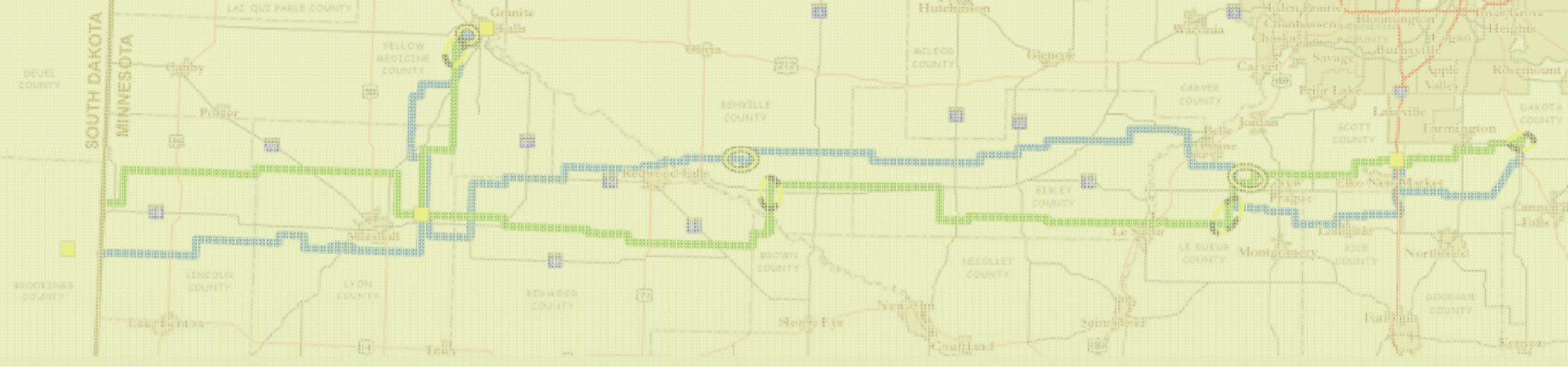


GIS and Transmission Siting:
Easy, Reliable, Defensible, and Repeatable Process

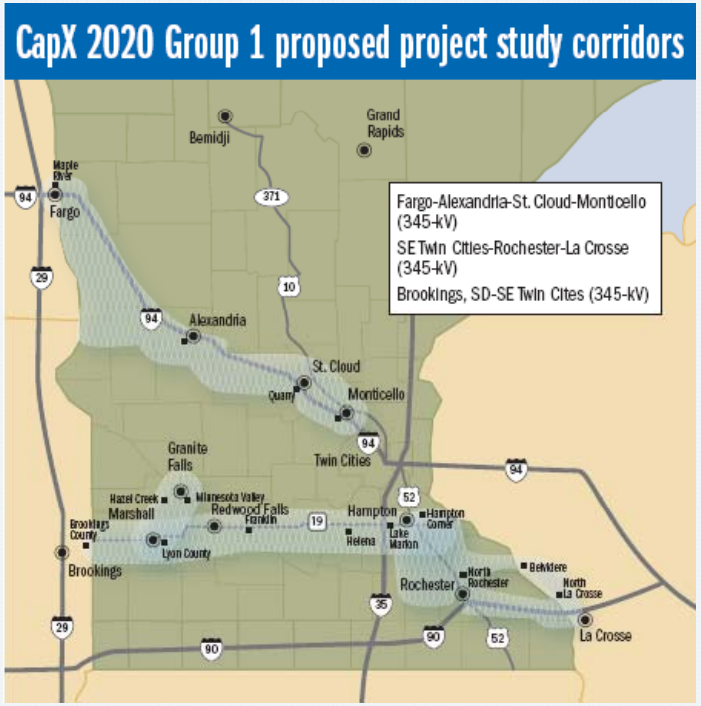
Authors:
Craig Poorker, Great River Energy
Jenn Walter, HDR, Inc
Dan Schmidt, HDR, Inc

2009 ESRI User Conference
San Diego, CA

Delivering electricity you can rely on

What is CapX?
Why is it an important project?

- Joint initiative of 11 transmission-owning utilities
- 4 projects – over 600 miles
- Meeting increase demand of 4,000 to 6,000 megawatts (MW) by 2020
- Updating transmission infrastructure last done in 1970s
- Meet Minnesota State Renewable Standard (RES) of 20% by 2025

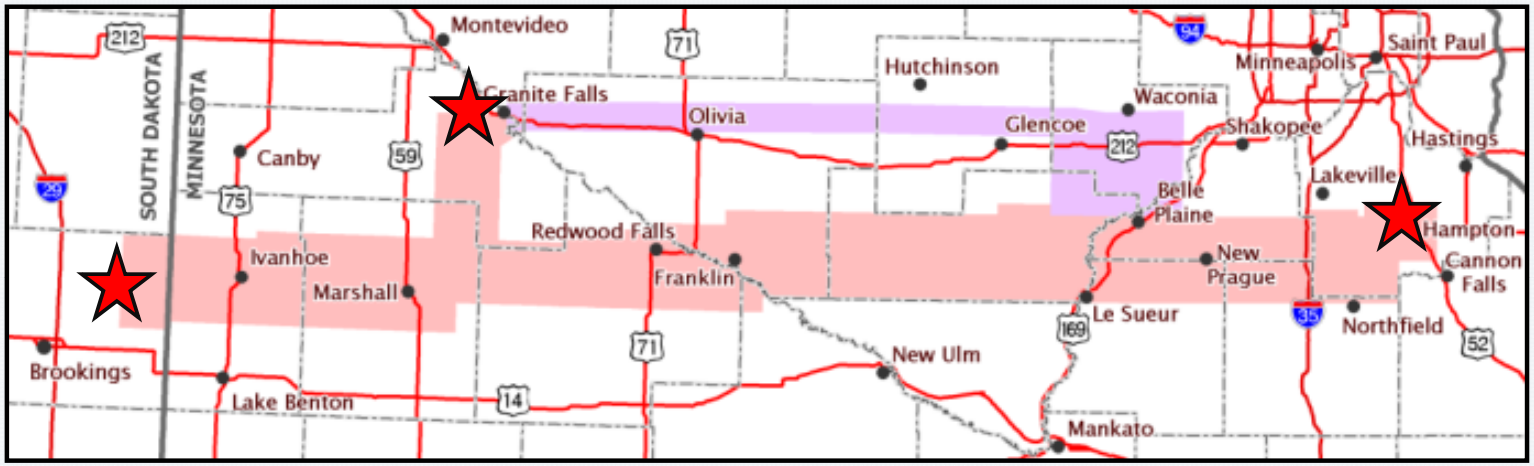


Why GIS is needed?

Initial project corridor 6-12 miles wide, 240 miles long, 15 counties (Huge!)

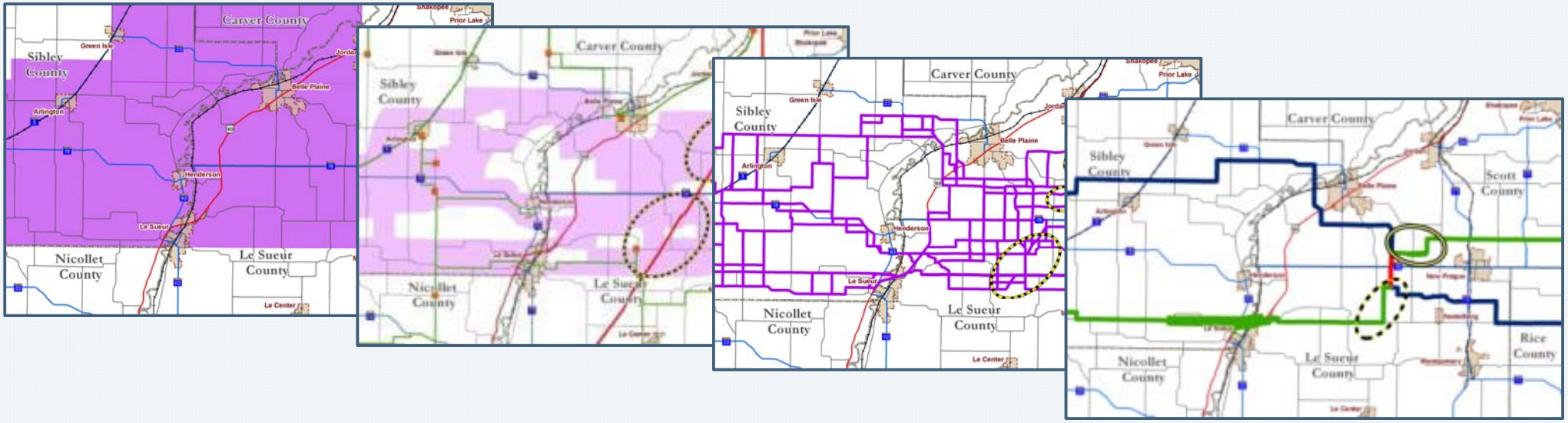
+ Efficient data management system: data collection and analysis
+ Inherently spatial in nature
+ Transparent and repeatable process

GIS best process to accomplish



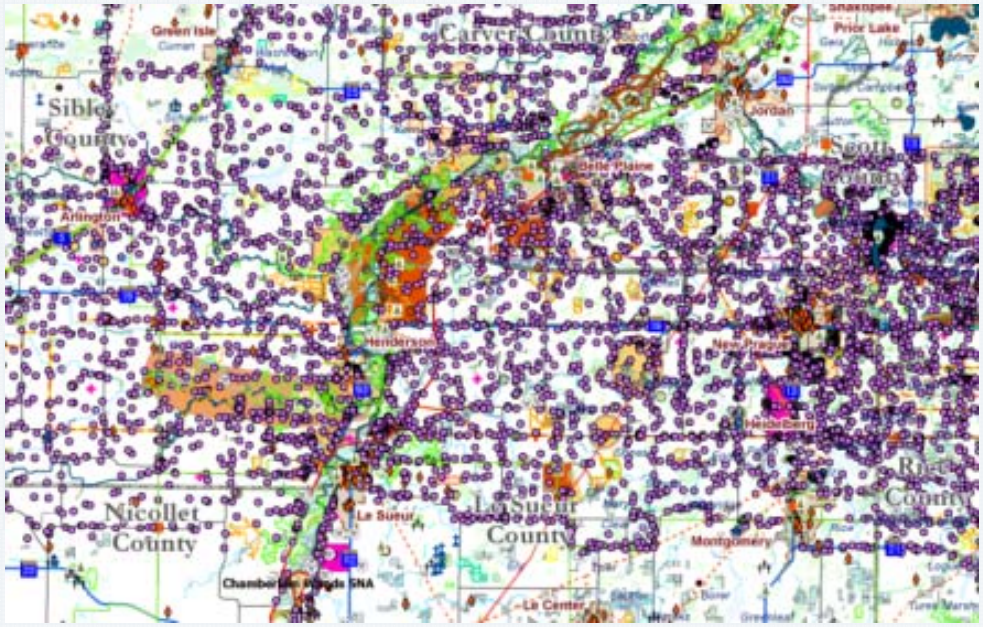
Project Background:
South Dakota to Twin Cities, MN

- Project corridor cross 11 Counties and 23,000 landowners
- Define endpoints and intermediate connections
- Refine route corridors and route segments
- Compare and evaluate route section chains
- Develop Preferred and Alternate Route



Field Data Collection

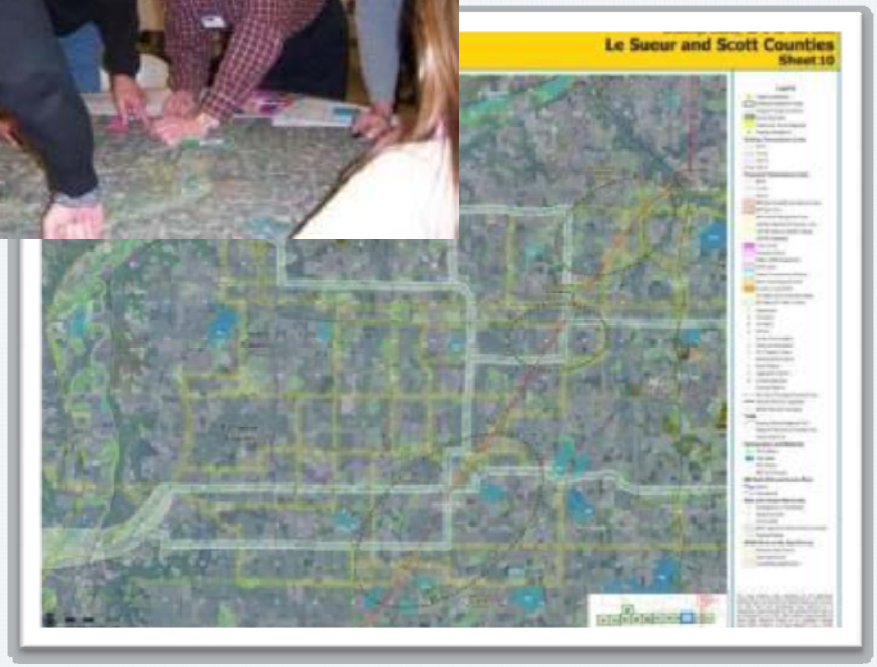
- Fieldwork observations of over 15,000 data points
- Gather data from local, state, federal agencies
- Gather data from general public and non-profit organizations
- Over 100 data layers

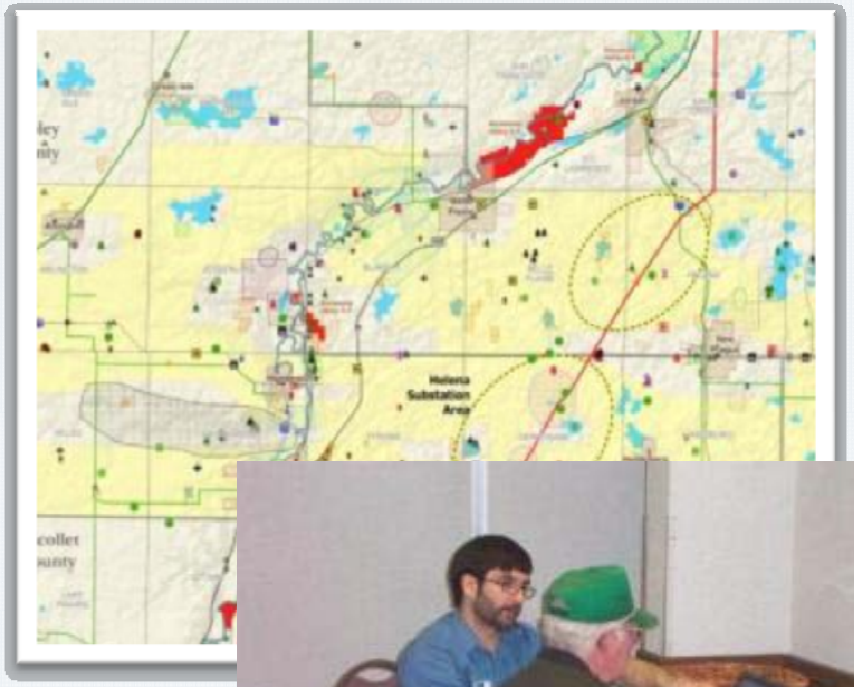


Just some data layers

Public Involvement:
Data Collection

- Traditional maps
- Interactive maps and data collection



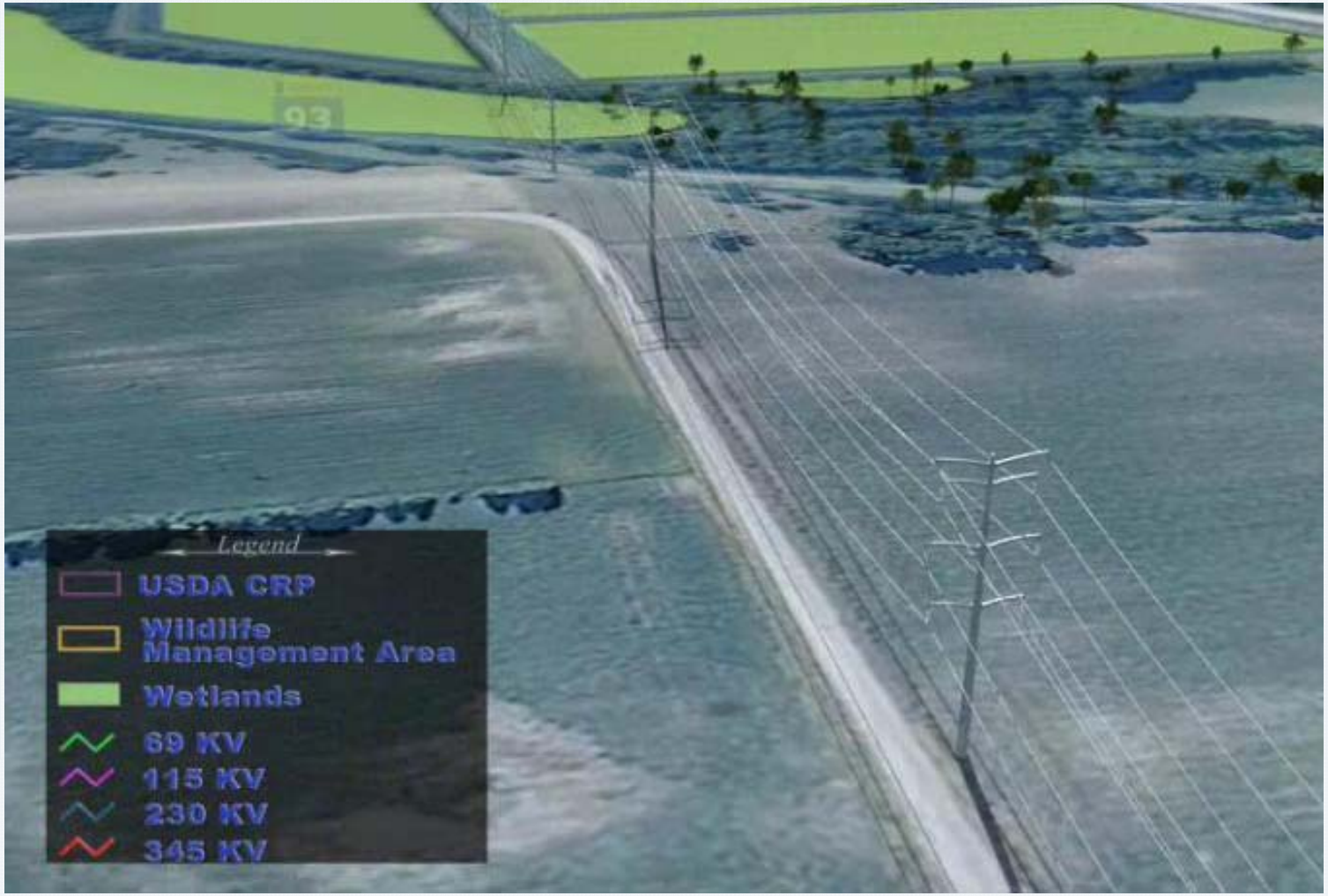


Public Involvement:
Scoping / Agency Task Force

- Keep count of map requests by export to PDF
  - Identify areas of large public interest
  - Gauge interest across project area
- Use mobile ArcMap stations to record data
- Provide feedback to Agency Task Force on alternatives identified

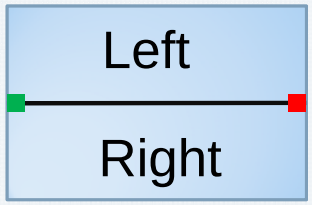
Public Involvement:
Public Education

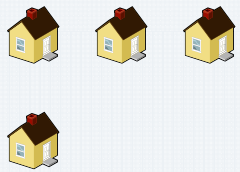
- Over 25 years since last large transmission project
- Visualizations are worth 1000 words



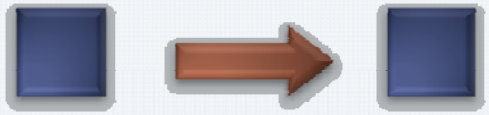
Route Development:
Make it easy from the beginning

- Digitize segments: west to east, south to north
- Segments assigned unique identifier; ie BL123, LV10
  - Geographical (substation to substation)
  - Sequential number (0 →)
- Assign single right-of-way category (1T, 2A,3)





West to East



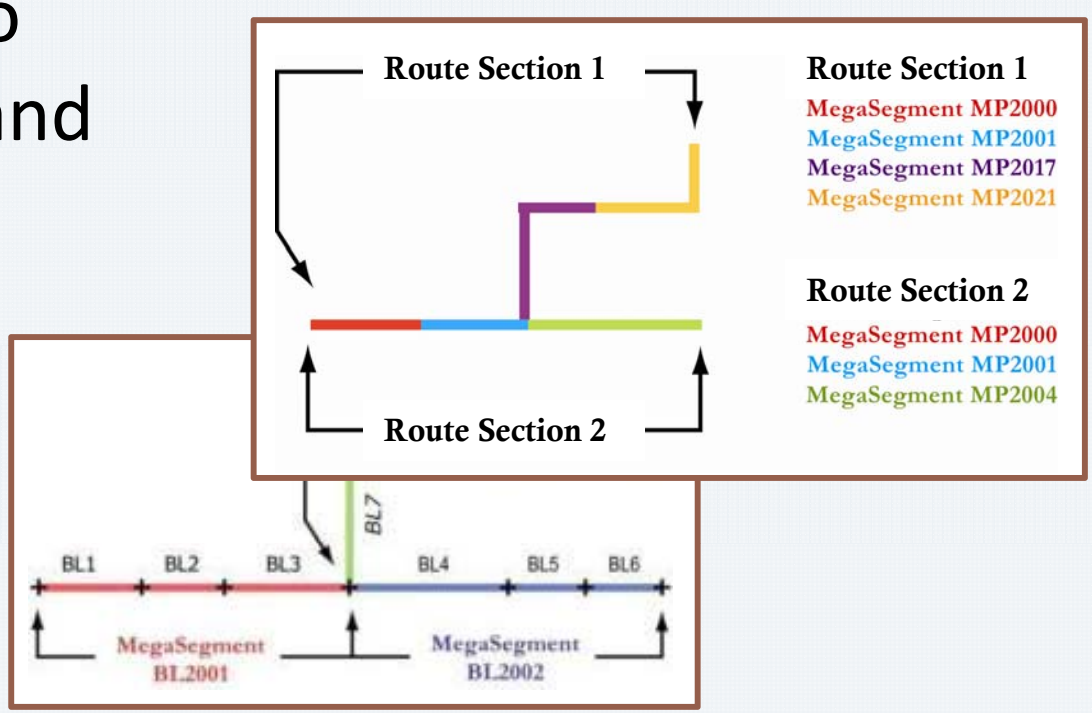
Brookings County Substation (B)

Lyon County Substation (L)

ROW Type – 1T (Township Road)

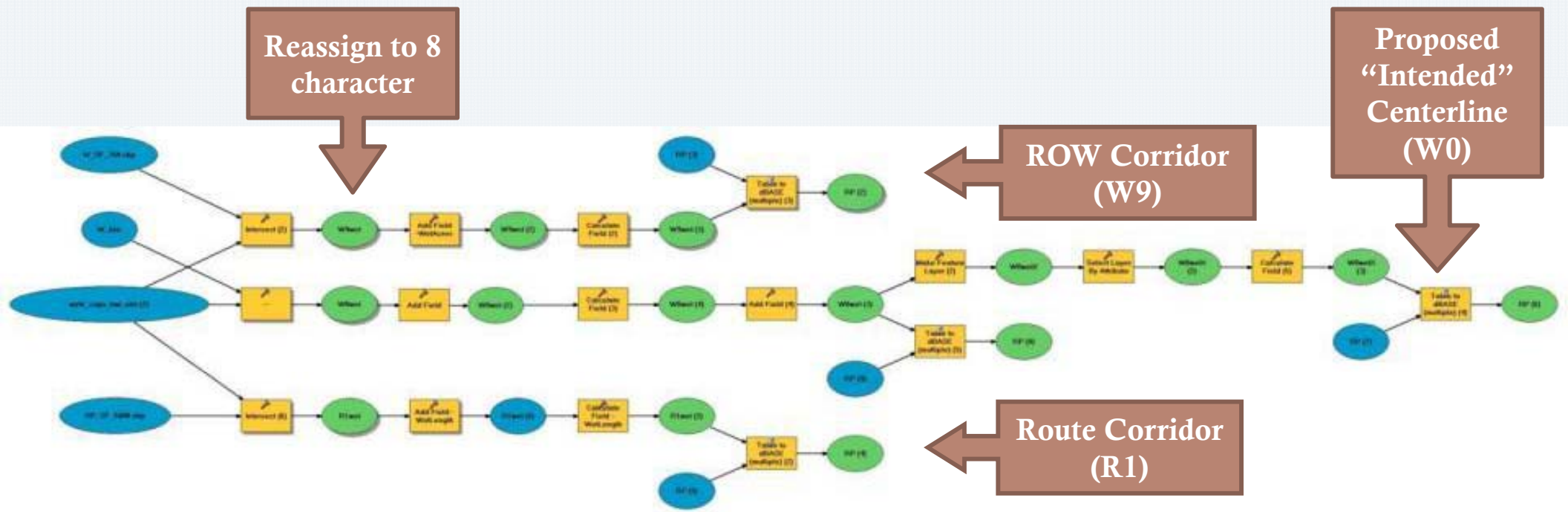
Route Development:
Compare route sections by mega segments

- Weed thru over 1800 route segments
- Evaluate suitability of each route segment: the good, the bad, the ugly
- Daisy chain segments to create mega segments and route sections
- Compare preliminary route sections



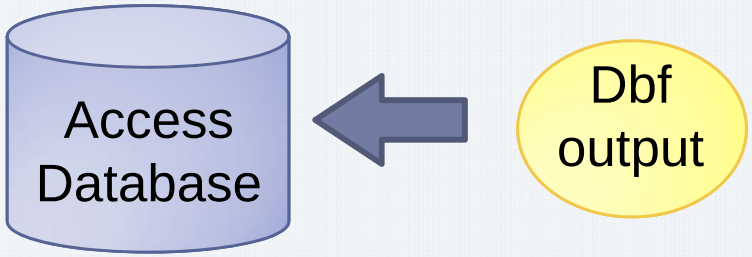
Model Builder:
Take it to the next level

- Flexibility to multi-task and run process
- Analysis completed in consistent manner
- Output is renamed to 8 character file based upon analysis; R1 = route, W9 = ROW, W0 = centerline
- Keep processing to objective, not subjective



Route Development:
Access Database becomes a power tool

- Link Model builder DBF output to Microsoft Access
- Establishes standardized nomenclature (streamlines)
- Define route in a single master table (mega segment)
- All GIS data based on segments



R1sna	MN SNA
R1stgo	STATSGO
R1te	Threathen and Endangered
R1wet	NWI
R1wma	MN WMA
R1wpa	USFWS WPA
R1wtlk	MN Lakes

SEGMENT	ROW	DIRECTION	MEGAsegm
BL10	3	north	
BL100	1T	east	
BL1000	1T	north	
BL1001	1T	north	
BL1002	1T	north	
BL1003	1T	east	BL2002
BL1004	2A	east	BL2002
BL1005	1T	east	BL2002
BL1006	1T	north	

Route Development:
Access makes it easier

- Consolidate route into one table, all queries updated
- Easy to compare sections
- Flexiblity to expand based upon GIS segment
  - Preliminary segments = over 1300
  - Final segments = over 1900
- Access 2007 advanced forms (end user output)

Final Routes

- Based on MN State Routing Criteria
- Based on data (natural and human environment)
- Route Permit Application
  - Route impact tables list individual segments
  - Segment map and impact table
    - Transparency
    - All segments considered

SEGMENT[1,12]	Length (mi)			N	N
BL10	0.51	Transmission Line	62	0	0
BL100	1.51	Township Road	183	1	0.66
BL1000	3.02	Township Road	366	0	0
BL1001	2.02	Township Road	244	1	0.50
BL1002	0.51	Township Road	62	0	0
BL1003	1.00	Township Road	121	1	1.00
BL1004	1.01	Field Line	123	0	0

Conclusions

- More efficient
- Regulators liked it
- Public approved

Conclusions

- Lessons learned
- What more we should do

Conclusion

- Questions?

- Thank you

www.capx2020.com

Craig Poorker
Jenn Walter
Dan Schmidt