A Real Time Assessment of the Columbia-Snake River Extended Lock Outage: Process and Impacts

Sara Simmons, Ken Casavant and Jeremy Sage
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Freight Policy Transportation Institute
The Issue

- 15 weeks
- December 2010 to March 2011
- Replace and rehabilitate an aging infrastructure
- Replaced downstream gates for three locks
Transportation Study and Approach

• Purpose and Phases
  • Determine
    • Historical use of the river system (Phase I)
    • Preparations of shippers, industries and governments (Phase II)
    • Impacts of the outage (Phase III)
    • Return of traffic to the river system (Phase IV)
  • Evaluate the economic and environmental impacts (Phase V)
Total Annual Downriver and Upriver Tonnage, 1991-2010

Source: U.S. Army Corps of Engineers Monthly Lock Tonnage Reports
Major Commodities, 1991 – 2010

Downriver Commodities
- Wheat
- Sand, gravel and stone
- Forest products
- Iron ore products
- Agricultural products
- Corn, rye, barley, rice, sorghum and oats

Upriver Commodities
- Gasoline
- Diesel
- Fertilizer
- Waste materials
Above Average Downriver Wheat Shipments, July – Dec 2010

- Above average months: August – November
  - Increased wheat production
- To preposition and fill early international orders
- Historic wheat prices and surge in international demand
  - Russian drought and export ban on wheat

Note: December 2010 data only includes the first nine days of the month.
Typical Percentage of Wheat Shipped via Various Modes

- Eastern Oregon
- Northern Idaho
- Southern Idaho
- Northern Washington
- Southern Washington
- Pacific Northwest

Modes:
- Truck
- Barge
- Rail
Phase II
Above Average Upriver Diesel Shipments, July – Dec 2010

- Above average months: September – November
- 9 days of December 2010: shipped almost as much as an average December
- Prepositioning and storing prior to outage
- Strong demand from farming community

Note: December 2010 data only includes the first nine days of the month.
Industrial and Regional Preparations

**Barge Line Preparations**
- Expected to take the brunt of the economical impact
- Implementation of a “business interruption surcharge”
- Prepared customers and employees

**Rail Line Preparations**
- Prepared for an increase in cargo loads and locomotives
- Helped industries in continuing shipments through the outage
- Advertised, identified inland markets and partnered with local ports to aid in the movement of products
Phase III

Rail and Truck Movements During Lock Outage

• Most products were transported by truck or a combination of truck and rail
  • Most industries planned to only use rail
    • Inexpensive and can transport large volumes
  • Short distances and small loads
  • Industries chose to send their goods to alternative markets
Barge Movements, December 2010 – March 2011

- A portion of the river worked: from the pool west of The Dalles to Portland
  - Bonneville Lock and Dam
- Downriver:
  - Movements were 79% below average
  - 4 major commodities
- Manufactured equipment and machinery traveled upriver
  - Gate leaves constructed for The Dalles Lock and Dam
# Pacific Northwest Wheat Survey

## Wheat Tonnage Shipped, Dec 2010 - Mar 2011

<table>
<thead>
<tr>
<th>Region</th>
<th>Tonnage Shipped in Bushels</th>
<th>Typical Total Tonnage Shipped</th>
<th>Lock Outage Total Tonnage Shipped</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Oregon</td>
<td>9,681,700</td>
<td>12.68%</td>
<td>27.29%</td>
</tr>
<tr>
<td>Northern Idaho</td>
<td>2,428,000</td>
<td>15.69%</td>
<td>6.84%</td>
</tr>
<tr>
<td>Southern Idaho</td>
<td>1,620,000</td>
<td>2.90%</td>
<td>4.57%</td>
</tr>
<tr>
<td>Northern Washington</td>
<td>20,315,826</td>
<td>33.98%</td>
<td>57.26%</td>
</tr>
<tr>
<td>Southern Washington</td>
<td>1,433,200</td>
<td>34.75%</td>
<td>4.04%</td>
</tr>
<tr>
<td>Pacific Northwest</td>
<td>35,478,726</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Phase III
Percentage of Wheat Shipped via Various Modes, Dec 2010 – Mar 2011

- Eastern Oregon
- Northern Idaho
- Southern Idaho
- Northern Washington
- Southern Washington

Modes:
- Truck
- Barge
- Rail
Shipping Rates for Wheat by Survey Respondents, Dec 2010 – Mar 2011

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of Firms</th>
<th>Average Rate in Cents per Bushel (to Portland)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Direct Truck to Final Market</td>
<td>Truck-Barge</td>
</tr>
<tr>
<td>Eastern Oregon</td>
<td>5</td>
<td>$0.56</td>
<td>$0.30</td>
</tr>
<tr>
<td>Northern Idaho</td>
<td>5</td>
<td>$1.50</td>
<td>-</td>
</tr>
<tr>
<td>Southern Idaho</td>
<td>3</td>
<td>$0.76</td>
<td>-</td>
</tr>
<tr>
<td>Northern</td>
<td>5</td>
<td>$0.45</td>
<td>-</td>
</tr>
<tr>
<td>Washington</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southern</td>
<td>8</td>
<td>$1.34</td>
<td>-</td>
</tr>
<tr>
<td>Washington</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific Northwest</td>
<td>26</td>
<td>$0.92</td>
<td>$0.30</td>
</tr>
</tbody>
</table>

Rates before the lock outage: Truck - $0.89 (4% ↑) and Rail - $0.65 (2% ↑)
Shipping Impacts and Activities

**Barge Line Impacts**
- Laid off employees
- Reduced employees’ work hours
- Continued service below The Dalles
- Barging tugs were called to Portland

**Rail Line Impacts**
- Increased cargo loads
- Increased employees’ hours to handle large loads and increased railcar numbers
- Increased fuel and employees’ costs
Phase IV

Monthly Downriver and Upriver Tonnage, April – June 2011

Source: U.S. Army Corps of Engineers Monthly Lock Tonnage Reports
Phase IV

Monthly Tonnage Shipped Downriver Post Lock Outage

Historical Total Average
Post Outage Total
Historical Wheat Average
Post Outage Wheat

April
May
June

Historical Total Average
Post Outage Total
Historical Wheat Average
Post Outage Wheat
Phase V

Economic Impacts

• Exact rates and costs were only recorded and/or available for the commodities wheat, forest products and vegetable products.

• To calculate costs, a Shipping Cost Model was developed.
Phase V

Economic Impacts – Wheat

- Wheat industry shipped an unusually above average amount of grain during the year of the lock outage
- Russian drought and ban on wheat exports
- Wheat prices reached historic highs
- Extensive planning for the lock outage

<table>
<thead>
<tr>
<th>Year</th>
<th>Time Period</th>
<th>Total Annual Bushels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aug - Nov</td>
<td>Dec - Mar</td>
</tr>
<tr>
<td>Typical August - July</td>
<td>171,352,480</td>
<td>132,586,318</td>
</tr>
<tr>
<td>August 2010 - July 2011</td>
<td>208,906,375</td>
<td>161,644,157</td>
</tr>
</tbody>
</table>
| Percentage Difference | 21.92%        | 21.92%               | 21.92%     | 21.92%
## Economic Impacts – Wheat

### Phase V

<table>
<thead>
<tr>
<th>Year</th>
<th>Time Period</th>
<th>Total Cost</th>
<th>Cents per Bushel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical August - July</td>
<td>Aug - Nov</td>
<td>$82.6</td>
<td>$0.48</td>
</tr>
<tr>
<td></td>
<td>Dec - Mar</td>
<td>$63.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Apr - Jul</td>
<td>$40.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$186.3</td>
<td></td>
</tr>
<tr>
<td>August 2010 - July 2011</td>
<td>Aug - Nov</td>
<td>$100.7</td>
<td>$0.54</td>
</tr>
<tr>
<td></td>
<td>Dec - Mar</td>
<td>$105.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Apr - Jul</td>
<td>$49.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$255.9</td>
<td></td>
</tr>
<tr>
<td>Difference</td>
<td>Aug - Nov</td>
<td>$18.1</td>
<td>$0.06</td>
</tr>
<tr>
<td></td>
<td>Dec - Mar</td>
<td>$42.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Apr - Jul</td>
<td>$8.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$69.6</td>
<td></td>
</tr>
<tr>
<td>Percentage Difference</td>
<td>Aug - Nov</td>
<td>21.95%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dec - Mar</td>
<td>67.38%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Apr - Jul</td>
<td>21.92%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>37.36%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>12.67%</td>
<td></td>
</tr>
</tbody>
</table>
# Environmental Impacts – Emissions Produced

<table>
<thead>
<tr>
<th>Emissions Component</th>
<th>Emissions in Pounds (Typical Year)</th>
<th>Emissions in Pounds (Lock Outage Year)</th>
<th>Percent Change in Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>HC</td>
<td>271,634</td>
<td>503,039</td>
<td>85.19%</td>
</tr>
<tr>
<td>CO</td>
<td>599,956</td>
<td>627,415</td>
<td>4.58%</td>
</tr>
<tr>
<td>NOx</td>
<td>4,646,348</td>
<td>4,964,671</td>
<td>6.85%</td>
</tr>
<tr>
<td>PM</td>
<td>107,663</td>
<td>131,145</td>
<td>21.81%</td>
</tr>
<tr>
<td>SOx</td>
<td>714,131</td>
<td>672,842</td>
<td>-5.78%</td>
</tr>
<tr>
<td>Total</td>
<td>6,339,732</td>
<td>6,899,114</td>
<td>8.82%</td>
</tr>
<tr>
<td>Emissions per Ton</td>
<td>0.43</td>
<td>0.41</td>
<td>-5.89%</td>
</tr>
</tbody>
</table>
Conclusions

• Stakeholders were well prepared
• Prior to outage, commodities moved in large and above average quantities
  • Forest products, iron ore, wheat, vegetables and processed grains
• Barge lines increased rates to capture additional revenue
• Rail lines prepared for possible increases in carloads and advertized to barge customers
Conclusions, Cont.

- During the outage, wheat producers shipped wheat heavily by truck even though rates increased.
- Barge lines temporarily laid off 1/3 – 2/3 of staff.
- Rail lines incurred additional costs.
- Traffic returned to barge in above average levels.
  - Especially wheat.
Conclusions, Cont.

• Transportation costs increased 37.4%
  • Tonnage increased
  • Global demand for wheat increased
  • Modal shifts
• Truck and rail rates increased 4% and 2%
• Energy consumption increased 10%, but Btu’s per ton decreased 5% due to heavy use of rail, which is more energy efficient
• Emissions production increased as well
• Result: “fears not realized”
Thank you!
Questions?

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