DRAFT FOR REVIEW

Surface-water Irrigation Entities and Groundwater Polygons for Calibration of Eastern Snake Plain Aquifer Model Version 2, As Built

University of Idaho
Idaho Water Resources Research Institute

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ESPAM2 Design Document DDW-V2-09 As Built “Entity Geometry”

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DESIGN DOCUMENT OVERVIEW

During calibration of the Eastern Snake Plain Aquifer Model Version 1.1 (ESPAM1.1), a series of Design Documents were produced to document data sources, conceptual model decisions and calculation methods. These documents served two important purposes; they provided a vehicle to communicate decisions and solicit input from members of the Eastern Snake Hydrologic Modeling Committee (ESHMC) and other interested parties, and they provided far greater detail of particular aspects of the modeling process than would have been possible in a single final report. Many of the Design Documents were presented first in a draft form, then in revised form following input and discussion, and finally in an "as-built" form describing the actual implementation.

This report is a Design Document for the calibration of the Eastern Snake Plain Aquifer Model Version 2 (ESPAM2). Its goals are similar to the goals of Design Documents for ESPAM1.1: To provide full transparency of modeling data, decisions and calibration; and to seek input from representatives of various stakeholders so that the resulting product can be the best possible technical representation of the physical system (given constraints of time, funding and personnel). It is anticipated that for some topics, a single Design Document will serve these purposes prior to issuance of a final report. For other topics, a draft document will be followed by one or more revisions and a final "as-built" Design Document. Superseded Design Documents will be maintained in a "superseded" file folder on the project Website, and successive versions will be maintained in a "current" folder. This will provide additional documentation of project history and the development of ideas.

INTRODUCTION

The largest source of recharge to the Eastern Snake Plain Aquifer is incidental recharge associated with surface-water irrigation. This occurs as seepage from canals, percolation below the root zone on irrigated parcels, and to some extent as seepage from drain ditches. The second largest discharge from the aquifer is pumping for groundwater irrigation.

The location and extent of irrigated lands is an important input to calculation of these components of the water budget. It is also necessary to correlate individual irrigated parcels to diversion and return data, and to various calculation and calibration parameters. This is done by assigning irrigated

parcels to Irrigation Entities. Entities associated with surface-water sources are called Surface-water Irrigation Entities and entities associated with groundwater irrigation are called Groundwater Polygons. This Design Document describes the geometry of the Surface-water Irrigation Entities and Groundwater Polygons that are used to make the assignments.

IRRIGATED LANDS REPRESENTATION

Representation in Calculations

In both ESPAM1.1 and ESPAM2, every irrigated parcel is represented by a GIS polygon or a pair of GIS polygons, as described in Design Document DDM V2-04 (Contor 2010a). If the irrigated parcel is represented as surface-water irrigated, is represented by a single GIS polygon with no overlaps. The polygon is associated with the appropriate underlying Surface-water Irrigation Entity. If the parcel is represented as groundwater irrigated, there is a single GIS polygon with no overlaps, associated with the appropriate underlying Groundwater Polygon. If the parcel is represented as mixed-source, there is a pair of identical, 100% overlapping GIS polygons. One GIS polygon is associated with the underlying Surface-water Entity and one with the underlying Groundwater Polygon.

Each GIS polygon is assigned a source fraction. Surface-water-only parcels and groundwater-only parcels have a source fraction of 1.00. On mixed-source lands, the source fractions for each pair of identical overlapping polygons sum to exactly 1.00. This is discussed more completely in DDM V2-04.

Surface-water entities are associated with diversions, returns, evapotranspiration adjustment factors, sprinkler percentages, and canal seepage. Groundwater polygons are associated with evapotranspiration (ET) adjustment factors and sprinkler percentages. Diversions and returns are described in DDW-V2-07 (Contor 2010b). ET adjustment factors and sprinkler percentages are discussed by Taylor (2010).

ESPAM1.1 Groundwater Polygons

ESPAM1.1 Design Document DDW-009 (Contor, 2002) describes how Groundwater Polygons were based on paper maps of depth to groundwater, under the assumption that irrigation technology and practices will be driven by cost of pumping, largely associated with pumping lift. The Mud Lake area and the A & B Irrigation District were segregated into their own unique Groundwater Polygons based on anecdotal indications of different development history, sprinkler percentages and irrigation practices than adjacent areas of similar depth to groundwater.

ESPAM1.1 Surface-water Entities

The creation and geometry of Surface-water Entities for ESPAM1.1 is described in Design Document DDW-008 (Gilliland 2002). Irrigation districts, canal companies and lands irrigated with private surface-water rights were aggregated into larger Irrigation Entities. The primary goal and guidance was to create Irrigation Entities that were as small as possible, but still allowed unique identification of diversions and returns for the geographic region.

In the Mud Lake and Monteview areas, significant groundwater irrigation takes place via groundwater pumped into canals and conveyed some distance to the place of use. This is termed "offsite pumping" (Contor 2010c). Because the calculation algorithms assume that in such a case the groundwater will be comingled with surface water in the canals, offsite pumping is only accommodated for surface-water entities. Consequently, the service areas of the Producers Canal Company, Monteview Canal Company, Jefferson Irrigation District, Mud Lake Water Users Association, Level Canal, Independent Canal and some private water rights were represented as surface-water irrigated in entities IESW044 and IESW029, even though some of these lands are actually irrigated only with groundwater.

ESPAM2 CHANGES

No substantive changes in philosophy or approach were made in ESPAM2 representation of Irrigation Entities. Minor refinements were made to the geometry of the Groundwater Polygons. Figure 1 illustrates the representation of groundwater polygons used in processing of irrigated lands for model input.

The inclusion of additional canals reinforced the decision to continue representing groundwater-irrigated lands in the Monteview/Mud Lake area within Surface Water Irrigation Entities, since canal seepage is also only accommodated in the calculation algorithms for Surface-water Irrigation Entities. A few Surface Water Irrigation Entities were combined, split, or realigned. This was done to improve the unique matching of diversions and returns to irrigated lands. Figure 2 through Figure 6 show the Surface-water Irrigation Entities for model calibration.

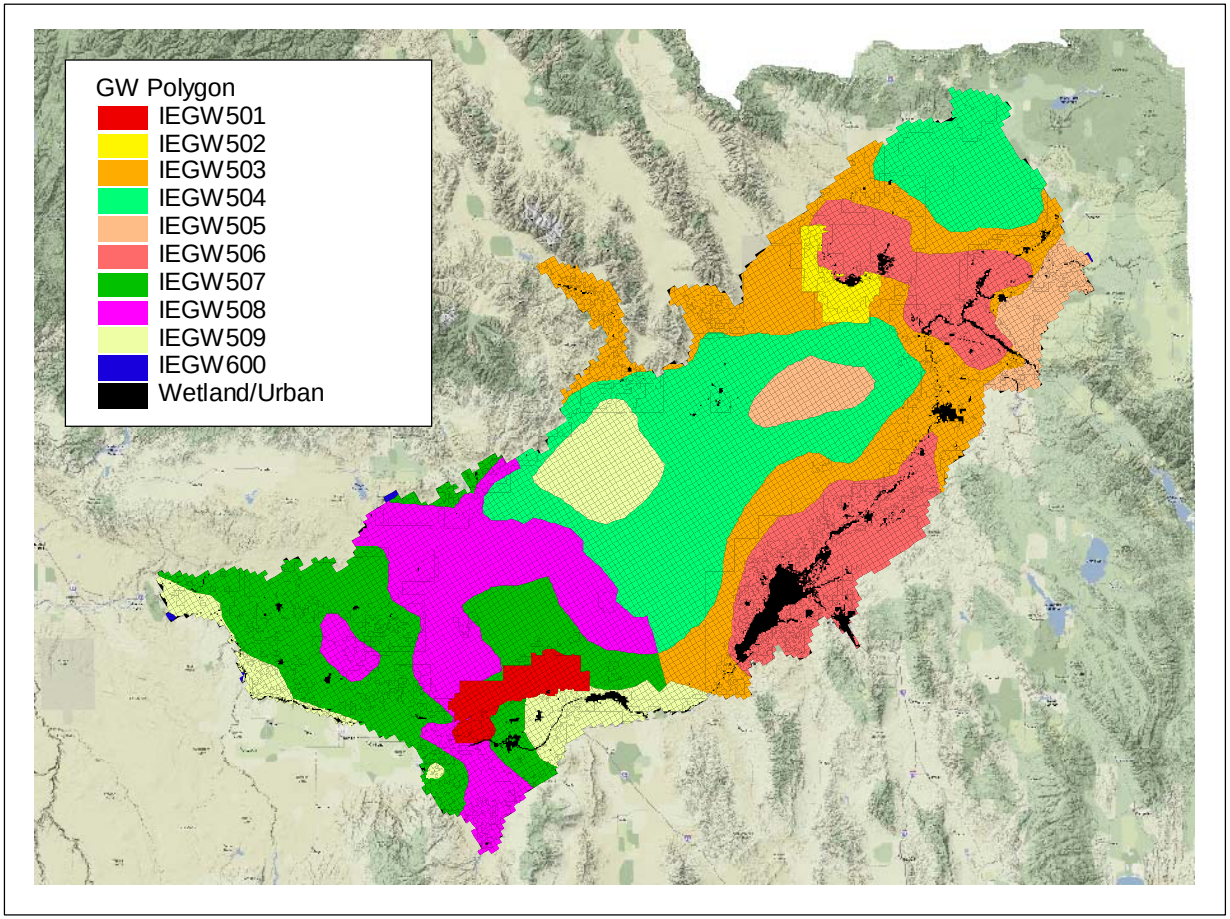

Figure 1. Groundwater Polygons from data set in data set "base_entity_source_20100610.shp" (IDWR 2010a). The black areas (wetlands, water, urban/industrial areas, and some small parcels arising from misalignment of borders) are masked out of irrigated lands during data processing.

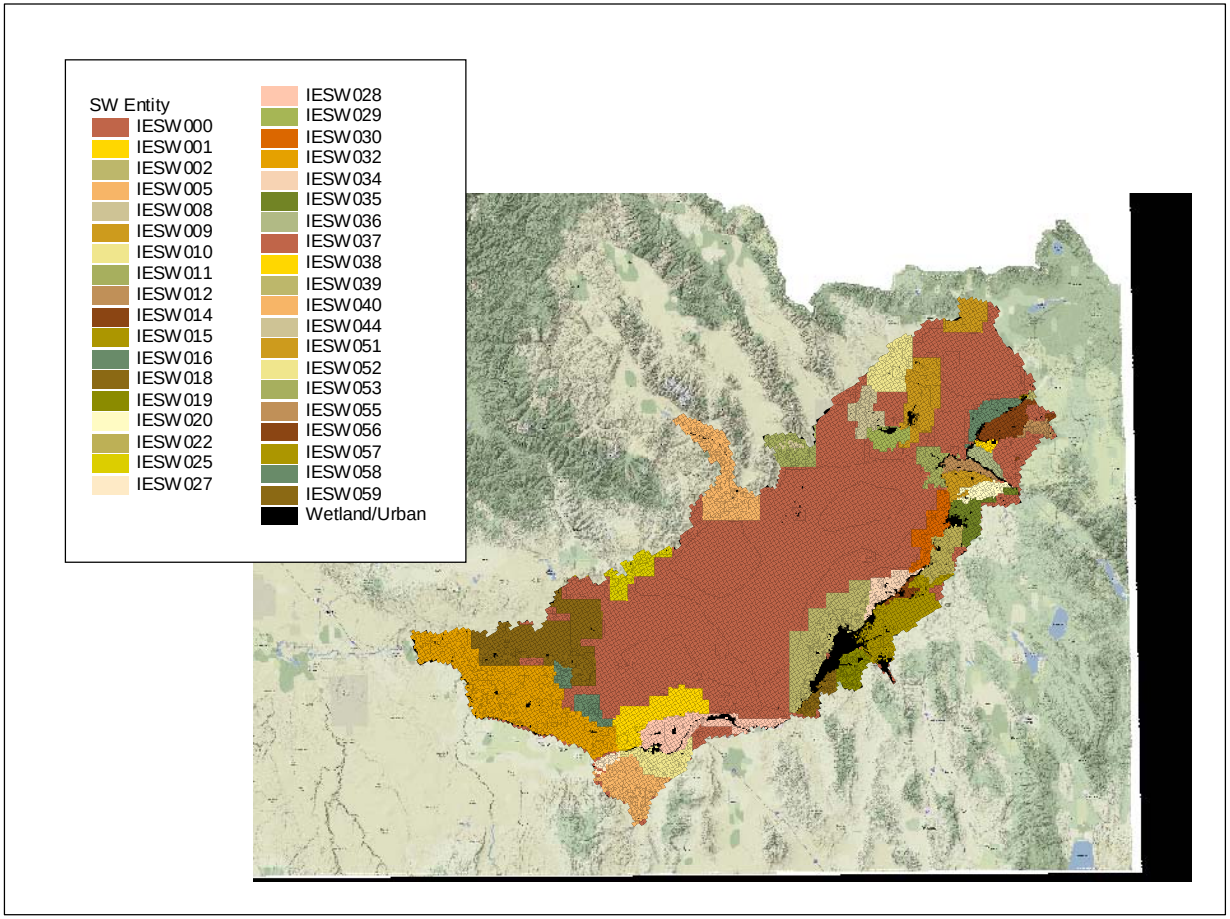

Figure 2. Surface-water Irrigation Entities, from “base_entity_source_20100610.shp” (IDWR 2010a).

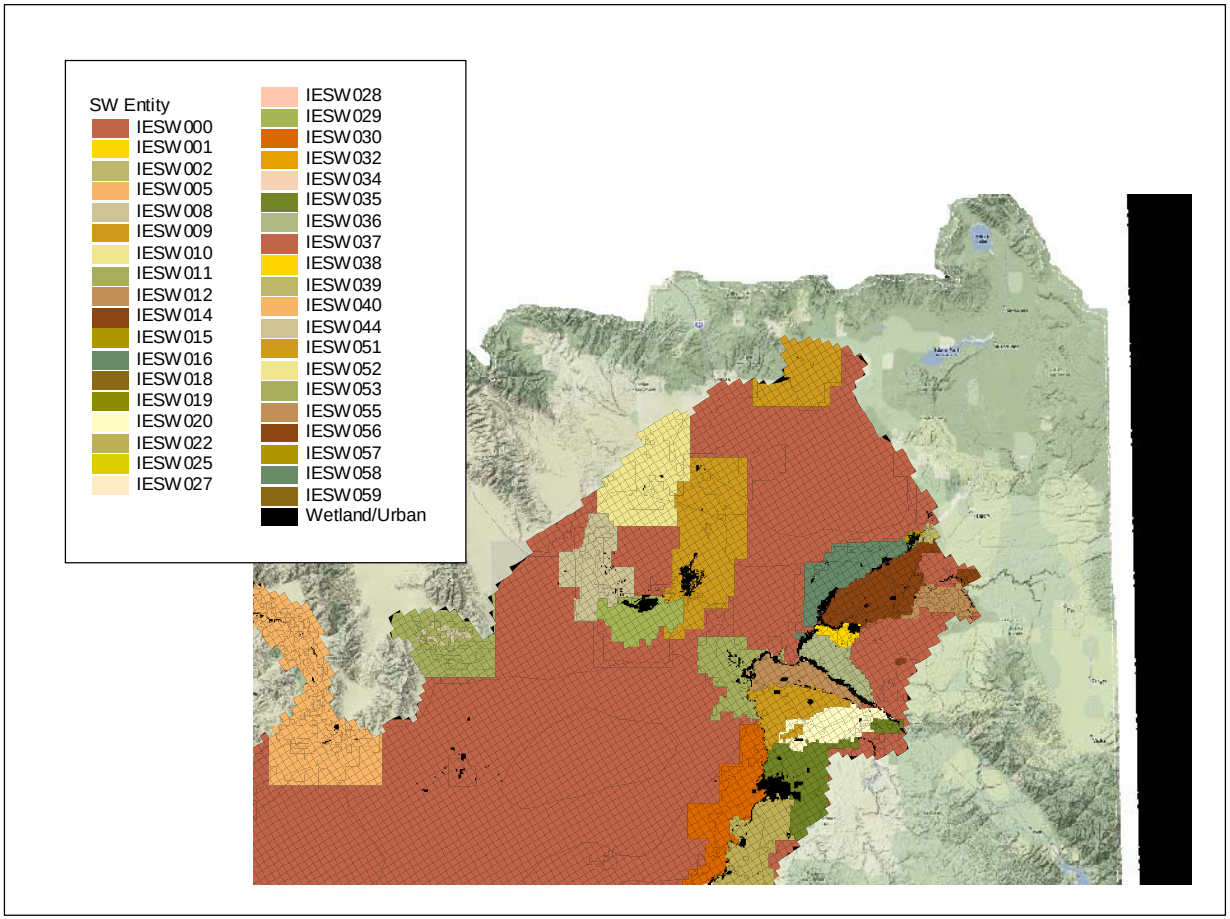

Figure 3. Close-up of Surface-water Irrigation Entities in the northeast part of the study area. These are also included in data set

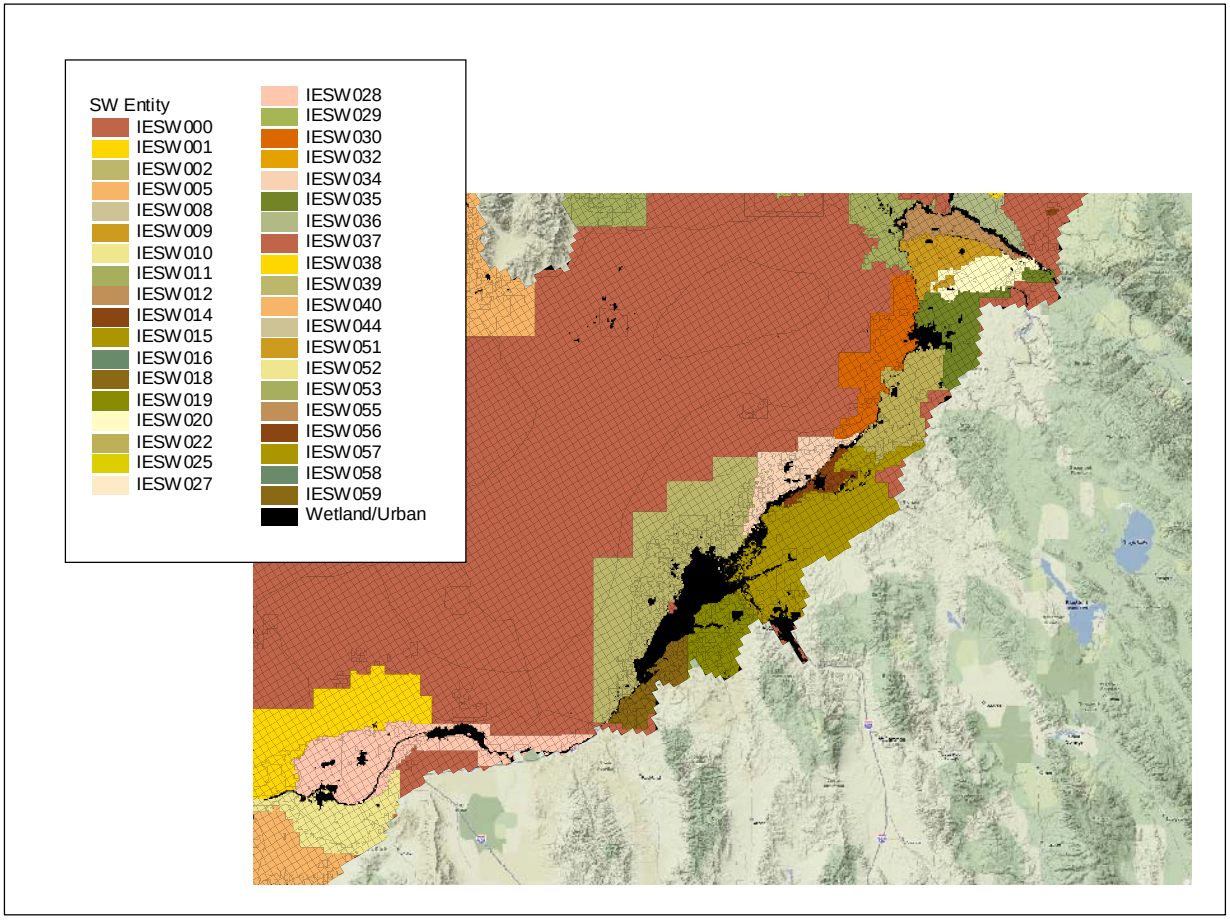

Figure 4. Close-up of Surface-water Irrigation Entities in the eastern part of the study area.

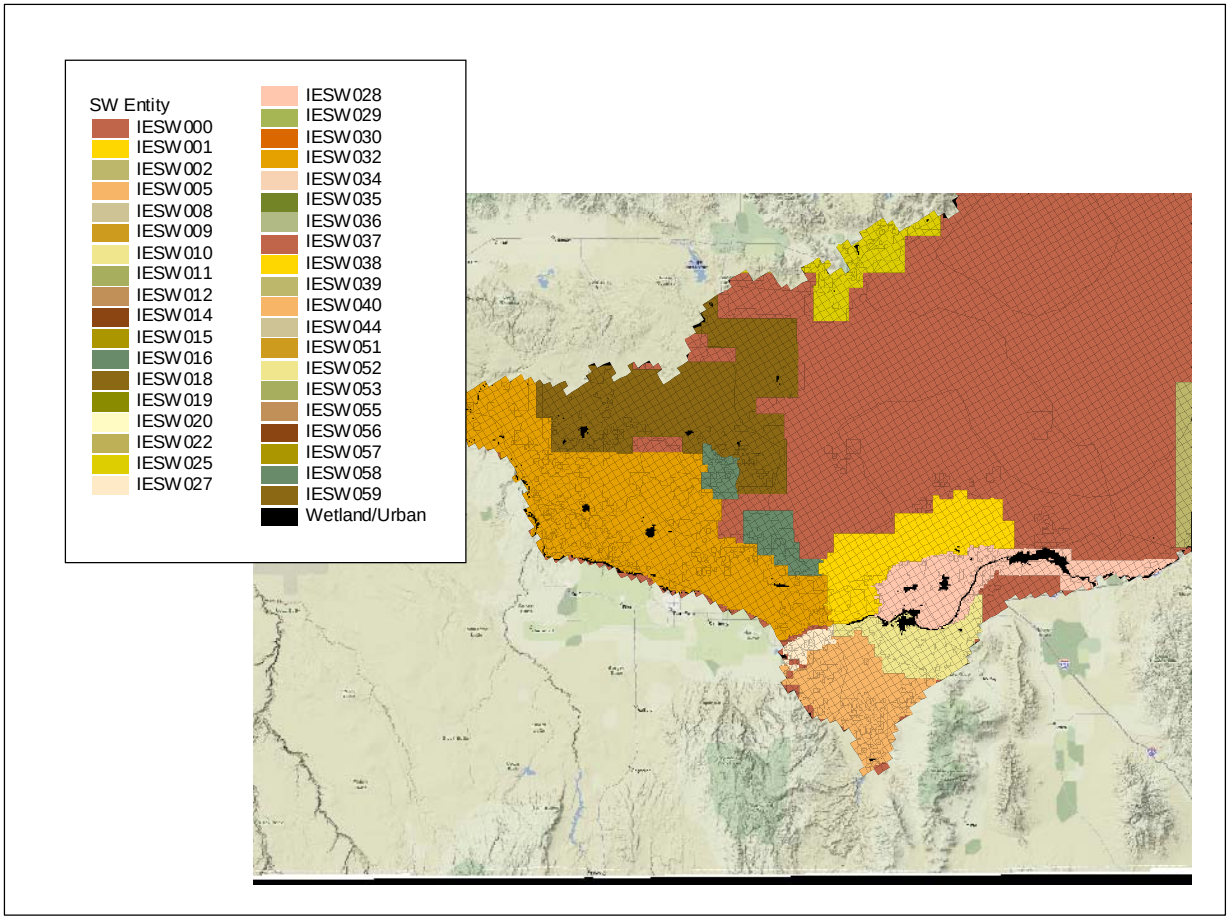

Figure 5. Close-up of Surface-water Irrigation Entities in the western part of the study area.

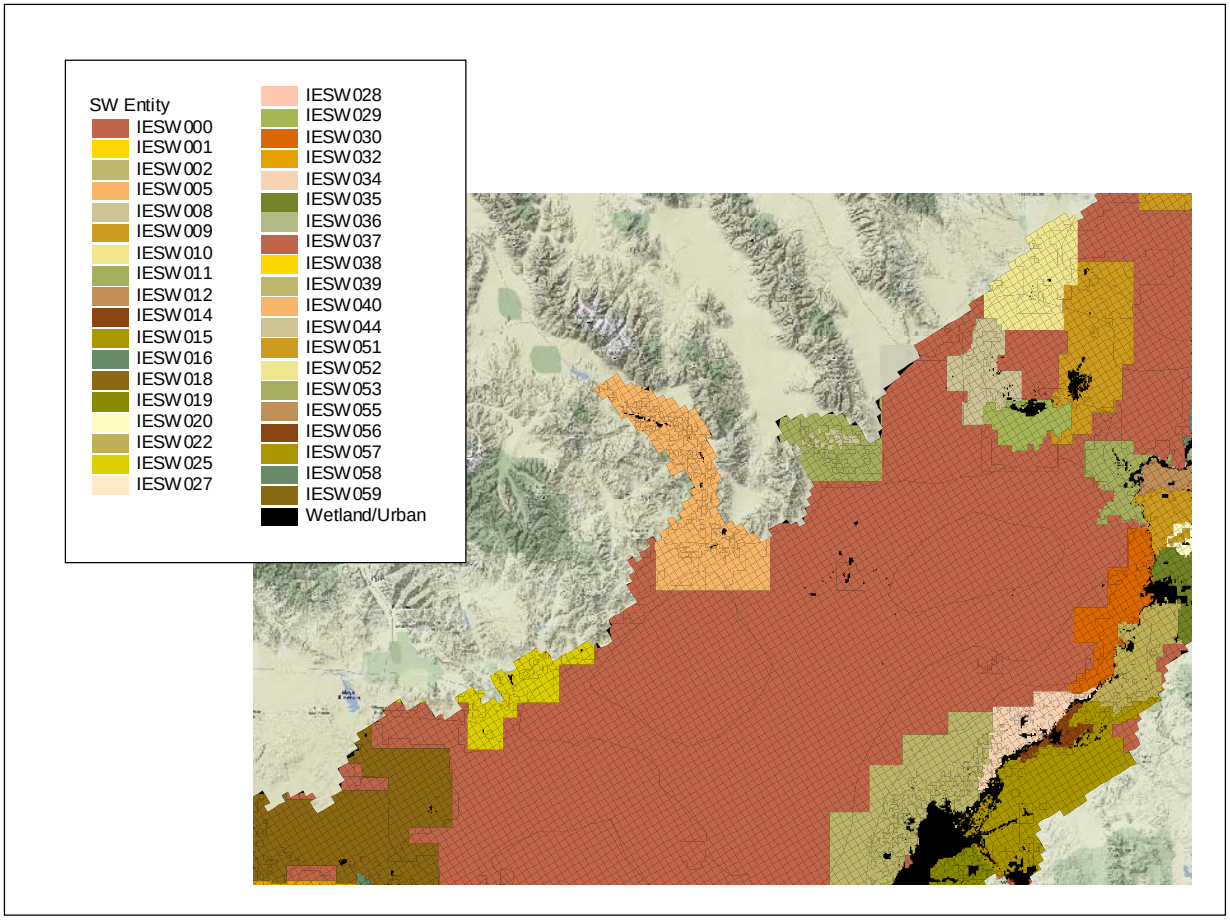

Figure 6. Close-up of Surface-water Irrigation Entities in the north central part of the study area.

Appendix A contains the text of a memo e-mailed to the ESHMC in October 2009 describing the surface-water entities and the individual canal companies or irrigation districts included within them. Appendix B contains the text of spreadsheet "Hist_all_snake_ESPAM2_DIVS_10_29_09.xls" referenced in the memo. Additional information on particular entities was also distributed, including two memos that were posted on the IDWR website (IDWR 2010c, 2010d).

Table 1 is updated from the October 2009 memo and reflects the incorporation of IESW031 and IESW041 into IESW000. Those two entities were entities where most of the irrigated lands were outside the study area, and where data regarding the extent of irrigation was not available for all the irrigated lands data sets. This made apportionment of diversions to lands within and without the study area problematic, so we used estimated application depths (see DDW-V2-07). Since that was also the treatment of IESW000, it seemed to be appropriate and more transparent to include all those lands in a single entity. Table 1 also reflects the updated common names for entities distributed in April 2010.

Table 1
Description of Surface-water Irrigation Entities
and Mapping of Irrigation Districts and Canal Companies
to Entities

ENTITY	Data source	Comment
IESW000 (Null)	GIS analysis of irrigated lands	This is a "catch-all" entity to provide an irrigation depth for stray irrigated parcels that happen to not lie within any defined entity. Diversion volumes are based on an assumed diversion depth (see Contor 2010d). This entity includes the small portions of Twin Falls Canal Company (IESW041 in ESPAM1.1) and Ashton-area canals (IESW031 in ESPAM1.1) that lie within the study area.
IESW001 (A&B)	RGLP	
IESW002 (AbSpring)	RGLP	
IESW005 (BigLost)	Watermaster records, USGS gage records	Includes all SW irrigation in the Big Lost River basin. Prior to 1997 data are from watermaster reports. From then on, watermaster reports include groundwater as well as surface water (but not distinguished by source), so after 1996, diversions are based on (upstream gages - downstream gage - calculated perched seepage)

ENTITY	Data source	Comment
IESW008 (BlaineCo)	Watermaster records	Blaine County Canal Company (Little Lost River, Basin 33). This entity was treated differently from other Little Lost River irrigation because it has inferior water rights, with different delivery patterns and more supplemental GW irrigation. See IESW053
IESW009 (Burgess)	RGLP	
IESW010 (Burley)	RGLP	
IESW011 (ButteMrk)	RGLP	
IESW012 (Canyon)	RGLP	
IESW014 (Blckfoot)	RGLP	
IESW015 (Dewey)	RGLP	At some time early in the study period this entity was converted from irrigation to a wildlife refuge, but diversion records continue so we have retained it as part of the irrigated-lands data set in order to incorporate diverted volumes in the water budget.
IESW016 (Egin)	RGLP	
IESW018 (Falls)	RGLP	
IESW019 (FortHall)	RGLP	
IESW020 (Harrison)	RGLP	
IESW022 (Idaho)	RGLP	
IESW025 (LtlWood)	IDWR	Carey tract. The only data we have located are constant-rate estimates which we applied to all model years.
IESW027 (Milner)	RGLP	
IESW028 (Minidoka)	RGLP	
IESW029 (MudLake)	Watermaster records	All SW irrigation directly from Mud Lake. Subset of WD31 diversions. See IESW051
IESW030 (NewSwedn)	RGLP	Combines entities IESW030 and IESW033 from ESPAM1.1.
IESW032 (Nrthside)	RGLP	RGLP data files contain many redundant entries; some are input files or intermediate files for

ENTITY	Data source	Comment
		calculations. Assignment of files is carried over from ESPAM1.1, which incorporated careful and extensive review with IDWR personnel.
IESW034 (Peoples)	RGLP	
IESW035 (Progress	RGLP	Please see accompanying Willow Creek memo.
IESW037 (Reno)	Birch Creek; watermaster and power-plant records	Serves lands under Reno Ditch Company
IESW038 (Rexburg)	RGLP	
IESW039 (Chester)	RGLP	
IESW040 (Oakley)	USGS gage and canal-company data	
IESW044 (Monteview)	(none)	Producers and Monteview Canal Companies and Jefferson Irrigation District, all in the Monteview/Mud Lake area. No surface-water diversions. This entity needed to be included to allow operation of Offsite Pumping routine, which adds offsite GW volumes to SW volumes to calculate canal loss and net impact of irrigation. Data tables are populated with values of zero SW diversion and return.
IESW051 (Dubois)	Watermaster records	Camas and Beaver Creek above Mud Lake. Diversions from WD31 watermaster records, less diversions attributed to IESW029.
IESW052 (Small)	Watermaster records	Medicine Lodge Creek. Diversions from WD32-C watermaster records, reduced for estimated portion of irrigated lands lying outside model boundary.
IESW053 (Howe)	Watermaster records	Little Lost River SW irrigation outside of Blaine County Canal Company. Diversions from WD33 watermaster records, subtracting canal co. (IESW008) and users whose place of use is outside the model boundary.
IESW055 (Labelle)	RGLP	
IESW056 (SugrCity)	RGLP	This entity has so many canals that there are two sub-worksheets in the diversion spreadsheet file.

ENTITY	Data source	Comment
IESW057 (Blk_Chub)	Watermaster and BIA records	Irrigation from Blackfoot River plus Reservation Canal. We used watermaster and BIA records in preference to RGLP data.
IESW058 (AmFalls2)	RGLP	Lands irrigated from Milner Gooding Canal between Milner Dam and the start of IESW059 under American Falls Reservoir District 2.
IESW059 (Good_Rch)	RGLP, USGS, Watermaster	Lands irrigated from the Big Wood River below Magic Reservoir, the Little Wood River below Carey, the Milner Gooding Canal below IESW058, and Thorn Creek and Dry Creek. Because of ambiguity in the RGLP data and unmeasured fluxes between Big Wood and Little Wood delivery systems, we combined all the irrigated lands from ESPAM1.1 entities IESW007 (less IESW058) and IESW054, and did an in-and-out mass balance of all surface-water fluxes crossing the entity boundary. These we partitioned into perched seepage and the net of (diversions minus returns). This is the same approach that was used in IESW005 after 1996.

DESIGN DECISION

The following design decision is proposed:

The delineation of Surface-water Entities and Groundwater Polygons in data set “base_entity_source_20100610.shp” (IDWR 2010a) will be used to assign irrigated lands to diversions, returns, ET adjustment factors and sprinkler percentages.

REFERENCES

Contor, B.A. 2010a. Representation of Irrigated Lands and Source of Irrigation Water, Eastern Snake Plain Aquifer Model Version 2. IWRRI Technical Completion Report 201002, Design Document DDM V2-04. In review.

Contor, B.A. 2010b. Irrigation Diversions for Calibration of Eastern Snake Plain Aquifer Model Version 2, As Built. IWRRI Technical Completion Report 201004, Design Document DDW-V2-07. In review.

Contor, B.A. 2010c. Fixed-point and Offsite-point Recharge and Discharge for Calibration of Eastern Snake Plain Aquifer Model Version 2, As Built. IWRRI Technical Completion Report 201005, Design Document DDW-V2—08. In progress.

Contor, B.A. 2010d. Ad-hoc Adjustments to Accommodate On-Farm Method: Progress Report. Slide presentation to ESHMC. http://www.idwr.idaho.gov/WaterInformation/Projects/espam/d/meetings/2010_ESHMC/4-7-2010/Ad_Hoc_Adjust_20100407.pdf, accessed 5 July 2010.

Contor, B.A. 2002. Ground Water Irrigation Polygons for Recharge Calculation, Design Document DDW-009. http://www.if.uidaho.edu/~johnson/DDW-009.pdf, accessed 29 July 2010

Gilliland, B. 2002. Aggregation of Surface Water Canal Companies Into Surface Water Irrigation Entities. IWRRI Technical Report 04-014. Design Document DDW-008. http://www.if.uidaho.edu/~johnson/DDW008_AggIEs.pdf, accessed 29 July 2010.

IDWR, 2010a. GIS data set "base_entity_source_20100610.shp," (including all files associated with the ESRI "shapefile" data format), http://www.idwr.idaho.gov/WaterInformation/Projects/espam/d/model_files/Version_2.0_Development/Current_Data/ESPAM2_Irrigated_Lands_20100629/Data_for_processing_irrigated_lands/, accessed 29 July 2010.

IDWR, 2010b. Data folder "Canal Seepage Calculations Round 2," http://www.idwr.idaho.gov/WaterInformation/Projects/espam/d/model_files/Version_2.0_Development/Current_Data/Canal_Seepage_Calculations_Round_2/, accessed 29 July 2010.

IDWR, 2010c. Memorandum regarding IESW059. http://www.idwr.idaho.gov/WaterInformation/projects/espam/d/model_files/Version_2.0_Development/Current_Data/Diversions/Diversions/MEMO_IESW059_Divs_Retrn_20091022.pdf, accessed 29 July 2010.

IDWR, 2010d. Memorandum regarding surface-water entities in the Willow Creek area. http://www.idwr.idaho.gov/WaterInformation/projects/espam/d/model_files/Version_2.0_Development/Current_Documentation/Microsoft%20Word%20-%20MEMO_WillowCreek_Contor_20090903.pdf, accessed 29 July 2010.

Taylor, S. 2010. (ET adjustment factor & *.ent file Design Document). In progress.

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APPENDIX A: October 2009 Memorandum.

MEMORANDUM

To: ESPAM2 Model Files
Fr: Bryce Contor
Date: 22 October 2009

Re: Mapping of diversions to Surface Water Entities

This memo identifies the data sources and diversions associated with each surface-water entity in ESPAM2 data. It accompanies spreadsheet file "Hist_all_Snake_Index_ESPAM2_DIVS_20091021_4.xls" and memos "MEMO_IESW059_Divs_Retrn_20091022.pdf" and "MEMO_Willow_Creek_Contor20090903_edited_20091022.pdf."

The spreadsheet is an index of the file names that appear in data for the IDWR Reach Gain and Loss Program, in files that generally include terms similar to "histupsnak" and "histlosnak" along with date qualifiers. The diversions and returns spreadsheet for ESPAM2 contains blocks of data from these RGLP spreadsheets, copied and pasted in a manner that allows automated calculation of diversions and returns with user-input stress period definitions. Those data identify many individual ditches by name. For other entities, the entity name and "Comments" in this memo describe the general area or water source for which diversions are represented.

Table 1 identifies summarizes the data sources and diversions for entities.

Table 1
Data Sources, Ditches and Canals
Assigned to Surface-water Irrigation Entities
for ESPAM2

ENTITY	Data source	Comment
IESW000 (Null Idaho)	GIS analysis of irrigated lands	This is a "catch-all" entity to provide an irrigation depth for stray irrigated parcels that happen to not lie within any defined entity. Diversion volumes are based on an assumed diversion depth of 6 feet, using GIS acreage from each irrigated lands data set.
IESW001 (A&B 1)[1]	RGLP	

[1] At one time the numeric suffix indicated the number of companies or service areas that were combined into a single entity, with the name of the entity coming from the company that was first alphabetically. Even during ESPAM1.1 data refinement, however, we did not change entity

ENTITY	Data source	Comment
IESW002 (Aberdeen Springfield 1)	RGLP	
IESW005 (Big Lost River 3)	Watermaster records, USGS gage records	Includes all SW irrigation in the Big Lost River basin. Prior to 1997 data are from watermaster reports. From then on, watermaster reports include groundwater as well as surface water (but not distinguished by source), so after 1996, diversions are based on (upstream gages - downstream gage - calculated perched seepage)
IESW008 (Blaine 1)	Watermaster records	Blaine County Canal Company (Little Lost River, Basin 33). This entity was treated differently from other Little Lost River irrigation because it has inferior water rights, with different delivery patterns and more supplemental GW irrigation. See IESW053
IESW009 (Burgess 5)	RGLP	
IESW010 (Burley 1)	RGLP	
IESW011 (Butte and Market 1)	RGLP	
IESW012 (Canyon Creek 3)	RGLP	
IESW014 (Corbett 4)	RGLP	
IESW015 (Dewey 1)	RGLP	At some time during the study period this entity was converted from irrigation to a wildlife refuge, but diversion records continue so we have retained it as part of the irrigated-lands data set.
IESW016 (Egin 2)	RGLP	
IESW018 (Falls 3)	RGLP	
IESW019 (Fort Hall 1)	RGLP	
IESW020 (Harrison 6)	RGLP	Please see accompanying Willow Creek memo.
IESW022 (Idaho 2)	RGLP	Please see accompanying Willow Creek memo.

names nor adhere to this convention as we continued to adjust entities and diversion assignments.

ENTITY	Data source	Comment
IESW025 (Little Wood 2)	IDWR	Carey tract. The only data we have located are constant-rate estimates which we applied to all model years.
IESW027 (Milner 1)	RGLP	
IESW028 (Minidoka 1)	RGLP	
IESW029 (Mud Lake 4)	Watermaster records	All SW irrigation directly from Mud Lake. Subset of WD31 diversions. See IESW051
IESW030 (New Sweden 7)	RGLP	Combines entities IESW030 and IESW033 from ESPAM1.1.
IESW031 (North Fremont 2)	GIS analysis of irrigated lands	Only a small part of the service areas lie within the study area. In ESPAM1.1 we partitioned the total diversion volume, but we have poor data on irrigated lands outside the study area. For ESPAM2 we applied a uniform depth of 6 feet to acreage indicated by GIS for various irrigation data sets.
IESW032 (Northside 7)	RGLP	RGLP data files contain many redundant entries; some are input files or intermediate files for calculations. Assignment of files is carried over from ESPAM1.1, which incorporated careful and extensive review with IDWR personnel. See note at IESW007 about realignment of boundaries and change in status of one data file.
IESW034 (Peoples 8)	RGLP	
IESW035 (Progressive 5)	RGLP	Please see accompanying Willow Creek memo.
IESW037 (Reno 1)	Birch Creek; watermaster and power-plant records	Serves lands under Reno Ditch Company
IESW038 (Rexburg 1)	RGLP	
IESW039 (Silkey 2)	RGLP	
IESW040 (Southwest 2)	USGS gage and canal-company data	Oakley Fan
IESW041 (Twin Falls	GIS analysis of irrigated	Only a small part of the service areas lie within the study area. In ESPAM1.1 we partitioned the total

ENTITY	Data source	Comment
1)	lands	diversion volume, but we have poor data on irrigated lands outside the study area. For ESPAM2 we applied a uniform depth of 6 feet to acreage indicated by GIS for various irrigation data sets.
IESW044 (Jefferson 3)	(none)	Producers and Monteview Canal Companies and Jefferson Irrigation District, all in the Monteview/Mud Lake area. No surface-water diversions. This entity needed to be included to allow operation of Offsite Pumping routine, which adds offsite GW volumes to SW volumes to calculate canal loss and net impact of irrigation. Data tables are populated with values of zero SW diversion and return.
IESW051 (Private Basin 31)	Watermaster records	Camas and Beaver Creek above Mud Lake. Diversions from WD31 watermaster records, less diversions attributed to IESW029.
IESW032 (Private Basin 32)	Watermaster records	Medicine Lodge Creek. Diversions from WD32-C watermaster records, reduced for estimated portion of irrigated lands lying outside model boundary.
IESW053 (Private Basin 33)	Watermaster records	Little Lost River SW irrigation outside of Blaine County Canal Company. Diversions from WD33 watermaster records, subtracting canal co. (IESW008) and users whose place of use is outside the model boundary.
IESW055 (Independent 6)	RGLP	
IESW056 (Henry's Fork)	RGLP	This entity has so many canals that there are two sub-worksheets in the diversion spreadsheet file.
IESW057 (Blackfoot River)	Watermaster and BIA records	Irrigation from Blackfoot River plus Reservation Canal. We used watermaster and BIA records in preference to RGLP data.
IESW058 (Milner Gooding)	RGLP	Lands irrigated from Milner Gooding Canal between Milner Dam and the start of IESW059. This is a new entity for ESPAM2; it was split off of ESPAM1.1 entity IESW007.

ENTITY	Data source	Comment
IESW059 (Wood Rivers)	RGLP, USGS, Watermaster	Lands irrigated from the Big Wood River below Magic Reservoir, the Little Wood River below Carey, the Milner Gooding Canal below IESW058, and Thorn Creek and Dry Creek. Because of ambiguity in the RGLP data and unmeasured fluxes between Big Wood and Little Wood delivery systems, we combined all the irrigated lands from ESPAM1.1 entities IESW007 (less IESW058) and IESW054, and did an in-and-out mass balance of all surface-water fluxes crossing the entity boundary. These we partitioned into perched seepage and the net of (diversions minus returns). This is the same approach that was used in IESW005 after 1996.

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APPENDIX B: Text of spreadsheet Hist_all_snake_ESPAM2_DIVS_10_29_09.xls

INDEX	Filename	Desc	Diversion Worksheet Assignment			
270	130855.00A	HISTORIC DIVERSION OF MINIDOKA N. SIDE PUMP (1000 AC-FT)	IESW001			
214	130616.10A	HISTORIC DIVERSION ABERDEEN CANAL (1000 AC-FT)	IESW002			
34	130381.10A	HISTORIC DIVERSION BURGESS CANAL (1000 AC-FT)	IESW009			
35	130381.15A	HISTORIC DIVERSION CLARK & EDWARDS CANAL (1000 AC-FT)	IESW009			
39	130381.80A	HISTORIC DIVERSION RIGBY CANAL (1000 AC-FT)	IESW009			
44	130383.05A	HISTORIC DIVERSION PARKS & LEWISVILLE CANAL (1000 AC-FT)	IESW009			
45	130383.15A	HISTORIC DIVERSION NORTH RIGBY CANAL (1000 AC-FT)	IESW009			
166	130570.30A	HISTORIC DISCHARGE DISCHARGE OF BEAR TRAP CANAL (1000 AC-FT)	IESW009			
181	130572.58A	Misc diversions Lorenzo/Rexburg to Willow Creek. Not part of RGLP spreadsheet; from IDWR directly	IESW009	(1/3)		
261	130805.00A	HISTORIC DIVERSION BURLEY SOUTH SIDE CANAL (1000 AC-FT)	IESW010			
165	130570.25A	HISTORIC DIVERSION OF BUTTE & MARKET LAKE CANAL (1000 AC-FT)	IESW011			
181.1	130572.58A	Misc diversions Lorenzo/Rexburg to Willow Creek. Not part of RGLP spreadsheet; from IDWR directly	IESW011	(1/3)	(Duplicate line)	
95	130484.75A	HISTORIC DIVERSION OF ENTERPRISE CANAL (1000 AC-FT)	IESW012			
129	130545.15A	HISTORIC DIVERSION: CANYON CREEK CANAL	IESW012			
130	130545.90A	HISTORIC DIVERSION: W STEVENS PUMP	IESW012			
215	130616.50A	HISTORIC DIVERSION CORBETT CANAL (1000 AC-FT)	IESW014			
216	130616.70A	HISTORIC DIVERSION OF NIELSEN-HANSEN CANAL (1000 AC-FT)	IESW014			
74	130463.10A	HISTORIC DIVERSION OF DEWEY CANAL (1000 AC-FT)	IESW015			
107	130495.50A	HISTORIC DIVERSION OF LAST CHANCE CANAL (1000 AC-FT)	IESW016			
112	130497.25A	HISTORIC DIVERSION ST. ANTHONY UNION CANAL (1000 AC-FT)	IESW016			
121	130505.25A	HISTORIC DIVERSION OF EGIN CANAL (1000 AC-FT)	IESW016			
122	130505.30A	HISTORIC DIVERSION OF ST. ANTHONY UNION FEEDER (1000 AC-FT)	IESW016			
123	130505.35A	HISTORIC DIVERSION OF INDEPENDENT CANAL (1000 AC-FT)	IESW016			
252	130764.00A	HISTORIC DIVERSION MICHAUD CANAL (1000 AC-FT)	IESW018			
233	130680.05A	HISTORIC DIVERSION FORT HALL MAIN CANAL (1000 AC-FT)	IESW019			
234	130680.10A	HISTORIC DIVERSIONS FORT HALL NORTH CANAL (1000 AC-FT)	IESW019			
246	130759.00A	HISTORIC DIVERSION FORT HALL MICHAUD CANAL (1000 AC-FT)	IESW019			
16	130379.80A	HISTORIC DIVERSION FARMERS FRIEND CANAL (1000 AC-FT)	IESW020			
17	130379.85A	HISTORIC DIVERSION ENTERPRISE CANAL (1000 AC-FT)	IESW020			
20	130380.25A	HISTORIC DIVERSION BUTLER ISLAND CANAL (1000 AC-FT)	IESW020			
21	130380.30A	HISTORIC DIVERSION ROSS AND RAND CANAL (1000 AC-FT)	IESW020			
22	130380.50A	HISTORIC DIVERSION STEELE CANAL (1000 AC-FT)	IESW020			

23	130380.55A	HISTORIC DIVERSION HARRISON CANAL (1000 AC-FT)	IESW020			
26	130380.65A	HISTORIC DIVERSION CHENEY CANAL (1000 AC-FT)	IESW020			
28	130380.85A	HISTORIC DIVERSION RUDY (PLUS BOOMER POST 1993) CANAL (1000 AC-FT)	IESW020			
32	130380.95A	HISTORIC DIVERSION BOOMER (NORTH RUDY) CANAL (1000 AC-FT)	IESW020			
33	130380.98A	HISTORIC DIVERSION KITE & NORD CANAL (1000 AC-FT)	IESW020			
50	130383.87A	HISTORIC DIVERSION OF NELSON CANAL (1000 AC-FT)	IESW020			
51	130383.88A	HISTORIC DIVERSION OF MATTSON CRAIG CANAL (1000 AC-FT)	IESW020			
175	130571.45A	HISTORIC DIVERSION OF IDAHO CANAL (1000 AC-FT)	IESW022			
196	130585.15A	SAND CREEK DELIVERY TO IDAHO CANAL (100 AC-FT)	IESW022	Inflow		
204	130595.25A	5 HISTORIC DIVERSION SNAKE RIVER VALLEY CANAL (1000 AC-FT)	IESW022			
238	130694.99A	SUM OF MISC DIVERSIONS SNAKE R SHELLEY TO NR BLACKFOOT (1000 AC-FT)	IESW022	(1/2)		
273	130860.00A	HISTORIC DIVERSION MILNER LOW LIFT PUMP NR MILNER (1000 AC-FT)	IESW027			
256	130776.52A	HISTORIC DIVERSION: OSBORN PUMP	IESW028			
259	130800.00A	HISTORIC DIVERSION MINIDOKA NORTH SIDE CANAL (1000 AC-FT)	IESW028			
263	130814.99A	SUM OF PUMP DIVERSIONS SNAKE RIVER NEELEY TO MINIDOKA (1000 AC-FT)	IESW028			
27	130380.80A	HISTORIC DIVERSION BUTLER ISLAND #2 (1000 AC-FT)	IESW030	See notation on Water Right 1-10		
167	130571.25A	HISTORIC DIVERSION OF OSGOOD CANAL (1000 AC-FT)	IESW030			
169	130571.26A	HISTORIC DIVERSION CLEMENTS CANAL PUMP (1000 AC-FT)	IESW030			
170	130571.30A	HISTORIC DIVERSION OF KENNEDY CANAL (1000 AC-FT)	IESW030			
171	130571.35A	HISTORIC DIVERSION OF GREAT WESTERN CANAL (1000 AC-FT)	IESW030			
179	130572.50A	HISTORIC DIVERSION OF PORTER CANAL (1000 AC-FT)	IESW030			
203	130595.05A	HISTORIC DIVERSION OF WOODVILLE CANAL (1000 AC-FT)	IESW030			
210	130614.30A	HISTORIC DIVERSION BLACKFOOT CANAL (1000 AC-FT)	IESW030			
232	130661.00A	HISTORIC AND ESTIMATED (1928-73) DIVERSION LITTLE INDIAN DITCH (KAF)	IESW030			
238.1	130694.99A	SUM OF MISC DIVERSIONS SNAKE R SHELLEY TO NR BLACKFOOT (1000 AC-FT)	IESW030	(1/2)	(Duplicate line)	
271	130858.00A	HISTORIC DIVERSION NORTHSIDE PA LATERAL PUMP (1000 AC-FT)	IESW032			
279	130865.20A	HISTORIC DIVERSION NORTH SIDE CROSS-CUT FROM GOODING (1000 AC-FT)	IESW032			
281	130870.00A	HISTORIC DIVERSION NORTH SIDE CANAL AT MILNER (1000 AC-FT)	IESW032			
286	130879.99A	SUM OF SMALL PUMP DIVERSIONS SNAKE RIVER MINIDOKA TO MILNER (1000 AC-F	IESW032			
342.1	131468.05A	HISTORIC FLOW, X-WASTE NEAR GOODING (1000 AC-FT)	IESW032	Outflow	(Duplicate line)	
211	130615.20A	HISTORIC DIVERSION NEW LAVA SIDE CANAL (1000 AC-FT)	IESW034			
213	130615.25A	HISTORIC DIVERSION PEOPLES CANAL (1000 AC-FT)	IESW034			
217	130617.05A	HISTORIC DIVERSION RIVERSIDE CANAL (1000 AC-FT)	IESW034			
219	130619.95A	HISTORIC DIVERSION DANSKIN CANAL (1000 AC-FT)	IESW034			

220	130620.50A	HISTORIC DIVERSION TREGO CANAL (1000 AC-FT)	IESW034				
223	130625.03A	HISTORIC DIVERSION WEARYRICK CANAL (1000 AC-FT)	IESW034				
225	130625.06A	HISTORIC DIVERSION WATSON CANAL (1000 AC-FT)	IESW034				
226	130625.07A	HISTORIC DIVERSION PARSONS CANAL (1000 AC-FT)	IESW034				
13	130375.05A	HISTORIC DIVERSION ANDERSON CANAL (1000 AC-FT)	IESW035				
14	130379.75A	HISTORIC DIVERSION EAGLE ROCK CANAL (1000 AC-FT)	IESW035				
189	130580.00A	WILLOW CREEK NR RIRIE (1000 AC-FT) <	IESW035	(See Willow Creek memo)			
196.1	130585.15A	SAND CREEK DELIVERY TO IDAHO CANAL (100 AC-FT)	IESW035	Outflow	(Duplicate line)		
197	130585.20A	HISTORIC DISCHARGE WILLOW CREEK FLOODWAY CHANNEL NR UCON (KAF)	IESW035	Outflow			
202	130585.49A	SUM OF PUMP DIVERSIONS WILLOW CREEK BELOW RIRIE (1000 AC-FT)	IESW035	(may have been omitted in Willov			
205	130599.99A	SUM OF PUMP DIVERSIONS SNAKE RIVER WILLOW CREEK TO SHELLEY (1000 AC-FT)	IESW035	(may have been omitted in Willov			
52	130383.92A	HISTORIC DIVERSION OF SUNNYDELL CANAL (1000 AC-FT)	IESW036				
55	130384.26A	HISTORIC DIVERSION OF LENROOT CANAL (1000 AC-FT)	IESW036				
56	130384.31A	HISTORIC DIVERSION OF REID CANAL (1000 AC-FT)	IESW036				
57	130384.34A	HISTORIC DIVERSION OF TEXAS FEEDER (1000 AC-FT)	IESW036				
58	130384.35A	HISTORIC DIVERSION: BANNOCK JIM SLOUGH	IESW036				
59	130384.36A	HISTORIC DIVERSION OF HILL PETINGER CANAL (1000 AC-FT)	IESW036				
61	130384.37A	HISTORIC DIVERSION OF NELSON COREY CANAL (1000 AC-FT)	IESW036				
62	130384.99A	SUM OF PUMP DIVERSIONS SNAKE RIVER HEISE TO LORENZO (1000 AC-FT)	IESW036	(1/2)			
158	130553.23A	HISTORIC DIVERSION OF CITY OF REXBURG CANAL (1000 AC-FT)	IESW038				
159	130553.34A	HISTORIC DIVERSION OF REXBURG IRRIGATION CANAL (1000 AC-FT)	IESW038				
161	130554.99A	SUM OF PUMP DIVNS (NOT SIDDOWAY) TETON R ST ANTHONY TO MOUTH (1000 AC-F	IESW038				
100	130490.08A	HISTORIC DIVERSION OF MCBEE CANAL (1000 AC-FT)	IESW039				
101	130490.10A	HISTORIC DIVERSION OF SILKEY CANAL (1000 AC-FT)	IESW039				
103	130490.15A	HISTORIC DIVERSION OF CURR CANAL (1000 AC-FT)	IESW039				
118	130504.99A	SUM OF MISC. DIVRSNS, HENRYS FORK FROM ASHTON TO ST. ANTHNY (1000 AC-FT)	IESW039	(1/2)			
29	130380.90A	HISTORIC DIVERSION LOWDER & JENNINGS CANAL (1000 AC-FT)	IESW055				
37	130381.45A	HISTORIC DIVERSION CROFT PUMP (1000 AC-FT)	IESW055				
38	130381.50A	HISTORIC DIVERSION EAST LABELLE CANAL (1000 AC-FT)	IESW055				
40	130382.05A	HISTORIC DIVERSION DILTS CANAL (1000 AC-FT)	IESW055				
41	130382.10A	HISTORIC DIVERSION ISLAND (INCLUDES DILTS 1930-34) CANAL (1000 AC-FT)	IESW055				
43	130382.25A	HISTORIC DIVERSION W. LABELLE & LONG ISLAND CANAL(1000 AC-FT)	IESW055				

46	130383.40A	HISTORIC DIVERSION OF WHITE CANAL (1000 AC-FT)	IESW055			
47	130383.60A	HISTORIC DIVERSION OF BRAMWELL CANAL (1000 AC-FT)	IESW055			
49	130383.62A	HISTORIC DIVERSION OF ELLIS CANAL (1000 AC-FT)	IESW055			
53	130383.98A	HISTORIC (28-85) DIVERSION OF ARNSBERGER CANAL (1000 AC-FT)	IESW055			
62.1	130384.99A	SUM OF PUMP DIVERSIONS SNAKE RIVER HEISE TO LORENZO (1000 AC-FT)	IESW055	(1/2)	(Duplicate line)	
181.2	130572.58A	Misc diversions Lorenzo/Rexburg to Willow Creek. Not part of RGLP spreadsheet; from IDWR directly	IESW055	(1/3)	(Duplicate line)	
98	130485.60A	HISTORIC DIVERSION FALL RIVER CANAL (1000 AC-FT	IESW056			
99	130487.05A	HISTORIC DIVERSION OF CHESTER CANAL (1000 AC-FT)	IESW056			
110	130497.05A	HISTORIC DIVERSION OF FARMERS FRIEND CANAL (1000 AC-FT)	IESW056			
111	130497.10A	HISTORIC DIVERSION OF TWIN GROVES CANAL (1000 AC-FT)	IESW056			
113	130498.05A	HISTORIC DIVERSION OF SALEM UNION CANAL (1000 AC-FT)	IESW056			
115	130500.15A	EST HIST DIV OF FALL R VIA CROSSCUT(=13049560-13050016) (1000 AC-FT)	IESW056	(not double-counting per e-mail fr		
118.1	130504.99A	SUM OF MISC. DIVRSNS, HENRYS FORK FROM ASHTON TO ST. ANTHNY (1000 AC-FT)	IESW056	(1/2)		
124	130505.45A	HISTORIC DIVERSION OF CONSOLIDATED FARMERS CANAL (1000 AC-FT)	IESW056			
136	130550.30A	HISTORIC DIVERSION OF WILFORD CANAL (1000 AC-FT)	IESW056			
139	130550.40A	HISTORIC DIVERSION OF TETON IRRIGATION CANAL (1000 AC-FT)	IESW056			
140	130550.42A	HISTORIC DIVERSION OF SIDDOWAY CANAL (1000 AC-FT)	IESW056			
141	130550.50A	HISTORIC DIVERSION OF PIONEER CANAL (1000 AC-FT)	IESW056			
142	130550.60A	HISTORIC DIVERSION OF STEWART CANAL (1000 AC-FT)	IESW056			
145	130552.05A	HISTORIC DIVERSION OF PINCOCK-BYINGTON CANAL (1000 AC-FT)	IESW056			
146	130552.10A	HISTORIC DIVERSION OF TETON ISLAND FEEDER CANAL (1000 AC-FT)	IESW056			
147	130552.45A	HISTORIC DIVERSION OF SALEM UNION B (1000 AC-FT)	IESW056			
148	130552.75A	HISTORIC DIVERSION OF ROXANA CANAL (1000 AC-FT)	IESW056			
149	130552.80A	HISTORIC DIVERSION OF ISLAND WARD CANAL (1000 AC-FT)	IESW056			
151	130552.95A	HISTORIC DIVERSION OF SAUREY SOMMERS CANAL (1000 AC-FT)	IESW056			
152	130553.06A	HISTORIC DIVERSION OF MCCORMICK-ROWE CANAL (1000 AC-FT)	IESW056			
153	130553.11A	HISTORIC DIVERSION OF PINCOCK-GARNER CANAL (1000 AC-FT)	IESW056			
154	130553.13A	HISTORIC DIVERSION OF GARDNER CANAL/PUMP (1000 AC-FT)	IESW056			
155	130553.14A	HISTORIC DIVERSION: BIGLER SLOUGH	IESW056			
157	130553.15A	HISTORIC DIVERSION OF WOODMANSEE-JOHNSON CANAL (1000 AC-FT)	IESW056			
280	130865.30A	HIST DIVERSION MILNER GOODING CANAL BLW XCUT - RES DIST 2 (1000 AC-FT)	IESW058			
359.1	131514.20A	HISTORIC DISCH, MILNER-GOODING CANAL ABV LITTLE WOOD R [#53] (1000 AC-FT	IESW058	Outflow	(Duplicate line)	
335	131425.00A	BIG WOOD RIVER BELOW MAGIC DAM, WM#3-NR RICHFIELD (1000 AC-FT)	IESW059	Inflow	See IESW059 memo	
342	131468.05A	HISTORIC FLOW, X-WASTE NEAR GOODING (1000 AC-FT)	IESW059	Inflow	See IESW059 memo	
359	131514.20A	HISTORIC DISCH, MILNER-GOODING CANAL ABV LITTLE WOOD R [#53] (1000 AC-FT	IESW059	Inflow	See IESW059 memo	

375		Big & Little Wood perched seepage from S. Taylor calculations	IESW059	Outflow.	See IESW059 memo
376		Malad R. Near Gooding (USGS)	IESW059	Outflow.	See IESW059 memo
377		Dry Creek near Blanche (USGS)	IESW059	Inflow	See IESW059 memo
378		Thorn Creek (Lee Peterson, former watermaster)	IESW059	Inflow	See IESW059 memo
9	130374.75A	HISTORIC DIVERSION (1928-98) OF RILEY CANAL (1000 AC-FT)	out of study area		
10	130374.99A	SUM OF PUMP DIVERSIONS SNAKE RIVER IRWIN TO HEISE (1000 AC-FT)	out of study area		
97	130485.55A	HISTORIC DIVERSION OF BELL CANAL (1000 AC-FT)	(assume not in study area - need to check fo		
104	130494.99A	SUM OF MISC DIVERSIONS FALLS RIVER SQUIRREL TO CHESTER (1000 AC-FT)	(mostly outside study area - neglected in ES		
133	130549.99A	SUM OF PUMP DIVERSIONS TETON RIVER SOUTH LEIGH CREEK TO ST ANTHONY (100	(mostly outside study area)		
25	130380.60A	HISTORIC DIVERSION CHENEY AND STEELE CANALS (1000 AC-FT)	(no data during study period)		
31	130380.94A	HISTORIC DIVERSION BOOMER-RUDY CANAL (1000 AC-FT)	(no data during study period)		
137	130550.35A	HISTORIC DIVERSION OF GOOD LUCK CANAL (1000 AC-FT)	(no diversions during study period)		
172	130571.36A	HISTORIC DIVERSION OF GREAT WESTERN & PORTER CANAL (1000 AC-FT)	(no diversions during study period)		
173	130571.39A	HISTORIC DIVERSION OF BEAR ISLAND & SMITH CANAL (1000 AC-FT)	(no diversions during study period)		