

Water & Energy Study

HB 1322

Energy Development & Transmission Committee

W.M. Schuh, ND State Water Commission
in cooperation with
the ND Department of Commerce
and EMPOWER Commission

Under 2009 Session Bill HB 1322

SECTION 2. WATER RESOURCES STUDY – REPORT TO LEGISLATIVE COUNCIL

1. During the 2009-10 interim, the state water commission shall conduct a study to:
 - a. Determine unit water use for each sector of energy production:
 1. Petroleum;
 2. Ethanol;
 3. Electrical generation; and
 4. Biodiesel;
 - b. Identify water quality constraints for each energy sector;
 - c. Estimate projected water use in each energy production sector based upon growth projections provided by the energy policy commission; and
 - d. Provide a qualitative assessment of the state's water resources and identify specific sources that have the potential of providing significant quantities of water for energy development

Participation & Collaboration

Energy Policy Commission – EMPOWER – Mike Fladeland, all members

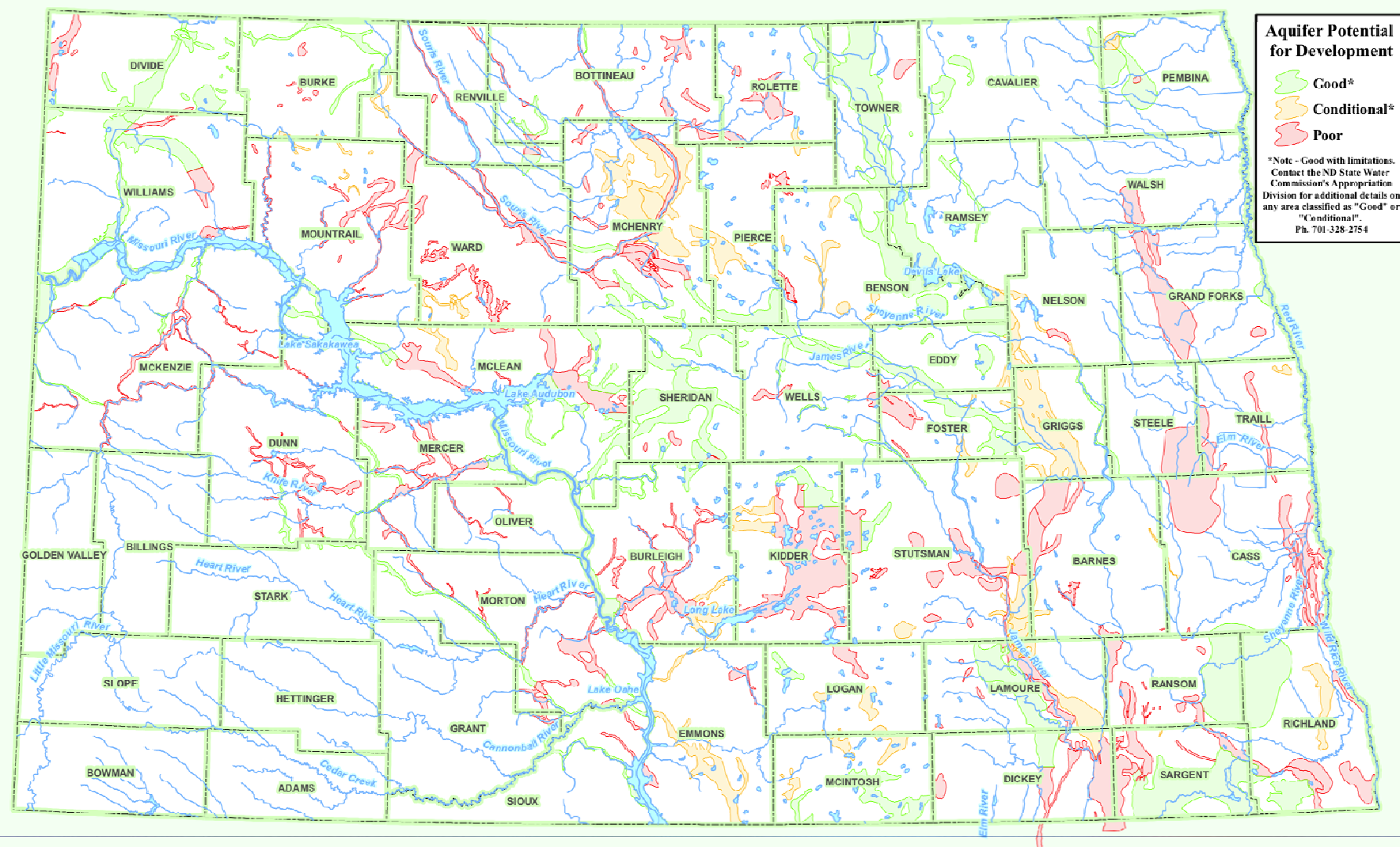
ND Oil and Gas Division – Lynn Helms and Dave Hvinden

Water Commission – Mike Hove, Al Wanek, Rod Bassler, Brenda Hove

Bureau of Reclamation – Mike Morohl, Jim Weigel

Corps of Engineers – Phil Brown

Energy and Environmental Resource Center - EERC – John Harju,
Dan Stepan



Estimated Water Available for the Energy Industry

Ground Water Available – Table 24

58,000 to 110,000 AF/yr.

Surface Water Available

?

Water Reuse

Municipal Wastewater Available for Reuse	41,598 AF/yr.
Industrial Wastewater Available for Reuse	4,282 AF/yr.

EXAMPLES

Tharaldson Ethanol
Spiritwood Energy Station
Dakota Spirit AgEnergy

Fargo Wastewater
Jamestown Wastewater
Spiritwood Energy

Aquifer Recharge and Recovery



- Storage of spring flows in aquifers
- 1,000 AF per year stored by Forest River Hutterites
- Short-term (1 to 2 year) retention

Potential Surface-Water Sources: HEART RIVER SYSTEM

Lake Tschida As much as 5,000 AF – irrigation allotment

Patterson Lake As much as 3,500 AF – irrigation allotment

As much as 3,200 AF – vacated by Dickinson

Up to 11,700 AF/yr. – Bureau's Discretion

Potential Surface-Water Sources: MISSOURI RIVER SYSTEM

Proposed McClusky Canal Corridor

Tens of thousands of AF

NAWS– East System

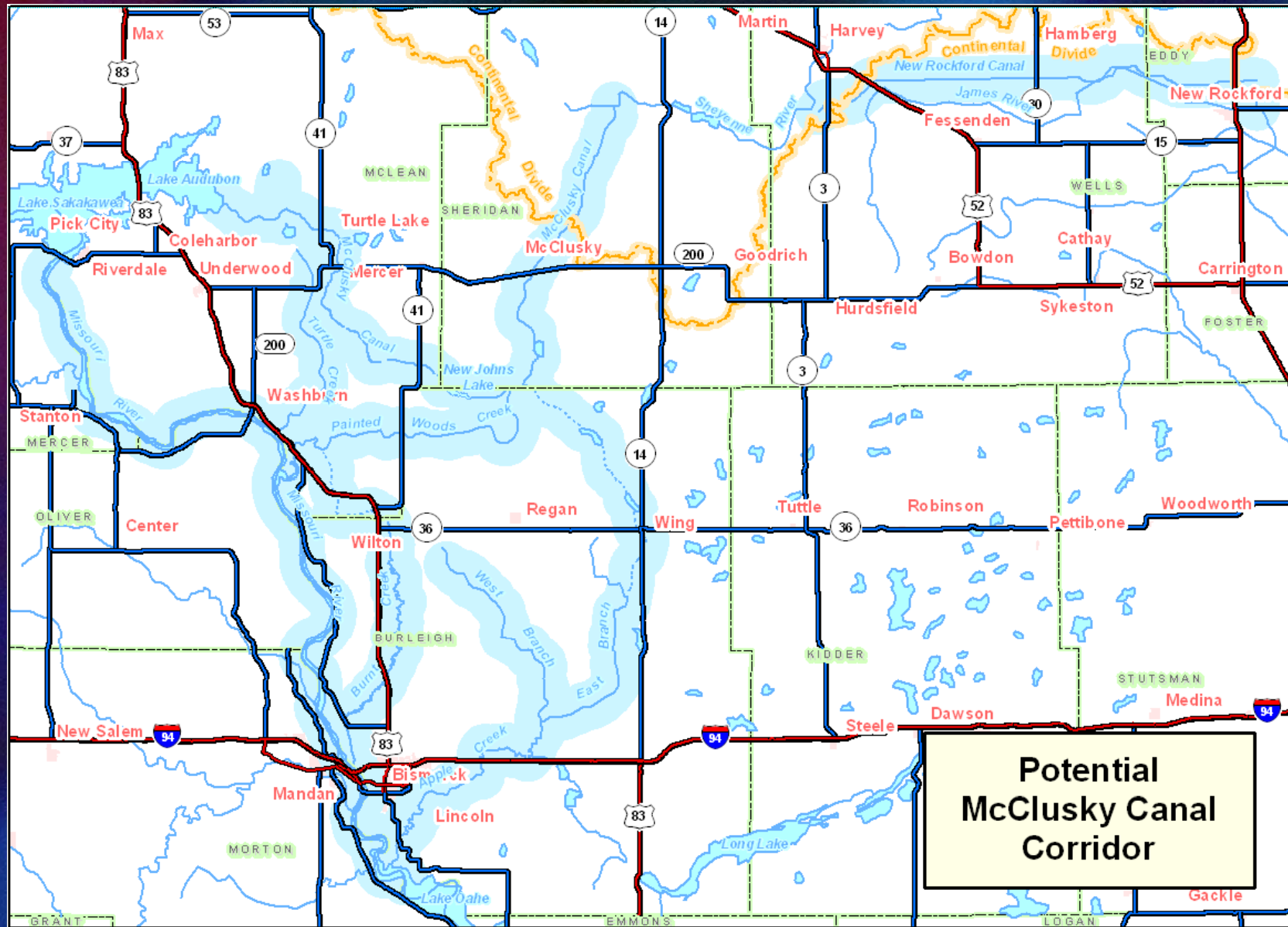
Off-peak & Substitution

- - Under Litigation - -

Southwest Pipeline Project

Red Trail Ethanol
South Heart – GNPD
Dodge Turnout
Other Turnouts

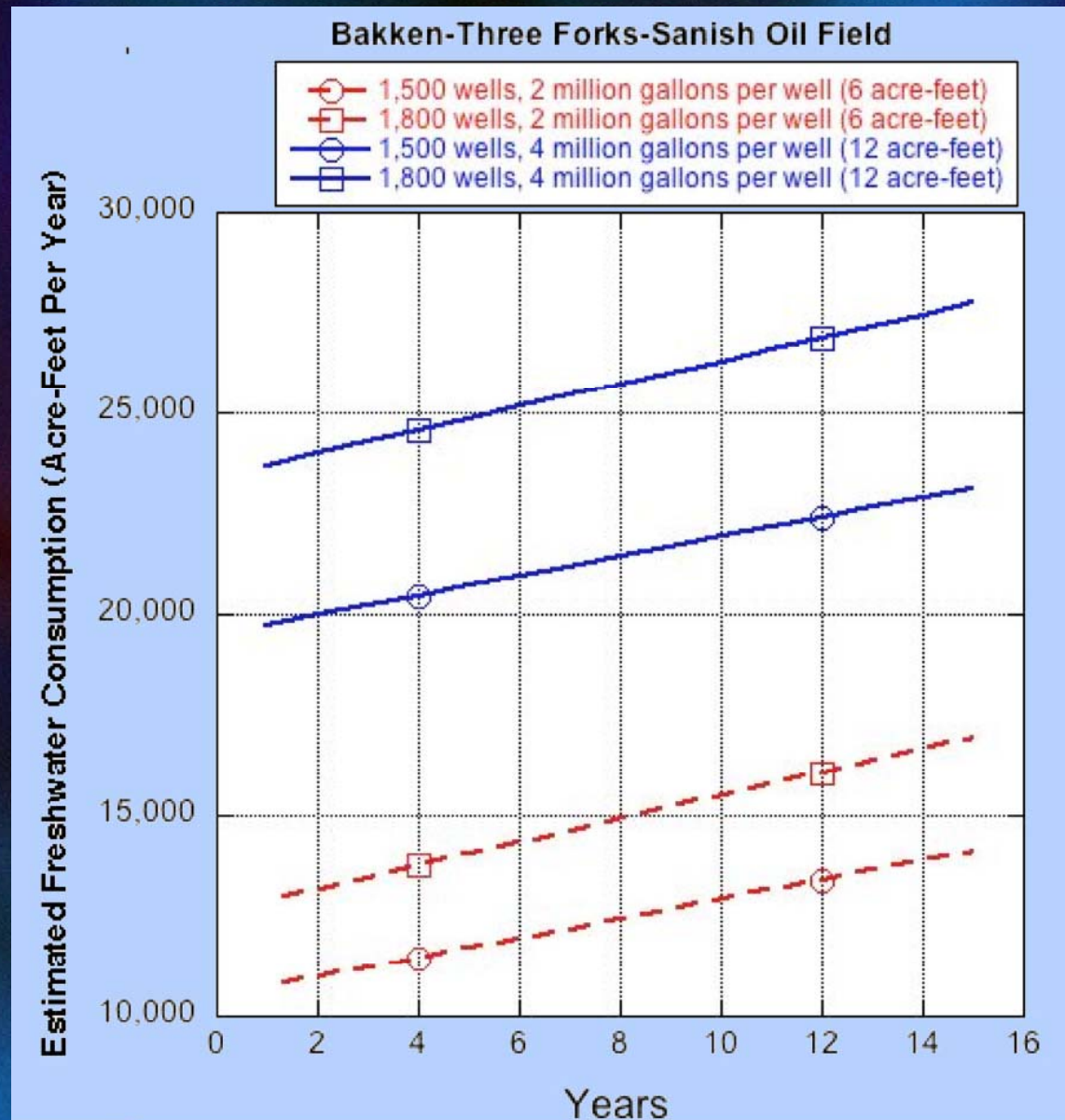
McClusky-New Rockford Corridor ?



Issues

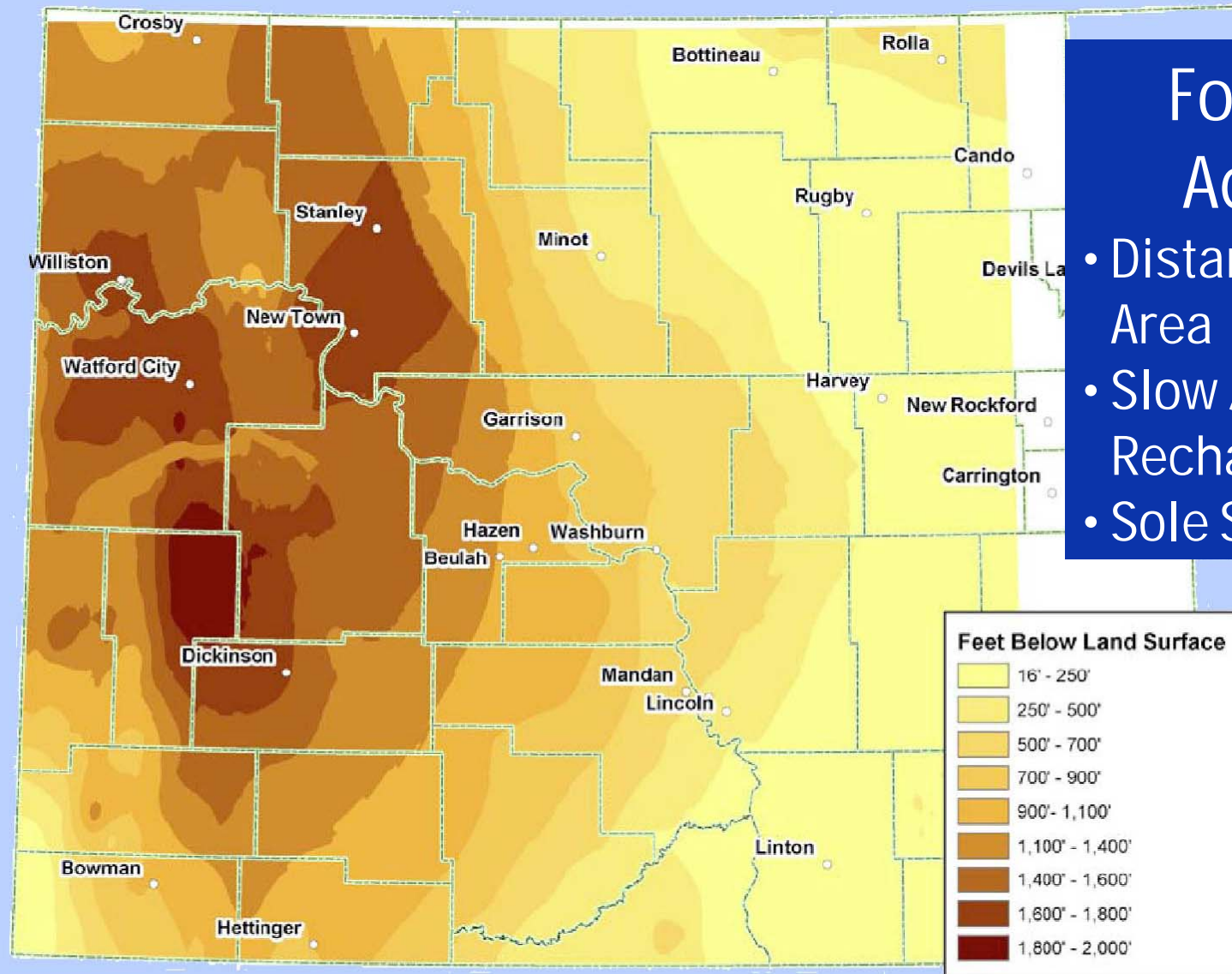
- 1 The Fox Hills Aquifer and Oil-Field Water Use
- 2 The Corps of Engineers – Access to Lake Sakakawea and Storage Fees

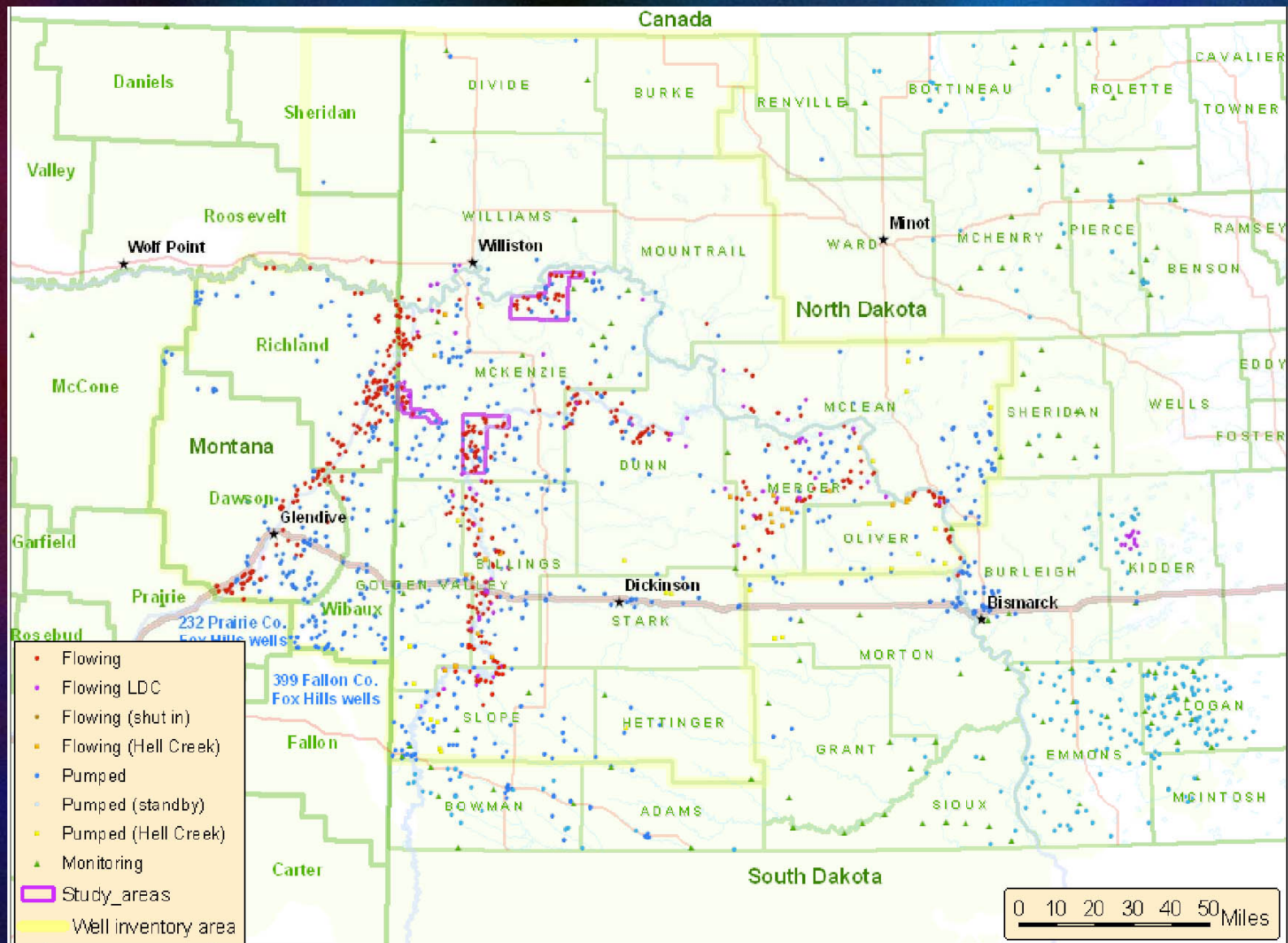
Projected Water Needs – Bakken Play



Fox Hills Aquifer

- Distant Recharge Area
- Slow / Unknown Recharge Rates
- Sole Source





Fox Hills Wells Survey

County	Wells	County	Wells
Adams	15	Morton	30
Benson	12	Mountrail *	5
Billings *	113	Oliver *	38
Bottineau	20	Pierce	14
Bowman	42	Renville	2
Burke *	0	Rolette	4
Burleigh	43	Sheridan	12
Divide *	4	Sioux	14
Dunn *	68	Slope *	80
Emmons	77	Stark *	22
Golden Valley *	48	Williams *	13
Grant	13	Custer, MT	1
Hettinger *	7	Daniels, MT	1
Kidder	30	Dawson, MT *	171
Logan	91	McCone MT	1
McHenry	14	Prairie, MT	1
McIntosh	11	Richland, MT *	90
McKenzie *	236	E. Roosevelt MT	1
McLean *	62	E. Sheridan MT	1
Mercer *	98	Wibaux, MT *	74

Fox Hills Wells Survey

Lindvig Memorandum 1984

"...the water needs of industry are in conflict with the farmers' and ranchers' need to conserve the aquifer pressure head. There is a need to develop a policy which will balance these needs."

- Agriculture – lower value over longer time
- Oil – higher value over shorter period of time

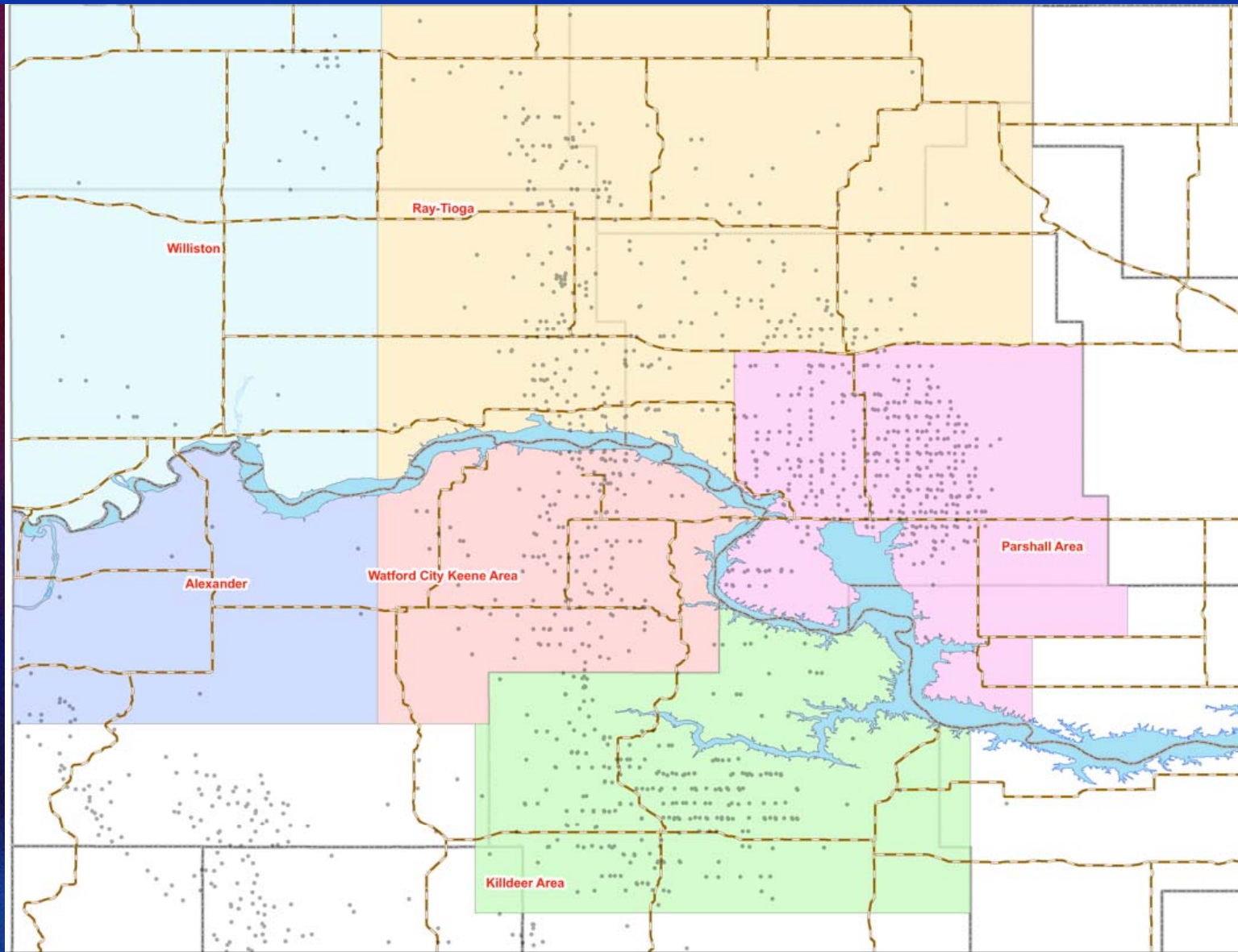
Lindvig Policy – Limited Use

"...require all industrial water permit applicants in northeast McKenzie County to develop their water supplies from the shallower Tertiary aquifers, and approve access to the FH-HC aquifer only when the shallower aquifers prove inadequate."

Water Permits & Applications for Ground-Water Depots

- 1984: 321 AF from Tertiary Aquifers
201 AFA from Fox Hills-Hell Creek
- 2009: 28 water depots for 2,340 AF
- 30 permits pending, possible total of 5,534 AF

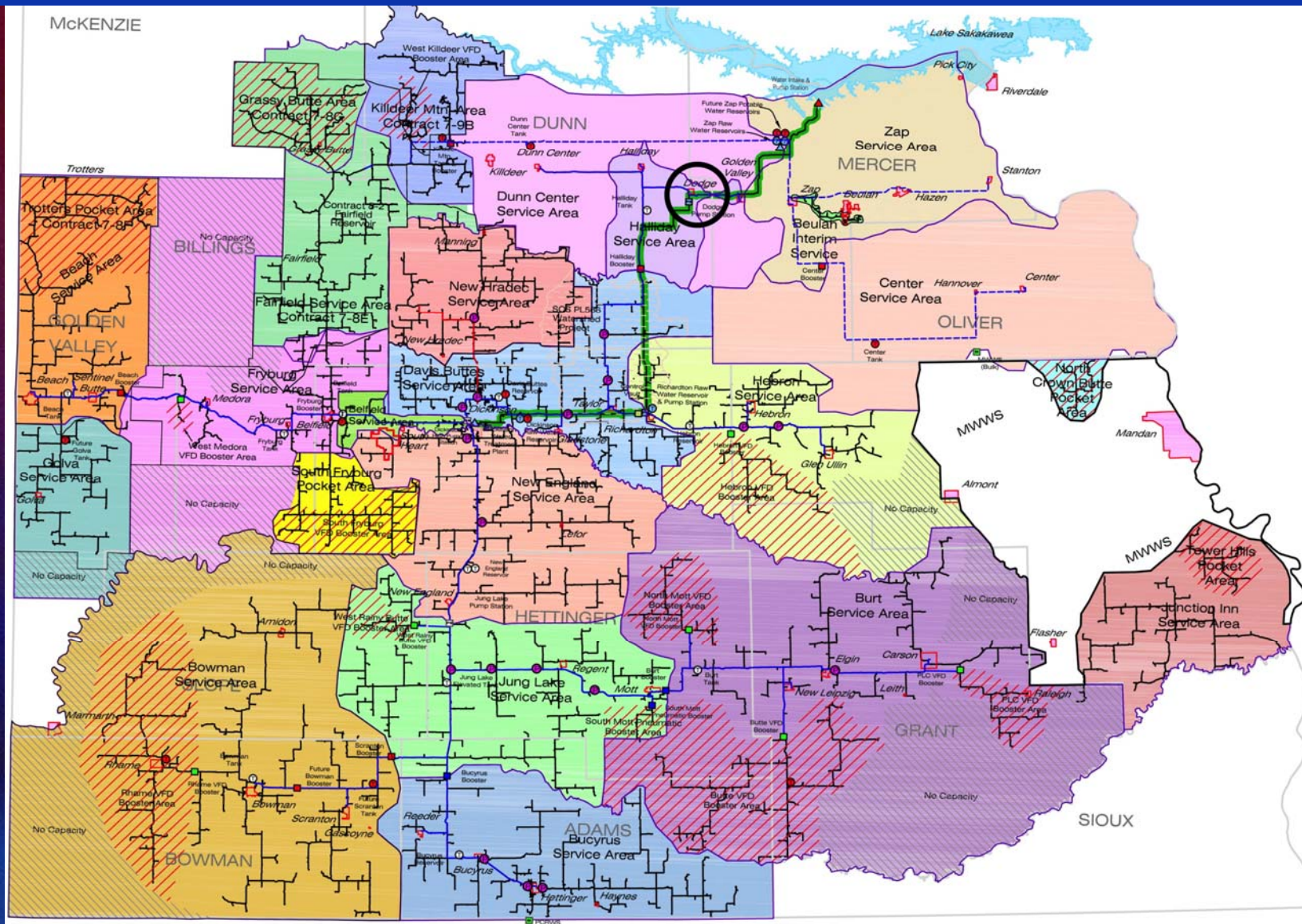
Water Supply Areas – Proposed by Helms



Issues

- 1 The Fox Hills Aquifer and Oil-Field Water Use
- 2 The Corps of Engineers – Access to Lake Sakakawea and Storage Fees

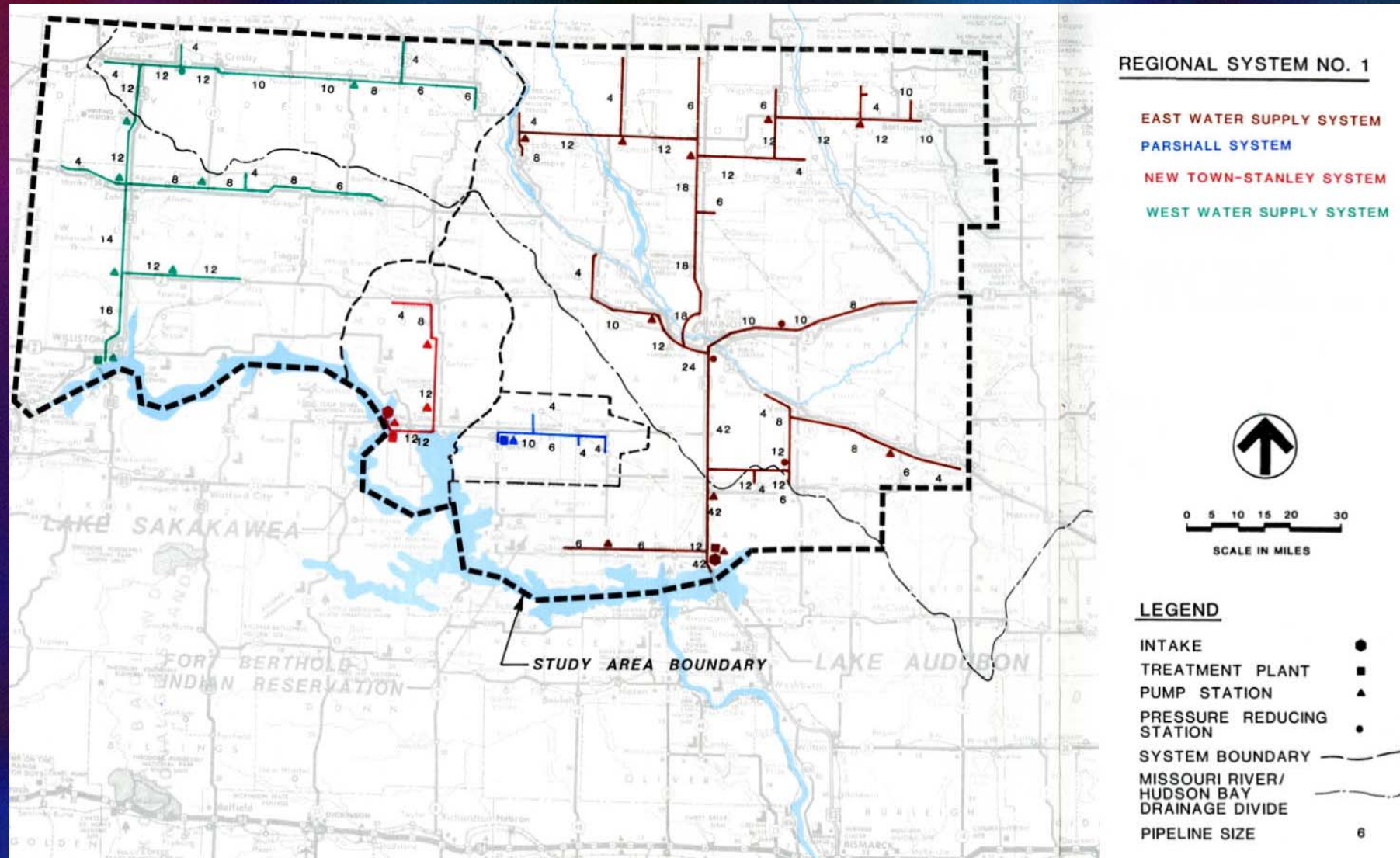
Southwest Pipeline / Dodge



Estimated Cost for SWPP Expansion

Additional Transmission gpm	Additional Annual Flow* AF	Additional Cost \$ in millions
0	0	0
0	0	0
200	323	3.9
450	726	5.3
700	1,129	5.5
1,450	2,339	12.8
1,975	3,186	19.8
2,975	4,799	31.2
3,975	6,412	42.1

NORTHWEST WATER SUPPLY



Potential Surface-Water Sources: MISSOURI RIVER SYSTEM

CITY OF PARSHALL & FORT BERTHOLD RURAL WATER – VAN HOOK ARM

Current Intake	0.5 M gpd
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New Intake	5 to 10 M gpd
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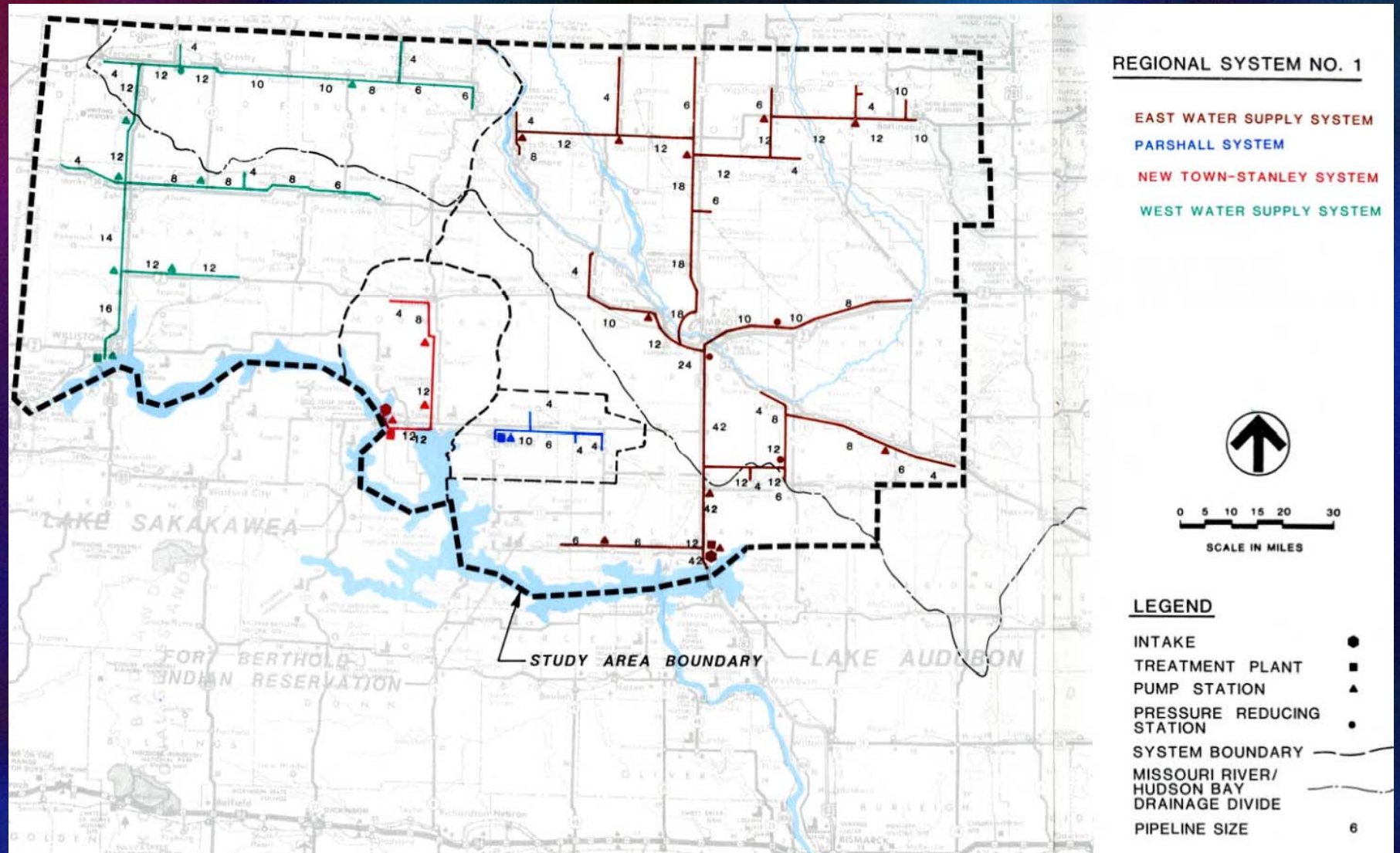
Treatment Capacity	2.5 M gpd
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Pipeline Capacity	5 M gpd
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Current Depot Permit	370 AF/yr.
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Potential Depot Sales	Several Thousand AF/yr.
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NORTHWEST WATER SUPPLY



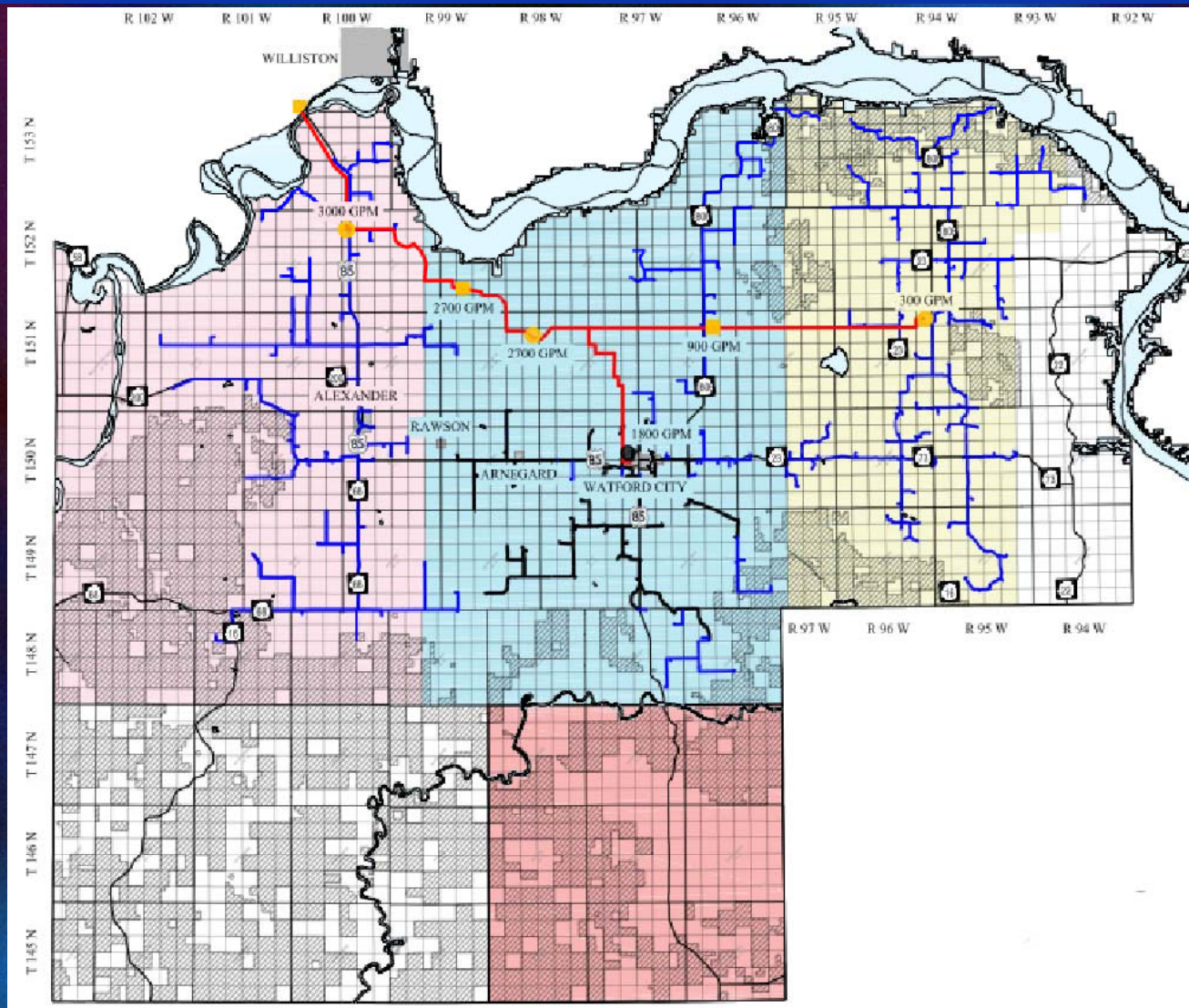
Potential Surface-Water Sources: MISSOURI RIVER SYSTEM

NORTHWEST AREA WATER SUPPLY - WEST

Williston & Williams Co. Rural Water Peak Use	6 M gpd
Williston Treatment Plant	10 M gpd
\$5 Million expandable to	14 M gpd
Expandable Option	20 M gpd
Watford City & McKenzie Rural Water	4 M gpd
Ray & Tioga – Wildrose	Ground Water?
Burke, Divide, Williams – BDW	Ground Water?

Integrated System – \$120 Million – AE2S Engr.

Williston Municipal / McKenzie County Rural Water District



Potential Surface-Water Sources: MISSOURI RIVER SYSTEM

PRIVATE SUPPLIES / APPLICATIONS

International Western	28,900 AF/yr.
Mortenson	5,370 AF/yr.
Hexom Earth	2,000 AF/yr.
Pease	1,000 AF/yr.
Pennington	800 AF/yr.
 TOTAL	 38,070 AF/yr.

Short-Term Measures

Temporary Water Permit to Apply Irrigation
Water For Oil-Field Uses

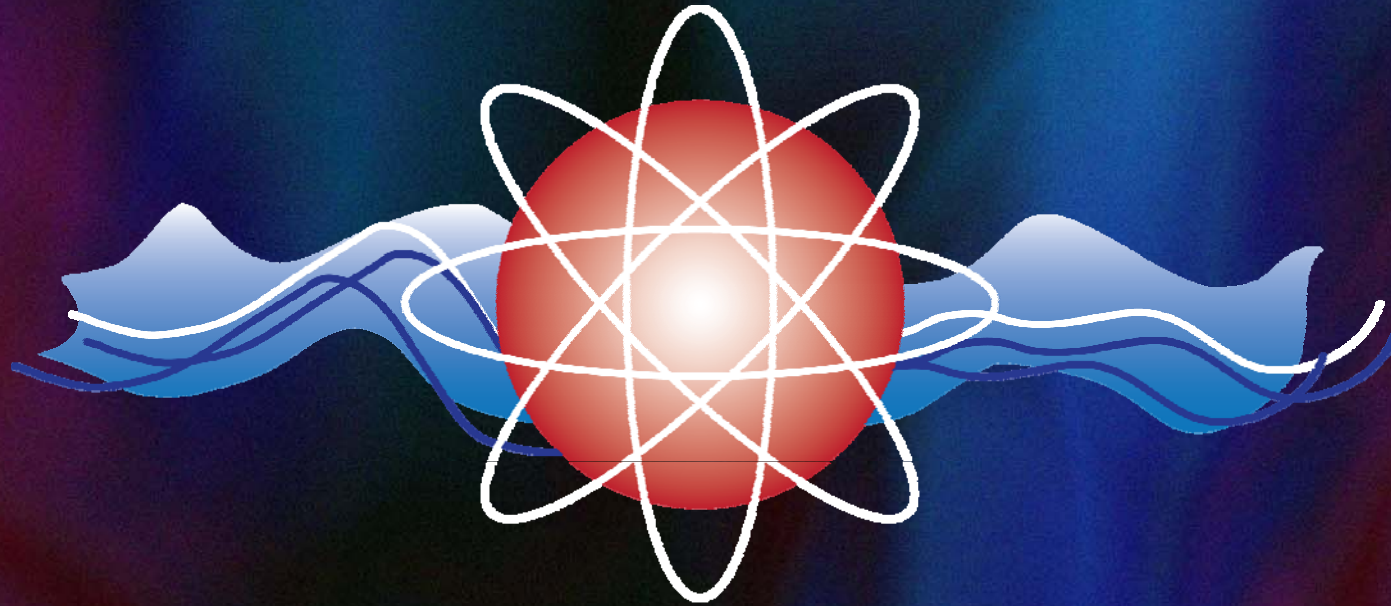
Off Peak Use of SWPP Water at Dodge

Issues

Carbon Capture = Water Consumption x 1.5 - 2

ND Coal Fired Thermoelectric Power
Consumes 28,500 AF/YR

Policy?



Thank You
Questions ?

Potential Surface-Water Sources: MISSOURI RIVER SYSTEM

Proposed McClusky Canal Corridor

Tens of thousands of AF

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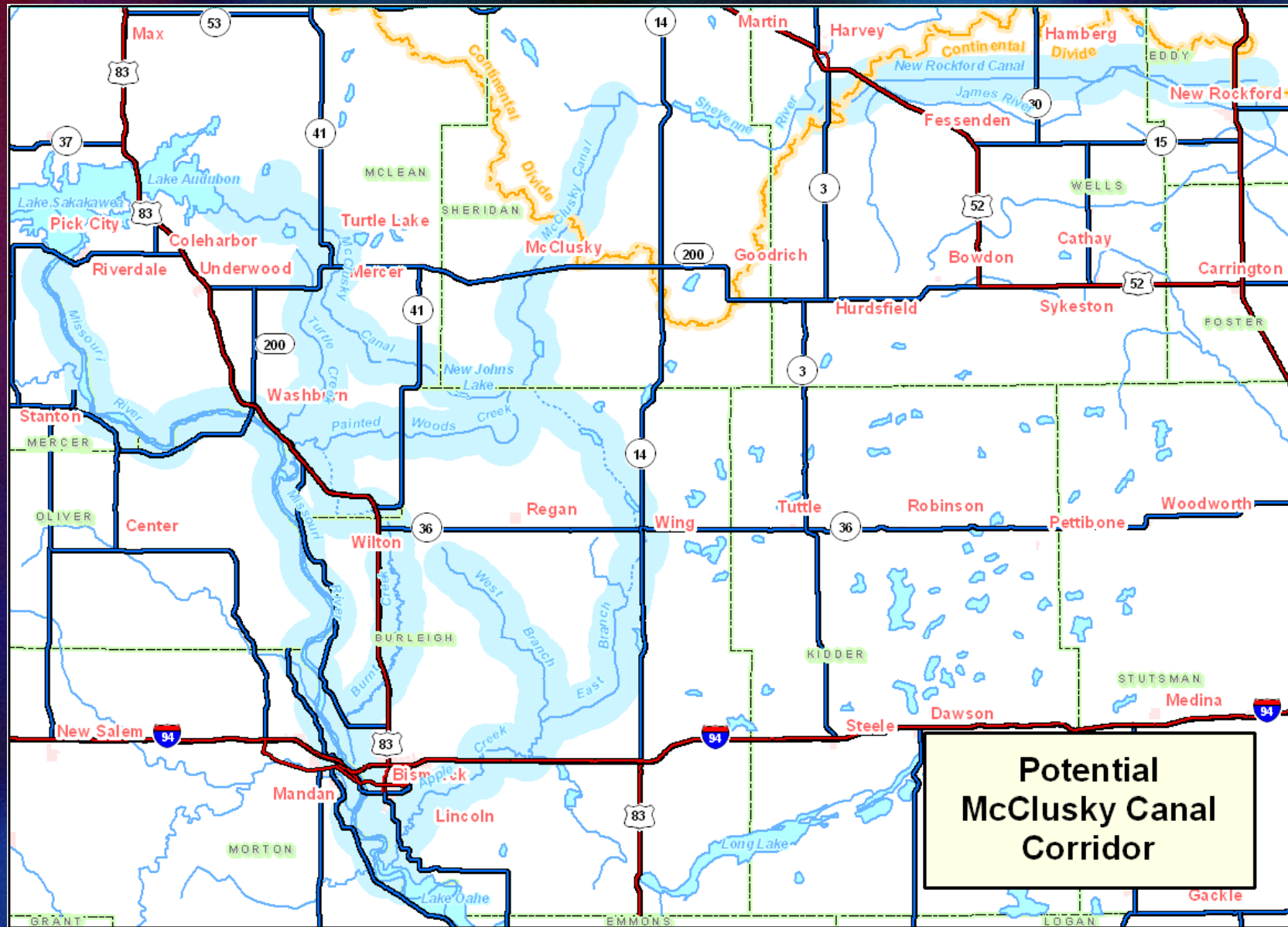
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Unit Water Use

Industry	No. Facilities	ND Water Use gal_w / gal_p	U.S. DOE gal_w / gal_p
Ethanol	5*	3 – 3.7	2 - 6
<i>Cellulosic Ethanol</i>	(1)		2 - 6
Biodiesel	(1) ADM**	1.5	0.3-3
Petroleum Refining	(1) Tesoro	0.48 C	1.5

*Alchem is on Hiatus ** Northwood is on Hiatus
 C = Consummed W = Withdrawn

Unit Water Use

Industry	No. Facilities	Capacity	Unit Water Use gal_w / MMCF-KWH
Natural Gas	29 listed 13 operational 16 inactive	0.5 to 120 MMCF/d	Negligible
Wind	17 completed 1 in construction 15 letters of intent 6 announced		Negligible
Syngas (methane)	Dakota Gasification		0.049 gal/SCF*
Syngas (Hydrogen)	South Heart		?
Syngas (Coal Liquifaction - Diesel?)	American Lignite Energy		?

*Efficiency enhanced by other products: anhydrous ammonia, ammonium sulfate, organic compounds

Unit Water Use: THERMOELECTRIC POWER GENERATION

Cooling System	No. Plants	W gal/kWh	W (U.S. DOE) gal/kWh	C (ND) gal/kWh	C (U.S. DOE) gal/kWh
Recirculating	3	0.5-0.57	1.2	0.5-0.55	0.1
Once-Through	6	22.4-37.8	37.7	0.03-0.05	0.1

W = Water Withdrawal

C = Water Consummed