/08	Kick-off 12/2-2008 through 12/4/2008	Advisory Committee Conf. Call 1/26/2009	County Commissioner's Briefing 6/11/2009
Lani Hickey	Klamath County (Public Works)	√	√	√	√
Randy Paul	Klamath County (Information Tech.)	√	√	√	√
Bruce Fichtman	Klamath County (Information Tech.)	√	√	√	√
Sidney Mitchell	Klamath County (Planning)	√	√		
Les Wilson	Klamath County (Planning)	√	√		
Ruth Wilcox	Klamath County (Planning)	√	√		
Vern Church	Klamath County (Public Works)	√	√		
Stan Strick	Klamath County (Public Works)	√	√		√
Mike Marcus	Klamath County (Surveyor)	√	√		
Willie Riggs	Extension Service	√	√	√	
Board of Commissioners	Klamath County		√		√

Stakeholder meetings were also conducted with various groups beginning on December 2, 2008 and ending December 4, 2008. The list of stakeholders invited and those that participated are shown in **Table 2**.

Table 2: Non-County Stakeholders Participating in Meetings

Organization	Invited	Participated
Fish and Wildlife Service (Refuge and Ecosystem Restoration Office)	√	√
Klamath Water Users Association	√	Conflict
Klamath Irrigation District	√	Conflict

Organization	Invited	Participated
Klamath Drainage District	√	√
Klamath Water and Power Authority	√	Conflict
Bureau of Reclamation	√	√
Oregon State University Extension	√	Conflict
Klamath Watershed Partnership	√	√
Klamath Tribes	√	Conflict
Klamath Soil and Water Conservation District	√	√
Klamath Power and Water Authority	√	√
Klamath Water Users Association	√	√
The Nature Conservancy	√	√
Natural Resource Conservation Service	√	√
Oregon Department of Fish and Wildlife	√	√
Oregon Department of Water Resources (Water Master Office)	√	√
Oregon Department of Fish and Wildlife	√	√
U.S. Forest Service (Fremont-Winema)	√	√
Bureau of Land Management	√	√

Those invited to the initial stakeholder meetings were requested to complete a questionnaire. The results of the questionnaire are shown in **Appendix A**.

3.2 Requirements Gathering Agenda

The results of the business analysis and technical requirements provided the content of this Requirements Document. The following summarizes the agenda and topics covered in the initial stakeholder meetings.

Project Concept and Business Analysis Process 11/20/08

- General project concept / portal purpose
- Application users and their roles and expectations
- User content and capabilities
- Graphical design
- Software / hardware options

Business Analysis and Infrastructure Definition (Functional Requirements) 12/2/2008 through 12/4/2008

- General project concept / portal purpose
- Application users and their roles and expectations
- User content and capabilities
- Graphical design
- Software / hardware options
- Example portal - main page content and navigation
- Map content browsing methodology
- Map content tools ad querying
- High-level use cases
- Base data layers
- Reporting and exporting capabilities
- Data update procedures
- Technical requirements issues

Infrastructure Definition & Functional Specifications (Technical Requirements) 1/26/09

- Software / hardware options
- Server operating system
- Hosting requirements
- Testing and deployment
- Data update procedures

4.0 Business Requirements

4.1 Users and Roles

The Klamath Basin WIP-DSS is open to the general public. The primary users of the application will be the residents of the Klamath Basin, local government staff and officials, and state and federal agency staff. The entire list of functionality will be accessible to any/all users. Users will be classified as primary and secondary.

- **Primary** – the most basic level of user designed to meet the needs of public use of the WIP-DSS. It includes basic map browsing and querying abilities. It is directed toward the residents of the Klamath Basin. It is the most basic use of the application allowing users a simplified, directed, and streamlined experience intended to be easy to use and to retrieve basic water resources, landscape-scale resource, ecological and restoration information.

- **Secondary** – an advanced level of user designed to meet the needs of local government officials and staff, non-profit staff and state and federal agency staff. In addition to the features available to the primary user, the application allows the user to access and obtain resource information useful in making resource management decisions. The information may include Irrigation District infrastructure, hydrologic forecast, water quantity, and resource management criteria information.

4.2 High-Level Use Cases

High-level use cases have been provided as a business workflow guideline for the Klamath Basin WIP-DSS. By providing content and intention, the use cases frame the logic used to guide the application design and simulate its use. A use case presents the purpose and specific workflow of the user. Many use cases are presented, for the purposes of prioritization and implementation as funding becomes available. This phase of the project is focused on implementing Use Case A.

Use Case A: Basin Resident and Advanced User (primary and secondary role) – General Use

The purpose of this use case is to demonstrate the use of the internet using a single point of access or URL (i.e., a watershed portal), Open Geographic Information System (GIS) Consortium specifications, and other currently available technologies, to obtain watershed and water related information for the Klamath Basin, within southern Oregon and Northern California. Watershed and water related data accessed through the watershed portal presently consists of groups of distributed, non-integrated geo-spatial databases pertaining to watershed and watershed information, which is maintained by a variety of local, state and federal agencies and non-governmental organizations.

The types of watershed and water related information included within the watershed portal, are those features of the natural landscape and man-made features which affect the amount, distribution, and rate of movement of surface water and ground water within the Klamath Basin. Watershed and landscape features to be accesses through the watershed portal, include hydrologic boundaries and the direction of surface water flow from the upper portion of the basin, downstream to the confluence with the Pacific Ocean. Information about the locations of groundwater seeps, streams, rivers, lakes, reservoirs and wetlands will be shown using the National Hydrography Database. Surface water feature information accessible is expected to include the type of stream or river (e.g., perennial or intermittent), the type of wetland (based on the National Wetland Inventory) and the type of lake or reservoir. Aquifer boundary and type information will also be accessible, based primarily on *Ground-water Hydrology of the Upper Klamath Basin, Oregon and California* (USGS Scientific Investigations Report 2007-5050). Groundwater information is expected to primarily consist of aquifer boundaries and select aquifer characteristics.

One feature of the portal, through the use of a interactive map interface, will be the ability to understand by clicking on a map, where water originates and terminates within the Klamath Basin. By clicking on the map (using the National Hydrography Database-Plus) the user will be able to visually see those upstream areas contributing surface runoff to the location and the downstream flow path.

The watershed portal will also provide access to basic man-made and landscape scale features, which affect water movement. The landscape scale features are expected to include basic land use information and cover types (e.g., forested versus cropland), terrain and slope, and soils, and land ownership (e.g., location of National Wildlife Refuges, National Forest Boundary). Man-made features are expected to include roads, dams, points of diversion, canals, irrigation district boundaries and related basic features of the Klamath Project.

Some basic ecological data which is related to the amount, distribution, and rate of movement of surface water and ground water will be accessible via the watershed portal. The primary information will be the approximate locations of species and habitat under special regulatory protection by the States or the Federal Government.

The locations and the actual information where Hydrometeorlogical data is gathered will be included in the watershed portal. This information will include the locations of streamflow measurements, the elevations and rate of flow leaving lakes and reservoirs, precipitation gages, snow depth monitoring and climate related measurements like wind speed, wind direction and evaporative loss rates. Information from surface water flow measurements will be summarized in a simple to read table, showing basic water balance information for the Klamath Basin, including the amount of precipitation which has occurred during the last 30-days, the amount of runoff measured, and the change in volume in lakes and reservoirs.

The watershed portal will include a demonstration of the relationship between measured runoff rates and forecasts of water availability based on the water supply forecasts completed by the National Resources and the U.S. Geological Survey. Water supply forecast information available through the watershed portal will be compared wither graphically or in tabular format to the actual amount of water measured at forecast locations.

The ability to implement the use case is based upon several assumptions. The primary assumptions include:

- The databases /information necessary are readily available. Based upon an initial review, most of the data are available. The critical issue will be the ease of access to the data and manipulating / converting the data into a suitable format (e.g., the Water Forecasts).
- Availability of data in electronic format. For example, to our knowledge, aquifer boundaries are currently not in an electronic format.
- Areas upstream and downstream may be shown through the use of graphical methods and have limited interactive capability (depending upon functionality of the National Hydrography Database – plus).
- Ecological data would be generalized and not show exact locations.
- Some data may be available only for a portion of the basin, but will be included to show the general concept.

Use Case B: Advanced User (secondary role) – Restoration Analysis & Buffering

A resource manager working for a non-profit organization needs basic information about conditions along a stream within the upper portion of the Klamath Basin, to evaluate the initial feasibility of implementing restoration measures / Best Management Practices / conservation measures. The information needed by the resource manager includes the location (i.e., Township, Range, Section, Quarter; and latitude and longitude) for the potential restoration measure, an indication of the stream condition interpreted from aerial imagery, and tools to derive basic information including land use along the stream, ownership information, the length of the stream channel, and a preliminary determination of the area involved. The locations of previous nearby restoration measures and the type of measures are also needed, as well as information about those restoration measures. This information about the restoration measure may include the sponsoring agency / organization sponsor the restoration measure, whether monitoring is associated with the measure, the funding entity and cost, and the anticipated benefits.

The user will go onto the Klamath Basin Information Portal Website and click the "interactive maps" link. The web mapping application will then open up to the view of the basin. The user can then search the map by entering a stream / river name or Township, Range and Section. The application returns the match for the stream / river name or Township, Range and Section. The user clicks on the match and the map zooms to the location within the basin. The user then clicks upon the aerial imagery as a background layer and uses the buffer, length measurement, and area measurement tools to obtain the basic information. The user can then print a custom map showing the location of interest and nearby previously completed restoration sites. The user can place a point feature on the map and record basic information about the type of restoration measure.

Use Case C: Basin Resident and Advanced User (primary and secondary role) – Taxlot Ownership

A resident wants to search taxlot information for lands located within the Klamath Basin. The citizen will go onto the Klamath Basin Information Portal Website and click the "interactive maps" link. The web mapping application will then open up to the view of the entire basin. The resident will then enter the taxlot owner name and the county name. The application returns the match for owner name and the county name. The user clicks on the map match icon and the map zooms to the location within the basin. The user then clicks upon the taxlot and the owner name and address is displayed on the screen. The user can then print a custom map showing the taxlot of interest and the name and address of the owner.

Use Case D: Advanced User (secondary role) – Irrigation District Infrastructure and Water Bank Potential

A staff member for an Irrigation District or Reclamation is interested in obtaining basic information about the location of the infrastructure within the boundary of the District. The basic information of interest includes the locations of the diversion structures sending water into the District, the canals and pipes which transport the water to the turnouts which deliver water to the fields, the location of the fields that are irrigated, and the drains that return the water to the river. The Manager wishes to obtain information about who owns or operates a specific field being irrigated, the type of crop planted or whether the field is fallowed, the irrigation method and the area irrigated by crop type.

The user obtains information about the basic dimensions of the fields and soils types. The information can serve as the basis for determining the amount of water which potentially can be banked within a District.) Basic information is also desired about the type of canal or pipe used to transport the water and the year installed and last maintained as well as turnout and drain condition and characteristics. The user also wished to obtain basic information about where groundwater pumping occurs, and the rate of pumping. The intent is to understand how fallowing land and the use of groundwater may offset the need for "project" water.

The user will go onto the Klamath Basin Information Portal Website and click the "field unit report" link. The user can then enter the field unit identification number, the owner name or the operator name into the data entry field. Upon pressing the "search" key the tool retrieves the field unit identification number, the owner name or the operator name entered by the user. The user clicks on the map match icon and the map zooms to the field unit within the irrigation district. The user then clicks upon the field unit and the owner name and basic information is displayed on the screen. The user is also able to access summary of wells, their pumping rate and the volume pumped. The user can then print a custom map showing the field unit of interest, the name and address of the owner, and information about field unit

Use Case E: Advanced User (secondary role) – Water Routing

A County staff person is responsible for reviewing a proposed residential development. The permit applicant has submitted hydrology and hydraulic models as a component of the permit application. The hydrology model includes information used to estimate the peak rate of runoff under current and proposed conditions. Basic information is needed to evaluate the reasonableness of input parameters and assumptions implicit within the hydrology model. These parameters include the types of soils including the hydrologic soils group, the infiltration rate,

the amount of impervious surface, the flow path and direction, the time of concentration, the subwatershed boundary and the flow direction and accumulation downstream.

The user will go the Klamath Basin Information Portal Website. (Note: this use case envisions an application similar to http://gisdmnspl.cr.usgs.gov/watershed/start_page.htm). The user clicks on the "start application" button to launch the application. The user then clicks on a static map, which shows the major basins in the Klamath Basin and the subwatershed within the major basin. The user clicks on a specific basin and the display shows all upstream contributing subwatersheds, as well as routine data used as input to hydrologic models.

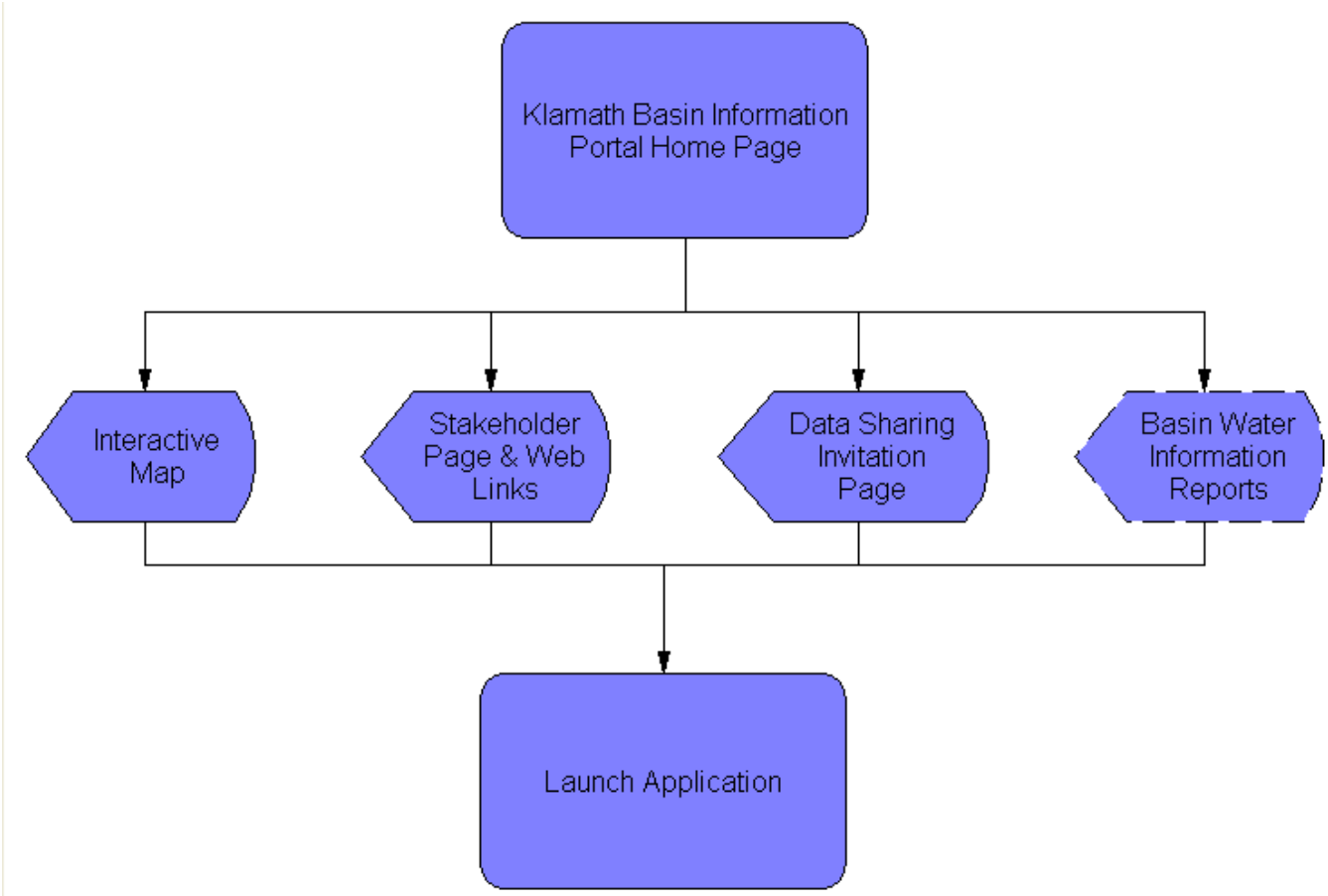
Use Case F: Advanced User (secondary role) – Ecological Resources Analysis

Information is needed by a resource manager to better understand the ecological implication of various water management alternatives, which affect flows within river systems of the Klamath Basin. The resource manager is specifically interested in the physical locations of important ecological resources and specific criteria which may be used to assess whether flow changes are expected to be beneficial, of little concern or potentially adverse to the resource. Specific ecological resources of interest include the locations of important fish habitats for a variety of life history stages for keystone species, the location and abundance of riparian wetlands, the extent and vigor of riparian areas, channel geomorphic condition, and the presence of threatened and endangered species.

The user will go the Klamath Basin Information Portal Website. The user clicks on the "start application" button to launch the application. The user then clicks on the layer tab portion of the interactive map, to show the available resource data layers. The user then clicks on a box next to the resource of interest, to display the data layers on the map. The user can also enter a Township, Range and Section, to zoom to a specific location within the Klamath Basin. By selecting the "identify" tool the user can click on the feature of interest, and obtain information about the feature and the various ecologic criteria believed necessary to sustain ecological integrity for the feature.

4.3 High-Level Workflow

The diagram below depicts the workflow diagram developed in the requirements gathering workshop.



5.0 Functional Application Requirements

5.1 Functional Requirements Overview

The following sections provide detailed specifications on how the WIP-DSS Application will function.

5.2 WIP-DSS Interactive Mapping Application

The following table outlines the desired functionality for the interactive map of the WIP-DSS.

Function	Description	User
Pan	Tool changes the map extent of the view without changing the map scale.	All
Slider Bar Zoom	Tool allows the user to zoom in or out to predefined scales using a sliding bar and/or plus (+) and minus (-) buttons.	All
Identify	Tool allows the user to click features and retrieve feature-specific information.	All
Print	Tool allows the user to print an 8.5 by 11 inch map of the current view on the user's printer, in Klamath County's designated layout. When user hits the Print button, window will pop up and the map document will appear, and the user can then print.	All
Measure Length	Tool allows the user to measure the distance in feet or miles between two or multiple points; distance will be shown in segments and total length.	All
Measure Area	Tool allows the user to measure areas on the map.	All
Mark-ups	Tool allows the user to mark-up/redline the map. Mark-ups are graphics that can be printed. Mark-up capability includes points, lines and polygons.	All
Feature Layer Toggle	Tool allows the user to turn the feature layer on or off.	All
Legend	A legend will display the names and symbology.	All
Scale Bar	A scale bar will show the current scale of the map in miles.	All

Function	Description	User
Search By Address	Tool allows the user to enter an address location and geocode it using the Google Maps API.	All
Search By Water Feature Name	Tool allows the user to search for a water feature (river, reservoir, lake) using the Streams and Lakes layer. The searched water feature is selected on the map. The map re-centers and zooms to the selected feature. Feature attributes appear in a new window.	All
Search By Hydromet Type	Tool allows the user to search for the type of hydromet feature (river flow gage, precipitation gage, etc) using the hydromet layers. The searched feature is selected on the map. The map re-centers nd zooms to the selected feature. Feature attributes appear in a new window.	All
Jump to Feature	Tool consists of a pull down menu which allows the user to jump to select geographic features (i.e., County, major watershed or national forest name).	All
Go to Bing Maps	Tool allows you to open your point of interest in Bing Maps	All
Go to Google Earth	Tool allows you to open your point of interest in Google Earth	All

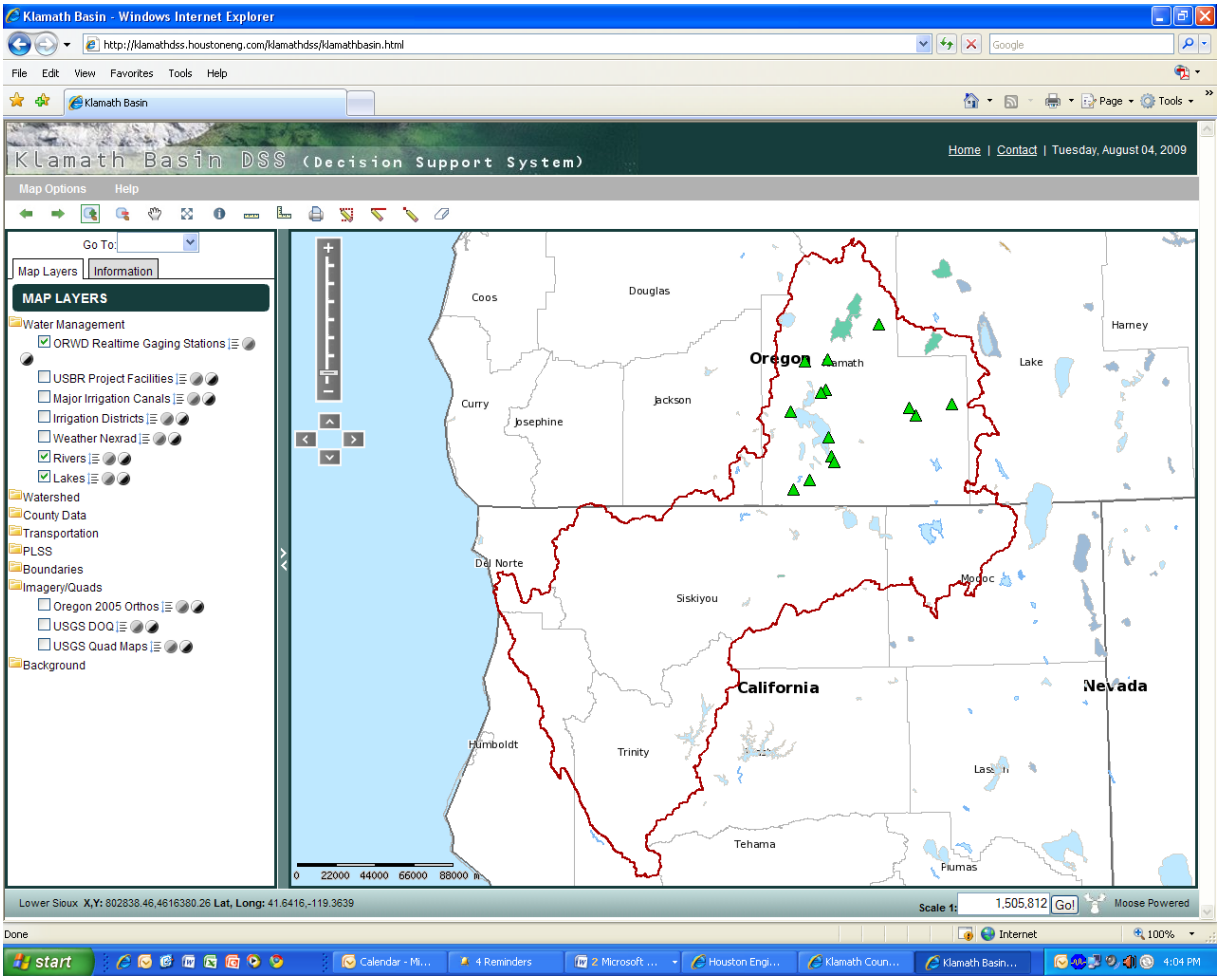
5.3 Documentation, Training, and Help Requirements

A serious of help files will be developed for end users of the interactive mapping application.

5.4 Draft User Interface

The WIP-DSS user interface will be designed as a modern looking and easy to use mapping applications.

Figure 1: Klamath Basin Watershed Information Portal – Decision Support System Application Mock-up (Main page)



6.0 Technical Environment (Infrastructure Definition)

The sections below provide information regarding the non-functional aspects of Klamath Basin Watershed Information Portal – Decision Support System. The hardware and software requirements for the application are described. The requirements for overall performance of the application and security considerations for user access are defined. Required application interfaces with external systems, data, and users are also documented.

6.1 Hardware Environment

The hardware environment will be hosted by Houston Engineering. The hardware the application is currently running on is a Microsoft Windows Server 2003 using IIS 6.0 with 3.5 GB RAM. The server is backed up nightly. The hardware environment does not have redundant fail over built into the hosting environment.

6.2 Software Environment

The software environment will provide the tools necessary to create a mapping application. This application leverages a variety of Open Source software projects. Details are listed below.

Server Software
University of Minnesota Mapserver (www.mapserver.org), GeoMOOSE (http://www.geomoose.org) and PHP (www.php.net)

Database Software
PostGreSQL (www.postgresql.org)

6.3 Network Environment

Miscellaneous Guidelines
The WIP-DSS will be cross browser compatible with common browsers such as Internet Explorer, Firefox, and Safari.

6.4 Performance Requirements

Performance will primarily be dependent on Houston Engineering's Server and Network capacity. Data optimization and server best practices will be deployed to ensure maximum performance of the application. The application will be hosted on a single shared server with no load balancing.

6.5 Security Requirements

The WIP-DSS will be a public Website hosted initially by Houston Engineering. It will not require secured access.

6.6 External Requirements

- The application will use Google's Geocoding Service for the search by address functionality.

- The application will use Microsoft Terraserver web service for USGS DOQ's and DRG map layers.

7.0 Data Requirements

7.1 Data Sources

The probable data sources for the WIP-DSS will be supplied by various users. All data is freely available and no data will be created for this application. The predominant projection for the spatial data is UTM Zone 10 NAD 83. The GIS layers will be updated as part of a future maintenance plan outlined by phase 6 of the Klamath Basin DSS concept. There is no planned maintenance to the data layers as part of this phase of the project.

Details on the layers to be included are listed in the following data source spreadsheet.

Table 2: Klamath Basin DSS Data and Service Sources

Layer Name (Display Name)	Data Type	Source
State, County and City Boundaries	Shapefile	U.S. Census Bureau
USGS DOQ and Quad Maps	WMS	http://terraservice.net
Oregon 2005 Orthos	WMS	http://wms.oregonexplorer.info
Weather NexRAD	WMS	Iowa State University
Lakes and Rivers	Shapefile	USGS NHD
Roads and Railroads	Shapefile	U.S. Census Bureau
Search Address	GeoCoding Service	Google Maps API
Watersheds	Shapefile	NRCS WBD
Stream Gaging Stations	Shapefile	USGS NWIS
Klamath County parcels	Shapefile	Klamath County
Townships and Sections	Shapefile	U.S. Census Bureau
Irrigation Districts	Shapefile	U.S. Bureau of Reclamation
Major Irrigation Canals	Shapefile	U.S. Bureau of Reclamation
ERO Projects	Shapefile	U.S. Fish and Wildlife Service
Federal Lands	Shapefile	U.S. Census

Layer Name (Display Name)	Data Type	Source
Reservoir Levels	Shapefile	U.S. Bureau of Reclamation
Precipitation Stations	Shapefile	National Weather Service
Groundwater Monitoring Sites	Shapefile	USGS NWIS
Snowtel Monitoring Stations	Shapefile	NRCS
Water Forecasts Locations	Shapefile	NRCS

7.2 Data Storage Requirements

Through the development and testing phases, all data for the portal will be stored in Shapefile or as a PostgreSQL database on Houston Engineering server.

8.0 Deployment Requirements

The application will be developed on Houston Engineering's development server environment. After initial development a beta version will be made available for testing by stakeholders. Final deployment of the application will continue to be served on a Houston Engineering production server, until Klamath County decides to migrate it to another server or organization.