



# **WATER SOURCE ADVISORY COUNCIL MEETING #4**

**October 18, 2022**

# WELCOME!

# INTRODUCTIONS

# RULES FOR ENGAGEMENT

- The deliberation process will be collaborative
- Everyone's perspective is valued and respected
- Listen to understand, not to debate
- Be concise
- Be hard on the issues – soft on the people
- Avoid right-wrong paradigms



# RULES FOR ENGAGEMENT

- Everyone should have an equal opportunity to participate
- Respect start and finish times
- Provide your full attention
- Full participation is critical
- Ask questions – don't wait
- Avoid sidebar conversations

# THE LEVELS OF CONSENSUS ARE:

1. I can say an unqualified 'yes' to the decision. I am satisfied that the decision is an expression of the wisdom of the group.
2. I find the decision perfectly acceptable.
3. I can live with the decision; I'm not especially enthusiastic about it.
4. I do not fully agree with the decision and need to register my view about it. However, I do not choose to block the decision. I am willing to support the decision because I trust the wisdom of the group.
5. I do not agree with the decision and feel the need to stand in the way of this decision being accepted.
6. I feel that we have no clear sense of direction of unity in the group. We need to do more work before consensus can be reached.

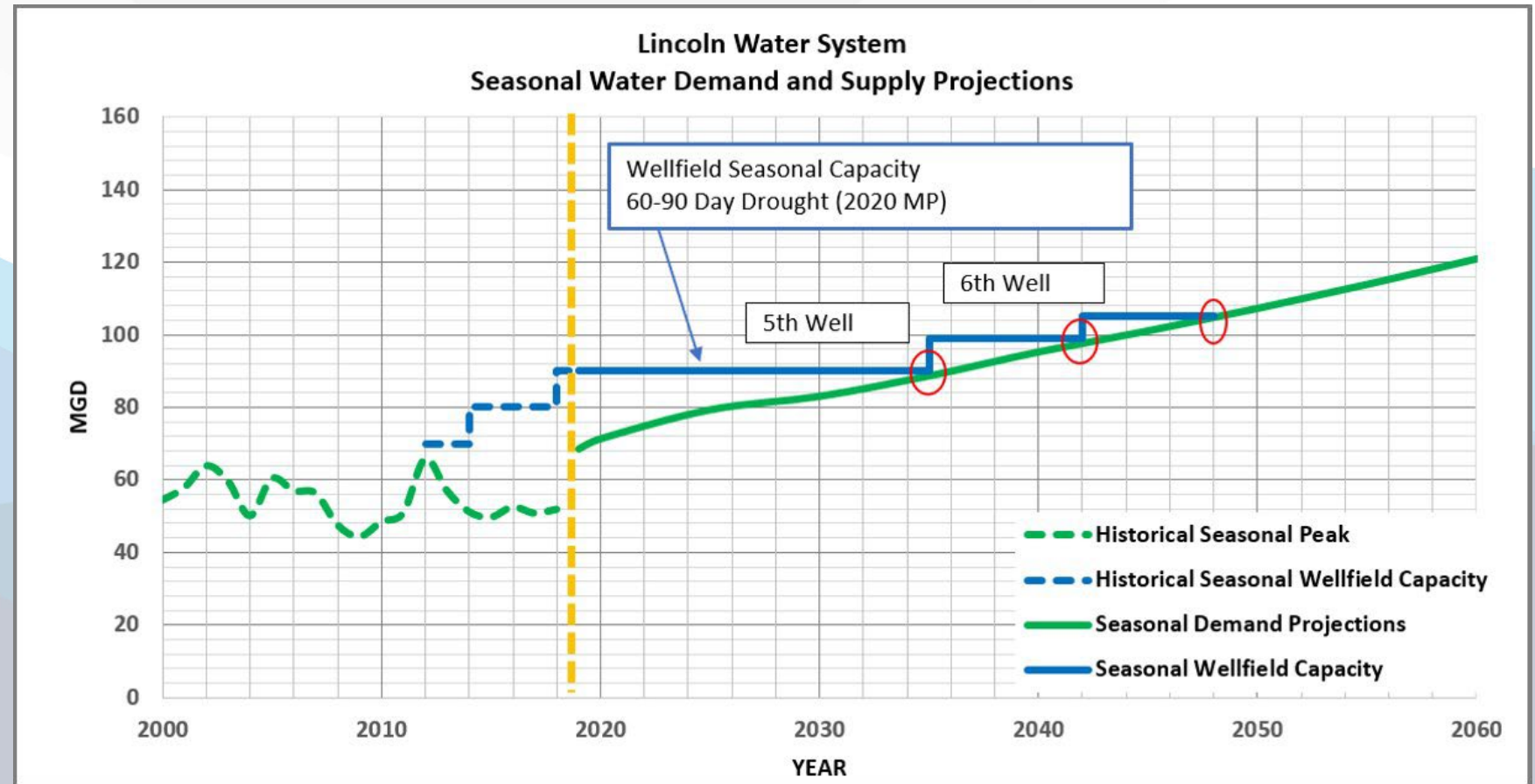
# AGENDA

# SCHEDULE GOING FORWARD

	SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
	Discuss Criteria	Score Alternatives	Discuss Criteria	Score Alternatives	Discuss Criteria	Score Alternatives	Discuss Criteria	Score Alternatives
Governance	✓							✓
Environmental Stewardship	✓	✓		✓				
Reliability					✓	✓		
Implementation			✓	✓				
Operations			✓	✓				
Stakeholder Impacts					✓	✓		
Life Cycle Costs							✓	✓

# ALTERNATIVE A FULLY DEVELOP EXISTING WELLFIELD

- HCW 5 & 6 are already planned and in the CIP
- HCW 7 & 8 have been evaluated and don't provide enough capacity
- Alternative A eliminated



# SCORING REFRESHER

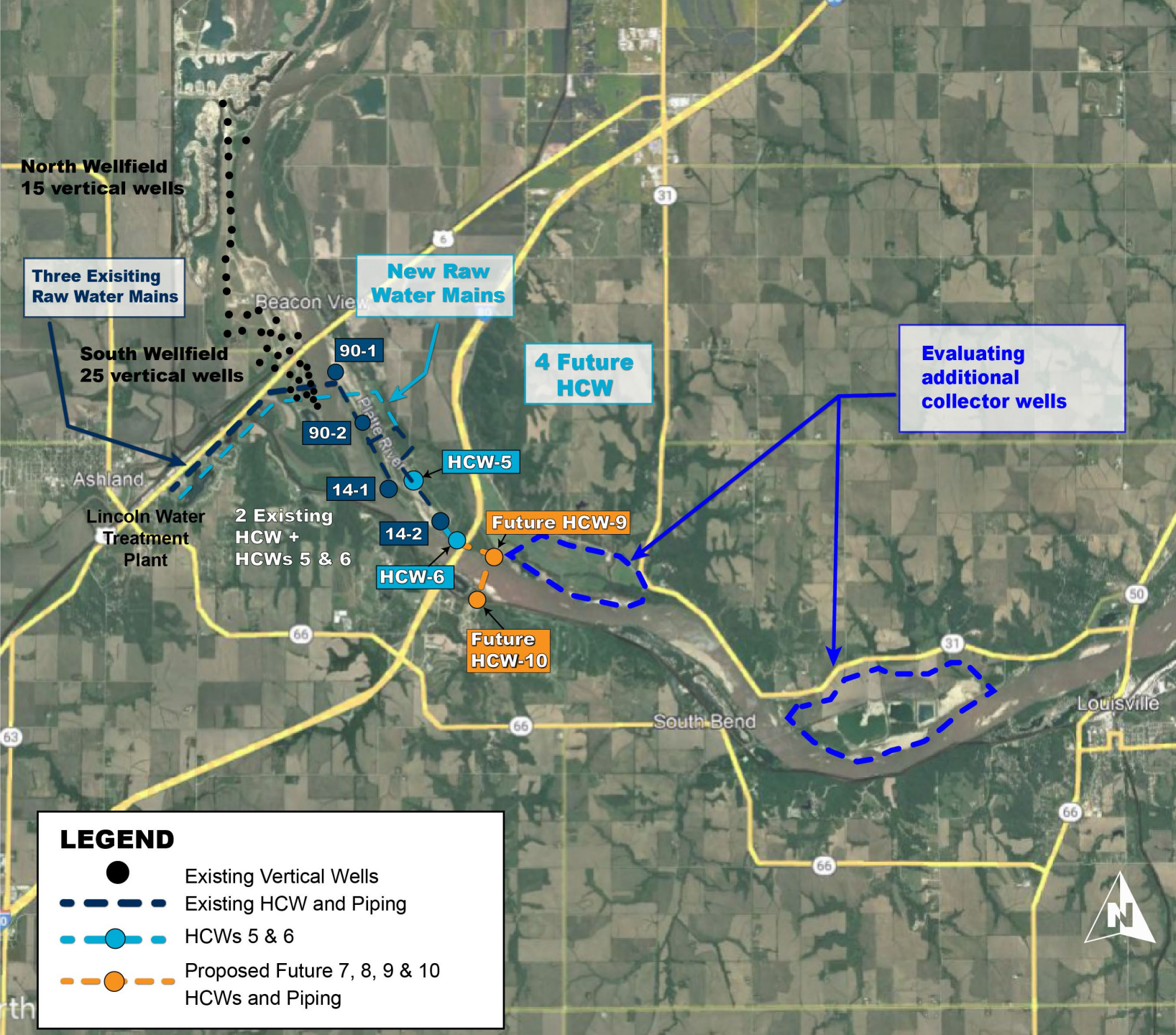
# ALTERNATIVE SCORING: **ENVIRONMENTAL STEWARDSHIP CRITERIA**

# ENVIRONMENTAL STEWARDSHIP CRITERIA

- Environmental Impacts
- Cultural Impacts



# ALTERNATIVE B EXPAND EXISTING WELLFIELD



## SCORING SHEET – Environmental Stewardship Criteria



### Alternative B - Expand Existing Wellfield

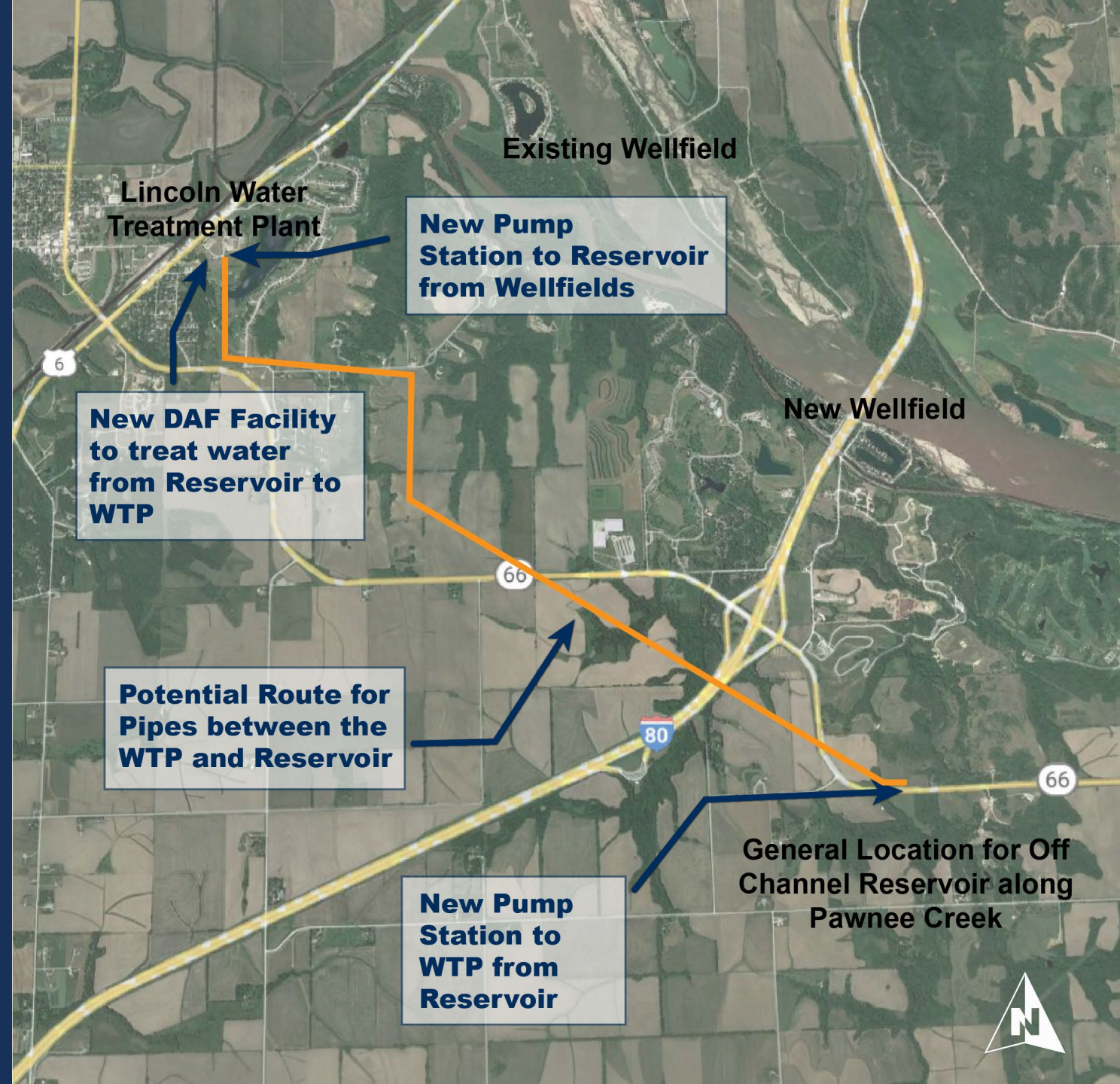
Environmental Impacts	Overview and Facts	Notes
<b>Stream Crossing</b> How many National Hydrography Dataset (NHD) Streams does the alignment cross?	1 channel crossing	
<b>Wetland and Open Waters</b>	<0.1 acre of permanent wetland impacts	
<b>Habitat</b> What Biologically Unique Landscape (BULs), Nebraska Game & Parks Commission (NGPC) lands, Wildlife Management Areas (WMAs) does the alignment extend through?	Lower Platte River (Riverine BUL)	
<b>Threatened &amp; Endangered (T&amp;E)</b> What T&E Species Habitat does the alignment extend through?	Estimated Range of: Western prairie fringed orchid, northern long-eared bat, Interior least tern, lake sturgeon, pallid sturgeon, sturgeon chub, Piping plover	
<b>Floodplain Development</b> How many floodplains does the alignment extend through?	1	
<b>US Army Corps of Engineers (USACE) 404</b>	Individual Permit (12-24 month review) Potential Wetland Mitigation	
Cultural Impacts		
<b>Historical / Cultural</b> Does the buffer go through any historic or cultural areas?	None	

#### SCORING KEY

5-Fully meets the criteria definition 4-Meets most of the criteria definition, 3-Meets some of the criteria definition, 2-Meets little of the criteria definition, 1-Meets none of the criteria definition



# ALTERNATIVE C OFF-CHANNEL RESERVOIR



## SCORING SHEET – Environmental Stewardship Criteria



### Alternative C - Off-Channel Reservoir

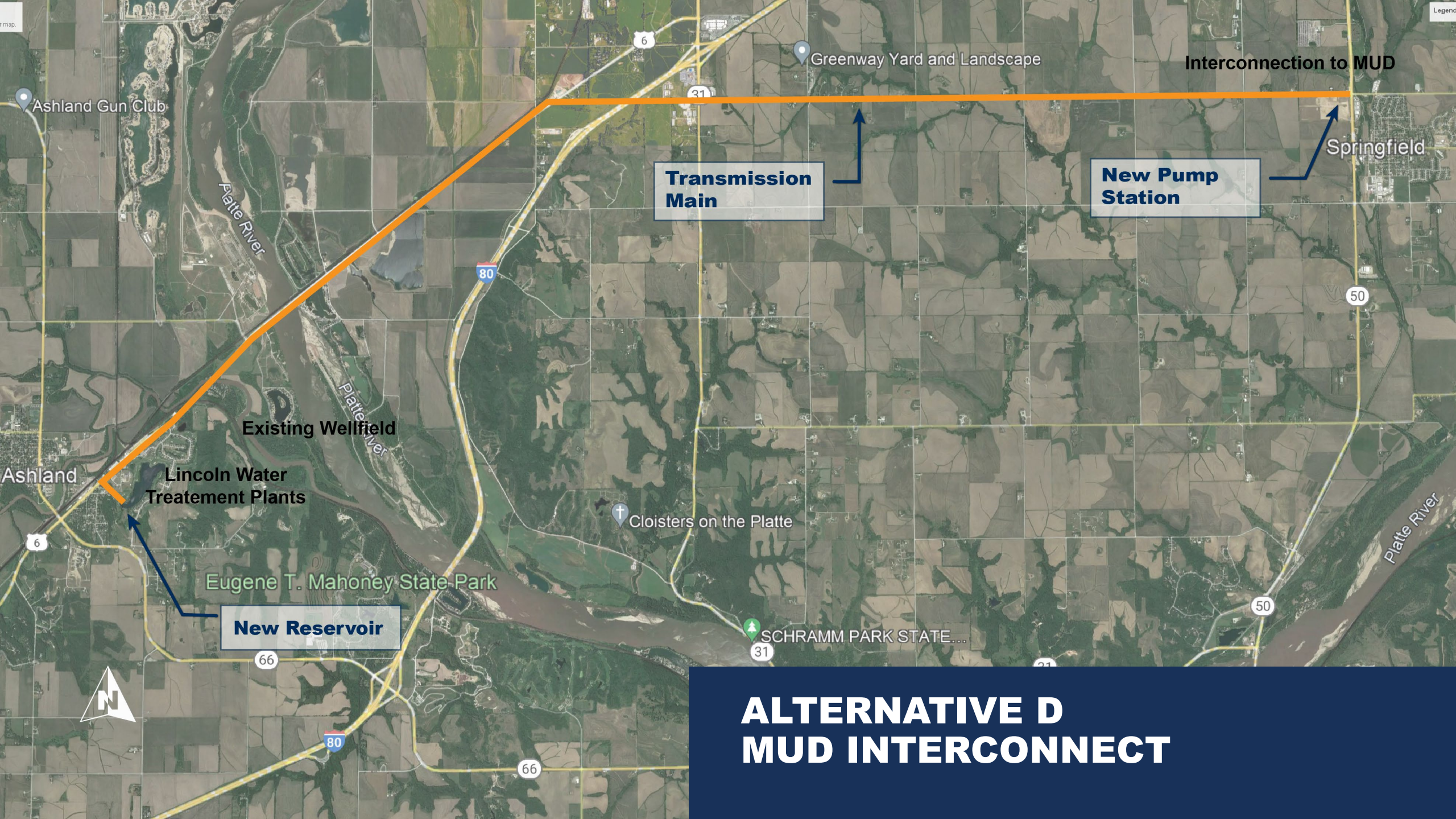
Score (1-5) \_\_\_\_\_

Environmental Impacts	Overview and Facts	Notes
<b>Stream Crossing</b> How many National Hydrography Dataset (NHD) Streams does the alignment cross?	Greater than 0.03 acre of Channel Impact	
<b>Wetland and Open Waters</b>	>0.1 acre of permanent wetland impacts	
<b>Habitat</b> What Biologically Unique Landscape (BULs), Nebraska Game & Parks Commission (NGPC) lands, Wildlife Management Areas (WMAs) does the alignment extend through?	Dependent on location	
<b>Threatened &amp; Endangered (T&amp;E)</b> What T&E Species Habitat does the alignment extend through?	Dependent on location	
<b>Floodplain Development</b> How many floodplains does the alignment extend through?	1	
<b>US Army Corps of Engineers (USACE) 404</b>	Individual Permit (12-24 month review) Potential Wetland and Stream Channel Mitigation	
Cultural Impacts		
<b>Historical / Cultural</b> Does the buffer go through any historic or cultural areas?	Dependent on location	

#### SCORING KEY

5-Fully meets the criteria definition 4-Meets most of the criteria definition, 3-Meets some of the criteria definition, 2-Meets little of the criteria definition, 1-Meets none of the criteria definition





**Transmission  
Main**

**New Pump  
Station**

**New Reservoir**

**Interconnection to MUD**

# ALTERNATIVE D MUD INTERCONNECT



## SCORING SHEET – Environmental Stewardship Criteria



### Alternative D - Omaha MUD Interconnect

Score (1-5) \_\_\_\_\_

Environmental Impacts	Overview and Facts	Notes
Length of Pipeline (Miles)	21.8	
Stream Crossing How many National Hydrography Dataset (NHD) Streams does the alignment cross?	29 channel crossings	
Wetland and Open Waters	14 total wetlands-lake (1) (0 linear feet), freshwater ponds (2) (229 linear feet), freshwater forested/shrub wetlands (7) (1925 linear feet), freshwater emergent wetlands (4) (40 linear feet)	
Habitat What Biologically Unique Landscape (BULs), Nebraska Game & Parks Commission (NGPC) lands, Wildlife Management Areas (WMAs) does the alignment extend through?	BUL: Lower Platte River (Riverine BUL), NGPC: Catfish Run WMA	
Threatened & Endangered (T&E) What T&E Species Habitat does the alignment extend through?	Estimated current range of: American Ginseng, Lake Sturgeon, Northern Long-eared Myotis, Pallid Sturgeon, Sturgeon Chub, Western Prairie Fringed Orchid, Interior Least Tern, Piping Plover	
Floodplain Development How many floodplains does the alignment extend through?	10	
US Army Corps of Engineers (USACE) 404	Nationwide Permit (NWP) (4-6 month review)	
Cultural Impacts		
Historical / Cultural Does the buffer go through any historic or cultural areas?	None	

#### SCORING KEY

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**ALTERNATIVE E  
MISSOURI RIVER SURFACE  
WATER INTAKE TO ASHLAND  
TREATMENT PLANT**

**Potential  
Route for New  
Transmission  
Main and  
Pump Stations  
with Storage  
Tanks**



## SCORING SHEET – Environmental Stewardship Criteria



### Alternative E - Missouri River Surface Water Intake to Ashland

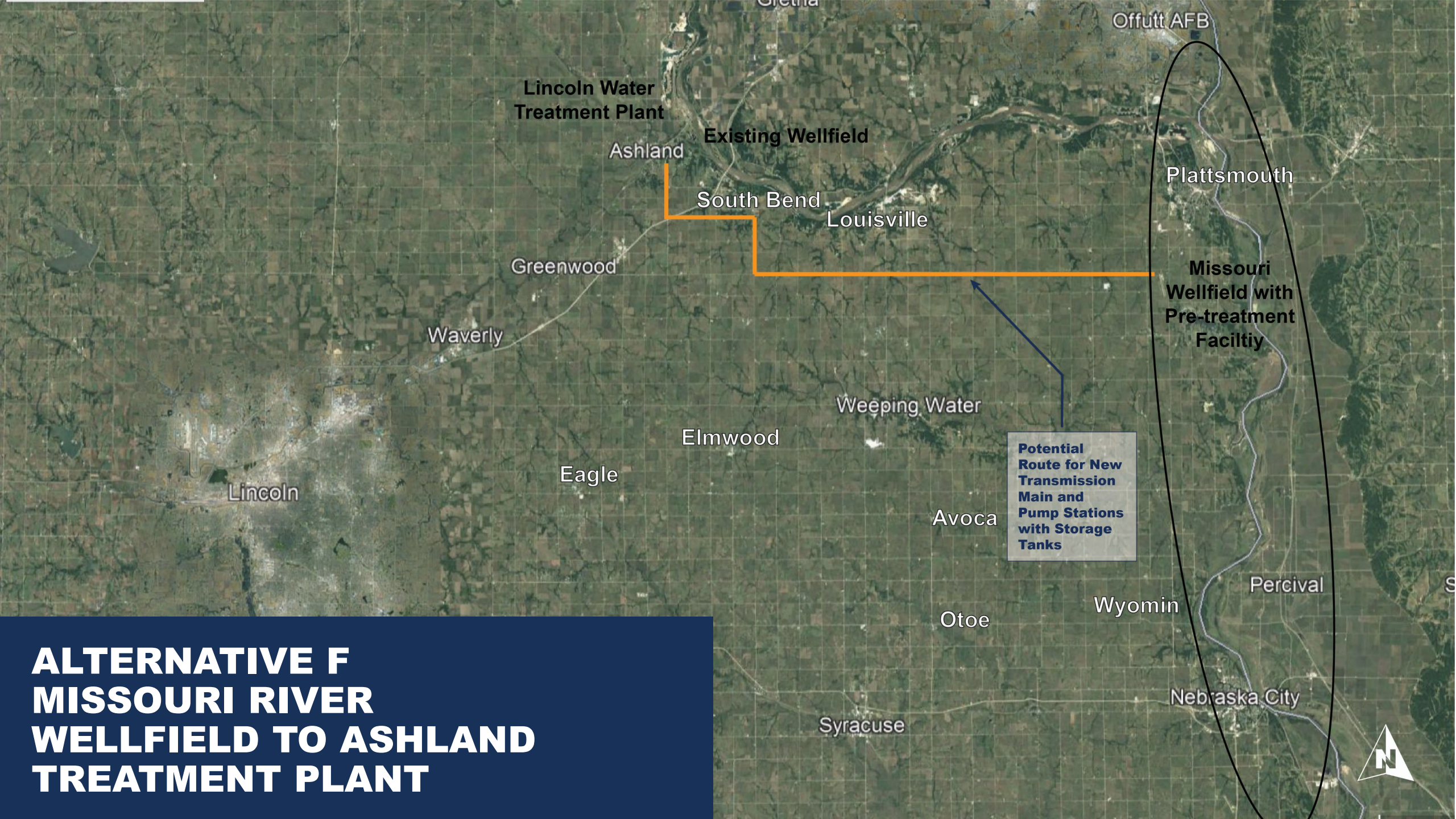
Score (1-5) \_\_\_\_\_

Environmental Impacts	Overview and Facts	Notes
Length of Pipeline (Miles)	38.5	
Stream Crossing How many National Hydrography Dataset (NHD) Streams does the alignment cross?	52 channel crossings	
Wetland and Open Waters	29 total wetlands-lake (1) (207 linear feet), freshwater ponds (5) (74 linear feet), freshwater forested/shrub wetlands (15) (325 linear feet), freshwater emergent wetlands (18) (85 linear feet)	
Habitat What Biologically Unique Landscape (BULs), Nebraska Game & Parks Commission (NGPC) lands, Wildlife Management Areas (WMAs) does the alignment extend through?	BUL: Missouri River (Riverine BUL) and Lower Platte River (Riverine BUL), no NGPC lands	
Threatened & Endangered (T&E) What T&E Species Habitat does the alignment extend through?	Estimated current range of: American Ginseng, Lake Sturgeon, Northern Long-eared Myotis, Pallid Sturgeon, Southern Flying Squirrel, Sturgeon Chub, Western Prairie Fringed Orchid, Interior Least Tern, Piping Plover	
Floodplain Development How many floodplains does the alignment extend through?	9	
US Army Corps of Engineers (USACE 404)	Nationwide Permit (NWP) (4-6 month review)	
Cultural Impacts		
Historical / Cultural Does the buffer go through any historic or cultural areas?	None	

#### SCORING KEY

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**ALTERNATIVE F  
MISSOURI RIVER  
WELLFIELD TO ASHLAND  
TREATMENT PLANT**



## SCORING SHEET – Environmental Stewardship Criteria



### Alternative F - Missouri River Wellfield to Ashland

Score (1-5) \_\_\_\_\_

Environmental Impacts	Overview and Facts	Notes
<b>Length of Pipeline (Miles)</b>	38.5	
<b>Stream Crossing</b> How many National Hydrography Dataset (NHD) Streams does the alignment cross?	52 channel crossings	
<b>Wetland and Open Waters</b>	29 total wetlands-lake (1) (207 linear feet), freshwater ponds (5) (74 linear feet), freshwater forested/shrub wetlands (15) (325 linear feet), freshwater emergent wetlands (18) (85 linear feet)	
<b>Habitat</b> What Biologically Unique Landscape (BULs), Nebraska Game & Parks Commission (NGPC) lands, Wildlife Management Areas (WMAs) does the alignment extend through?	BUL: Missouri River (Riverine BUL) and Lower Platte River (Riverine BUL), no NGPC lands	
<b>Threatened &amp; Endangered (T&amp;E)</b> What T&E Species Habitat does the alignment extend through?	Estimated current range of: American Ginseng, Lake Sturgeon, Northern Long-eared Myotis, Pallid Sturgeon, Southern Flying Squirrel, Sturgeon Chub, Western Prairie Fringed Orchid, Interior Least Tern, Piping Plover	
<b>Floodplain Development</b> How many floodplains does the alignment extend through?	9	
<b>US Army Corps of Engineers (USACE 404)</b>	Nationwide Permit (NWP) (4-6 month review)	
<b>Cultural Impacts</b>		
<b>Historical / Cultural</b> Does the buffer go through any historic or cultural areas?	None	

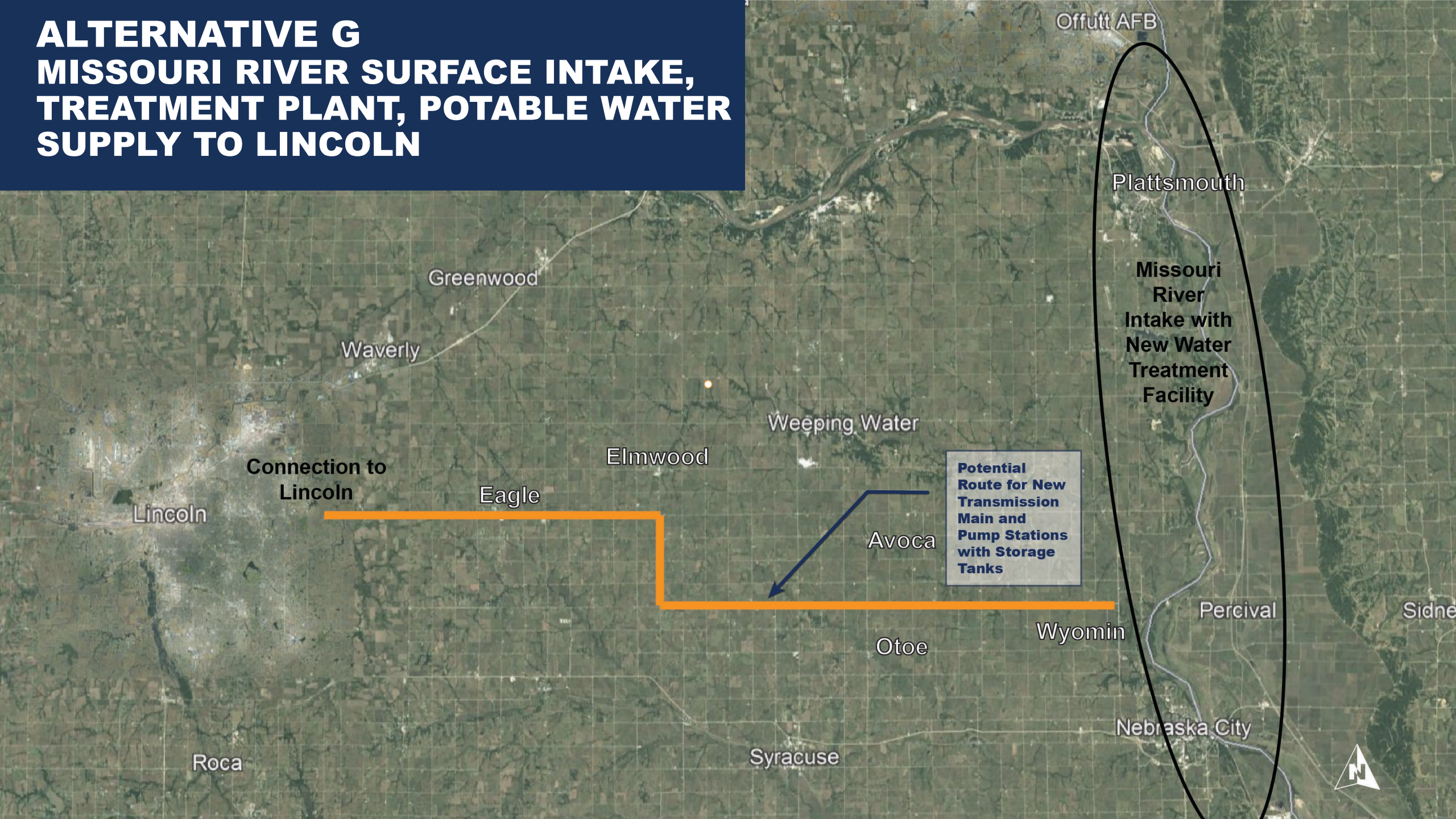
#### SCORING KEY

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# ALTERNATIVE G

## MISSOURI RIVER SURFACE INTAKE, TREATMENT PLANT, POTABLE WATER SUPPLY TO LINCOLN





## SCORING SHEET – Environmental Stewardship Criteria



### Alternative G - Missouri River Surface Water Intake to Lincoln

Score (1-5) \_\_\_\_\_

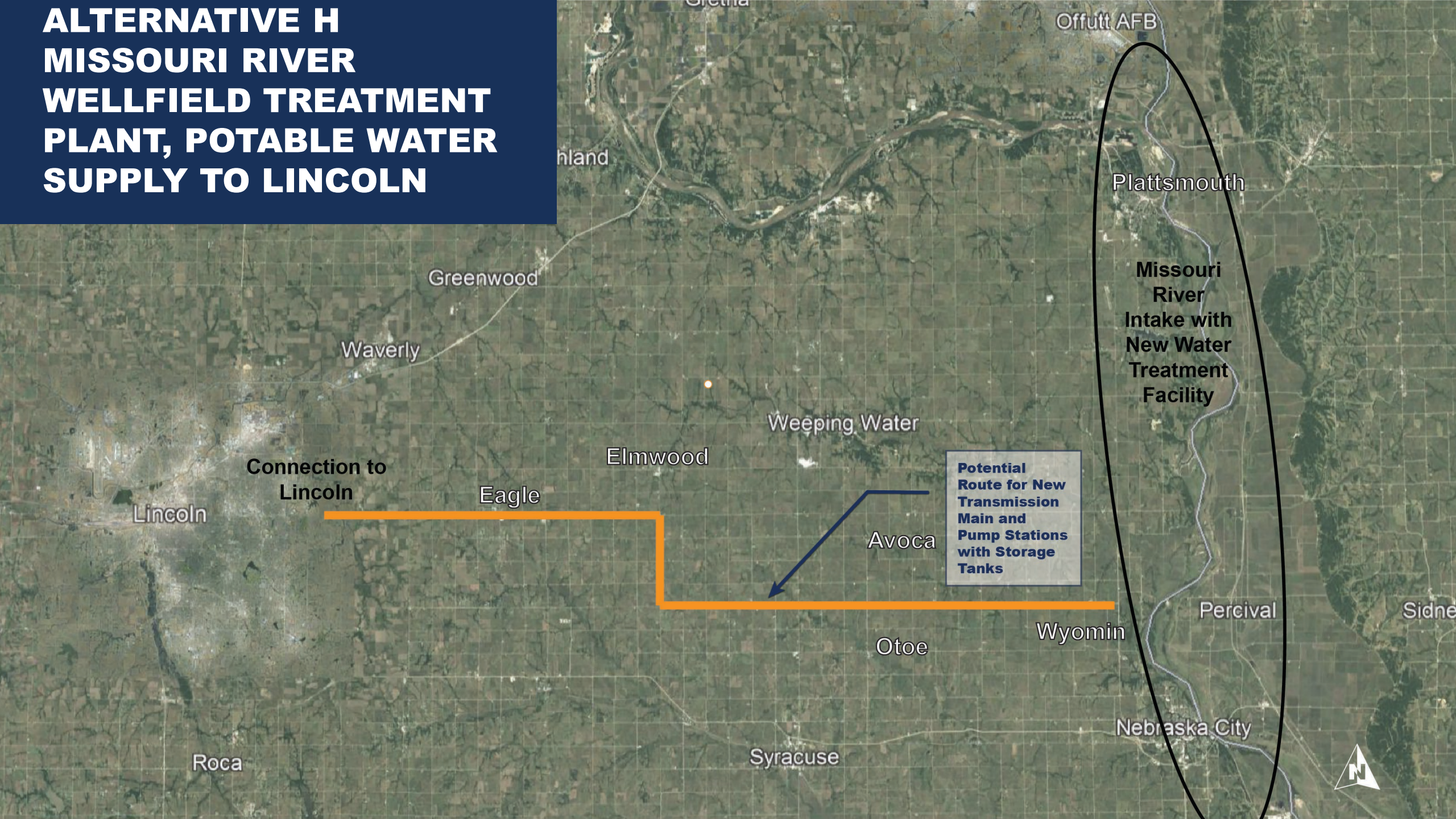
Environmental Impacts	Overview and Facts	Notes
Length of Pipeline (Miles)	46.1	
Stream Crossing How many National Hydrography Dataset (NHD) Streams does the alignment cross?	66 channel crossings	
Wetland and Open Waters	51 total wetlands-lake (1) (235 linear feet), freshwater ponds (6) (577 linear feet), freshwater forested/shrub wetlands (15) (385 linear feet), freshwater emergent wetlands (29) (962 linear feet)	
Habitat What Biologically Unique Landscape (BULs), Nebraska Game & Parks Commission (NGPC) lands, Wildlife Management Areas (WMAs) does the alignment extend through?	BUL: Missouri River (Riverine BUL), no NGPC lands	
Threatened & Endangered (T&E) What T&E Species Habitat does the alignment extend through?	Estimated current range of: American Ginseng, Lake Sturgeon, Northern Long-eared Myotis, Pallid Sturgeon, Southern Flying Squirrel, Sturgeon Chub, Western Prairie Fringed Orchid	
Floodplain Development How many floodplains does the alignment extend through?	27	
US Army Corps of Engineers (USACE 404)	Nationwide Permit (NWP) (4-6 month review)	
Cultural Impacts		
Historical / Cultural Does the buffer go through any historic or cultural areas?	Snoke Farmstead (National Register of Historic Places -- National Park Service)	

#### SCORING KEY

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**ALTERNATIVE H**  
**MISSOURI RIVER**  
**WELLFIELD TREATMENT**  
**PLANT, POTABLE WATER**  
**SUPPLY TO LINCOLN**





## SCORING SHEET – Environmental Stewardship Criteria



### Alternative H - Missouri River Wellfield to Lincoln

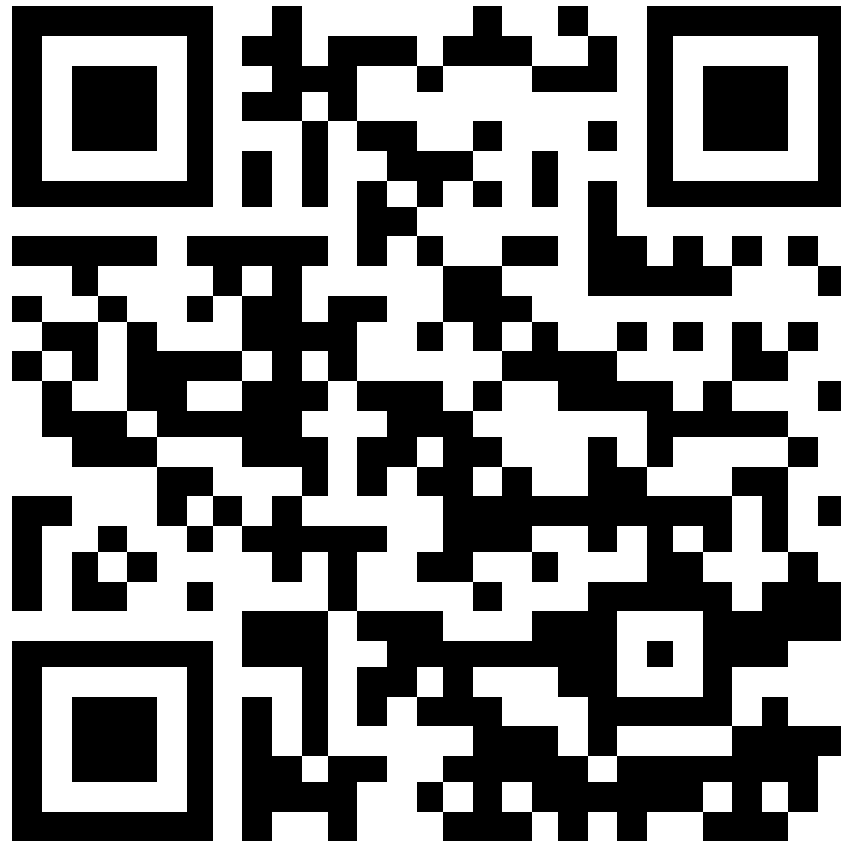
Score (1-5) \_\_\_\_\_

Environmental Impacts	Overview and Facts	Notes
<b>Length of Pipeline (Miles)</b>	46.1	
<b>Stream Crossing</b> How many National Hydrography Dataset (NHD) Streams does the alignment cross?	66 channel crossings	
<b>Wetland and Open Waters</b>	51 total wetlands- lake (1) (235 linear feet), freshwater ponds (6) (577 linear feet), freshwater forested/shrub wetlands (15) (385 linear feet), freshwater emergent wetlands (29) (962 linear feet)	
<b>Habitat</b> What Biologically Unique Landscape (BULs), Nebraska Game & Parks Commission (NGPC) lands, Wildlife Management Areas (WMAs) does the alignment extend through?	BUL: Missouri River (Riverine BUL), no NGPC lands	
<b>Threatened &amp; Endangered (T&amp;E)</b> What T&E Species Habitat does the alignment extend through?	Estimated current range of: American Ginseng, Lake Sturgeon, Northern Long-eared Myotis, Pallid Sturgeon, Southern Flying Squirrel, Sturgeon Chub, Western Prairie Fringed Orchid	
<b>Floodplain Development</b> How many floodplains does the alignment extend through?	27	
<b>US Army Corps of Engineers (USACE 404)</b>	Nationwide Permit (NWP) (4-6 month review)	
Cultural Impacts		
<b>Historical / Cultural</b> Does the buffer go through any historic or cultural areas?	Snoke Farmstead (National Register of Historic Places -- National Park Service)	

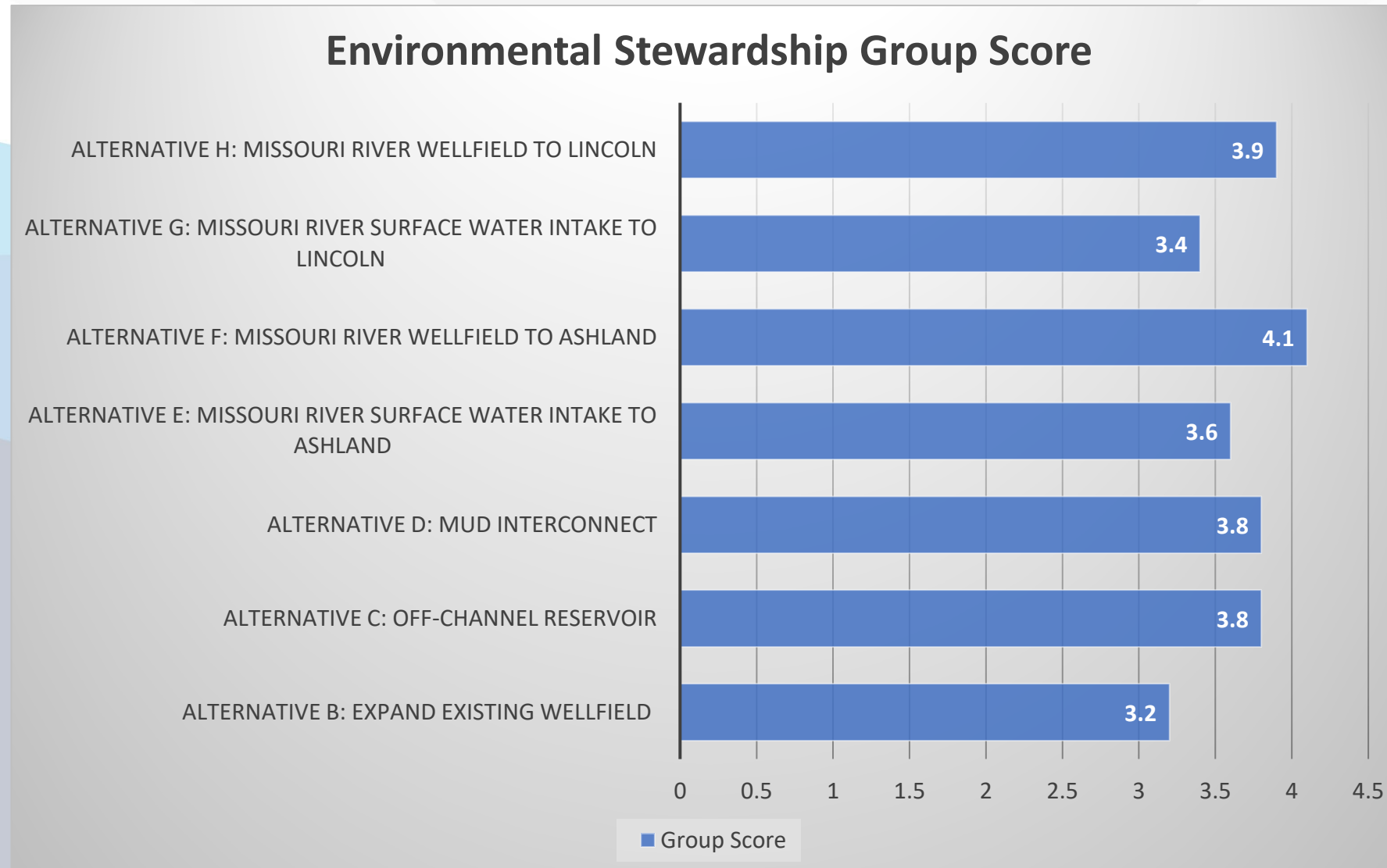
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2-Meets little of the criteria definition, 1-Meets none of the criteria definition

# ALTERNATIVE SCORING ENVIRONMENTAL STEWARDSHIP CRITERIA



# ALTERNATIVE SCORING: ENVIRONMENTAL STEWARDSHIP CRITERIA





# OPERATIONS CRITERIA



# **WATER SYSTEM BASIC OPERATIONS CRITERIA**

*Treatment Needs Based on Source Water Quality and Finished Water Goals*



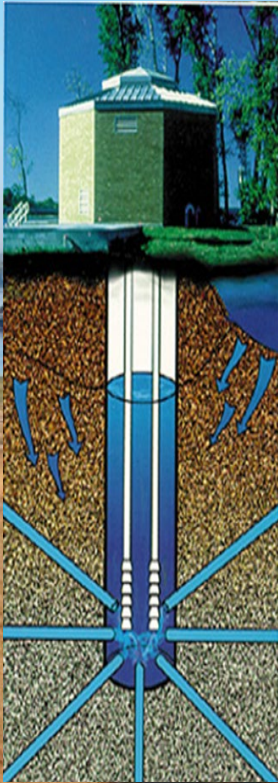
# HEALTH ASPECTS OF WATER QUALITY

- Acute - Pathogenic organisms (gastrointestinal illness)
- Chronic – Organic, inorganic chemicals (increased risk of cancer, liver and kidney damage, reproductive difficulties)
- Aesthetic - Taste and odor (*geosmin*, MIB), Color, Salinity, Iron, Manganese
- Turbidity – Surrogate for treatment effectiveness
  - Essentially clearness, measured in NTU, Nephelometric Turbidity Units.

Source Water Quality, Regulations, and Aesthetic Goals Set Treatment Needs

Objective is to meet the requirements of the Safe Drinking Water Act

# GROUNDWATER OR SURFACE WATER SUPPLIES



- **Groundwater**

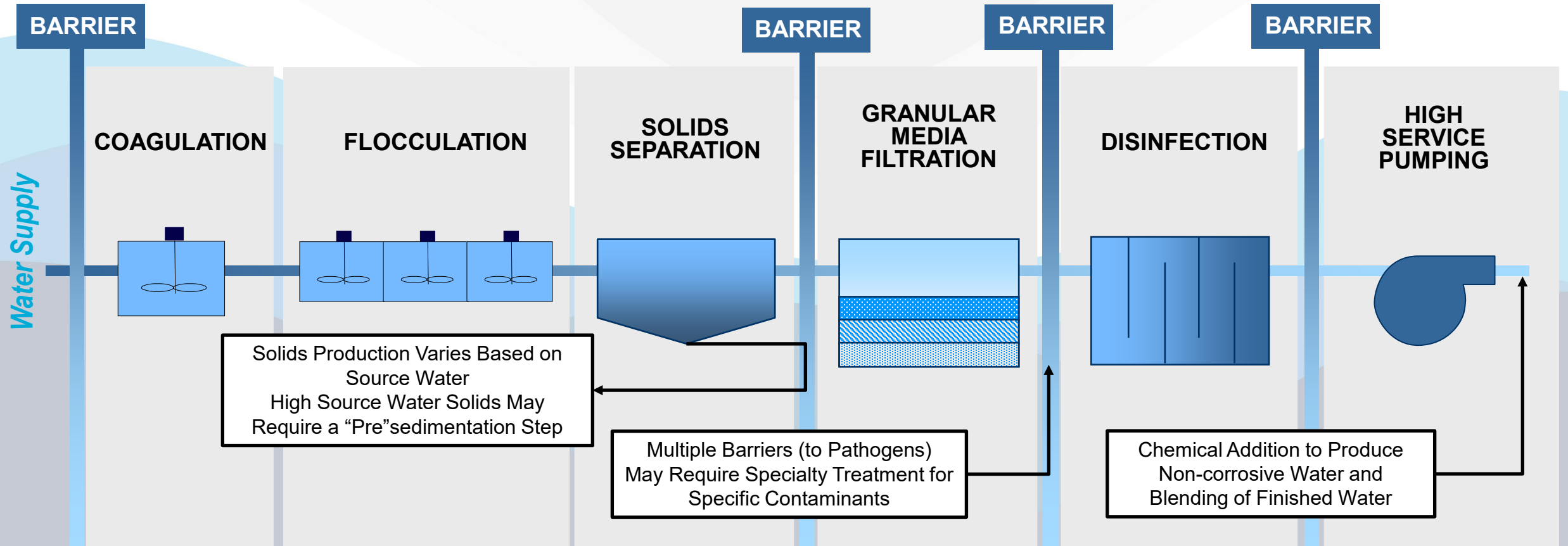
- Typically, Higher and More Consistent Quality
- Less Microbial Influence
- Relatively Consistent Temperature
- Lower Quantity – Long-term Yield Factors
- Far and away, the Largest Number of U.S. Water Systems use Groundwater
- Wellhead Protection Programs

- **Surface Water**

- Rivers, Lakes, and **Ground Water Under Direct Influence**
- Can be Highly Variable (“Flashy”) – Turbidity, Spills
- Greater Microbial Vulnerability
- Temperature Variations
- Tend to be Larger Yielding
- Watershed Protection Programs



# TYPICAL CONVENTIONAL WATER TREATMENT PLANT

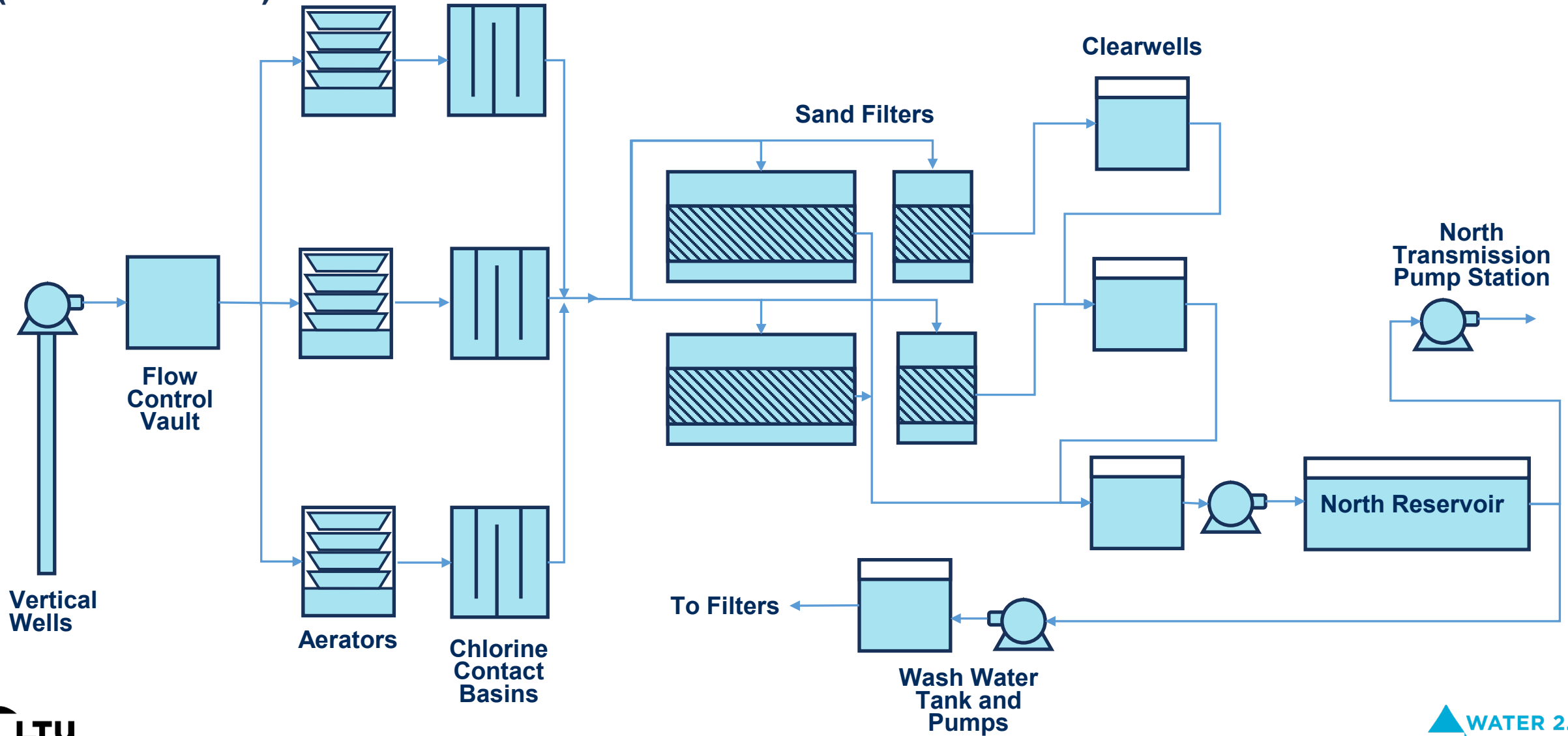


# WEST WTP

(GROUND WATER)

## COLOR LEGEND

 Existing Facility

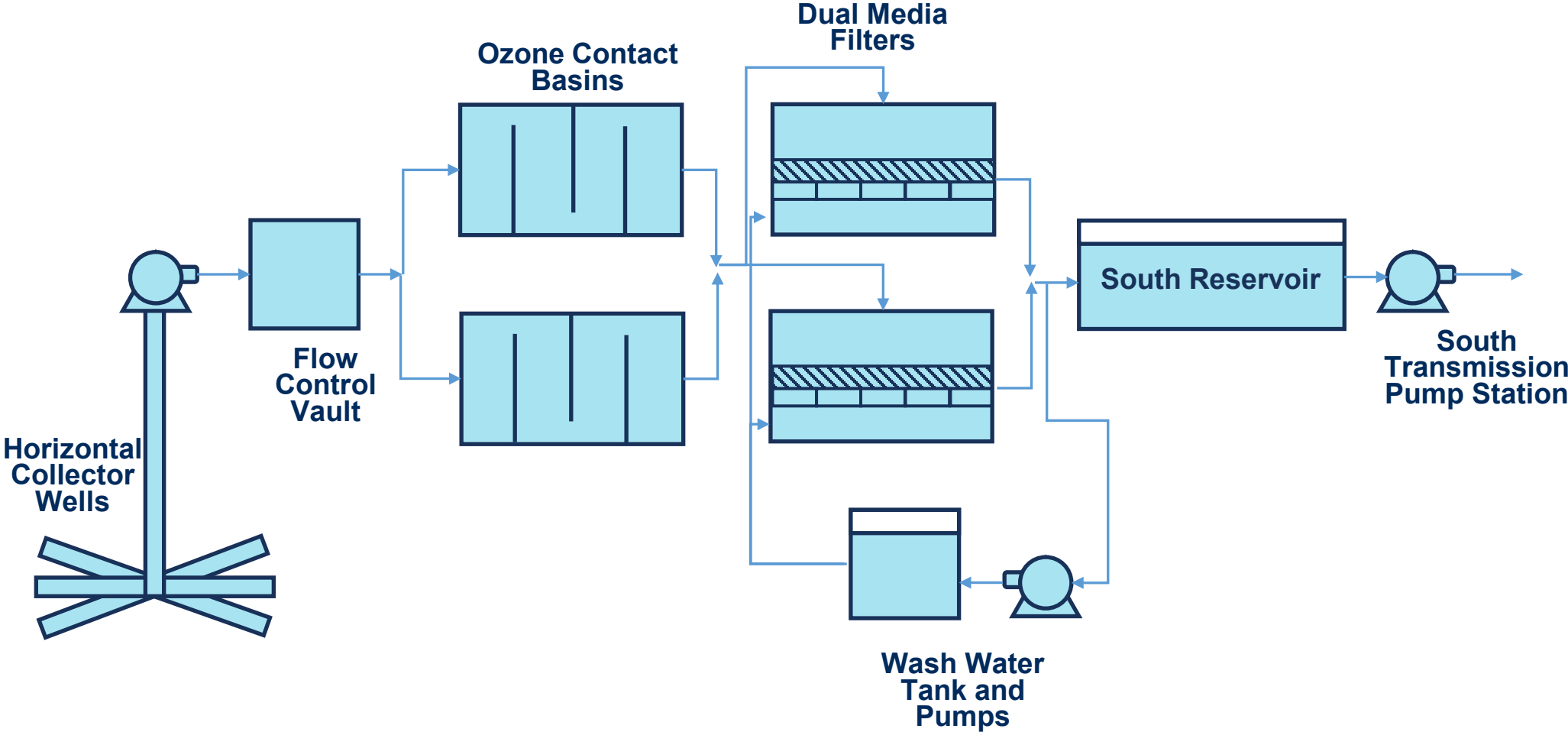


# EAST WTP

(GROUND WATER UNDER DIRECT INFLUENCE)

COLOR LEGEND

 Existing Facility



# SCORING OF ALTERNATIVES: **OPERATIONS CRITERIA**



# OPERATIONS CRITERIA

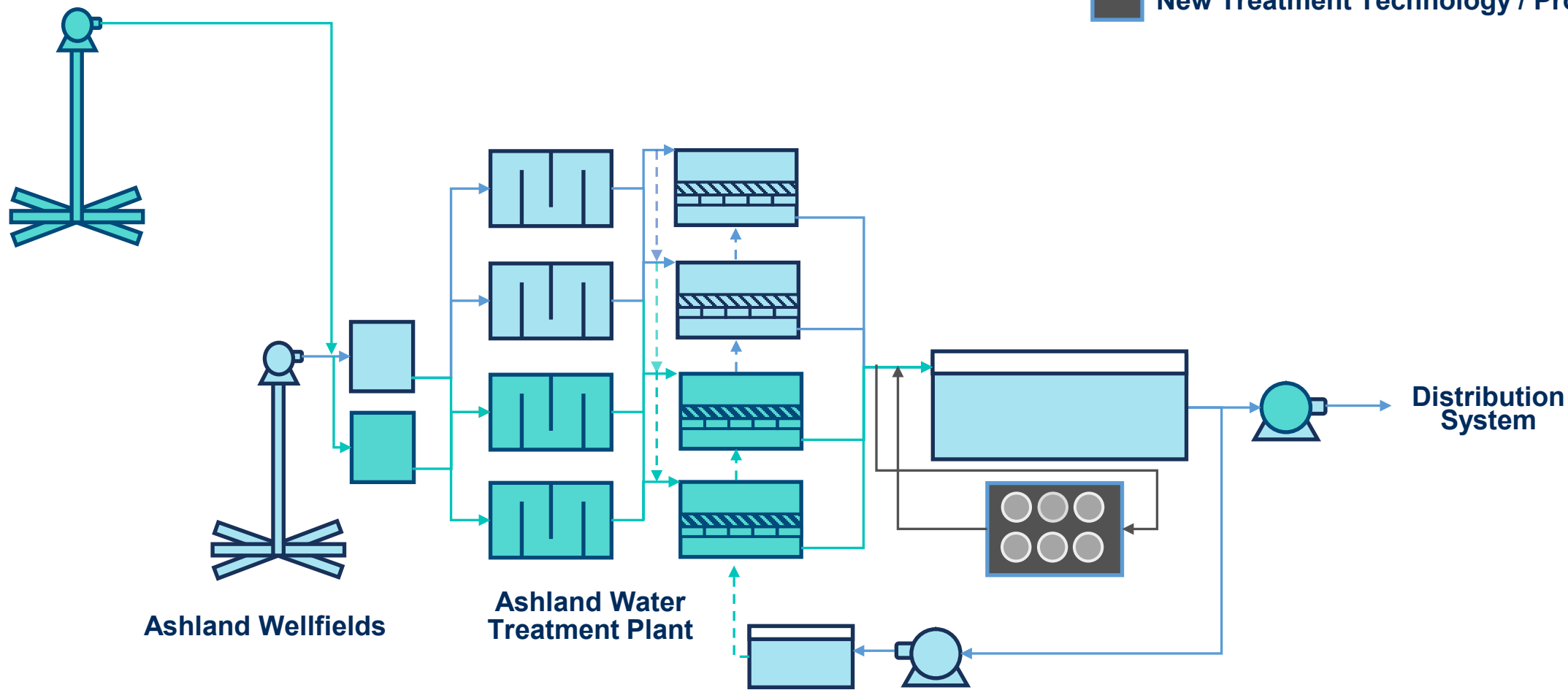
- Capacity or availability constraints
- Complexity
- Flexibility
- Agility
- Expertise

# ALTERNATIVE B

## EXPAND EXISTING WELLFIELD

COLOR LEGEND

- Existing Facility (East WTP)
- Expansion of Existing Facility / Addition of Similar Treatment to Existing Facility
- New Treatment Technology / Process



## SCORING SHEET – Operations Criteria

### Alternative B - Expand Existing Wellfield

Score (1-5) \_\_\_\_\_

Capacity/Availability Constraints	Overview and Facts	Notes
Are there constraints to treating and distributing the required demands?	<ul style="list-style-type: none"> <li>Treatment provided for expected water quality</li> <li>Well withdrawals must be managed, but can supply additional storage during droughts due to aquifer recharge from surface</li> </ul>	
Complexity		
Is the source water difficult to treat and/or blend with existing sources?	<ul style="list-style-type: none"> <li>Treatability of the existing and future Horizontal Collector Wells Wells (HCW) is the same – the East Water Treatment Plant (WTP) treats groundwater under direct influence of surface water (GWUDI)</li> </ul>	
Flexibility		
What regulatory/weather events could affect the new source and how would the facility respond?	<ul style="list-style-type: none"> <li>Flood/drought susceptibility is the same since same source</li> <li>Arsenic levels similar (treatment provided)</li> <li>PFAS expected to be low</li> </ul>	
Agility		
As system demands/influent water quality change, how quickly can the treatment processes and pumping respond?	<ul style="list-style-type: none"> <li>Personnel at one site easily coordinated</li> <li>Treatment easily adjusted to fluctuations in water quality (pump rate/chemical dosing/filtration rate)</li> </ul>	
Expertise		
Does City currently have experiences with the proposed treatment technologies?	Same as existing facility	
Would this alternative require additional personnel and/or training?	Minimal additional personnel for expansion	

#### SCORING KEY

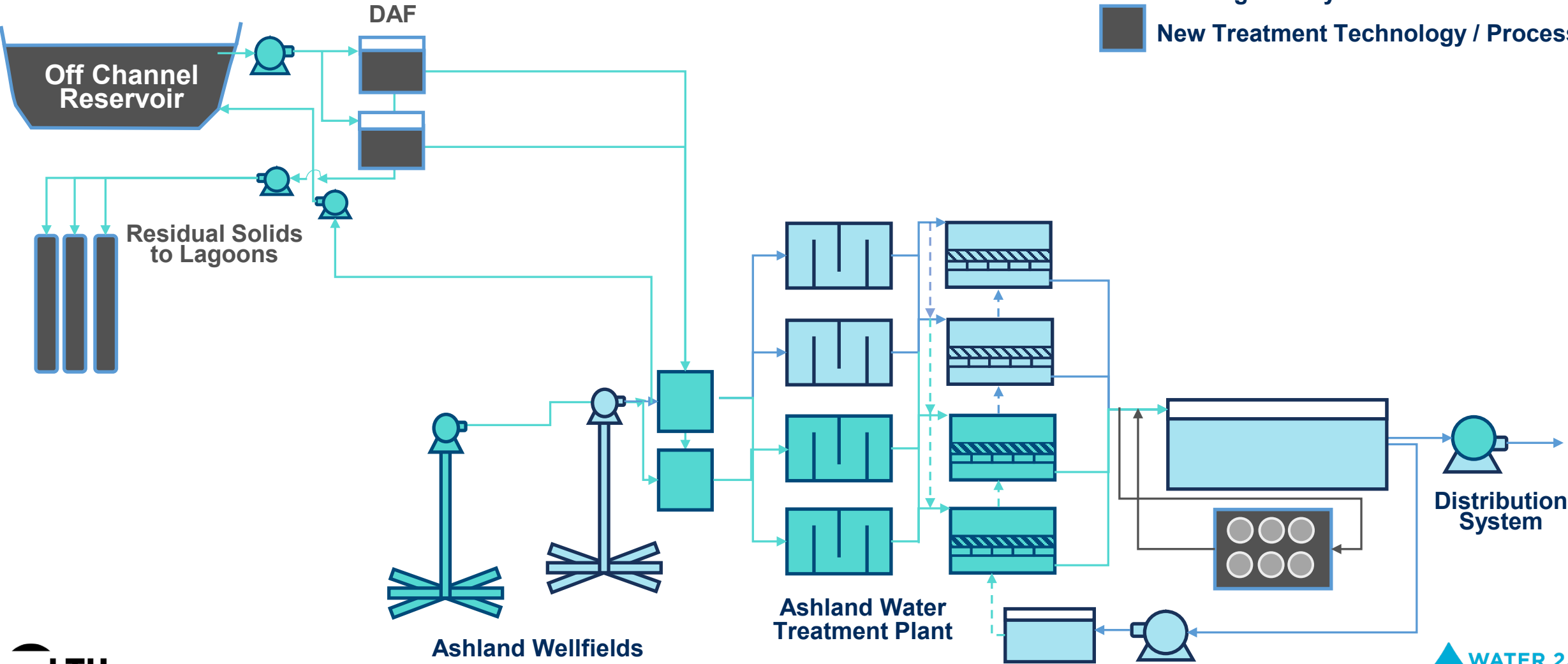
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# ALTERNATIVE C

## OFF CHANNEL RESERVOIR

COLOR LEGEND

- Existing Facility (East WTP)
- Expansion of Existing Facility / Addition of Similar Treatment to Existing Facility
- New Treatment Technology / Process



## SCORING SHEET – Operations Criteria

### Alternative C - Off-Channel Reservoir

Score (1-5) \_\_\_\_\_

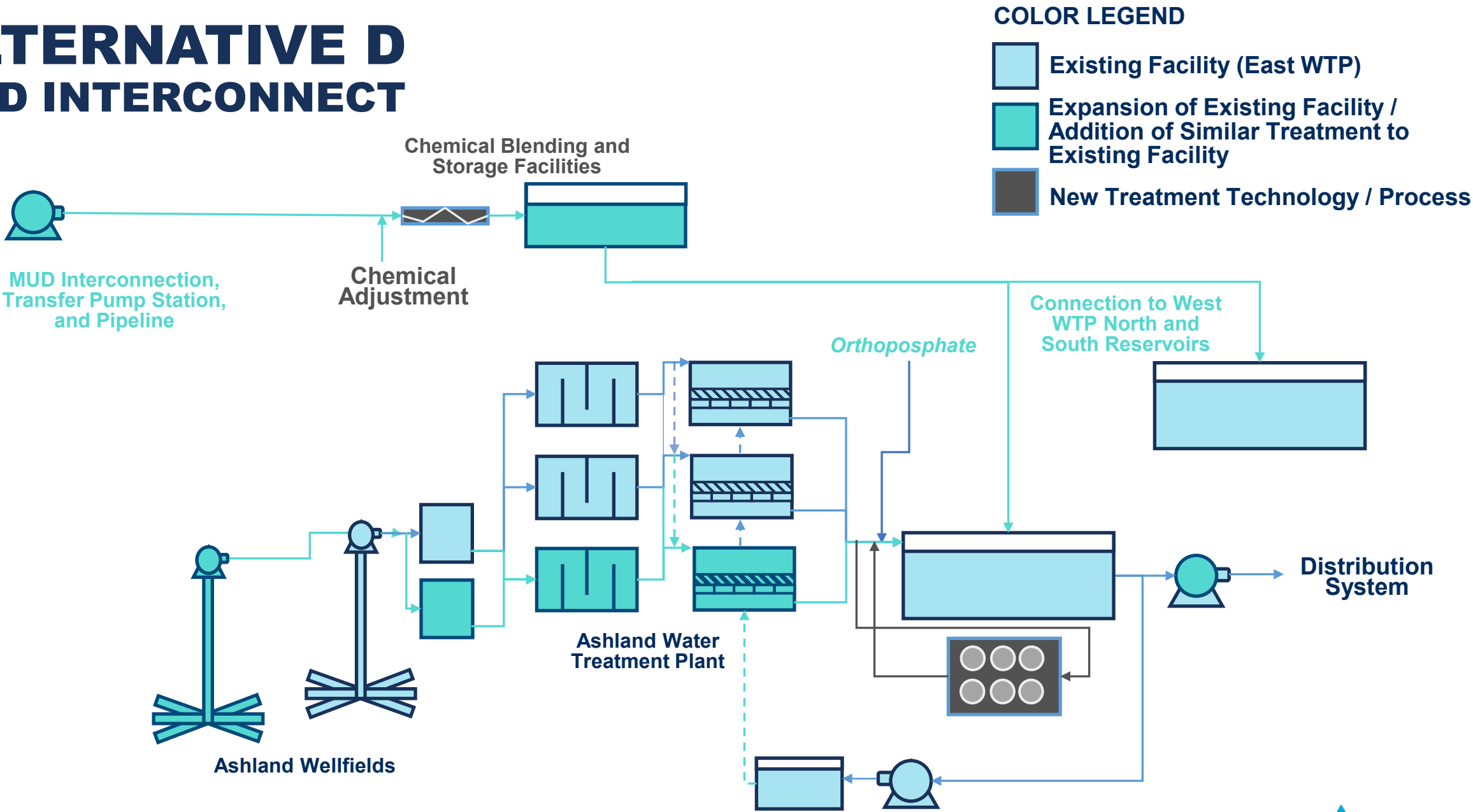
Capacity/Availability Constraints	Overview and Facts	Notes
Are there constraints to treating and distributing the required demands?	<ul style="list-style-type: none"> <li>• Treatment provided for expected water quality</li> <li>• Well withdrawals must be managed, but can supply additional storage during droughts due to aquifer recharge from surface</li> <li>• During each year, water quantity must be coordinated to maintain reservoir</li> <li>• Supplying well water to the reservoir may reduce the potential yield available during a drought condition</li> <li>• The reservoir will be impacted by evaporation, ground infiltration, flood conditions, drought, and potentially other non-City withdrawals</li> </ul>	
Complexity		
Is the source water difficult to treat and/or blend with existing sources?	<ul style="list-style-type: none"> <li>• Surface water management may be required to keep the water treatable</li> <li>• Algal blooms in the reservoir may pose treatability concerns which requires rapid adjustments in DAF treatment or temporary stops in using the reservoir</li> <li>• DAF will require solids handling (air-dried solids in lagoons for disposal)</li> </ul>	

#### SCORING KEY

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# ALTERNATIVE D

## MUD INTERCONNECT





## SCORING SHEET – Operations Criteria



### Alternative D - MUD Interconnect

Score (1-5) \_\_\_\_\_

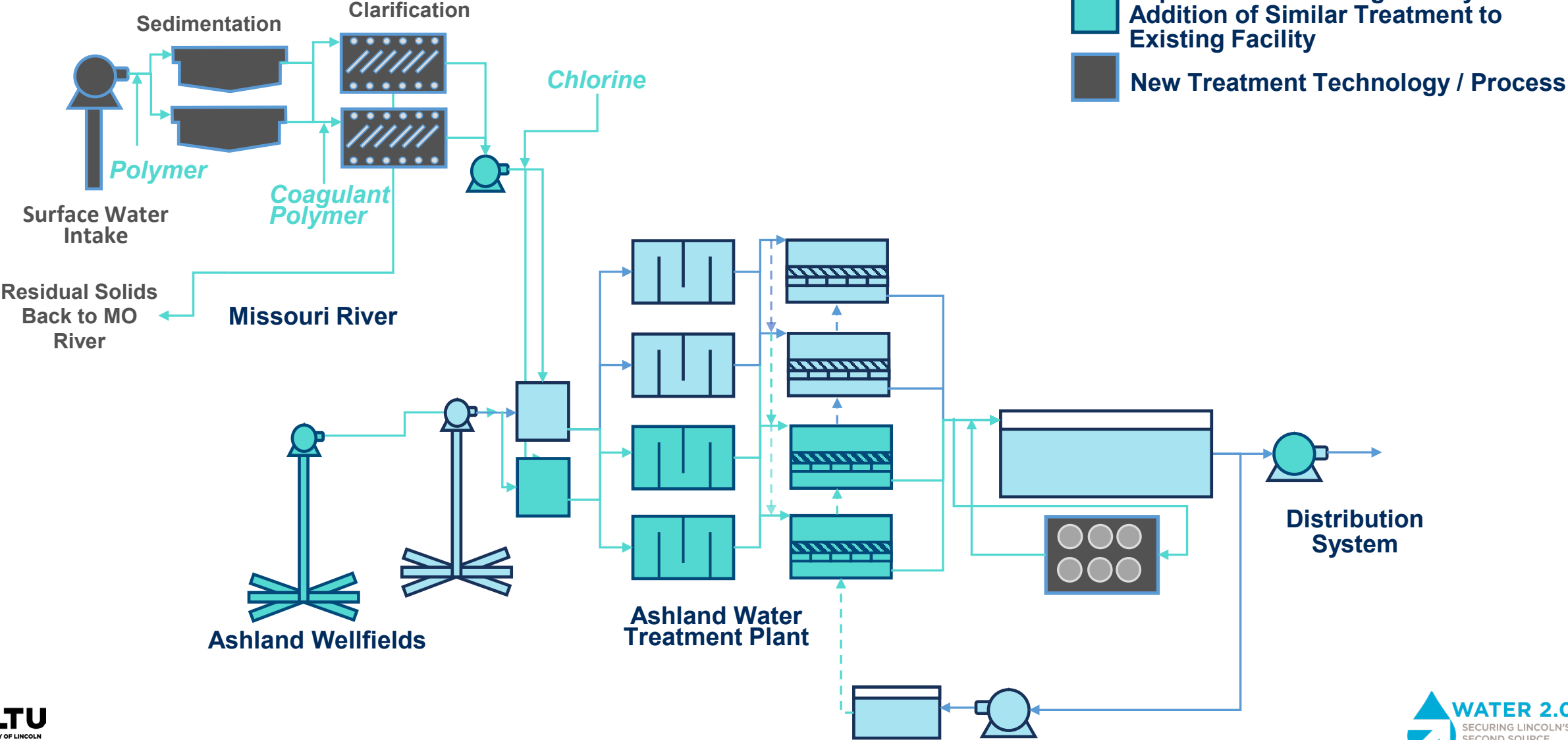
Capacity/Availability Constraints	Overview and Facts	Notes
Are there constraints to treating and distributing the required demands?	<ul style="list-style-type: none"> <li>• Treatment provided for expected water quality</li> <li>• During drought years, water quantity must be coordinated with other water sources - MUD is partially supplied by the Platte River and may experience similar limitations in water quantity as the City</li> <li>• The quantity available from MUD is yet to be determined</li> </ul>	
Complexity		
Is the source water difficult to treat and/or blend with existing sources?	<ul style="list-style-type: none"> <li>• MUD finished water quality is substantially different to the City's finished water - chemistry adjustments will be required for both MUD water (pH, alkalinity, hardness) and the City's water (orthophosphate) for corrosivity considerations</li> <li>• City will control chemical adjustments and blending ratios, so no large concern is present for consistency of water quality delivered</li> </ul>	
Flexibility		
What regulatory/weather events could affect the new source and how would the facility respond?	<ul style="list-style-type: none"> <li>• Response to regulatory changes/weather events covered under governance</li> </ul>	

### SCORING KEY

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# ALTERNATIVE E

## MISSOURI RIVER SURFACE WATER INTAKE TO ASHLAND



## SCORING SHEET – Operations Criteria



### Alternative E - Missouri River Surface Water Intake to Ashland

Score (1-5) \_\_\_\_\_

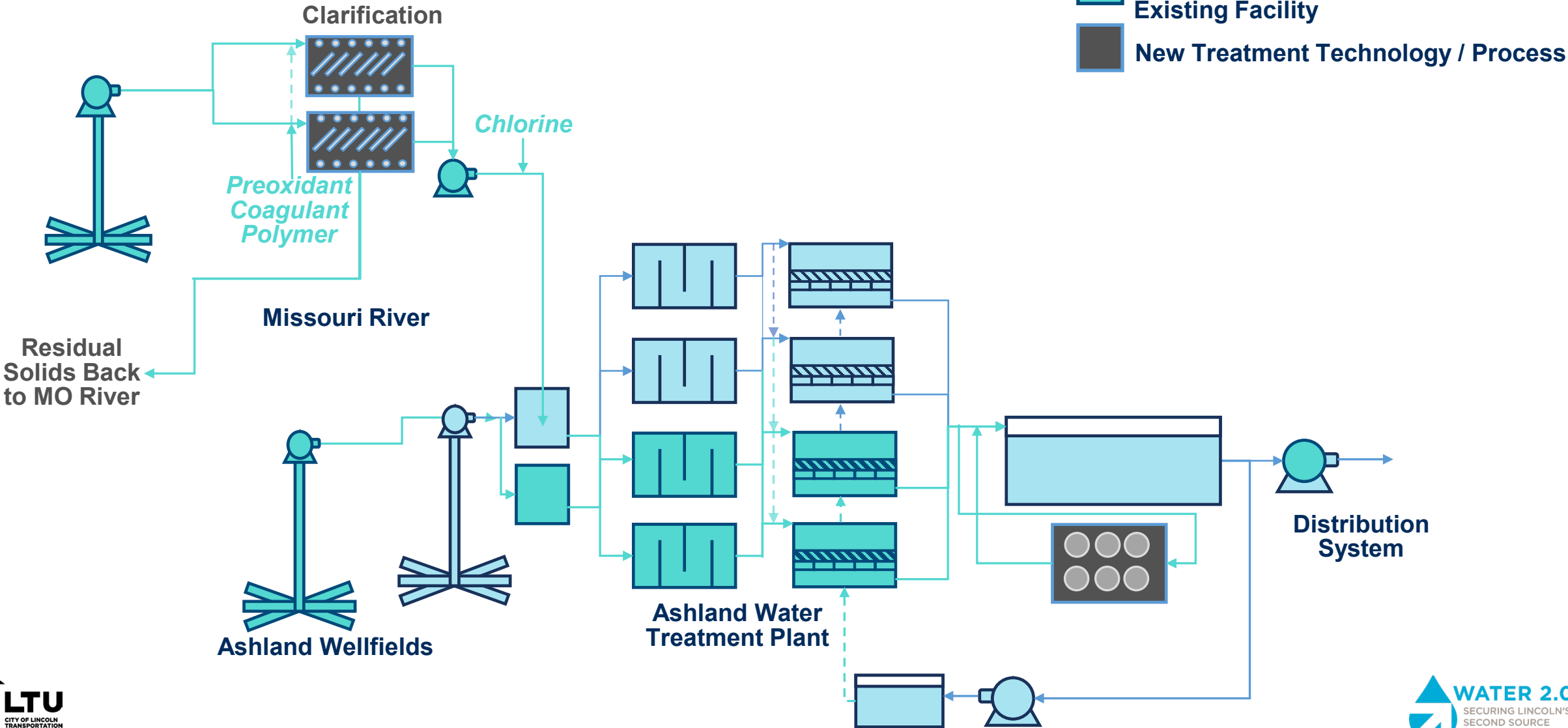
Capacity/Availability Constraints	Overview and Facts	Notes
Are there constraints to treating and distributing the required demands?	<ul style="list-style-type: none"> <li>• Treatment provided for expected water quality</li> <li>• During drought years, water quantity from the Platte River wells must be coordinated with the Missouri River surface water intake</li> </ul>	
Complexity		
Is the source water difficult to treat and/or blend with existing sources?	<ul style="list-style-type: none"> <li>• Operator must rapidly respond to changes in influent water quality; in addition to turbidity, water chemistry changes can occur seasonally (rain, drought) that require treatment adjustments</li> <li>• Sedimentation provided for highly variable and temporal spikes in turbidity; it is often said treating a river surface water is "equal parts art and science"</li> </ul>	
Flexibility		
What regulatory/weather events could affect the new source and how would the facility respond?	<ul style="list-style-type: none"> <li>• Surface water intakes are susceptible to damage (ice, vessel impacts) and contamination events</li> <li>• Missouri River may require additional disinfection Cryptosporidium relative to existing City experience</li> </ul>	

#### SCORING KEY

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# ALTERNATIVE F

## MISSOURI RIVER WELLFIELD TO ASHLAND



## SCORING SHEET – Operations Criteria



### Alternative F - Missouri River Wellfield to Ashland

Score (1-5) \_\_\_\_\_

Capacity/Availability Constraints	Overview and Facts	Notes
Are there constraints to treating and distributing the required demands?	<ul style="list-style-type: none"> <li>Treatment provided for expected water quality</li> <li>During drought years, water quantity from the Platte River wells must be coordinated with the Missouri River wells</li> </ul>	
Complexity		
Is the source water difficult to treat and/or blend with existing sources?	<ul style="list-style-type: none"> <li>Missouri River groundwater is expected to have similar water quality and treatability to existing HCWs</li> <li>Install clarification for arsenic at river</li> </ul>	
Flexibility		
What regulatory/weather events could affect the new source and how would the facility respond?	<ul style="list-style-type: none"> <li>Flood/drought susceptibility involves two sources</li> <li>Arsenic levels similar (treatment provided)</li> <li>PFAS expected to be low</li> </ul>	
Agility		
As system demands/influent water quality change, how quickly can the treatment processes and pumping respond?	<ul style="list-style-type: none"> <li>Personnel must coordinate treatment between two sites</li> <li>Treatment easily adjusted to fluctuations in water quality (pump rate/chemical dosing/filtration rate)</li> </ul>	

#### SCORING KEY

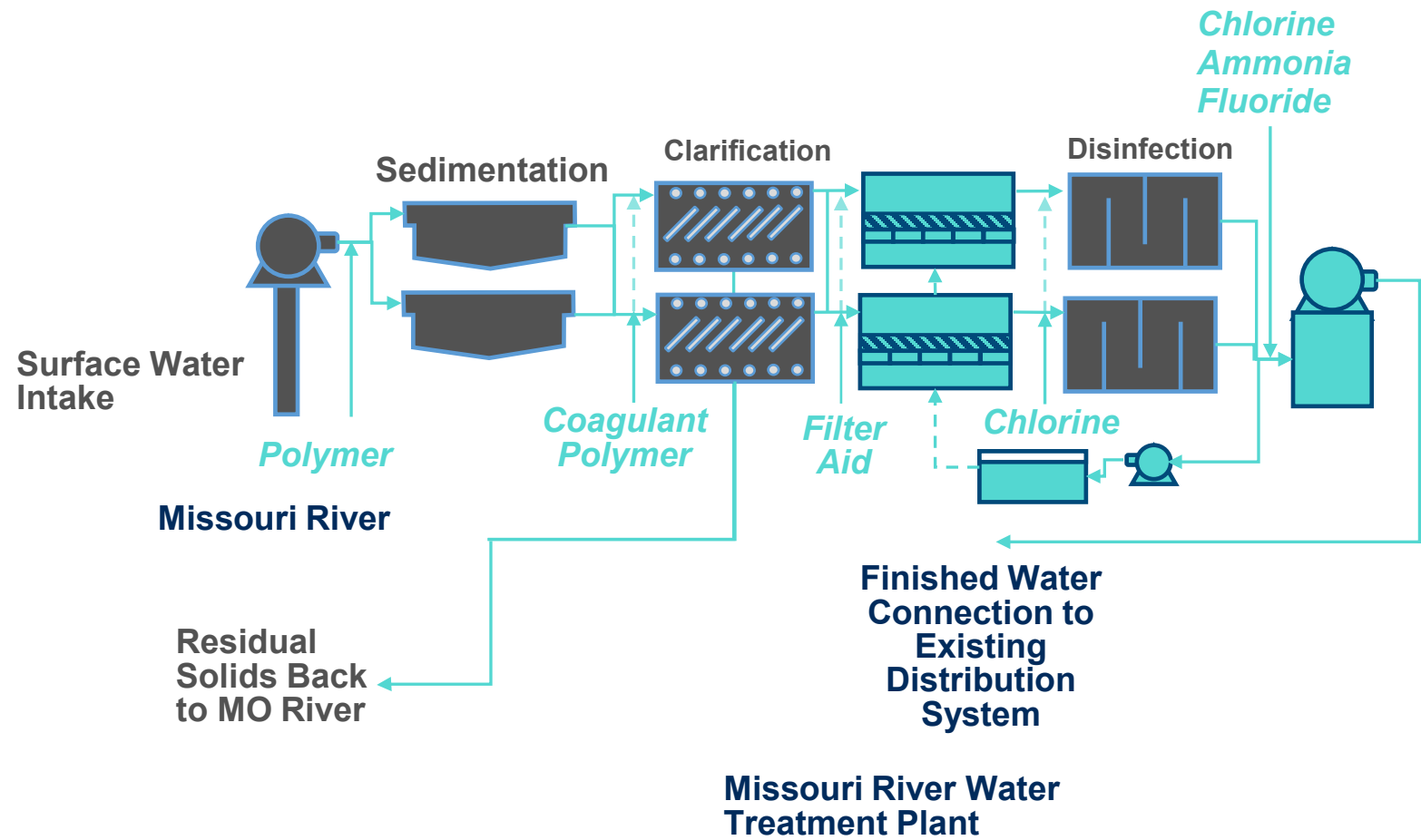
5-Fully meets the criteria definition 4-Meets most of the criteria definition, 3-Meets some of the criteria definition, 2-Meets little of the criteria definition, 1-Meets none of the criteria definition

# ALTERNATIVE G

## MISSOURI RIVER SURFACE WATER INTAKE TO LINCOLN

COLOR LEGEND

- Existing Facility (East WTP)
- Expansion of Existing Facility / Addition of Similar Treatment to Existing Facility
- New Treatment Technology / Process





## SCORING SHEET – Operations Criteria



### Alternative G - Missouri River Surface Water Intake to Lincoln

Score (1-5) \_\_\_\_\_

Capacity/Availability Constraints	Overview and Facts	Notes
Are there constraints to treating and distributing the required demands?	<ul style="list-style-type: none"> <li>Treatment provided for expected water quality</li> <li>During drought years, water quantity from the Platte River wells must be coordinated with the Missouri River surface water intake</li> </ul>	
Complexity		
Is the source water difficult to treat and/or blend with existing sources?	<ul style="list-style-type: none"> <li>Operator must rapidly respond to changes in influent water quality; in addition to turbidity, water chemistry changes can occur seasonally (rain, drought) that require treatment adjustments</li> <li>Sedimentation provided for highly variable and temporal spikes in turbidity; it is often said treating a river surface water is "equal parts art and science"</li> </ul>	
Flexibility		
What regulatory/weather events could affect the new source and how would the facility respond?	<ul style="list-style-type: none"> <li>Surface water intakes are susceptible to damage (ice, vessel impacts) and contamination events</li> <li>Missouri River may require additional disinfection Cryptosporidium relative to existing City experience</li> </ul>	

#### SCORING KEY

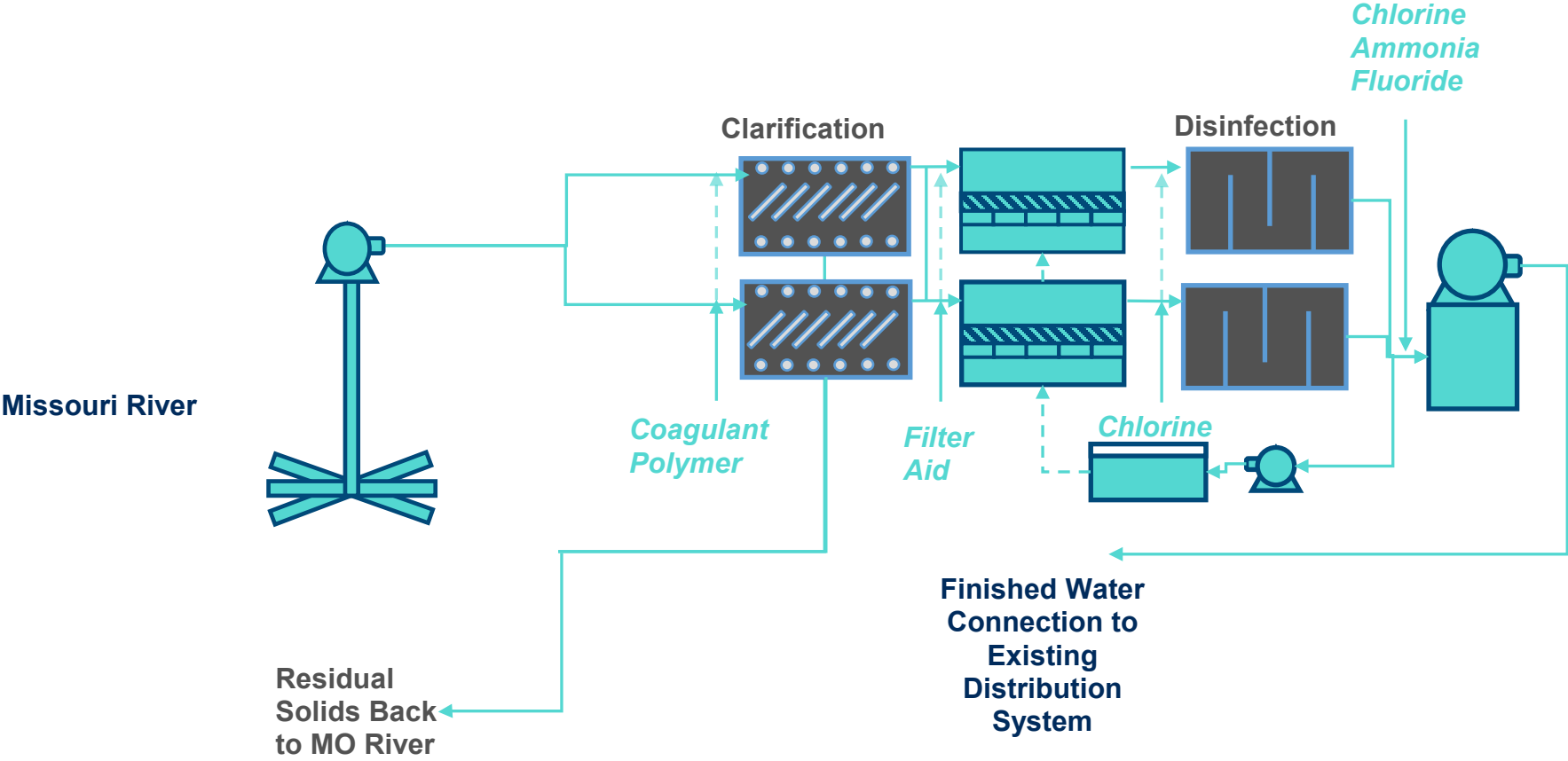
5-Fully meets the criteria definition 4-Meets most of the criteria definition, 3-Meets some of the criteria definition, 2-Meets little of the criteria definition, 1-Meets none of the criteria definition

# ALTERNATIVE H

## MISSOURI RIVER WELLFIELD TO LINCOLN

COLOR LEGEND

- Existing Facility (East WTP)
- Expansion of Existing Facility / Addition of Similar Treatment to Existing Facility
- New Treatment Technology / Process



Missouri River Water Treatment Plant

## SCORING SHEET – Operations Criteria

### Alternative H - Missouri River Wellfield to Lincoln

Score (1-5) \_\_\_\_\_

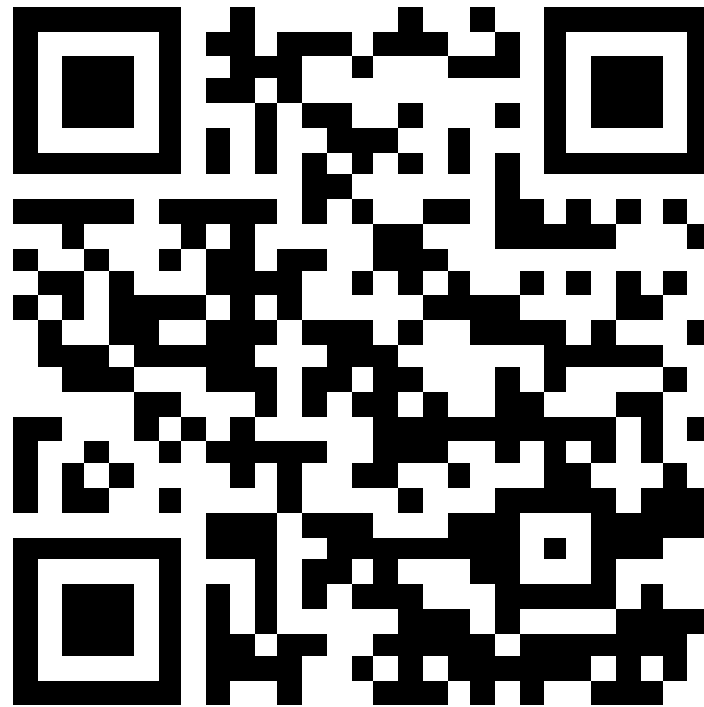
Capacity/Availability Constraints	Overview and Facts	Notes
Are there constraints to treating and distributing the required demands?	<ul style="list-style-type: none"> <li>Treatment provided for expected water quality</li> <li>During drought years, water quantity from the Platte River wells must be coordinated with the Missouri River wells</li> </ul>	
Complexity		
Is the source water difficult to treat and/or blend with existing sources?	<ul style="list-style-type: none"> <li>Missouri River groundwater is expected to have similar water quality and treatability to existing HCWs</li> <li>Install clarification for arsenic at river</li> </ul>	
Flexibility		
What regulatory/weather events could affect the new source and how would the facility respond?	<ul style="list-style-type: none"> <li>Flood/drought susceptibility involves two sources</li> <li>Arsenic levels similar (treatment provided)</li> <li>PFAS expected to be low</li> </ul>	
Agility		
As system demands/influent water quality change, how quickly can the treatment processes and pumping respond?	<ul style="list-style-type: none"> <li>Personnel at two sites provide separate treatment</li> <li>Treatment easily adjusted to fluctuations in water quality (pump rate/chemical dosing/filtration rate)</li> </ul>	

#### SCORING KEY

5-Fully meets the criteria definition 4-Meets most of the criteria definition, 3-Meets some of the criteria definition, 2-Meets little of the criteria definition, 1-Meets none of the criteria definition

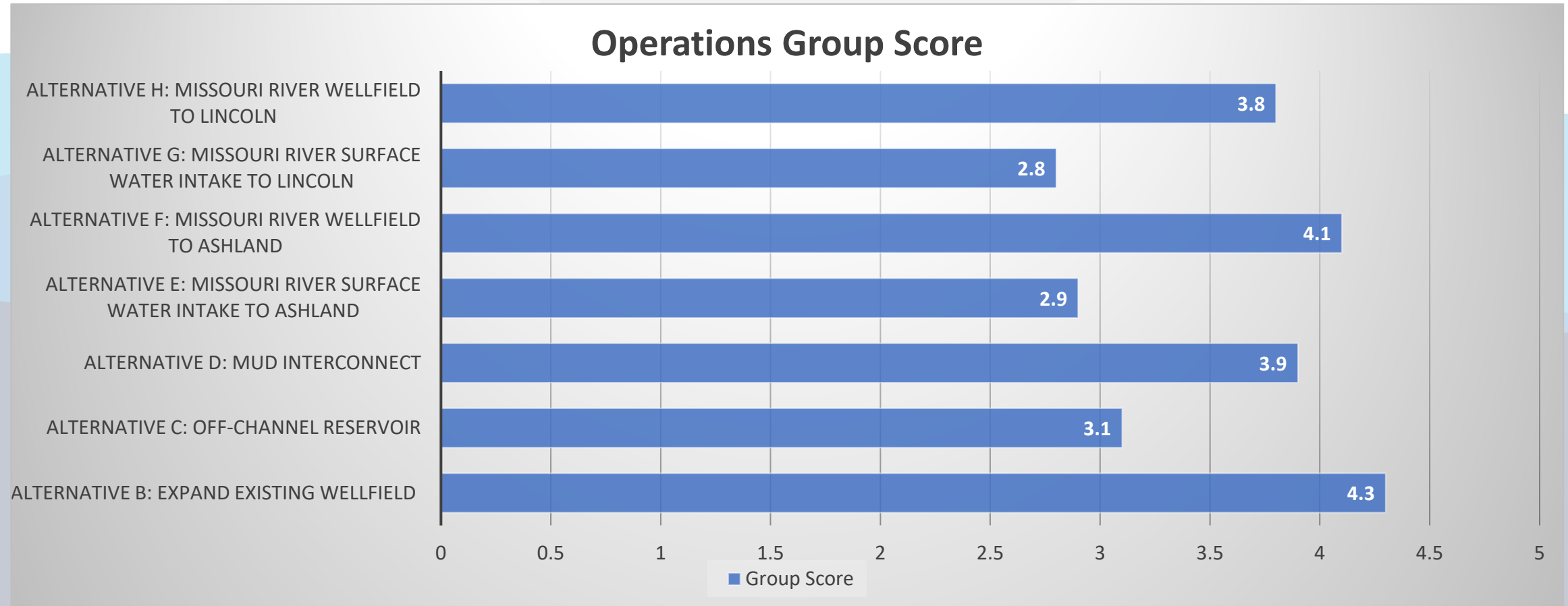
# SCORING OF ALTERNATIVES

## **OPERATIONS CRITERIA**





# SCORING OF ALTERNATIVES: OPERATIONS CRITERIA



# IMPLEMENTATION CRITERIA

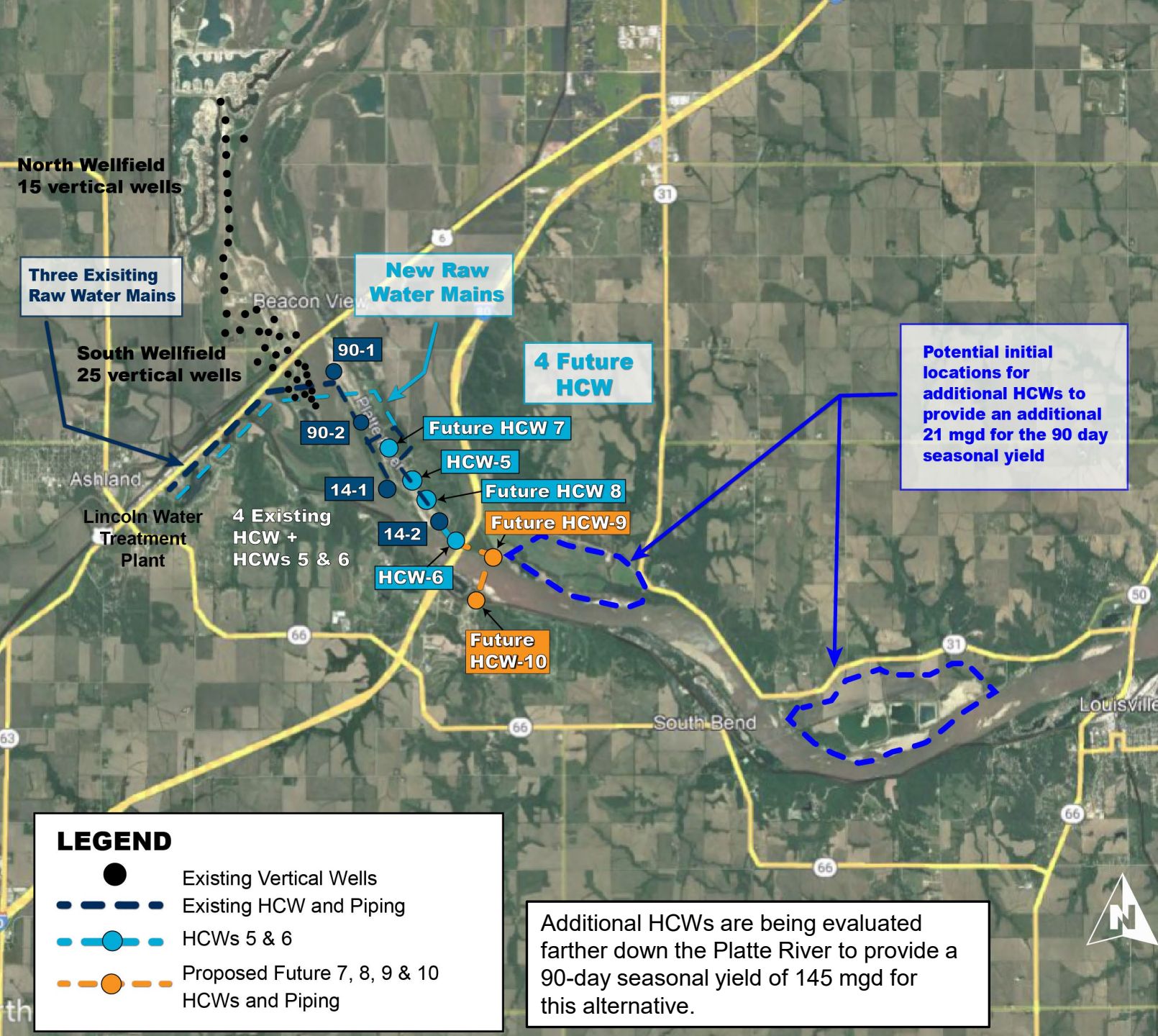
# IMPLEMENTATION CRITERIA

- Time to implement
- Permitting
- Water rights
- Change in water quantity / quality

# SCORING OF ALTERNATIVES: **IMPLEMENTATION CRITERIA**



# ALTERNATIVE B EXPAND EXISTING WELLFIELD



## SCORING SHEET – Implementation Criteria



### Alternative B - Expand Existing Wellfield South of I-80

Score (1-5) \_\_\_\_\_

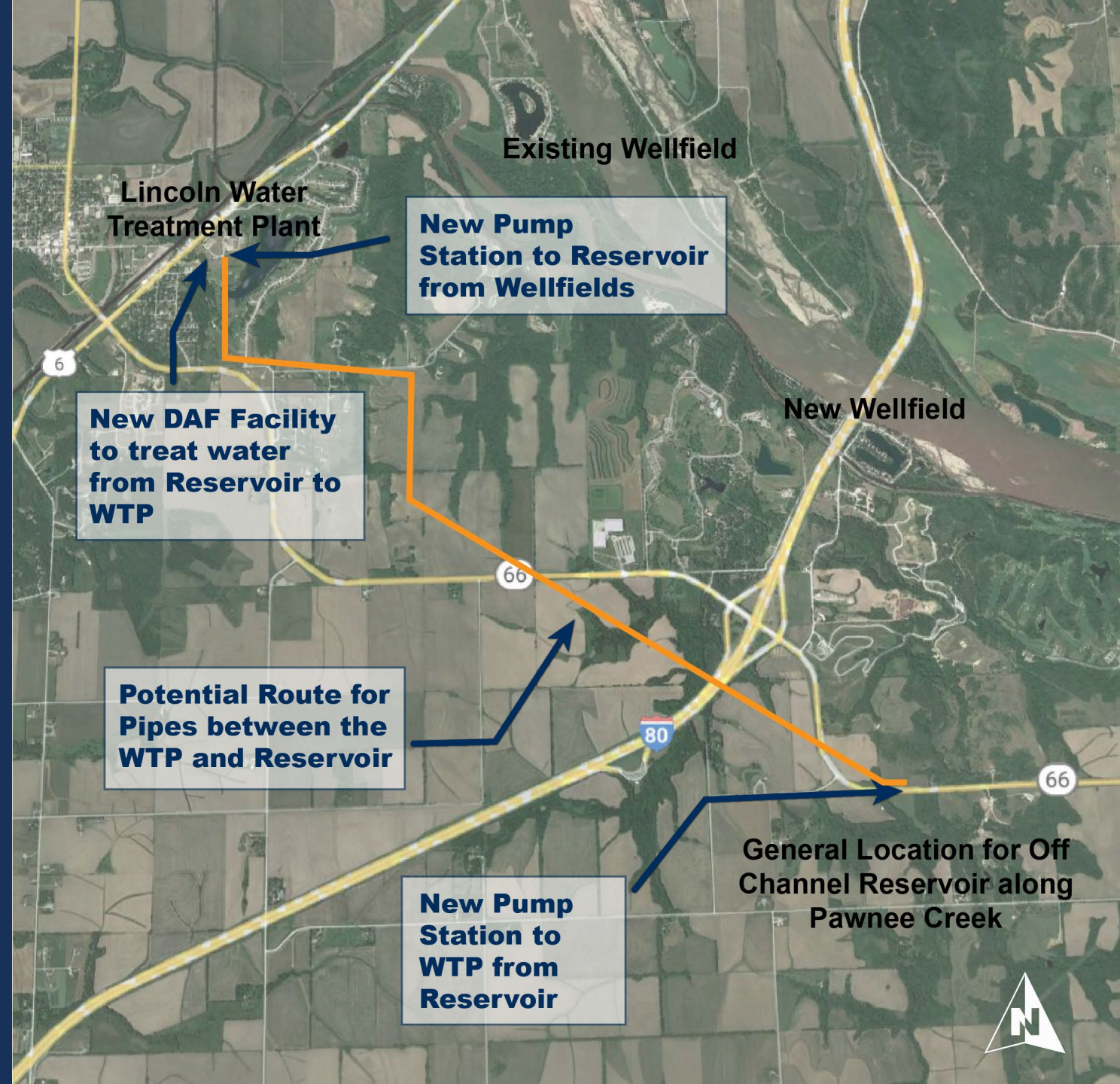
Time to Implement	Overview and Facts	Notes
Will the project(s) related to this alternative be constructed prior to the City's Year 2075 needs?	Based on projections for the maximum day wellfield pumpage and 90-day seasonal yield (seasonal peak 90-day demand), the first improvements would need to be implemented by 2035 with the installation of HCW-5. This alternative allows the City to systematically expand supply and defer capital cost as long as possible.	
What are the major risks for implementation schedule?	<ul style="list-style-type: none"> <li>• Property and easement acquisition</li> <li>• Flood conditions during construction</li> <li>• Capability to provide 145 MGD is still being analyzed.</li> </ul>	
For this alternative, what are typical estimation of tasks?	Typical per project: <ul style="list-style-type: none"> <li>• Easements / Permits: 1 to 2 years</li> <li>• Design: 2 to 3 years</li> <li>• Construction of facilities: 3 to 5 years</li> <li>• Overall: 5 to 7 years</li> </ul>	
Permitting		
Types of permits required.	<ul style="list-style-type: none"> <li>• NDOT</li> <li>• NDEE</li> <li>• County</li> <li>• USACE 404 Permit</li> <li>• Floodplain Development Permit</li> <li>• NRD Well Permit</li> <li>• NRD – Municipal Groundwater Transfer Permit - Recommended</li> <li>• Induced Groundwater Recharge Permit</li> </ul>	

#### SCORING KEY

5-Fully meets the criteria definition 4-Meets most of the criteria definition, 3-Meets some of the criteria definition, 2-Meets little of the criteria definition, 1-Meets none of the criteria definition



# ALTERNATIVE C OFF-CHANNEL RESERVOIR



## SCORING SHEET – Implementation Criteria

### Alternative C - Off-Channel Reservoir

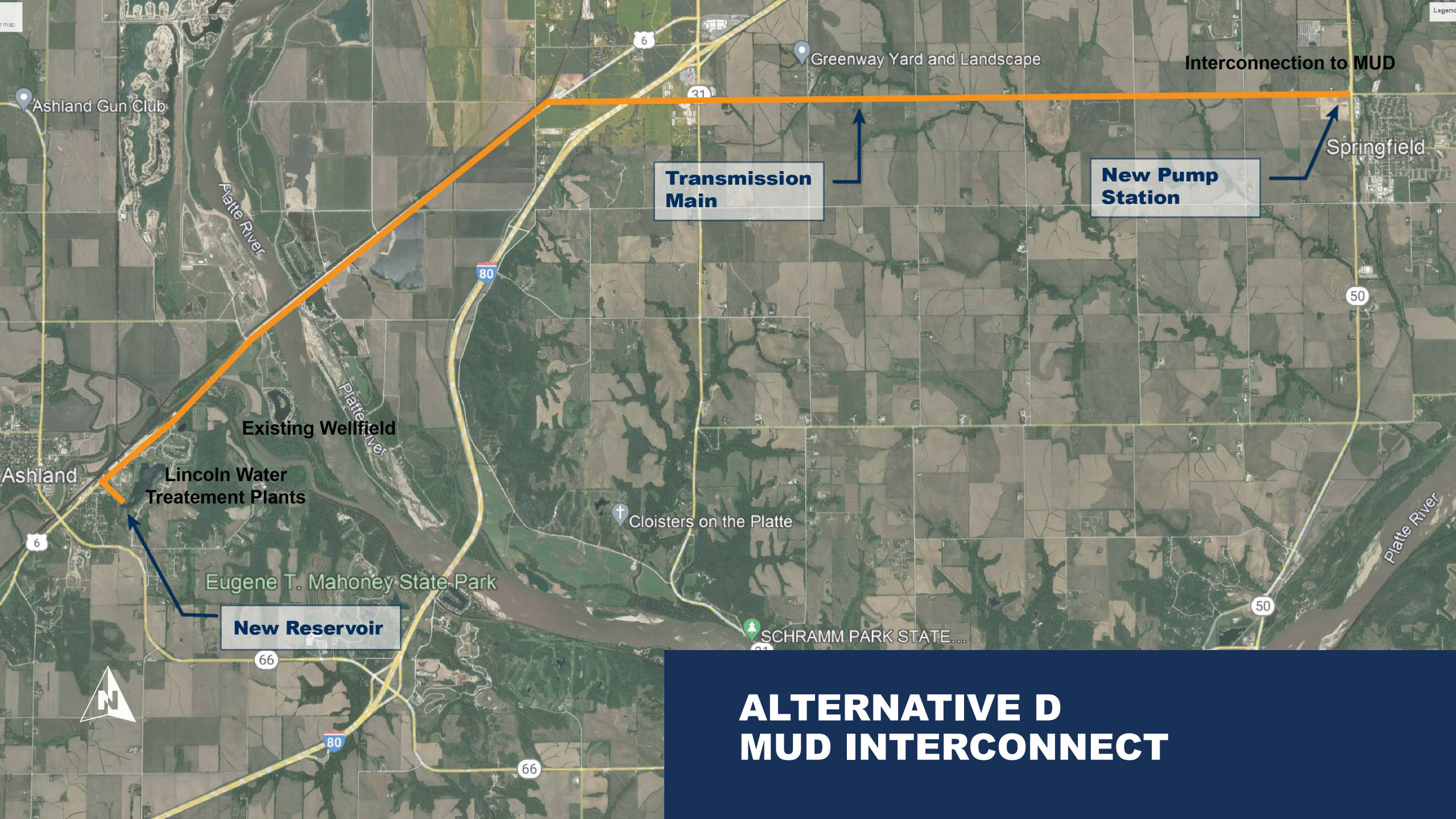
Score (1-5) \_\_\_\_\_

Time to Implement	Overview and Facts	Notes
Will the project(s) related to this alternative be constructed prior to the City's Year 2075 needs?	Based on projections for the maximum day wellfield pumpage and 90-day seasonal yield (seasonal peak 90-day demand), the first improvements would need to be implemented by 2035 with the installation of HCW-5. This will allow sufficient time for the City to plan and implement the off-channel reservoir before 2042 when additional supply is needed.	
What are the major risks for implementation schedule?	<ul style="list-style-type: none"> <li>• Flood conditions during construction</li> <li>• Property and land acquisition/easements</li> <li>• Public acceptance</li> <li>• Permitting for development of dam</li> <li>• Not being able to provide 145 MGD due to uncontrollable factors (refer to Change in Water Quality/Quantity below)</li> </ul>	
For this alternative, what are typical estimation of tasks?	Typical per project: <ul style="list-style-type: none"> <li>• Easements / Permits: 2 to 4 years</li> <li>• Property acquisition: 3 to 5 years</li> <li>• Design: 1 to 3 years</li> <li>• Construction of facilities: 5 to 7 years</li> <li>• Overall: 9 to 12 years</li> </ul>	

#### SCORING KEY

5-Fully meets the criteria definition 4-Meets most of the criteria definition, 3-Meets some of the criteria definition, 2-Meets little of the criteria definition, 1-Meets none of the criteria definition





**Transmission  
Main**

**New Pump  
Station**

**New Reservoir**

**Interconnection to MUD**

# ALTERNATIVE D MUD INTERCONNECT



## SCORING SHEET – Implementation Criteria



### Alternative D - MUD Interconnect

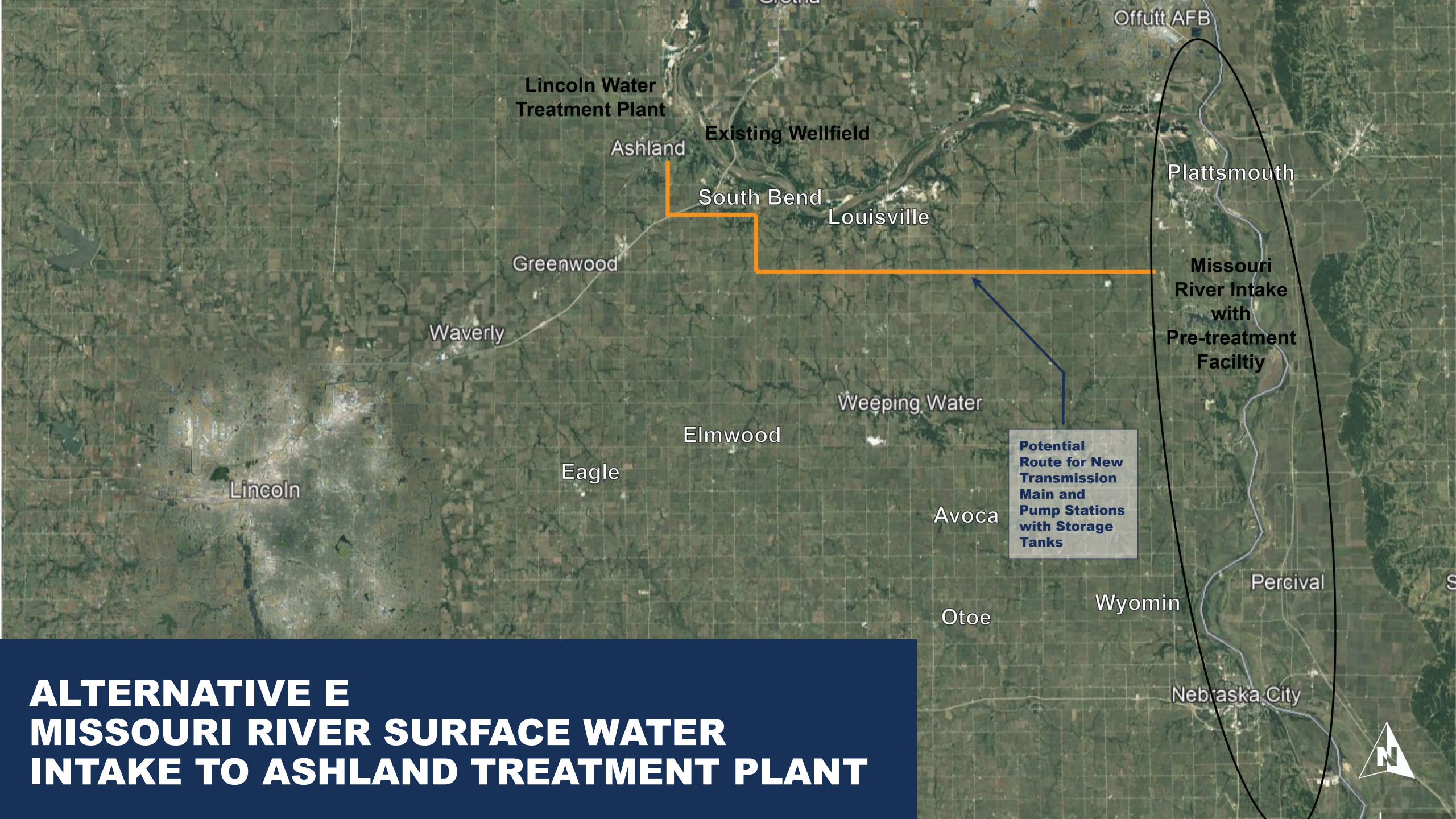
Score (1-5) \_\_\_\_\_

Time to Implement	Overview and Facts	Notes
Will the project(s) related to this alternative be constructed prior to the City's Year 2075 needs?	<ul style="list-style-type: none"> <li>Based on projections for the maximum day wellfield pumpage and 90-day seasonal yield (seasonal peak 90-day demand), the first improvements would need to be implemented by 2035 with the installation of HCW-5. This will allow sufficient time for the City to plan and implement the interconnect with MUD.</li> <li>The schedule may be influenced depending on when MUD elects to complete their portion of the work. This unknown could influence the sequence of implementation.</li> </ul>	
What are the major risks for implementation schedule?	<ul style="list-style-type: none"> <li>Property and land acquisition/easements</li> <li>Unknown schedule and improvements that MUD needs to construct</li> <li>Quantity of water unknown from MUD (refer to Change in Water Quality/Quantity below)</li> </ul>	
For this alternative, what are typical estimation of tasks?	<p>Typical per project:</p> <ul style="list-style-type: none"> <li>Pipe Loop Testing: 1 to 2 years</li> <li>Easements / Permits: 1 to 3 years</li> <li>Design: 1 to 3 years</li> <li>Construction of facilities: 4 to 6 years</li> <li>Overall: 8 to 11 years</li> </ul>	

#### SCORING KEY

5-Fully meets the criteria definition 4-Meets most of the criteria definition, 3-Meets some of the criteria definition, 2-Meets little of the criteria definition, 1-Meets none of the criteria definition





**ALTERNATIVE E  
MISSOURI RIVER SURFACE WATER  
INTAKE TO ASHLAND TREATMENT PLANT**

**Potential  
Route for New  
Transmission  
Main and  
Pump Stations  
with Storage  
Tanks**



## SCORING SHEET – Implementation Criteria



### Alternative E - Missouri River Surface Water Intake to Ashland

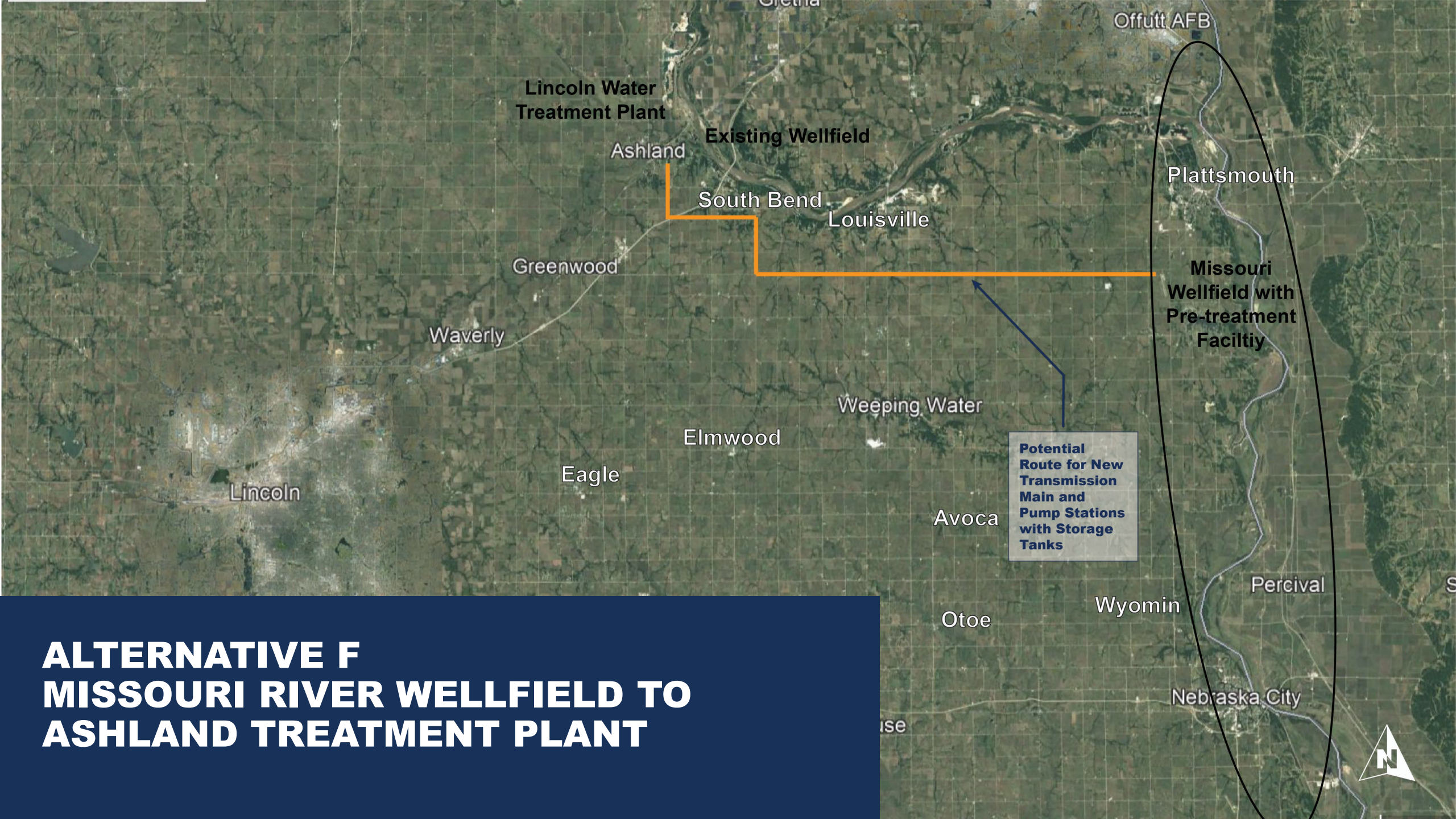
Score (1-5) \_\_\_\_\_

Time to Implement	Overview and Facts	Notes
Will the project(s) related to this alternative be constructed prior to the City's Year 2075 needs?	<ul style="list-style-type: none"> <li>Based on projections for the maximum day wellfield pumpage and 90-day seasonal yield (seasonal peak 90-day demand), the first improvements would need to be implemented by 2035 with the installation of HCW-5. This will allow sufficient time for the City to plan and implement a water supply system from the Missouri River.</li> <li>The schedule may be influenced depending on when follow-up investigation work occurs to determine the specific site along the Missouri River and if a river intake or a wellfield is the best option going forward.</li> </ul>	
What are the major risks for implementation schedule?	<ul style="list-style-type: none"> <li>Flood conditions during construction</li> <li>Property and land acquisition/easements</li> <li>Unknown soil conditions along transmission main route</li> <li>Multi-coordination with various communities, counties, and agencies</li> </ul>	
For this alternative, what are typical estimation of tasks?	<p>Typical per project:</p> <ul style="list-style-type: none"> <li>Preliminary Site Investigations and Testing: 1 to 2 years</li> <li>Easements / Permits: 1 to 3 years</li> <li>Design: 1 to 3 years</li> <li>Construction of facilities: 4 to 7 years</li> <li>Overall: 9 to 12 years</li> </ul>	

#### SCORING KEY

5-Fully meets the criteria definition 4-Meets most of the criteria definition, 3-Meets some of the criteria definition, 2-Meets little of the criteria definition, 1-Meets none of the criteria definition





**ALTERNATIVE F  
MISSOURI RIVER WELLFIELD TO  
ASHLAND TREATMENT PLANT**



## SCORING SHEET – Implementation Criteria



### Alternative F - Missouri River Wellfield to Ashland

Score (1-5) \_\_\_\_\_

Time to Implement	Overview and Facts	Notes
Will the project(s) related to this alternative be constructed prior to the City's Year 2075 needs?	<ul style="list-style-type: none"> <li>Based on projections for the maximum day wellfield pumpage and 90-day seasonal yield (seasonal peak 90-day demand), the first improvements would need to be implemented by 2035 with the installation of HCW-5. This will allow sufficient time for the City to plan and implement a water supply system from the Missouri River.</li> <li>The schedule may be influenced depending on when follow-up investigation work occurs to determine the specific site along the Missouri River and if a river intake or a wellfield is the best option going forward.</li> </ul>	
What are the major risks for implementation schedule?	<ul style="list-style-type: none"> <li>Flood conditions during construction</li> <li>Property and land acquisition/easements</li> <li>Unknown soil conditions along transmission main route</li> <li>Multi-coordination with various communities, counties, and agencies</li> </ul>	
For this alternative, what are typical estimation of tasks?	<p>Typical per project:</p> <ul style="list-style-type: none"> <li>Preliminary Site Investigations and Testing: 1 to 2 years</li> <li>Easements / Permits: 1 to 3 years</li> <li>Design: 1 to 3 years</li> <li>Construction of facilities: 4 to 7 years</li> <li>Overall: 9 to 12 years</li> </ul>	

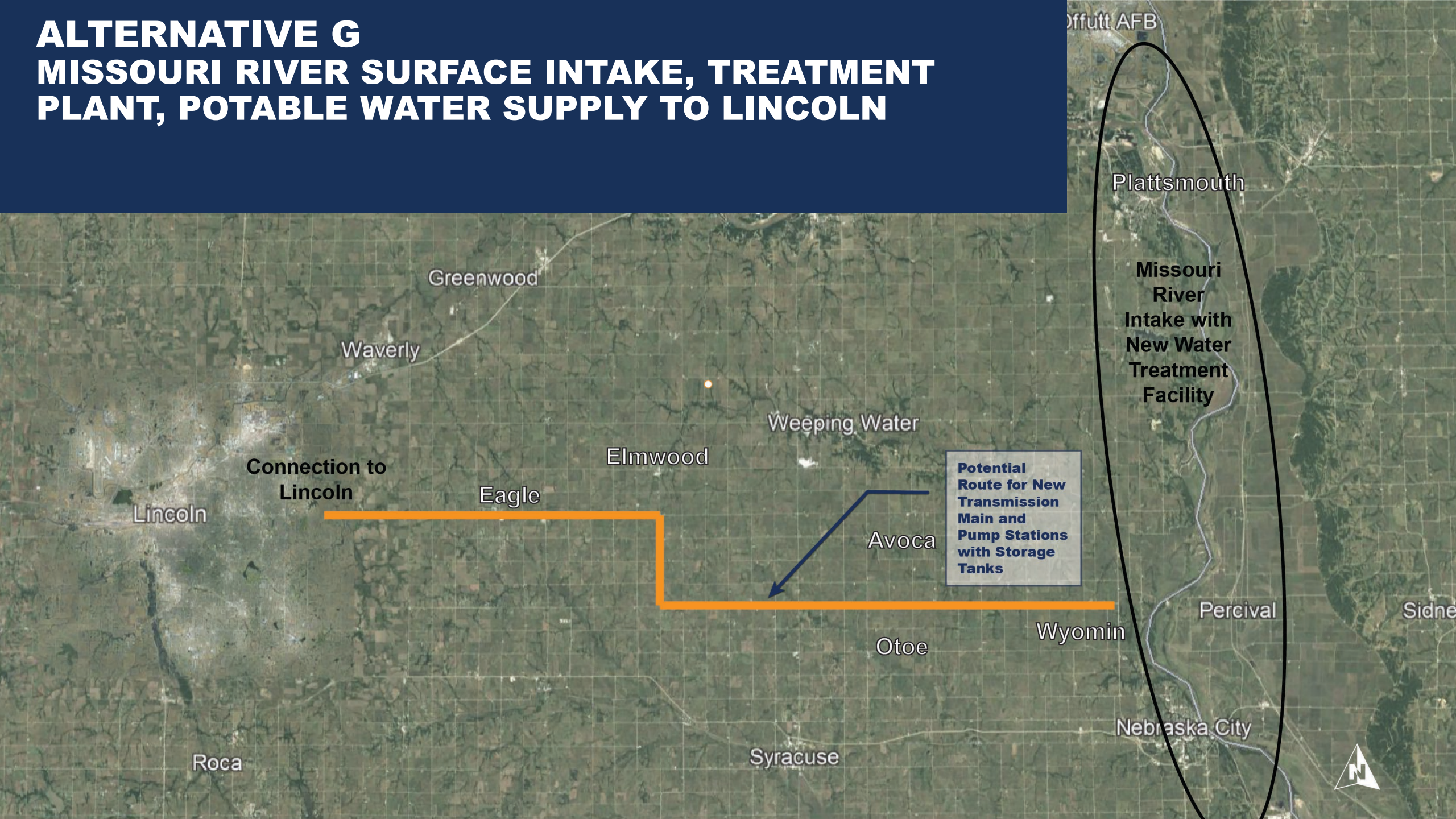
#### SCORING KEY

5-Fully meets the criteria definition 4-Meets most of the criteria definition, 3-Meets some of the criteria definition, 2-Meets little of the criteria definition, 1-Meets none of the criteria definition



# ALTERNATIVE G

## MISSOURI RIVER SURFACE INTAKE, TREATMENT PLANT, POTABLE WATER SUPPLY TO LINCOLN





## SCORING SHEET – Implementation Criteria

### Alternative G - Missouri River Surface Water Intake to Lincoln

Score (1-5) \_\_\_\_\_

Time to Implement	Overview and Facts	Notes
Will the project(s) related to this alternative be constructed prior to the City's Year 2075 needs?	<ul style="list-style-type: none"><li>• Based on projections for the maximum day wellfield pumpage and 90-day seasonal yield (seasonal peak 90-day demand), the first improvements would need to be implemented by 2035 with the installation of HCW-5. This will allow sufficient time for the City to plan and implement a water supply system from the Missouri River.</li><li>• The schedule may be influenced depending on when follow-up investigation work occurs to determine the specific site along the Missouri River and if a river intake or a wellfield is the best option going forward.</li></ul>	
What are the major risks for implementation schedule?	<ul style="list-style-type: none"><li>• Flood conditions during construction</li><li>• Property and land acquisition/easements</li><li>• Unknown soil conditions along transmission main route</li><li>• Multi-coordination with various communities, counties, and agencies</li></ul>	
For this alternative, what are typical estimation of tasks?	<p>Typical per project:</p> <ul style="list-style-type: none"><li>• Preliminary Site Investigations and Testing: 1 to 2 years</li><li>• Easements / Permits: 1 to 3 years</li><li>• Design: 1 to 3 years</li><li>• Construction of facilities: 5 to 8 years</li><li>• Overall: 11 to 15 years</li></ul>	

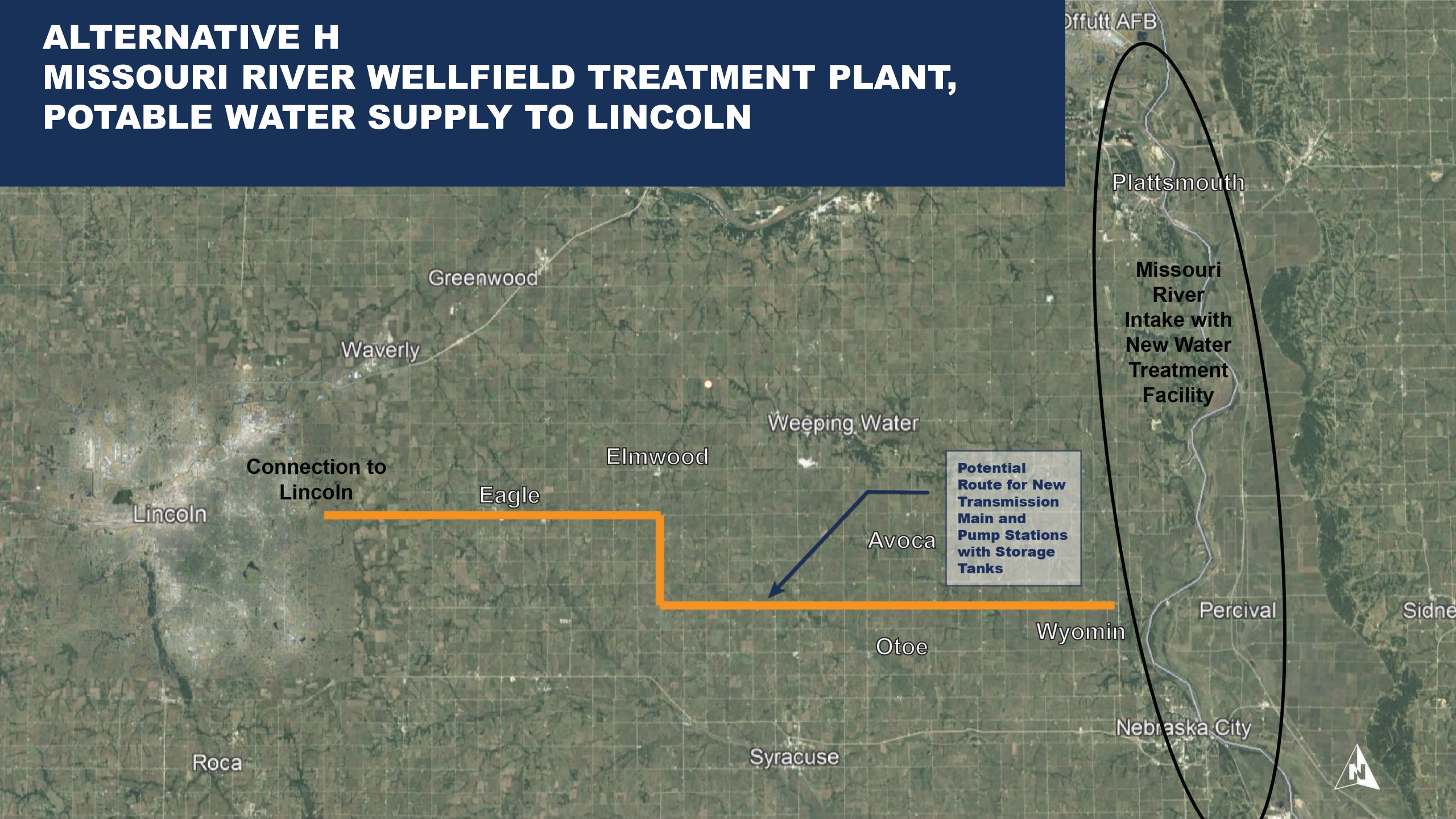
#### SCORING KEY

5-Fully meets the criteria definition 4-Meets most of the criteria definition, 3-Meets some of the criteria definition, 2-Meets little of the criteria definition, 1-Meets none of the criteria definition



# ALTERNATIVE H

## MISSOURI RIVER WELLFIELD TREATMENT PLANT, POTABLE WATER SUPPLY TO LINCOLN





## SCORING SHEET – Implementation Criteria



### Alternative H - Missouri River Wellfield to Lincoln

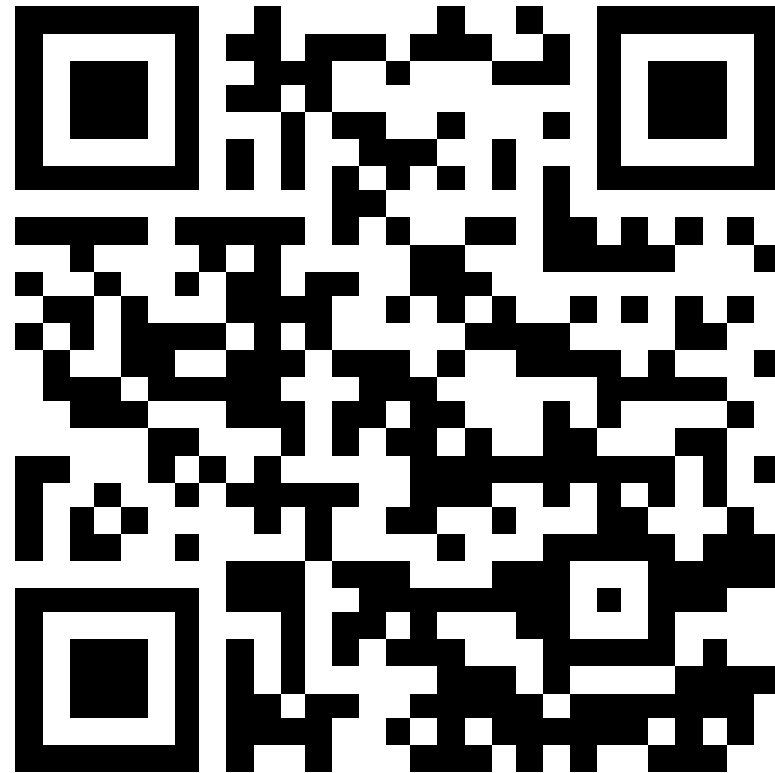
Score (1-5) \_\_\_\_\_

Time to Implement	Overview and Facts	Notes
Will the project(s) related to this alternative be constructed prior to the City's Year 2075 needs?	<ul style="list-style-type: none"> <li>Based on projections for the maximum day wellfield pumpage and 90-day seasonal yield (seasonal peak 90-day demand), the first improvements would need to be implemented by 2035 with the installation of HCW-5. This will allow sufficient time for the City to plan and implement a water supply system from the Missouri River.</li> <li>The schedule may be influenced depending on when follow-up investigation work occurs to determine the specific site along the Missouri River and if a river intake or a wellfield is the best option going forward.</li> </ul>	
What are the major risks for implementation schedule?	<ul style="list-style-type: none"> <li>Flood conditions during construction</li> <li>Property and land acquisition/easements</li> <li>Unknown soil conditions along transmission main route</li> <li>Multi-coordination with various communities, counties, and agencies</li> </ul>	
For this alternative, what are typical estimation of tasks?	<p>Typical per project:</p> <ul style="list-style-type: none"> <li>Preliminary Site Investigations and Testing: 1 to 2 years</li> <li>Easements / Permits: 1 to 3 years</li> <li>Design: 1 to 3 years</li> <li>Construction of facilities: 5 to 8 years</li> <li>Overall: 11 to 15 years</li> </ul>	

#### SCORING KEY

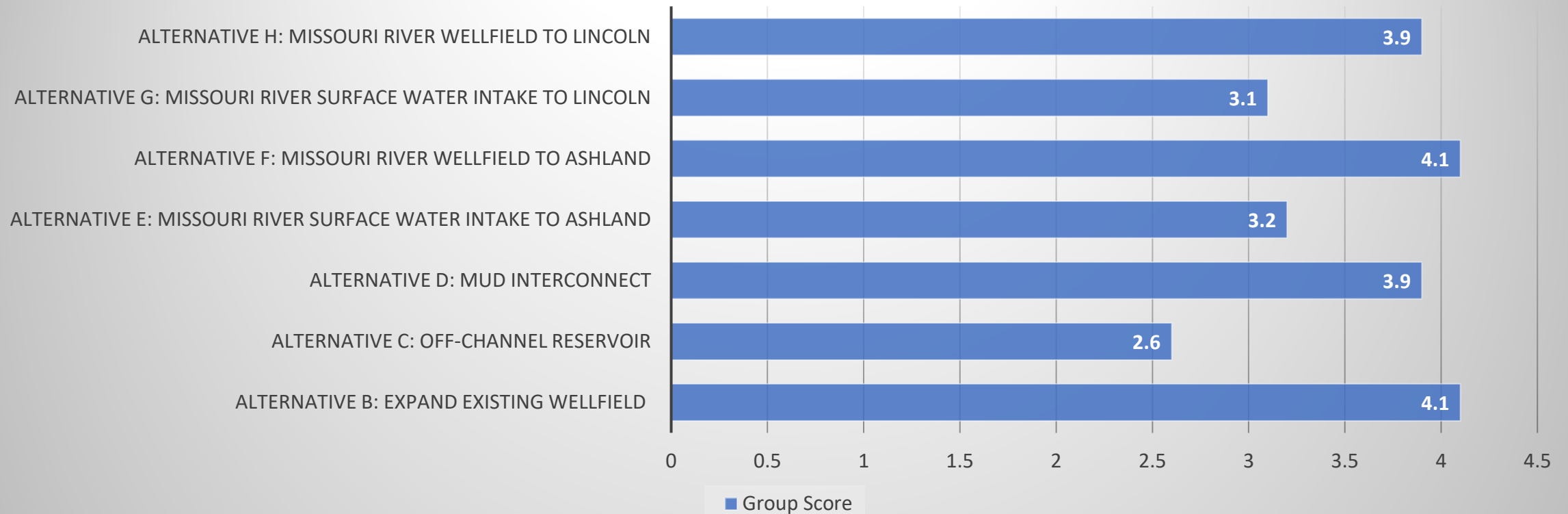
5-Fully meets the criteria definition 4-Meets most of the criteria definition, 3-Meets some of the criteria definition, 2-Meets little of the criteria definition, 1-Meets none of the criteria definition

# SCORING OF ALTERNATIVES IMPLEMENTATION



# SCORING OF ALTERNATIVES: IMPLEMENTATION CRITERIA

Implementation Group Score



# QUESTIONS



# CLOSING THOUGHTS