Tools for analyzing groundwater – surface water interaction in the BWRGWMA

Presented to the BWRGWMA Advisory Committee

December 16, 2020
Presentation outline

• Aquifer systems in BWRGWMA
• Conceptual models
• Quantifying consumptive use of groundwater
• Evaluating impacts of consumptive use of groundwater
• Other analyses of groundwater-surface water interaction
Big Wood River GWMA

Ground Water Management Area
• Groundwater irrigation point of diversion
From 1991 order establishing BWRGWMA

• “The surface and ground waters of the Big Wood River drainage are interconnected. Diversion of ground water from wells can deplete the surface water flow in streams and rivers. New ground water uses can also deplete available supplies for other users and affect basin underflow which presently accumulates in the Magic Reservoir.”

• “Injury could occur to prior surface and ground water rights including the storage right in Magic Reservoir if the flows of streams, rivers and ground water underflow in the Big Wood River Basin are intercepted by junior priority ground water diversions.”
Aquifer systems in the BWRGWMA

- Camas Prairie aquifer system discharges to:
  - Camas Creek
  - Magic Reservoir

- Wood River aquifer system discharges to:
  - Big Wood River
  - Silver Creek
  - Underflow to Eastern Snake Plain aquifer system
From 1991 order establishing BWRGWMA

• “The surface and ground waters of the Big Wood River drainage are interconnected. Diversion of ground water from wells can deplete the surface water flow in streams and rivers. New ground water uses can also deplete available supplies for other users and affect basin underflow which presently accumulates in the Magic Reservoir.”

• “Injury could occur to prior surface and ground water rights including the storage right in Magic Reservoir if the flows of streams, rivers and ground water underflow in the Big Wood River Basin are intercepted by junior priority ground water diversions.”
Tools for analyzing GW-SW interaction

• Predict effects of aquifer stresses on magnitude and timing of aquifer discharge to streams
  • Aquifer stresses can include:
    • Groundwater pumping
    • Incidental recharge (canal seepage, infiltration of applied water)
    • Natural recharge (tributary underflow, infiltration of precipitation)
    • Managed recharge

• Do NOT predict
  • Whether *impacts* to streamflow result in *material injury* to senior water rights
  • Fate of increases in streamflow
Tools for analyzing GW-SW interaction

• Conceptual model (hydrogeologic framework)
  • Wood River aquifer system (Bartolino, 2012; 2014)
  • Camas Prairie aquifer system (Walton, 1962; Wallace, 1972; Young, 1978)
    • Recent water level and seepage survey data (IDWR – Alex Moody)
    • Play Fairway geothermal study (Neupane et al., 2017; Glen et al., 2017; Shervais et al., 2018)

• Quantify consumptive use of groundwater
  • Pumping records
    • assume efficiency to estimate consumptive use
  • Evapotranspiration and precipitation data
    • crop irrigation requirement (CIR = ET – precip)
    • assume duty of surface water irrigation on mixed source land (canal seepage, efficiency)
Wood River Valley unconfined aquifer water table

From Bartolino (2014)
Wood River Valley confined aquifer head surface

From Bartolino (2014)
Representation of Wood River Valley aquifer system

Figure 6. Calibrated hydraulic conductivity for Layers 1, 2, and 3.

From Wylie, 2019, Version 1.1 groundwater flow model report
Confined and unconfined aquifers

From Jim Bartolino, USGS, presentation to BWRGWMA Advisory Committee, 12/2/2020
Camas Prairie confined aquifer head surface (September 1957)

From Walton (1962)
Camas Prairie confined aquifer head surface (April 2019)

Provisional potentiometric surface contours from Alex Moody
Camas Prairie seepage surveys

Figure 1: The Camas Prairie Watershed (HUC8 17040220) and location of measured sites in the November 2018 seepage survey.

From Moody (2019)
Do recent studies of the Camas Prairie geothermal system change the conceptual model of the Camas Prairie cold-water aquifer system?

Play Fairway analysis cites previous work with respect to groundwater flow in the cold-water aquifer system (Neupane, et al. 2017)

- “In general, both surface and subsurface waters of the Camas Prairie area flow from west to east towards the Big Wood River, and ultimately, to the Magic Hot Springs Reservoir (Wallace, 1972).”

- “An overlying seal is critical to retain heat and fluids, in order to preserve a viable hydrothermal power source.” (Shervais, et al. 2018)

  - Magnetotelluric surveys suggest a hydrothermally altered clay seal separates the geothermal system from overlying aquifers.
  - Fine-grained basin sediments may also provide an additional seal between the geothermal and cold-water aquifer systems.
Western Camas basin cross-section (Glen, et al. 2017)

Figure 8) Two-dimensional geophysical model of the Camas Prairie along road 600W.

Figure 2) Shaded topographic index maps of the Camas Prairie study area showing newly collected seismic reflection profiles, MT stations, gravity stations, magnetic traverses, and rock property sample locations. Also shown are existing gravity data, modeled profiles, faults, and thermal springs.
Camas geothermal system (Glen, et al. 2017)

Figure 11) Cartoon illustrating our conceptual model of the structure and geothermal system
Tools for analyzing GW-SW interaction

• Hydrogeologic framework (conceptual model)
  • Wood River aquifer system (Bartolino, 2012)
  • Camas Prairie aquifer system (Walton, 1962; Wallace, 1972; Young, 1978; Neupane et al., 2017; Shervais et al., 2018)

• Quantify consumptive use of groundwater
  • Pumping records
    • assume efficiency to estimate consumptive use
  • Evapotranspiration and precipitation data
    • crop irrigation requirement (CIR = ET – precip)
    • assume duty of surface water irrigation on mixed source land (canal seepage, efficiency)
Groundwater use, Wood River aquifer system

- Modeled curtailed GWCU
- GGWD & SVGWD reported GW diversions (from WD37)
- Estimated GWCU (85% of diversions)
- Surface water diversions
- Big Wood River flow past Hailey gage

Annual flow volume (AF)

Annual volume of consumptive use/diversions (AF)
Groundwater use, Wood River aquifer system

Groundwater consumptive use vs. annual streamflow at Hailey gage

$y = -0.0522x + 47254$
$R^2 = 0.4464$

$y = -0.0192x + 46729$
$R^2 = 0.8416$

Modeled curtailed GWCU (1995-2014)
85% of recorded diversions (2016-2019)
Groundwater use, Camas Prairie aquifer system
Recent groundwater use, BWRGWMA

Estimated groundwater consumptive use

Annual volume (AF)

Wood River Valley  Camas Prairie

Tools for analyzing GW-SW interaction

• Quantify impacts on aquifer discharge
  • Wood River aquifer system
    • Net impact is equal to consumptive use of groundwater
    • From conceptual model, impacts are to Big Wood River, Silver Creek and underflow to Eastern Snake Plain Aquifer
    • Model partitions impact between Big Wood River, Silver Creek, and underflow to Eastern Snake Plain Aquifer
    • Model predicts timing of impacts
    • Spatial and temporal predictions are constrained by model calibration to observed historical data
    • Model uncertainty (Wylie, 2019)

• Camas Prairie aquifer system
  • Net impact is equal to consumptive use of groundwater
  • From conceptual model, impacts are to Magic Reservoir inflow
  • Analytical or numerical model has not been developed to predict timing of impacts
Quantifying impacts, WRV groundwater flow model
Quantifying impacts, WRV groundwater flow model

Predicted impacts of groundwater consumptive use in 2007 (AF)

Predicted impacts of groundwater consumptive use in 2007 (cfs)

Average rate (cfs)
Quantifying impacts, WRV groundwater flow model

Predicted impacts of groundwater consumptive use in 2007 (AF)

Predicted impacts of groundwater consumptive use in 2007

nr Ketchum to Hailey  | Hailey to HRR  | HRR to Stanton + Willow

nr Ketchum to Hailey  | Hailey to HRR  | HRR to Stanton + Willow
Other potential applications of WRV groundwater flow model

• Simulate a user-specified change in aquifer stress, such as...
  • Partial reduction in consumptive use
    • Percentage reduction by all users
    • Reduction during specific month(s)
    • Reduction in specific areas
      • by GWD
      • Fallow acres in specific areas
      • Raise crops with lower consumptive use in specific areas
  • Managed recharge
  • Changes in natural recharge (precipitation, tributary underflow)
  • Changes in surface water infiltration
    • Changes in canal seepage
    • Changes in surface water irrigation efficiency

• Model predicts spatial distribution and timing of impacts on river reaches and underflow to ESPA

• Additional analyses may be needed to evaluate effect of changes in streamflow on downstream water users
DISCUSSION
Total irrigated acres (2020) within BWCC/AFRD2 service area: 109,715 acres
Total irrigated acres (2020) within BWCC/AFRD2 service area with BWCC/ARFD2 water rights only: 75,164 acres (no other overlapping place of use water rights)

(75,164 acres out of 109,715 acres; does not include NSCC overlap)
Total irrigated acres (2020) within BWCC/AFRD2 service area with overlapping place of use surface water rights: 16,146 acres

(16,146 acres out of 109,715 acres, includes about 5,200 acres of NSCC overlap, see circles)
Total irrigated acres (2020) within BWCC/AFRD2 service area with overlapping place of use ground water rights: 21,738 acres
Total irrigated acres (2020) within BWCC/AFRD2 service area with overlapping place of use ground water and surface water rights: 3,333 acres
Irrigated Areas without water rights along BWCC boundary

- 13 locations
- 611 acres total
- 12 – 165 acres each
- Letter sent to BWCC in June 2020
- BWCC investigating
- 1 non-irrig use within BWCC
Irrigated Areas without water rights along BWCC Boundary

Location Example
Irrigated Areas without water rights along BWCC Boundary
Irrigated Areas without water rights along BWCC Boundary
Bellevue Triangle Area

Eyeball Review – November 2020
- Potential Enlargements: 4 tracts
  - 60 acres total
    - 5 to 27 acres each
    - Follow-up needed
- Several additional tracts found
  - Inconclusive (likely sub-irrigated)
    - Follow-up needed
- Several tracts found needing transfers
Prior Reviews – Upper Wood River Area

• 2014
  • 29 NOVs issued
  • 21 resolved with Consent Orders/penalties
  • 4 cases with no violations & 4 resolved through transfers or WSB
  • Small acreage violations
  • Over $18,000 in civil penalties

• 2008
  • 47 sites investigated
  • 23 NOVs issued
  • Mostly small acreage violations
Spills out of WD 37
From Big/Little Wood and Malad Rivers near Gooding
<table>
<thead>
<tr>
<th>DATE</th>
<th>X Can</th>
<th>Station 17</th>
<th>Station 18</th>
<th>Kral</th>
<th>SOUTH Googie</th>
<th>LY</th>
<th>River</th>
<th>Y canal</th>
<th>Z Canal</th>
<th>USGS 21 Malad near Googie</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/11/12</td>
<td>351</td>
<td>61</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>20.15</td>
<td>197</td>
<td>102</td>
</tr>
<tr>
<td>7/11/12</td>
<td>351</td>
<td>61</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>21.11</td>
<td>197</td>
<td>102</td>
</tr>
<tr>
<td>7/11/12</td>
<td>351</td>
<td>61</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>20.35</td>
<td>197</td>
<td>102</td>
</tr>
<tr>
<td>7/13/12</td>
<td>357</td>
<td>62</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>13.35</td>
<td>197</td>
<td>102</td>
</tr>
<tr>
<td>7/14/12</td>
<td>367</td>
<td>62</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>21.00</td>
<td>200</td>
<td>102</td>
</tr>
<tr>
<td>7/15/12</td>
<td>367</td>
<td>62</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>21.00</td>
<td>200</td>
<td>102</td>
</tr>
<tr>
<td>7/16/12</td>
<td>367</td>
<td>62</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>20.50</td>
<td>200</td>
<td>102</td>
</tr>
<tr>
<td>7/17/12</td>
<td>367</td>
<td>62</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>20.50</td>
<td>200</td>
<td>102</td>
</tr>
<tr>
<td>7/18/12</td>
<td>367</td>
<td>62</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>21.00</td>
<td>200</td>
<td>102</td>
</tr>
<tr>
<td>7/19/12</td>
<td>367</td>
<td>62</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>21.00</td>
<td>200</td>
<td>102</td>
</tr>
<tr>
<td>7/20/12</td>
<td>367</td>
<td>62</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>21.00</td>
<td>200</td>
<td>102</td>
</tr>
<tr>
<td>7/21/12</td>
<td>367</td>
<td>62</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>21.00</td>
<td>200</td>
<td>102</td>
</tr>
<tr>
<td>7/22/12</td>
<td>367</td>
<td>62</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>21.00</td>
<td>200</td>
<td>102</td>
</tr>
<tr>
<td>7/23/12</td>
<td>367</td>
<td>62</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>21.00</td>
<td>200</td>
<td>102</td>
</tr>
<tr>
<td>7/24/12</td>
<td>367</td>
<td>62</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>21.00</td>
<td>200</td>
<td>102</td>
</tr>
<tr>
<td>7/25/12</td>
<td>367</td>
<td>62</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>21.00</td>
<td>200</td>
<td>102</td>
</tr>
<tr>
<td>7/26/12</td>
<td>367</td>
<td>62</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>21.00</td>
<td>200</td>
<td>102</td>
</tr>
<tr>
<td>DATE</td>
<td>X Canal NSCC</td>
<td>Station #17 Little Wood @ Gooding</td>
<td>Station #23 Big Wood @ Gooding</td>
<td>Kall Spill</td>
<td>SOUTH GOODING Ls Spill</td>
<td>River Deliveries</td>
<td>Y Canal NSCC</td>
<td>Z Canal NSCC</td>
<td>USGS #21 Malad near Gooding</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>--------------</td>
<td>-----------------------------------</td>
<td>-------------------------------</td>
<td>------------</td>
<td>------------------------</td>
<td>-----------------</td>
<td>--------------</td>
<td>--------------</td>
<td>-----------------------------</td>
<td></td>
</tr>
<tr>
<td>7/1/2020</td>
<td>346</td>
<td>243</td>
<td>168</td>
<td>13</td>
<td>4</td>
<td>3</td>
<td>16.29</td>
<td>221</td>
<td>137</td>
<td>422.0</td>
</tr>
<tr>
<td>7/2/2020</td>
<td>333</td>
<td>173</td>
<td>130</td>
<td>3</td>
<td>9</td>
<td>3</td>
<td>16.55</td>
<td>206</td>
<td>131</td>
<td>320.0</td>
</tr>
<tr>
<td>7/3/2020</td>
<td>338</td>
<td>195</td>
<td>130</td>
<td>3</td>
<td>9</td>
<td>3</td>
<td>16.69</td>
<td>204</td>
<td>136</td>
<td>346.0</td>
</tr>
<tr>
<td>7/4/2020</td>
<td>352</td>
<td>135</td>
<td>45</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>16.90</td>
<td>209</td>
<td>138</td>
<td>360.0</td>
</tr>
<tr>
<td>7/5/2020</td>
<td>342</td>
<td>141</td>
<td>42</td>
<td>8</td>
<td>5</td>
<td>4</td>
<td>16.89</td>
<td>206</td>
<td>131</td>
<td>368.0</td>
</tr>
<tr>
<td>7/6/2020</td>
<td>344</td>
<td>141</td>
<td>42</td>
<td>8</td>
<td>5</td>
<td>4</td>
<td>17.06</td>
<td>205</td>
<td>131</td>
<td>368.0</td>
</tr>
<tr>
<td>7/7/2020</td>
<td>346</td>
<td>116</td>
<td>35</td>
<td>15</td>
<td>4</td>
<td>2</td>
<td>17.35</td>
<td>206</td>
<td>132</td>
<td>366.0</td>
</tr>
<tr>
<td>7/8/2020</td>
<td>353</td>
<td>128</td>
<td>19</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>17.54</td>
<td>206</td>
<td>134</td>
<td>374.0</td>
</tr>
<tr>
<td>7/9/2020</td>
<td>370</td>
<td>127</td>
<td>12</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>17.54</td>
<td>206</td>
<td>134</td>
<td>374.0</td>
</tr>
<tr>
<td>7/10/2020</td>
<td>371</td>
<td>123</td>
<td>18</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>20.16</td>
<td>211</td>
<td>118</td>
<td>748.0</td>
</tr>
<tr>
<td>7/11/2020</td>
<td>373</td>
<td>121</td>
<td>13</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>21.16</td>
<td>211</td>
<td>118</td>
<td>752.0</td>
</tr>
<tr>
<td>7/12/2020</td>
<td>356</td>
<td>121</td>
<td>13</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>21.16</td>
<td>213</td>
<td>118</td>
<td>752.0</td>
</tr>
<tr>
<td>7/13/2020</td>
<td>357</td>
<td>121</td>
<td>13</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>21.16</td>
<td>213</td>
<td>118</td>
<td>752.0</td>
</tr>
<tr>
<td>7/14/2020</td>
<td>360</td>
<td>127</td>
<td>18</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/15/2020</td>
<td>410</td>
<td>67</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/16/2020</td>
<td>420</td>
<td>42</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/17/2020</td>
<td>360</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/18/2020</td>
<td>360</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/19/2020</td>
<td>360</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/20/2020</td>
<td>360</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/21/2020</td>
<td>360</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/22/2020</td>
<td>360</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/23/2020</td>
<td>360</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/24/2020</td>
<td>360</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/25/2020</td>
<td>360</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/26/2020</td>
<td>360</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/27/2020</td>
<td>360</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/28/2020</td>
<td>360</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/29/2020</td>
<td>360</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/30/2020</td>
<td>360</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
<tr>
<td>7/31/2020</td>
<td>360</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18.73</td>
<td>211</td>
<td>117</td>
<td>503.0</td>
</tr>
</tbody>
</table>
Municipal Water Use
<table>
<thead>
<tr>
<th>System Name</th>
<th>People Served/Connections Approximate</th>
<th>Storage (Gallons)</th>
<th>Average Daily Demand</th>
<th>Max Daily Demand</th>
<th>Reported Sales 2018 (million)*</th>
<th>Reported Salaries 2018 (million)*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BELLEVUE CITY OF</strong></td>
<td>2,287/943</td>
<td>1,000,000</td>
<td>750,000</td>
<td>2,300,000</td>
<td>$80</td>
<td>$41</td>
</tr>
<tr>
<td><strong>HAILEY WATER AND SEWER</strong></td>
<td>8,000/3238</td>
<td>3,000,000</td>
<td>2,700,000</td>
<td>7,000,000</td>
<td>$291</td>
<td>$216</td>
</tr>
<tr>
<td><strong>KETCHUM CITY OF</strong></td>
<td>3,800/1750</td>
<td>3,000,000</td>
<td>2,380,000</td>
<td>5,100,000</td>
<td>$379</td>
<td>$216</td>
</tr>
<tr>
<td><strong>SUN VALLEY WATER AND SEWER DIST</strong></td>
<td>3427/908</td>
<td>3,000,000</td>
<td>1,400,000</td>
<td>6,300,000</td>
<td>$110</td>
<td>$42</td>
</tr>
</tbody>
</table>


**Acre Feet Use by Year**

<table>
<thead>
<tr>
<th>Municipal</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bellevue</td>
<td>1448.67</td>
<td>1234.29*</td>
<td>1022.98</td>
<td>1231.21</td>
</tr>
<tr>
<td>Hailey</td>
<td>2820.43</td>
<td>2442.51</td>
<td>2911.54</td>
<td>2574.11</td>
</tr>
<tr>
<td>Ketchum</td>
<td>2830.10</td>
<td>3196.40</td>
<td>3176.86</td>
<td>2718.55</td>
</tr>
<tr>
<td>Sun Valley</td>
<td>3098.86</td>
<td>3176.91</td>
<td>3344.74</td>
<td>3241.83</td>
</tr>
</tbody>
</table>

* Meter failed in 2017 this is an average of the reported years

Blaine County has an estimated 50 Public Water Systems which are systems that serve at least 25 people or have at least 15 connections – HOA, Trailer Parks, Campgrounds, Churches, Summer Camps, Municipalities.
<table>
<thead>
<tr>
<th>Water Usage / GDP Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blaine</strong></td>
</tr>
<tr>
<td>2019 GDP (US BEA)</td>
</tr>
<tr>
<td>ratio</td>
</tr>
<tr>
<td>Domestic Water Usage</td>
</tr>
<tr>
<td>ratio</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wage Export / Economic Impact Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blaine County Jobs filled by commuters</strong> *</td>
</tr>
<tr>
<td><strong>Ave. Annual Blaine County Wage</strong> **</td>
</tr>
<tr>
<td><strong>Ave. wage spent locally (National Assoc. of Homebuilders)</strong></td>
</tr>
<tr>
<td><strong>Direct Economic Impact</strong></td>
</tr>
<tr>
<td><strong>Multiplier Effect</strong> ***</td>
</tr>
<tr>
<td><strong>Indirect Economic Impact</strong></td>
</tr>
<tr>
<td><strong>Total Economic Impact of Blaine County jobs in Lincoln and Gooding Counties:</strong></td>
</tr>
</tbody>
</table>

*Idaho Dept. of Labor

**Accommodation & Food Service, Retail & Construction Industry weighted average (Idaho Dept of Labor & SVED)

***IMPLAN Labor Income Multiplier Effects range from 1.3 to 2.0 depending on industry