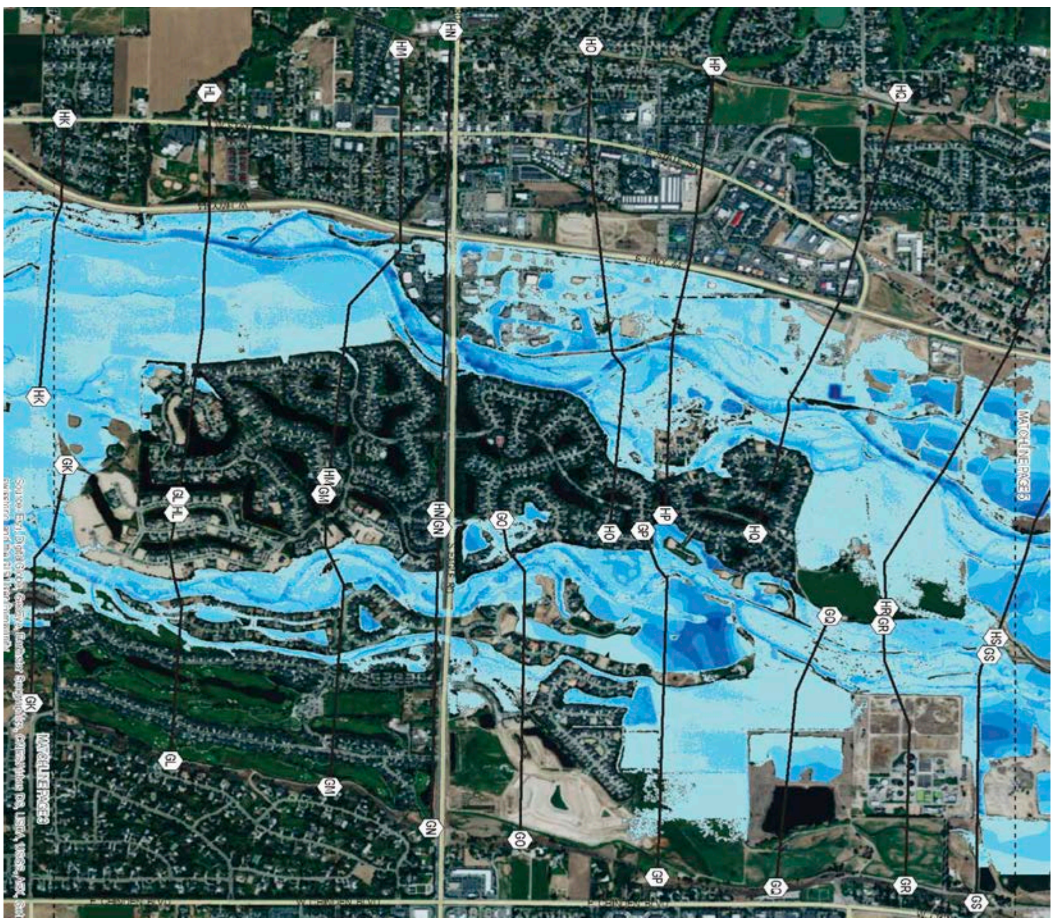
US Army Corps of Engineers®
Walla Walla District

Boise River Inundation Mapping Study
Eagle to Star Reach, Ada County, Idaho

Project Partner: Ada County Emergency Management



September 2015

Authority: Section 22 of the Water Resource Development Act of 1974
Planning Assistance to States

Volume 1

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ACRONYMS AND ABBREVIATIONS

Acronym/ Abbreviation	Definition
ACEM	Ada County Emergency Management
AHPS	Advanced Hydrologic Prediction Service
cfs	cubic feet per second
F	Fahrenheit
FEMA	Federal Emergency Management Agency
FIM Mapper	USGS Flood Inundation Mapping Program website
FIRM	flood insurance rate maps
GIS	Geographic Information System
GPS	Global Positioning System
HEC-RAS	USACE Hydrologic Engineering Center River Analysis Software
LiDAR	Light Detection and Ranging
mi^2	square miles
NAD	North American Datum
NAVD	North American Vertical Datum
NFIP	National Flood Insurance Program
NOAA NWS	National Oceanic and Atmospheric Administration, National Weather Service
QA/QC	quality assurance/quality control
RAS Mapper	River Analysis Software Mapper
RM	river mile
RMSE	root mean square errors
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
XS	cross section

1. INTRODUCTION

In 2012, Ada County Emergency Management (ACEM) (formerly Ada City-County Emergency Management) and the U.S. Army Corps of Engineers, Walla Walla District (USACE), partnered to add additional water surface profiles to an existing Boise River floodplain study for the river reach from Diversion Dam to the head of Eagle Island (USACE 2012a). The study created shaded depth inundation maps for 15 different flows in the Boise River reach to assist with flood response planning and to communicate flood risk to the community.

In 2014, ACEM sent a written request to USACE asking for assistance with completion of the inundation mapping for the remainder of the Boise River reach that is located in Ada County from the head of Eagle Island (RM 49.50) near Eagle to the western boundary of Ada County (RM 36.00) near Star. The Boise River Inundation Mapping Study, Eagle to Star Reach completes the inundation map library for the Boise River in Ada County. The USACE conducted the study under the authority of Section 22 of the Water Resources Development Act of 1974, as amended. The authorization allows the USACE to assist States, local governments, and Indian Tribes with preparation of comprehensive plans for development, utilization, and conservation of water and related land resources.

Study Partners

ACEM, a division of Ada County government responsible for disaster preparedness, was the study sponsor, providing project coordination, non-Federal matching funds, and other staffing assistance on behalf of Ada County. A review committee, including members of the Idaho Silver Jackets team from the National Oceanic and Atmospheric Administration National Weather Service (NOAA NWS), U.S. Geological Survey (USGS), Ada County, the cities of Boise, Eagle, Star, Garden City, provided technical feedback throughout the modeling and mapping process.

Previous Studies

The area has previously been studied multiple times by private consultants, state and Federal agencies, including an existing Flood Insurance Study for Ada County, Idaho, and Incorporated Areas (Federal Emergency Management Agency (FEMA) Flood Insurance Study number 16001CV000B, revised 02 October 2003). FEMA is currently updating this flood insurance study. Draft updated flood insurance rate maps (FIRMs) were currently under review by the communities when this study was conducted (USACE 2015).

USACE adapted the draft hydraulic model developed for FEMA’s current update study to produce the inundation maps contained in this report. The maps in volume 2, appendix A are not regulatory maps for the purposes of the National Flood Insurance Program (NFIP). FEMA panels that currently cover the study area include 16001C0120H, 16001C0134H, 16001C0140H, 16001C0141H, 16001C0142H, 16001C0153H, 16001C0161H, 16001C062H, 16001C0166H (FEMA, 2003). USACE has studied this reach in 1981(USACE, 1981) for FEMA, 2004 for an environmental restoration study, and an ongoing study presently for FEMA.

2. PURPOSE

The primary purpose of this study is to develop a library of Boise River inundation maps to enhance communications about flood risk and provide information for planning emergency response during flood events. ACEM intends to share the floodplain spatial data with NOAA NWS for the creation of an Advanced Hydrologic Prediction Services (AHPS) Inundation Mapping web page and posting on the USGS Flood Inundation Mapping website (FIM Mapper). Online access through these web pages will allow easy public access to spatial floodplain data. Other communities in the watershed will benefit as it will provide important tools to plan for future flood events.

3. STUDY AREA

The study area is located in Ada County, Idaho. The modeled portion includes the main stem Boise River, including both north and south channels forming Eagle Island; this study does not include various tributaries entering the Boise River. The extents are from the head of Eagle Island (RM 49.50) to the western boundary of Ada County (RM 36.00) (New modeling for this effort resulted in a slightly different river mile numbering system than past studies. The river mileage system was updated due to changes in river thalweg over time, and more precise evaluation of the river centerline.) This portion of the river includes areas of unincorporated Ada County, as well as the cities of Eagle, Star, Garden City. Significant development has occurred in the floodplain of the river. Ada County is the largest county by population in the State of Idaho, and Boise is the State's largest city.

The Boise River is regulated by three Federal dams located upstream of Boise and numerous irrigation diversions and returns. Together, the three dams regulate peak spring flows. The ability to regulate flows is more pronounced for yearly and biannual floods and diminishes significantly for more extreme floods. There has not been a large flood event resulting in a loss of life or appreciable structure damage in the lower Boise watershed since water storage behind Lucky Peak Dam began in 1954.

4. STREAMS AND DRAINAGE AREA

The Boise River watershed covers approximately 4,100 square miles (mi^2), draining the western side of the Sawtooth Range and portions of the Snake River Plain. Much of the upper Boise River (upstream of Lucky Peak Dam) lies in Boise, Elmore, Ada counties. The topography of the Boise River basin ranges from 10,600 feet above sea level in the Sawtooth Range down to approximately 2,300 feet above sea level at the confluence of the Boise River and the Snake River. The Boise River drains approximately 2,650 mi^2 at Lucky Peak Dam, with much of the watershed above the reservoir characterized by steep slopes, deep V-shaped valleys, and narrow ridges.

Three forks make up the upper Boise River. The North Fork generally flows from the Sawtooth Wilderness Area along the Boise-Elmore County line southwest through the Boise National Forest. The Middle Fork drains the southern Sawtooth Wilderness Area, flows past Atlanta, Idaho, and joins with the North Fork and flows into the northwest arm of Arrowrock Reservoir. The South Fork flows from northern Camas County in the Smoky Mountains in the Sawtooth National Forest, southwest into Anderson Ranch Reservoir. From there, the South Fork flows generally northwest through Elmore County into Arrowrock Reservoir. Mores Creek is a major tributary to the Boise River and generally flows southwest out of the mountains in the Boise National Forest and joins the Boise River in Lucky Peak Lake reservoir. The Boise River flows generally west out of Lucky Peak Lake reservoir through Ada and Canyon counties before its confluence with the Snake River west of Parma, Idaho and south of Nyssa, Oregon. The Snake River flows generally west into the Columbia River, and finally to the Pacific Ocean.

5. CLIMATE

Downtown Boise sits at an elevation of approximately 2,704 feet above sea level. Temperature extremes in Boise can range from 0°F in the winter to 100°F in the summer. Mean high and low temperatures in January are 38°F and 25°F, respectively. In July, the mean high and low temperatures are 91°F and 60°F. The valley receives approximately 12 inches of precipitation annually, primarily in the cooler months (USACE, 2011).

6. FLOOD HISTORY

Flooding on the Boise River is primarily snow-melt driven and generally occurs in the spring months of April, May, June. The maximum measured flow on the Boise River was 35,500 cubic feet per second (cfs), observed near the current Lucky Peak dam site, on June 14, 1896. In the period between 1865 and 1894, five other flow events were estimated to have exceeded 30,000 cfs. A Columbia-Snake region-wide massive flood event occurred in 1862, with a flow on the Boise River estimated to be in excess of 70,000 cfs (USACE, 2011). The largest flood since construction of Arrowrock Dam (completed in 1915) occurred in April 1943 with a peak flow of approximately 21,000 cfs, as measured at Capitol Boulevard (USGS Gage No. 13205500) (USGS 2015c).

Since completion of all three Federal dams (1954), the maximum flood flow on the Boise River was 9,840 cfs at the Glenwood Gage (USGS Gage No. 13206000) (USGS 2015a) on June 13, 1983. The next largest floods occurred on May 31, 1998, with a flow of 8,350 cfs recorded at the Glenwood Gage, and on May 5, 2012, with a flow of 8,310 cfs. The three more recent flows exceeded the flood stage threshold of 7,000 cfs at the Glenwood Gage as defined by NOAA NWS.

7. HYDROLOGIC ANALYSIS

A hydrologic analysis of peak frequency discharges for both regulated flows at the location of the Glenwood Gage and unregulated flows at Lucky Peak Dam (USACE 2012b) was completed by the USACE and is included in a pending update to the Boise

River Water Control Manual (USACE, 2011). Results of this updated frequency study are also being incorporated in the FEMA mapping study presently in progress. Table 1 shows the published flood frequencies for regulated and unregulated peak flows (USACE 2011). The new hydrologic analysis is shown in table 2 (USACE 2012b). In comparison, the only regulated peak flow difference is for the 10 percent chance exceedance flood. For consistency with modeling and mapping completed for ACEM in 2012, values from table 1 were used for this study.

Table 1. Regulated Flood Frequency Analysis for the Lower Boise River and Unregulated Flows into Lucky Peak Lake Reservoir (USACE, 2011)

Annual Exceedance Probability (percent)	***Equivalent Return Period (years)***	***Regulated Peak Flow at Glenwood Gage (cfs)***	***Unregulated Peak Flow into Lucky Peak (cfs)***
0.2	500	34,800	52,000
1.0	100	16,600	41,200
2.0	50	11,000	36,200
10.0	10	7,200	25,200
50.0	2	4,900	13,800

Table 2. Regulated Flood Frequency Analysis for the Lower Boise River and Unregulated Flows into Lucky Peak Reservoir (USACE, 2012b)

Annual Exceedance Probability (percent)	***Equivalent Return Period (years)***	***Regulated Peak Flow at Glenwood Gage (cfs)***	***Unregulated Peak Flow into Lucky Peak (cfs)***
0.2	500	34,800	59,800
1.0	100	16,600	44,100
2.0	50	11,000	38,000
10.0	10	7,500	25,200
50.0	2	4,900	13,000

8. HYDRAULIC ANALYSIS

The hydraulic analysis for this study was performed using the USACE Hydrologic Engineering Center River Analysis Software (HEC-RAS) version 4.1.0, dated January 2010 (USACE, 2010). The HEC-RAS model is a one-dimensional hydraulic model, operated with steady flow regime.

Model geometry was developed using 2007 Green Light Detection and Ranging (LiDAR) data that was obtained in partnership between the USACE, other agencies, and local governments. The LiDAR data was determined to have minimal introduction of errors as Root Mean Square Errors (RMSE) ranged from 0.082 to 0.138; these results compare favorably with those of other bathymetric LiDAR systems (Skinner, 2009). The

LiDAR data had an accuracy range of ± 0.5 ft. Therefore, the 2007 Green LiDAR is a suitable choice for use in this study. The LiDAR was initially processed by Idaho Department of Water Resources and re-processed by Tetra Tech, Inc. under contract with ACEM. The model used for this study reach was developed from a 2014 draft model for an ongoing study USACE is performing for FEMA which utilized the data processed under contract to Tetra Tech, Inc. The following is an overview of the general model development work.

> Cross section locations were developed using the 2003 FEMA FIRM and HEC-RAS model as a guide. Additional cross sections were also cut through the LiDAR data to provide better resolution of the flood plain. All Geographic Information System (GIS) data used in model development was projected to North American Datum (NAD) 1983 State Plane Idaho, West FIPS1103, feet. All elevations were converted to North American Vertical Datum 1988 (NAVD 88). The model geometry includes 143 cross sections which define the main channel and overbank areas of the modeled reach. The USACE also conducted detailed field visits along both banks of the river throughout the study area to appropriately characterize the banks and overbank areas and assign modeling parameters to them, including Manning's roughness coefficient.
>
> All known existing bridge structures in the modeled reach that existed on the river as of 2014 were included in this study, including all road bridges and pedestrian bridges. Future flood control projects, constructed features, and major changes to the shape and grading of the land adjacent to the river since 2007 were not included in this study. As-built bridge drawings were used, if available, for six bridge model inputs including Eagle Road and Linder Road bridges on the north and south channels, State Highway 16 Bridge, Star Road Bridge. A survey of the Monroc private bridge on the north channel was completed and used for model input (HDR, Inc. 2011). Field surveys were conducted by Rogers Surveying for bridges when as-built drawings were not available, which were used for two bridge model inputs, including Eagle Island State Park Bridge and Merrill Community Park pedestrian bridge, both on the north channel. The survey by Rogers was completed on November 6, 2012 using Global Positioning System (GPS) and conventional means in NAVD 88 (Rogers Surveying 2013).
>
> The channel roughness values vary between 0.026 and 0.034, with the majority of values between 0.03 and 0.032. The channel characteristics justifying these values are "Clean, straight, no rifts or deep pools, with some stones and weeds". The roughness values vary between 0.04 and 0.12, with the majority between 0.045 and 0.08. The floodplain characteristics justifying these values are "cultivated areas, weeds, and scattered light, or medium to dense brush".

USACE originally built the geometry to the above specifications to model the 10-, 2-, 1-, 0.5-, and 0.2-percent chance exceedance flood events, and calibration flows. The model was adapted to generate water surface profiles for a total of 15 flow rates as requested by ACEM and listed in table 3, two of which were used for model calibration. The 2006 and 2012 flood events were used for calibration to aerial extents of flooding, while 2012 was used for calibration to high water measurements at bridges.

In modeling the Eagle Island flow split, junctions and lateral structures were used to optimize the split for each flow regime. The 2011 and 2012 floods were used to verify the flow split trend, as they were the most recent floods and had the highest flow rates since installation of the USGS gage on the Boise River south channel. Observed data was developed from identical dates for daily flow from USGS gages for total Boise River flow (USGS gage no. 13206000) (USGS 2015a) and Boise River south channel flow (USGS gage no. 13206305) (USGS 2015b). Figures 1 and 2 summarize observed and modeled flows for the north and south channels. In the figures, cross sections (XS) 48.4 and 49.1 are the first set of cross sections in their respective channels, at the head of the island. The Eagle Road bridge is located at XS 45.7 (south channel) and XS 46.2 (north channel). The USGS gage no. 13206305 is located at the upstream face of Eagle Road, which corresponds to XS 45.766. Overall, the modeled flow split trends have strong correlation to observed data.

Calibration of the model was accomplished using available USGS gage data and 2012 flood elevations at bridges and geo-referenced orthorectified photography from historic floods. There is only one USGS gage (USGS 13206305) in the modeled reach; therefore, calibration at this location was given high weight during calibration. Modeled results have a RMSE of 0.4 feet compared to the USGS gage rating curve (figure 3).

Since there was only one USGS gage (USGS 2015b) in the reach, historic flood elevations and inundations were used to expand calibration efforts. USACE measured observed water surfaces at all bridges in the modeled reach during the 2012 flood; measurements were made on May 9, 2012 when daily average total river flow was 7,940 cfs. Tables 4 and 5 show the calibration results at bridges; the RMSE is also 0.4 feet.

Table 3. Modeled Flow Rates

Flow Rate (cfs)	***Comments***
4,900	50-percent chance flow
6,500	Bankfull flow
7,000	Flood stage at USGS Glenwood Gage
7,200	10-percent chance flow (pre-2012)
7,440	2006 flow event used for calibration
8,310	1998 and 2012 flood events used for calibration
9,500	New flow
11,000	2-percent chance flow
13,000	New flow
15,000	New flow
16,600	1-percent chance flow
20,000	New flow
23,900	0.5-percent chance flow
29,000	New flow
34,800	0.2-percent chance flow

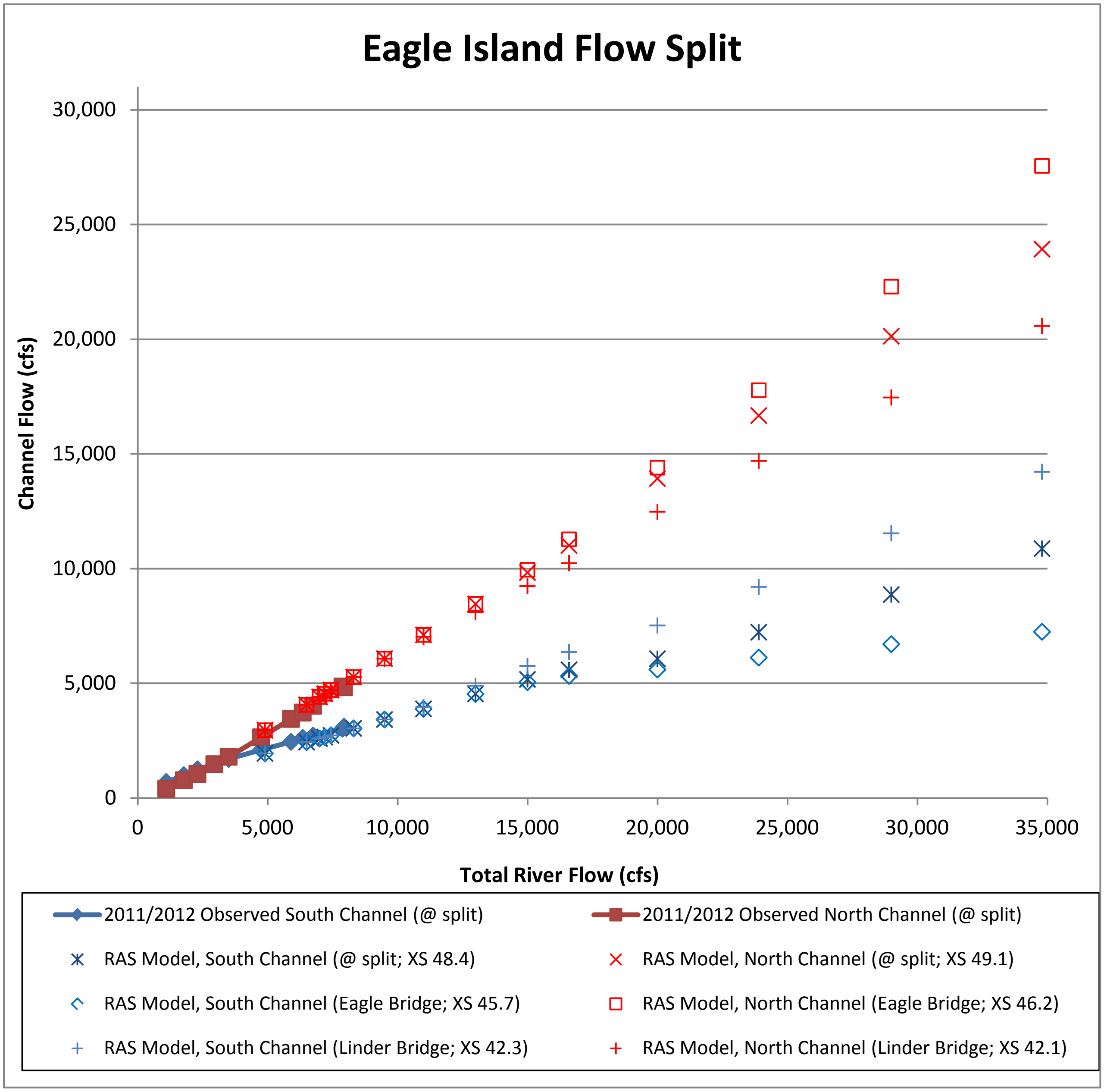

Figure 1. Boise River at Eagle Island, Flow Split into North and South Channels (XS = cross section)

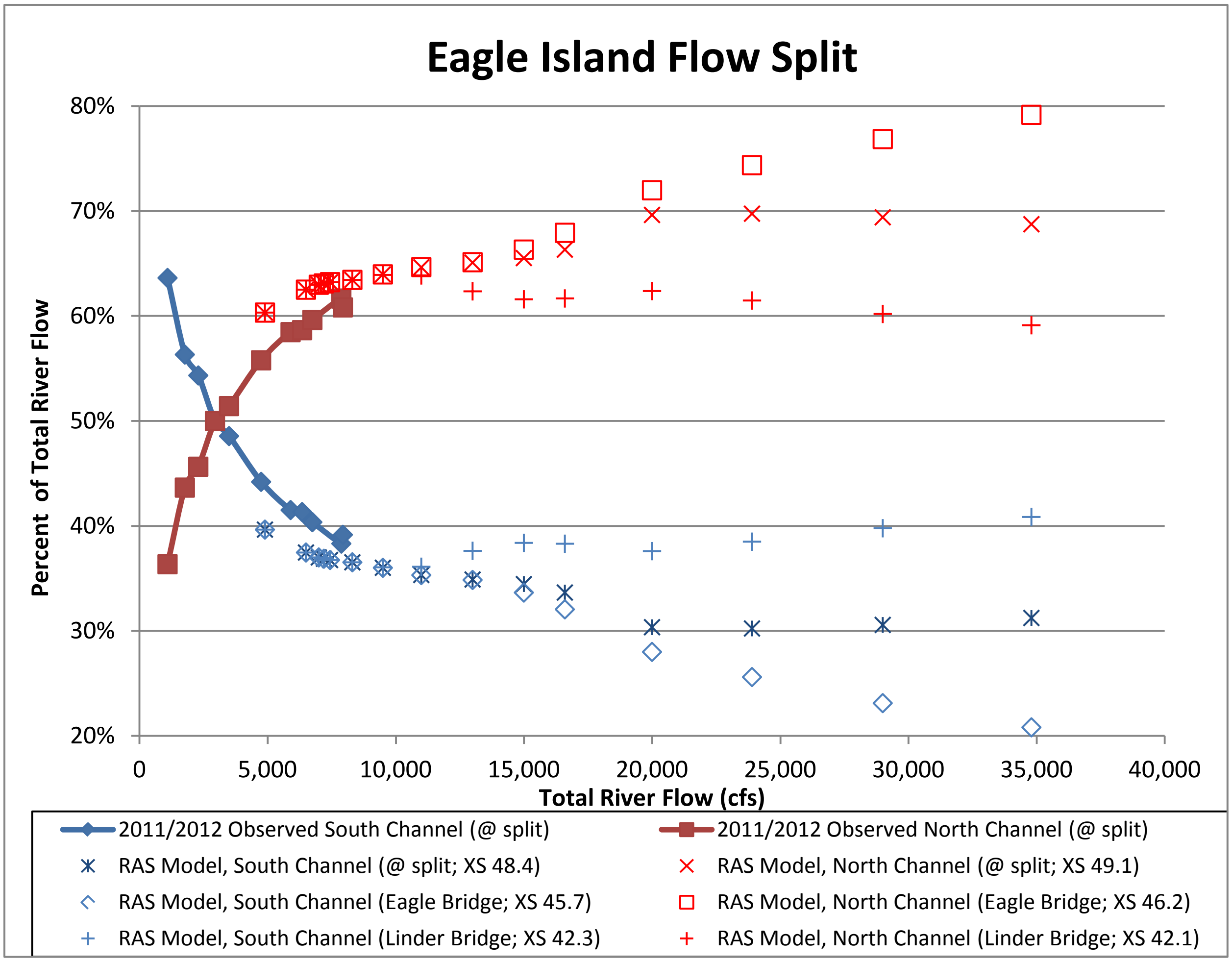

Figure 2. Percent of Total River Flow, Boise River at Eagle Island Flow Split into North and South Channels

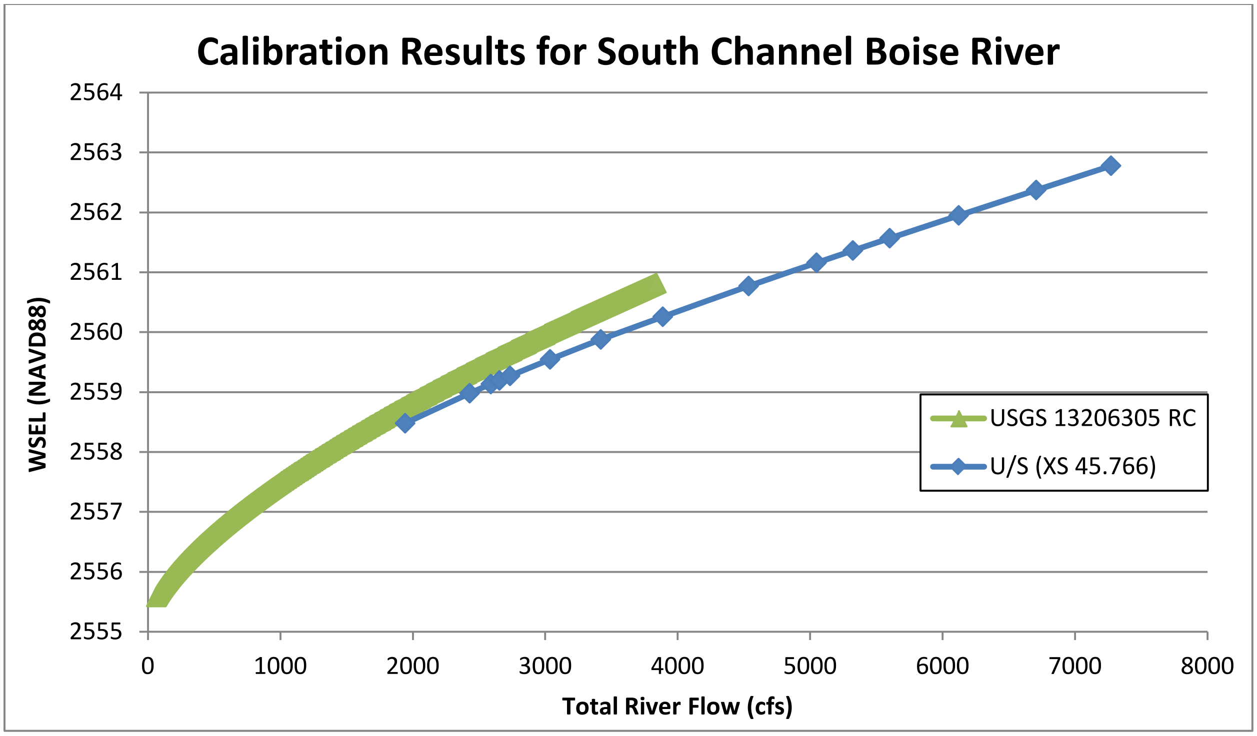

Figure 3. Modeled Results Comparison to USGS Gage No. 13206305 Rating Curve

Table 4. North Channel Calibration Results for 2012 Flow Case (7,940 cfs)

Cross Section Number	***Observed WSEL (feet)***	***Modeled WSEL (feet)***	***Difference (feet)***
48.49	2582.4	2582.3	-0.1
46.791	2562.3	2562.4	+0.1
46.242	2555.5	2555.6	+0.1
43.632	2529.9	2530.1	+0.2
42.32	2519.0	2519.3	+0.3

Table 5. South Channel Calibration Results for Flow 2012 Flow Case (7,940 cfs)

Cross Section Number	***Observed WSEL (feet)***	***Modeled WSEL (feet)***	***Difference (feet)***
45.766	2559.4	2559.3	-0.1
42.121	2519.3	2518.3	-1.0

9. RESULTS

The depth and extent of each of the 15 flows are shown on maps located in appendix A. A regulatory 1-percent floodway was not computed in this study, as it was not deemed critical for emergency planning purposes. HEC-RAS outputs, such as water surface profiles for the 1-percent and 0.2-percent flood events, or the model-generated report files are not included with this hard copy report, but can be provided upon request.

After calibration, the model was run at all of the flow rates, including extrapolated values with flows above 8,500 cfs. Data to support the depth and extents of the water surface at extrapolated flow rate were not available. However, flow split and water surface calibration, discussed in section 8.0, Hydraulic Analysis, showed strong correlation to trends and expected results due to cross island transfers.

Once the modeling was complete, the data was exported from HEC-RAS and imported into GIS software using River Analysis System (RAS) Mapper. RAS Mapper is part of the HEC-RAS 4.1.0 software package (USACE 2010). The process involves converting the calculated water surface elevations from the model into a vector data format that can be overlaid on the LiDAR data within GIS software to produce the inundation depth maps. These maps contain data on the depth and extents of the flood. A separate water surface elevation raster was produced for each of the 15 tested flow rates. The 2006 and 2012 aerial flood photos were used to verify flood extents from model results. The GIS metadata is included in appendix B.

10. MAPPING LIMITATIONS AND STUDY CONSIDERATIONS

USACE, ACEM, and an external review committee participated in a thorough review process of the study results. USACE performed an initial Quality Assurance and Quality Control (QA/QC) procedure based on numerous site visits, calibration efforts, and comparison to historic flood extents. Changes made during this effort included removing ‘orphan’ polygons that included areas that were not hydraulically connected to the river and erroneous areas related to the translation from the hydraulic model to the GIS data. Inundation mapping does not address subsurface connections as the hydraulic model is only capable of surface hydraulic connections. Bridge surfaces are displayed with depth inundation only if overtopping occurs. Further detailed QA/QC was performed by an external review committee including staff from Ada County, NOAA NWS, USGS, local community officials. The external review committee relied on historic photographs, conversations with residents, USGS elevation data, and site specific visits to identify adjustments and revisions to the final inundation mapping. Decisions to revise maps were reviewed by USACE and the external review committee.

The modeling study and subsequent QA/QC efforts were guided by knowledge of the particular limitations inherent in this type of study.

First, the LiDAR data was collected in 2007 and provided a high-resolution representation of the floodplain on the Boise River. Development in Boise has continued since 2007, so there are areas that have changed. LiDAR precision is not high enough to capture exact tops of narrow berms aligned parallel to the river. This caused an apparent connection between the river and floodplain, even though the berm may not allow this connection. However, berms or raised ground of this narrow width, rarely withstand the scour of flood flows, so their negation is reasonable. A site visit to verify these berms was not practical for every instance due to the vast number of berms; however, critical areas were visited in June 2015. USACE worked with the external review committee to most reasonably model and map each area.

Second, the use of one-dimensional hydraulic models for studying floodplains is the most common and generally accepted approach to floodplain modeling. One-dimensional modeling is less computationally and less data intensive than two- or even three-dimensional modeling, and it provides a good estimate of the elevation and extents of the water surface at a given flow rate given all the uncertainties of river hydraulics. However, there may be localized areas where the additional detail of a two-dimensional model may provide additional insight. Before a two-dimensional model is employed, it should be understood that the two-dimensional models do not account for scour, deposition or other uncertainties during flooding, and the results may not provide a significantly more reliable result than a one-dimensional model for all applications.

Lastly, river modeling is a simulation based on the best available data and the best possible engineering assumptions and judgment. During a flood event, unforeseen circumstances could cause water to access areas that were not anticipated in the model study, or may not extend as far as modeled. These circumstances may include, but are not limited to, debris or ice buildup at bridges or other locations in the floodplain, subsurface water rising above ground level, streambank or embankment failures, low elevation localized flooding, tributary flooding, other possible events.

Overall, this modeling study presents a reasonable estimate of the potential extents and depths of flooding scenarios. The HEC-RAS model was calibrated to observed events with a RMSE of 0.4 feet and is consistent within 0.5 feet at the USGS gage and within 1.0 feet for measured elevations at bridges during the 2012 flood. The largest historic event, which was used for calibration, is approximately a 5-percent chance exceedance (1 in 20-year chance) flood. Therefore, larger flood scenarios are an extrapolation of the hydraulic models calibrated scenarios. The final maps provide a valuable tool to communities and emergency managers for understanding what areas may be affected by flooding or at risk at certain flow rates.

This study was not intended to evaluate or certify any levees in the modeled reach. Berms were included in the analysis as part of the geometry, but not assumed to provide any particular level of protection to any communities. When the water surface elevations justified allowing water behind berms during the modeling process, water was allowed to access the floodplain behind the entire berm. No failure modes or failure scenarios were examined, or probable failure mode determined. This analysis was outside this study scope.

11. REFERENCES

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Inundation Areas (s_##k)

Metadata also available as

Metadata:

Identification_Information:

Citation:

Citation_Information:

Originator: U.S. Army Corps of Engineers, Walla Walla District
Publication_Date: 20120221
Title: Inundation Areas (s_##k)
Publication_Information:

Publication_Place: Walla Walla, WA
Publisher: U.S. Army Corps of Engineers, Walla Walla District

Description:

Abstract:
This feature class contains polygons showing the inundation extents based on modeled water surface elevations as determined for the Boise River at Boise. This information is to be displayed on the National Weather Service's (NWS's) Advanced Hydrologic Prediction Service (AHPS) website.
Purpose:
This data set was developed for use with the National Weather Service's (NWS) Advanced Hydrologic Prediction Service (AHPS) website and by Ada County and the Cith of Boise's Emergency Management personnel.

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 20120221

Currentness_Reference: Publication date

Status:

Progress: Complete

Maintenance_and_Update_Frequency: None Planned

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North_Bounding_Coordinate: 43.670973
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Point_of_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Sean Redar
Contact_Organization: U.S. Army Corps of Engineers, Walla Walla District

Contact_Position: eGIS Manager
Contact_Address:

Address_Type: mailing and physical address
Address: 301 N. 3rd Ave

City: Walla Walla
State_or_Province: WA
Postal_Code: 99362

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Contact_Facsimile_Telephone: 509-527-7812
Contact_Electronic_Mail_Address: sean.p.redar@usace.army.mil
Contact_Instructions: [<http://www.nww.usace.army.mil/>](http://www.nww.usace.army.mil/)

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Logical_Consistency_Report:
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Completeness_Report:
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Positional_Accuracy:

Horizontal_Positional_Accuracy:

Horizontal_Positional_Accuracy_Report:
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Vertical_Positional_Accuracy:

Vertical_Positional_Accuracy_Report:
As with any engineering analysis of this type, variation from the estimated flood heights and floodplain boundaries is possible. Details of the process used to produce this data can be found in project documentation available from the data contact person. Verticall accuracy was tested by evaluating boundaries to best available topographic dataset.

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Process_Step:

Process_Description:
A hydraulic model was developed for the Boise River using HEC RAS. Fifteen different flow scenarios were modeled. Inundation areas and depth data for each scenario were created by evaluating modeled waterelevations against LiDAR derived bare earth terrain data in RAS Mapper. The resulting inundataion area polygons were edited to remove any flooding hydraulically disconnected from the main channel and other areas inconsistent with emperical data and expert knowledge. Due to discripencies resulting from the translantion from the RAS model to GIS outputs additional inundation area and water depth corrections were required. This consisted of enforcing the presence of the floodway, decresing depth in certain areas that were an arifact from the main channel and filling some small gaps resulting from cross over geometry. The final processing for all scenarios consisted of clipping the depth grids to the modified inundataion areas.
Process_Date: None

Process_Step:

Process_Description:
Modifications to the RAS Mapper gridded depth data consisted of the removal and/or addition of specificed areas. Removal of hydraulically disconnected areas were accomplished by appling edits to the representative polygon feature class for the appropriated flow then using said polygons to clip the corresponding depth grids to the polygon boundaires. Filling certain depth areas was needed for most flow scenarios due to limitations of the LiDAR bare earth datasets lack of properly represneting bare earth in certain areas. To fill absent depth area per flow scenario, areas were isolated using polygon representaions of the missing depths, then using a roving window or focal statistics, average depths for the missing areas were calculated from surrounding depths. This technique resulted in smooth transitions between missing and present depth data since the adjoining depths were consistent. ArcGIS model builder was used to build and processes these data and are included in the root geodata.gdb geodatabases. A similar technique was used to smooth a selection of very traingulated ponds.
Process_Date: None

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Planar:

Grid_Coordinate_System:

Grid_Coordinate_System_Name: Universal Transverse Mercator
Universal_Transverse_Mercator:

UTM_Zone_Number: 11
Transverse_Mercator:

Scale_Factor_at_Central_Meridian: 0.99960000
Longitude_of_Central_Meridian: -117
Latitude_of_Projection_Origin: 0.00000000
False_Easting: 500000.00000000
False_Northing: 0.00000000

Planar_Coordinate_Information:

Planar_Coordinate_Encoding_Method: coordinate pair
Coordinate_Representation:

Abscissa_Resolution: 0.00001
Ordinate_Resolution: 0.00001

Planar_Distance_Units: feet

Geodetic_Model:

Horizontal_Datum_Name: North American Datum of 1983
Ellipsoid_Name: Geodetic Reference System 1980
Semi-major_Axis: 6378137.000000
Denominator_of_Flattening_Ratio: 298.257222

Entity_and_Attribute_Information:

Detailed_Description:

Entity_Type:

Entity_Type_Label: s_##k

Attribute:

Attribute_Label: OBJECTID
Attribute_Definition: Internal feature number.
Attribute_Definition_Source: ESRI
Attribute_Domain_Values:

Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.

Attribute:

Attribute_Label: Shape
Attribute_Definition: Feature geometry.
Attribute_Definition_Source: ESRI
Attribute_Domain_Values:

Unrepresentable_Domain: Coordinates defining the features.

Attribute:

Attribute_Label: Shape_Length
Attribute_Definition: Length of feature in internal units.
Attribute_Definition_Source: ESRI
Attribute_Domain_Values:

Unrepresentable_Domain: Positive real numbers that are automatically generated.

Attribute:

Attribute_Label: Shape_Area
Attribute_Definition: Area of feature in internal units squared.
Attribute_Definition_Source: ESRI
Attribute_Domain_Values:

Unrepresentable_Domain: Positive real numbers that are automatically generated.

Metadata_Reference_Information:

Metadata_Date: 20120223
Metadata_Contact:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: U.S. Army Corps of Engineers, Walla Walla District

Contact_Person: Sean Redar

Contact_Position: eGIS Manager
Contact_Address:

Address_Type: mailing and physical address
Address: 301 N. 3rd Ave
City: Walla Walla
State_or_Province: WA
Postal_Code: 99362

Contact_Voice_Telephone: 509-527-7635
Contact_Facsimile_Telephone: 509-527-7812
Contact_Electronic_Mail_Address: sean.p.redar@usace.army.mil
Contact_Instructions: <http://www.nww.usace.army.mil/>

Metadata_Standard_Name: FGDC Content Standard for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998

Generated by mp version 2.9.14 on Fri Mar 09 10:26:21 2012

Water Depth (s_##k)

Metadata also available as

Metadata:

Identification_Information:

Citation:

Citation_Information:

Originator: U.S. Army Corps of Engineers, Walla Walla District
Publication_Date: 20120221
Title: Water Depth (s_##k)
Publication_Information:

Publication_Place: Walla Walla, WA
Publisher: U.S. Army Corps of Engineers, Walla Walla District

Description:

Abstract:
These raster files represent estimated depth of flooding based on modeled water surface elevations as determined for the Boise River at Boise. This information is to be displayed on the National Weather Service's (NWS's) Advanced Hydrologic Prediction Service (AHPS) website.
Purpose:
This data set was developed for use with the National Weather Service's (NWS) Advanced Hydrologic Prediction Service (AHPS) website and by Ada County and the Cith of Boise's Emergency Management personnel.

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 20120221

Currentness_Reference: Publication date

Status:

Progress: Complete

Maintenance_and_Update_Frequency: None Planned

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -116.310284
East_Bounding_Coordinate: -116.091157
North_Bounding_Coordinate: 43.670973
South_Bounding_Coordinate: 43.537877

Keywords:

Theme:

Theme_Keyword_Thesaurus: ISO 19115 Topic Category
Theme_Keyword: elevation
Theme_Keyword: geoscientificInformation
Theme_Keyword: inlandWaters

Theme:

Theme_Keyword_Thesaurus: User
Theme_Keyword: Flood
Theme_Keyword: Hydraulics
Theme_Keyword: Hydrography
Theme_Keyword: Hydrology
Theme_Keyword: Inundation
Theme_Keyword: Modeling
Theme_Keyword: River

Place:

Place_Keyword_Thesaurus: None
Place_Keyword: Boise
Place_Keyword: Idaho

Access_Constraints: None.
Use_Constraints:
Users assume responsibility to determine the appropriate use of this data. Users should be aware of the limitations of this dataset if using for critical application.
Point_of_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Sean Redar
Contact_Organization: U.S. Army Corps of Engineers, Walla Walla District

Contact_Position: eGIS Manager
Contact_Address:

Address_Type: mailing and physical address
Address: 301 N. 3rd Ave

City: Walla Walla
State_or_Province: WA
Postal_Code: 99362

Contact_Voice_Telephone: 509-527-7635
Contact_Facsimile_Telephone: 509-527-7812
Contact_Electronic_Mail_Address: sean.p.redar@usace.army.mil
Contact_Instructions: <http://www.nww.usace.army.mil/>

Data_Quality_Information:

Logical_Consistency_Report:
These data are believed to be logically consistent, although not tested. Geometry appears topologically clean.
Completeness_Report:
Spatial and attribute properties are believed to be complete, although attribute information has been simplified. Geometric thresholds from original data are preserved. No tests have been completed for exhaustiveness.
Positional_Accuracy:

Horizontal_Positional_Accuracy:

Horizontal_Positional_Accuracy_Report:
As with any engineering analysis of this type, variation from the estimated flood heights and floodplain boundaries is possible. Details of the process used to produce this data can be found in project documentation available from the data contact person. Horizontal accuracy was tested by evaluating boundaries to best available topographic dataset.

Vertical_Positional_Accuracy:

Vertical_Positional_Accuracy_Report:
As with any engineering analysis of this type, variation from the estimated flood heights and floodplain boundaries is possible. Details of the process used to produce this data can be found in project documentation available from the data contact person. Verticall accuracy was tested by evaluating boundaries to best available topographic dataset.

Lineage:

Process_Step:

Process_Description:
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Process_Date: None

Spatial_Data_Organization_Information:

Direct_Spatial_Reference_Method: Vector
Raster_Object_Information:

Raster_Object_Type: Pixel
Row_Count: 8251
Column_Count: 9164

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Planar:

Grid_Coordinate_System:

Grid_Coordinate_System_Name: Universal Transverse Mercator
Universal_Transverse_Mercator:

UTM_Zone_Number: 11
Transverse_Mercator:

Scale_Factor_at_Central_Meridian: 0.99960000
Longitude_of_Central_Meridian: -117
Latitude_of_Projection_Origin: 0.00000000
False_Easting: 500000.00000000
False_Northing: 0.00000000

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Horizontal_Datum_Name: North American Datum of 1983
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Semi-major_Axis: 6378137.000000
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Metadata_Reference_Information:

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Contact_Organization: U.S. Army Corps of Engineers, Walla Walla District
Contact_Person: Sean Redar

Contact_Position: eGIS Manager
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Contact_Instructions: <http://www.nww.usace.army.mil/>

Metadata_Standard_Name: FGDC Content Standard for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998

Generated by mp version 2.9.14 on Fri Mar 09 10:41:56 2012