Content:

• The EIS study in transportation
• Gaps
• Best practice with best available data

• The I-69 case study (SIU 9 – Memphis-TN)
• Gathering the best available data
• Identifying gaps and comparing impacted features
  \textit{stream crossings / wetlands / ponds / buildings}
• Findings

• Next Steps
• Conclusions & recommendations
EIS PROCESS IN TRANSPORTATION PLANNING

**EIS goal:** Identifies and assesses the environmental impacts associate with the construction of a transportation corridor

**EIS process:**

- Biophysical, Socio-Economic and Cultural characteristics are considered to predict negative and positive impacts

- Several concurrent corridor alternatives are normally analysed. Numbers are compared!

**NCRST-SEPP Research Objective:**

- Straighforward: streamlining corridor environmental analysis
Example: Three Cities River Crossing Study – Ada County, ID

PARTICULAR CONSTRAINTS:

• Cottonwood riparian area (important for wildlife habitat, wetlands and bald eagles);
• Migratory birds nesting areas;
• The 100-year floodplain;
• The Boise River floodway;
• Neighborhoods, farms, or businesses that the alignment passes through;
• Sites eligible for the National Register of Historic Places

Source: http://www.achd.ada.id.us/Projects/ThreeCitiesBackground.aspx
GAPS on traditional EIS approach:

- Best existing available datasets are not often employed to define the preliminary alternative corridors

- Complementary data derived from RS/GIS techniques are rarely employed to update EIS information.

- The evaluation of impacted features is based on extensive efforts on ground survey and manual image interpretation. “CRS&SI can offer significant reduction in time and cost”

- This will not eliminate ground work, but will enable better screening and planning for areas to be surveyed.
The I-69 case study (SIU 9 – Memphis-TN)
Extracting data from FEIS

- **1000-foot**
- **300-foot**

**Table (numbers)**

<table>
<thead>
<tr>
<th>Ecological Feature</th>
<th>Alternative Alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of New (feet)</td>
<td>A-1</td>
</tr>
<tr>
<td>Total Area of Riparian (acres)</td>
<td>15.2</td>
</tr>
<tr>
<td>Wetland Area within 1,000 Corridor (acres)</td>
<td>730</td>
</tr>
<tr>
<td>Wetland Area within 300' ROW Footprint (acres)</td>
<td>48</td>
</tr>
<tr>
<td>Average Quality of the Wetlands **</td>
<td>Moderate</td>
</tr>
<tr>
<td>Number of Streams Crossing within 1,000 Corridor</td>
<td>21</td>
</tr>
<tr>
<td>Number of Streams Crossing within 300' ROW Footprint</td>
<td>21</td>
</tr>
<tr>
<td>Endangered Species within or near 1,000 Corridor</td>
<td>None</td>
</tr>
<tr>
<td>Number of Ponds within 1,000 Corridor</td>
<td>3</td>
</tr>
<tr>
<td>Number of Wet Weather Conduits within 1,000 Corridor</td>
<td>3</td>
</tr>
</tbody>
</table>

*The table above is an excerpt from a summary of ecological sites within alternative alignments.*

**The average quality of the wetlands was determined by averaging all of the values for both the `Computer` and `Field-based` methods. It is important to note that all diagrams are a result of the ESRI / W.R. analysis. Calculations should be considered approximate for each individual wetland.**

**Final EIS**

I-69 / SIU#9

http://www.tdot.state.tn.us/i69/segment9/default.htm

**Graphics (maps)**

- **Stream (#, length)**
- **Wetlands (area)**
- **Ponds (#)**
- **Buildings (#)**
Based on Final EIS maps ....

1. Georeferencing FEIS maps
Based on Final EIS maps ....

1. Georeferencing FEIS maps

2. Extracting 1000 ft corridor
Based on Final EIS maps ....

1. Georeferencing FEIS maps

2. Extracting 1000 ft corridor

3. Extracting 300 ft corridor
Based on Final EIS maps ....

1. Georeferencing FEIS maps
2. Extracting 1000 ft corridor
3. Extracting 300 ft corridor
4. Loading existing datasets
Based on Final EIS maps ....

1. Georeferencing FEIS maps
2. Extracting 1000 ft corridor
3. Extracting 300 ft corridor
4. Loading existing datasets
5. Subset study area
Gathering the best available data

Existing Datasets

- NHD
- NAIP
- NWI
- NLCD

Stream Crossings
Ponds
Buildings
Wetlands

updating
complementation

Existing Datasets

Gathering the best available data
Stream Crossings
Stream Crossings

Final EIS

NHD

Yellow corridor = 1000-foot
Green corridor = 300-foot
Stream Crossings

### Buffers 1000-ft

<table>
<thead>
<tr>
<th>Segments</th>
<th>Reported in Final EIS</th>
<th>Showed in FEIS maps</th>
<th>Extracted from NHD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># streams</td>
<td>Total length (feet)</td>
<td># streams</td>
</tr>
<tr>
<td>A1</td>
<td>21</td>
<td>21970</td>
<td>27</td>
</tr>
<tr>
<td>A3</td>
<td>22</td>
<td>21220</td>
<td>19</td>
</tr>
<tr>
<td>B1</td>
<td>47</td>
<td>58125</td>
<td>50</td>
</tr>
<tr>
<td>B2</td>
<td>49</td>
<td>73320</td>
<td>51</td>
</tr>
<tr>
<td>B3</td>
<td>43</td>
<td>48705</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>182</td>
<td>223340</td>
<td>186</td>
</tr>
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</table>

### Number of Stream Crossings

<table>
<thead>
<tr>
<th>Segments</th>
<th>Final EIS</th>
<th>FEIS maps</th>
<th>NHD</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>10</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>A3</td>
<td>12</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>B1</td>
<td>15</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>B2</td>
<td>17</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>B3</td>
<td>18</td>
<td>9</td>
<td>6</td>
</tr>
</tbody>
</table>

### Total Length (feet)

<table>
<thead>
<tr>
<th>Segments</th>
<th>Final EIS</th>
<th>FEIS maps</th>
<th>NHD</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>10000</td>
<td>5000</td>
<td>1000</td>
</tr>
<tr>
<td>A3</td>
<td>12000</td>
<td>6000</td>
<td>1200</td>
</tr>
<tr>
<td>B1</td>
<td>15000</td>
<td>7500</td>
<td>1500</td>
</tr>
<tr>
<td>B2</td>
<td>17000</td>
<td>8500</td>
<td>1700</td>
</tr>
<tr>
<td>B3</td>
<td>18000</td>
<td>9000</td>
<td>1800</td>
</tr>
</tbody>
</table>
Impacted Ponds
Ponds

Final EIS

NHD and NAIP 2007

Yellow corridor = 1000-foot
Green corridor = 300-foot
Ponds

Final EIS

(NHD ∪ NAIP 2007) ⊕ Buffer

Yellow corridor = 1000-foot
Green corridor = 300-foot
ENVIRONMENTAL FEATURE EXTRACTION:
TRADITIONAL VS INNOVATIVE CRS&SI APPROACHES

Ponds

Buffers 1000-ft

<table>
<thead>
<tr>
<th>Segments</th>
<th>Reported in FEIS</th>
<th>Showed in FEIS maps</th>
<th>Extracted from NHD+NAIP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># ponds</td>
<td># ponds</td>
<td># ponds</td>
</tr>
<tr>
<td>A1</td>
<td>3</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>A3</td>
<td>12</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>B1</td>
<td>37</td>
<td>41</td>
<td>46</td>
</tr>
<tr>
<td>B2</td>
<td>51</td>
<td>53</td>
<td>69</td>
</tr>
<tr>
<td>B3</td>
<td>33</td>
<td>34</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>136</td>
<td>150</td>
<td>178</td>
</tr>
</tbody>
</table>

Number of Impacted Ponds
Impacted Wetlands
Wetlands

Final EIS

NWI $\cup$ NLCD 2001

Yellow corridor = 1000-foot
Green corridor = 300-foot
Wetlands

### Buffers 1000-ft

<table>
<thead>
<tr>
<th>Segments</th>
<th>Final EIS area (acres)</th>
<th>Extracted from Final EIS area (acres)</th>
<th>NWI + NLCD area (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>108.50</td>
<td>131.00</td>
<td>252.95</td>
</tr>
<tr>
<td>A3</td>
<td>145.40</td>
<td>163.00</td>
<td>273.39</td>
</tr>
<tr>
<td>B1</td>
<td>227.50</td>
<td>248.00</td>
<td>340.50</td>
</tr>
<tr>
<td>B2</td>
<td>189.10</td>
<td>220.00</td>
<td>269.99</td>
</tr>
<tr>
<td>B3</td>
<td>21.60</td>
<td>27.00</td>
<td>150.54</td>
</tr>
</tbody>
</table>

Total: 692.10, 789.00, 1287.38

### Wetlands area (acres)

- Final EIS
- FEIS Maps
- NWI + NLCD 2001
Impacted Buildings
Buildings

NAIP 2007 IMAGERY – Photo-Identified Structures
Buildings (single-family, multi-families, mobile home)

<table>
<thead>
<tr>
<th>Segments</th>
<th>Reported in FEIS # buildings</th>
<th>Showed in FEIS maps # buildings</th>
<th>Extract from NAIP 2007 # buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>23</td>
<td>no data</td>
<td>35</td>
</tr>
<tr>
<td>A3</td>
<td>65</td>
<td>no data</td>
<td>78</td>
</tr>
<tr>
<td>B1</td>
<td>70</td>
<td>no data</td>
<td>172</td>
</tr>
<tr>
<td>B2</td>
<td>59</td>
<td>no data</td>
<td>148</td>
</tr>
<tr>
<td>B3</td>
<td>89</td>
<td>no data</td>
<td>191</td>
</tr>
<tr>
<td></td>
<td>306</td>
<td></td>
<td>624</td>
</tr>
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</table>

Number of Buildings

- Final EIS
- NAIP 2007
Findings

For this study area, federal data provided a conservative basis for screening environmental constraints that were consistent across possible alignments. Spatial data sets included nearly twice the features or lengths or areas for factor considered than were reported in the I-69 / I-269 Final EIS.

- Streams → 89% more length
- Wetlands → 86% more area
- Ponds → 31% more # of ponds reported
- Buildings → 104% more # of buildings

Additionally – FEIS constraint maps include more features than reported in the FEIS. This indicates that photo-interpretation found features over-and-above EIS reporting requirements.
Findings

Stream “Length”
constraints maps ↔ FEIS: 7.91% more
Federal data ↔ FEIS: 88.5% more
Fed data ↔ constr maps: 74.7% more

Ponds “#”
constraints maps ↔ FEIS: 10.3% more
Federal data ↔ FEIS: 30.9% more
Fed data ↔ constr maps: 18.7% more

Wetland “Area”
constraints maps ↔ FEIS: 14.0% more
Federal data ↔ FEIS: 86.0% more
Fed data ↔ constr maps: 63.2% more

Buildings (#)
federal data ↔ FEIS 103.9% more

Federal data ↔ constr maps: 14% more
Next Steps

• Maximize RS and GIS automatization processes

• Include new variables and additional spatial information such as parcel data and costs of acquisitions and relocations

• Automate the generation of map and tabular results of feature extraction and analysis methods.

• Provide highly useful GeoPDF maps!

Optimize Processes

Determine which processes best address filling gaps in EIS needs!
Conclusions & Recommendations

• CRS&SI technologies may be used to estimate environmental features associated with potential transportation alignments. Buffering and intersecting possible roadway alignments with environmental features may efficiently produce a conservative starting point for screening possible impacts of roadway alignments being considered.

• CRS&SI methods produced estimates greater than those reported in the final EIS. The use of these technologies can deliver rapid estimations as well as enhanced “analysis results” that may improve decision-making to narrow down alternatives and help inform field work planning.

• As a long process, EIS takes years from surveying to decision. The analysis of existing datasets combined with CRS&SI technologies can offer the capability to reduce time and cost on EIS by effectively managing field crews and directing activities that will reduce time in field surveying processes and deliver equivalent or better results.
Acknowledgements

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Streamlining Environmental and Planning Processes