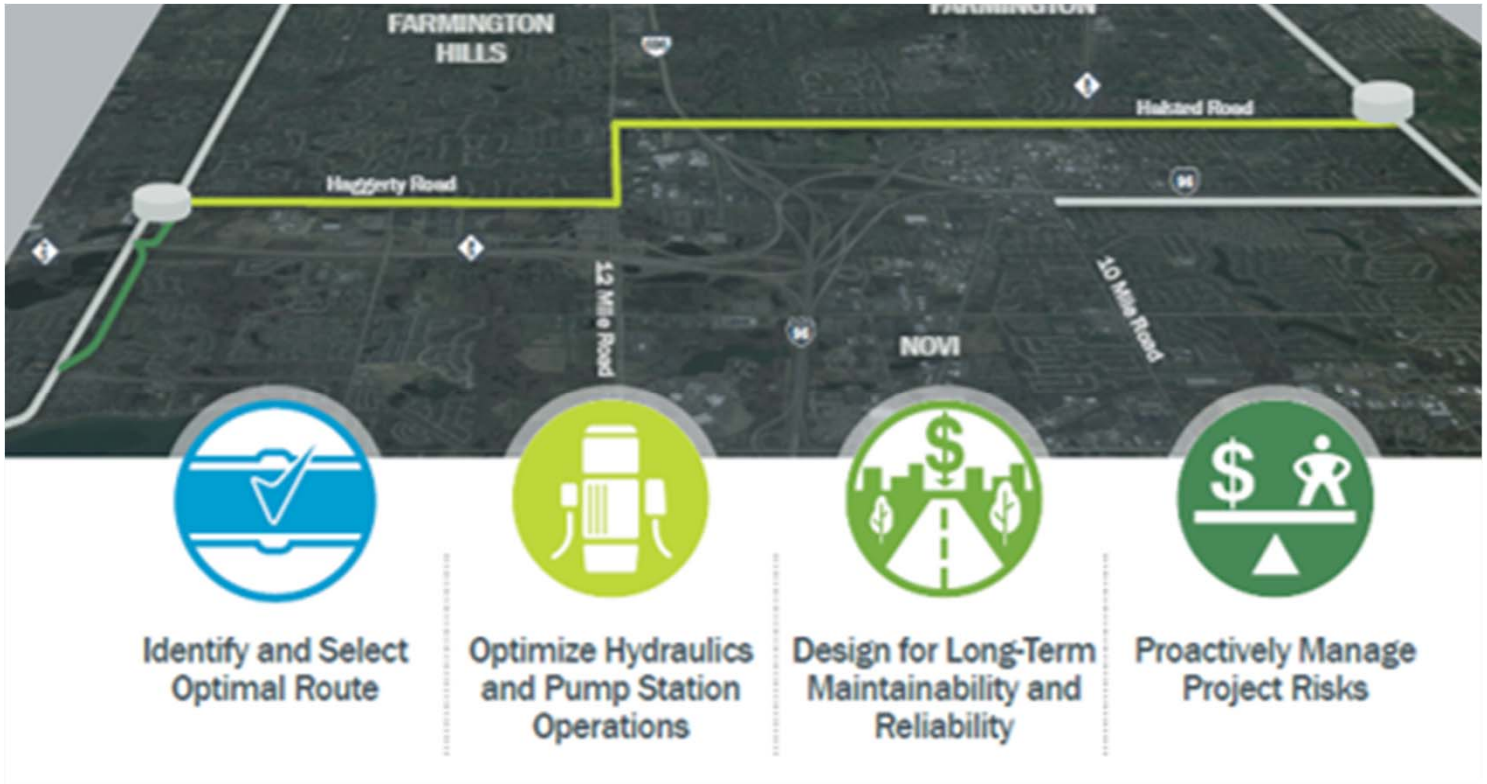
Great Lakes Water Authority

Contract No. 1802448
14 Mile Road Transmission Main Loop

September 9, 2019



Agenda

- Purpose of the project
- Route Study
- Recommendation

Project Team

GLWA Project Manager

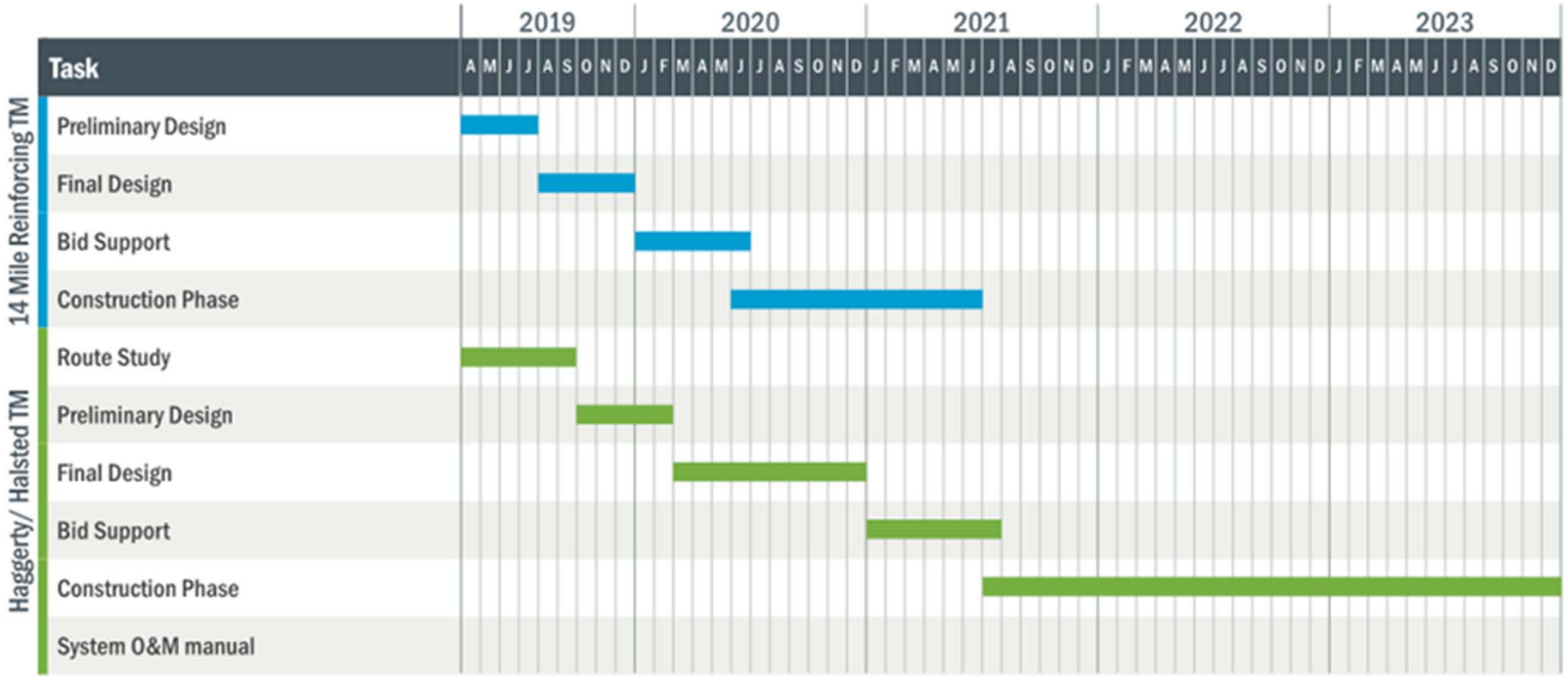
- Tim Kuhns

Key Team Members:

- Brown and Caldwell
- DLZ
- Brierley Associates

Project Schedule and Work Phases/Tasks

- Phase 1: 14 Mile Rd. TM Reinforcement (Complete July 2021)
- Phase 2: Haggerty Halsted TM (Complete December 2023)

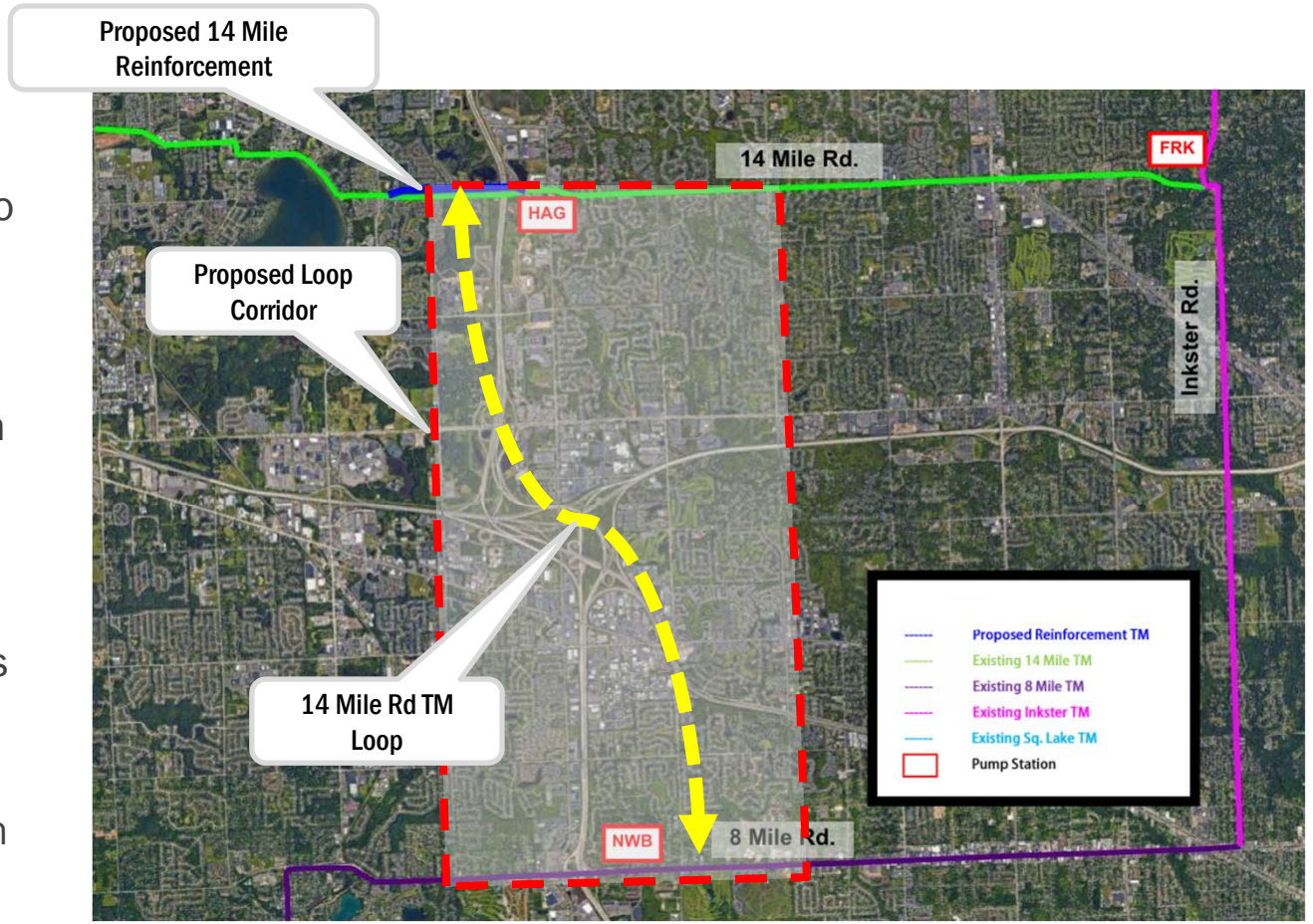


Route Study Workshop

Brown AND Caldwell

Project Background/Purpose

- 14 Mile Road transmission main runs east to west from Franklin Pump Station to Walled Lake
  - Not currently interconnected with the rest of the system
  - Existing pipe is PCCP that has history of failures
  - Vulnerable to outages due to pipe failures
- Looping 8 Mile Rd and 14 Mile Rd transmission mains makes the system more reliable



How do we minimize the risk? – Route Study

The Path to Optimal Route Selection

Step 1: Kickoff Meeting: Align Goals

Our team will collaborate with GLWA to align goals, develop communication protocols, develop a preliminary evaluation matrix and plan to engage stakeholders.

Step 2: Identify Initial Alignments and Engage Stakeholders

BC will identify several initial route alternatives based upon desktop analyses and field investigations. BC will engage stakeholders to obtain their input and construction requirements.

Step 3: Determine Top Alignments

Our team will eliminate the least feasible alternatives from further consideration, narrowing the field to the top alternatives.

Step 4: Conduct Detailed Investigations

BC will conduct detailed research to include: utility research, geotechnical investigations, identification of hazardous sites, easement requirements, traffic concerns, permitting requirements, tunnel crossings, etc.

Step 5: Populate Evaluation Matrix

BC will document the risks and challenges of each alternative alignments and determine a preliminary score.

Step 6: Segment Scoring

The BC team will divide each route into quantifiable segments and evaluate each to determine its cost, constructability and community impact. Detailed breakdowns can be used to make minor changes to the route to reduce impacts of the project.

Step 7: Determine Final Routes

BC will identify the final route alternatives and prepare a comparative cost estimate for each. Stakeholders will be engaged to obtain their input on proposed weighting criteria.

Step 8: Weighting Criteria Workshop

The goal of this workshop is to review route alternatives and engineering and community impacts. These impacts will be quantified to provide a transparent category weighting so that a balanced decision can be made.

Step 9: Sensitivity Analysis

The BC team and GLWA will work interactively to vary weighting factors to determine whether any category has a disproportionate impact on the scores.

Step 10: Additional Investigation (if required)

If necessary, BC will conduct additional research to verify evaluation data and engage stakeholders to reduce impacts on final route selection.

Step 11: Alignment Selection Workshop

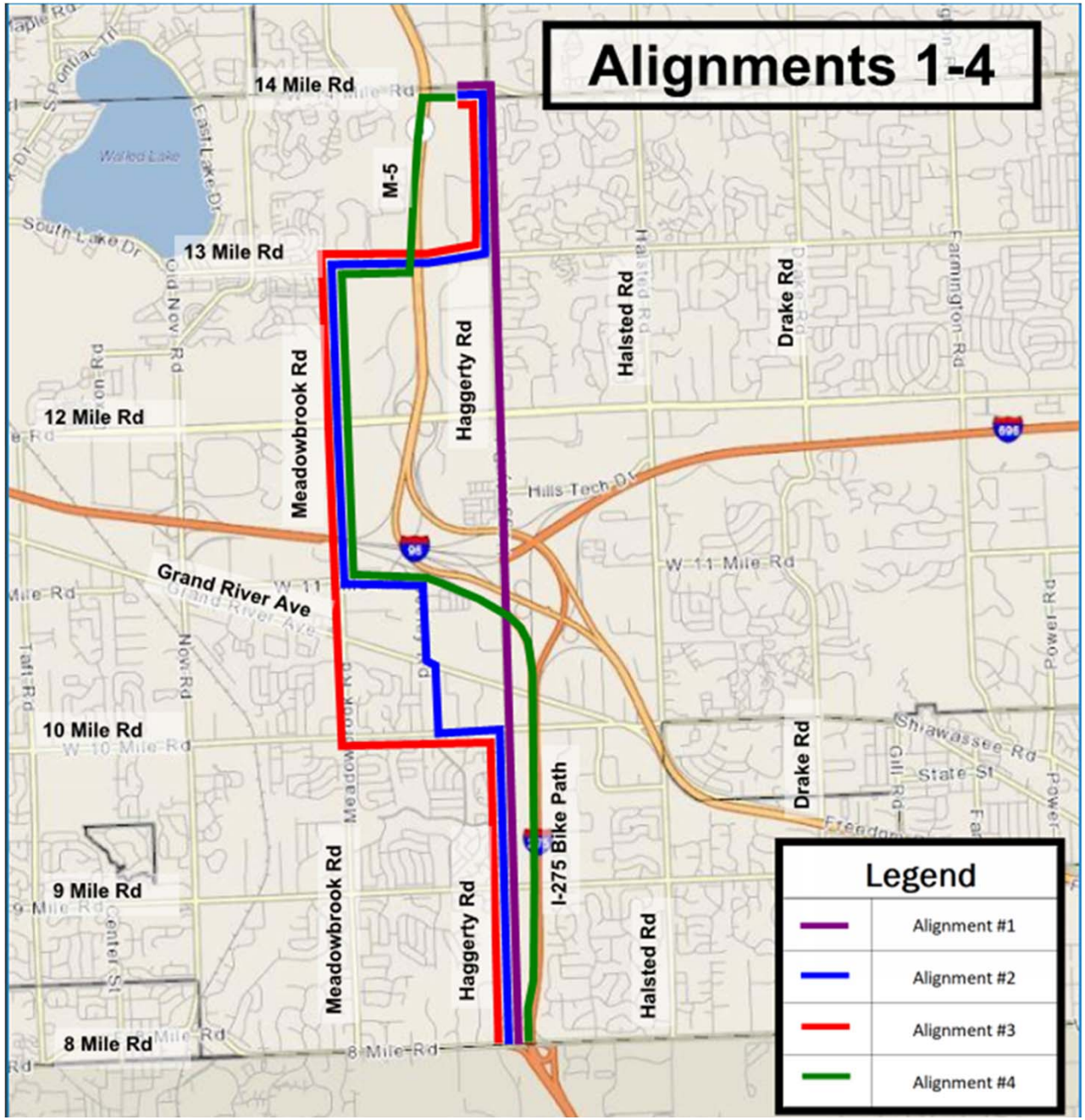
The goal of this workshop will be to either select a route or determine factors needing further investigation.

Step 12: GLWA Approval

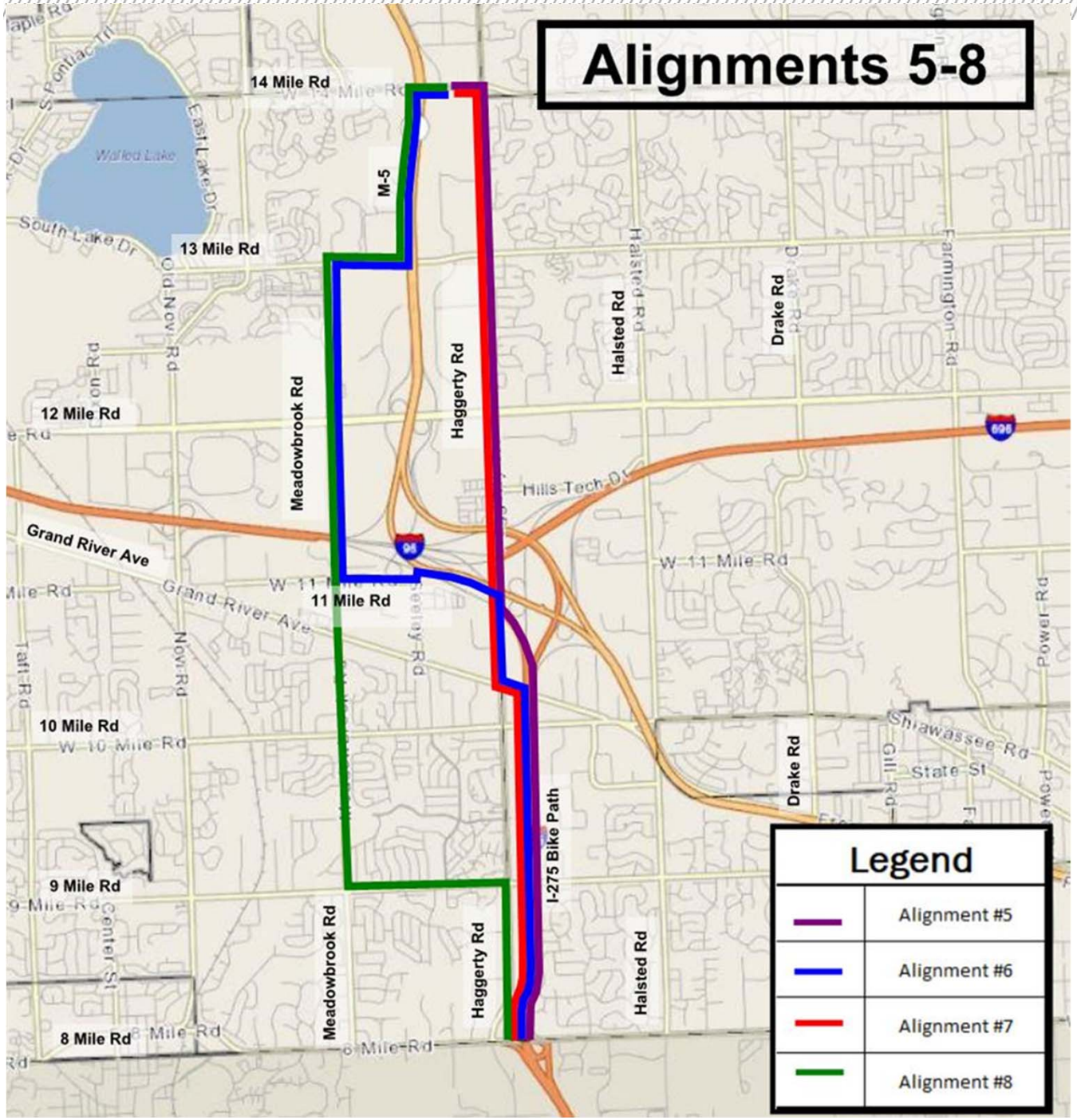
After the workshop, BC will evaluate and research the items identified and feed any new information into the evaluation matrix. The results conveyed to GLWA for review and approval. The final recommended route will be the basis for the preliminary design.

Categories Evaluated

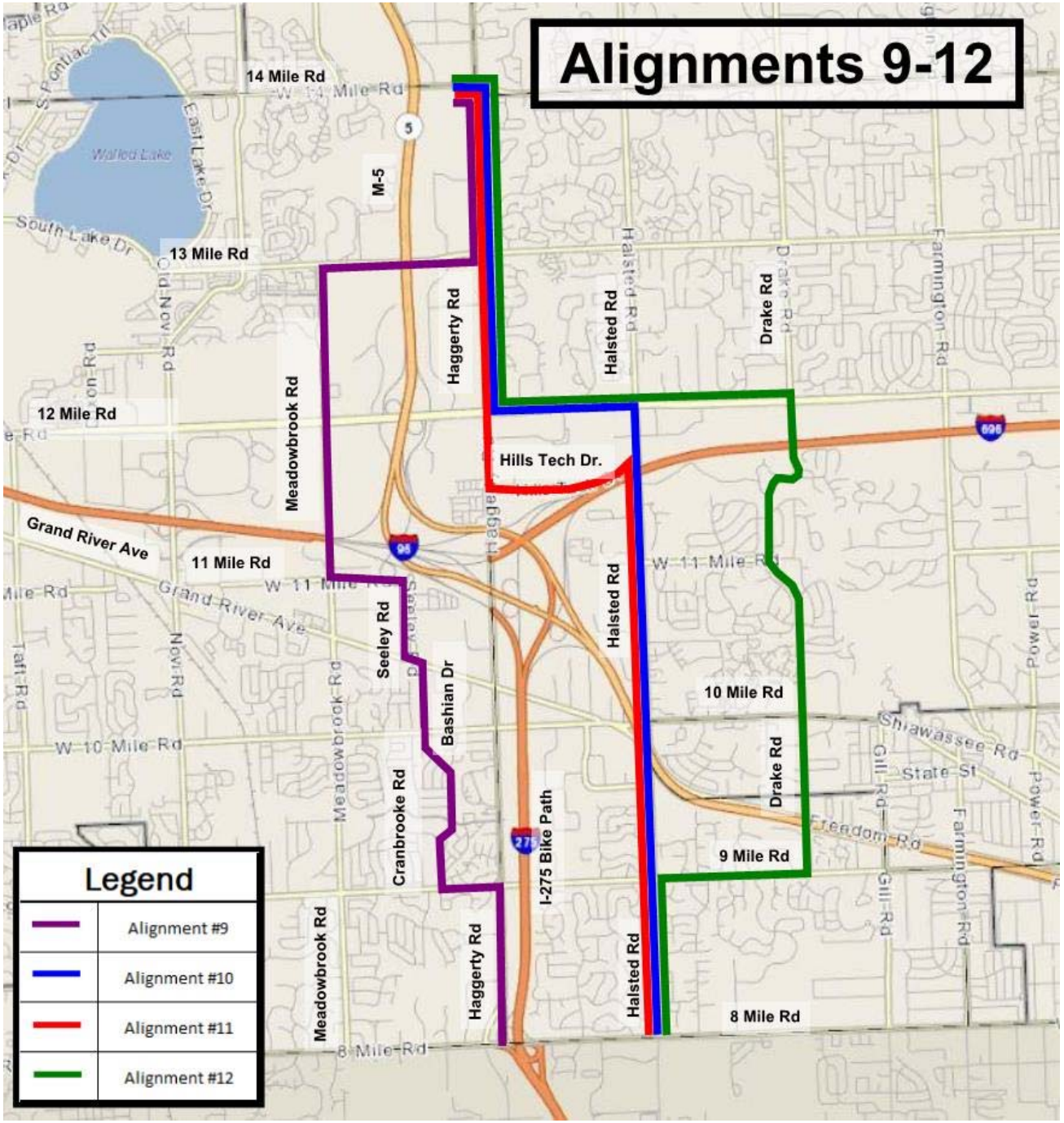
Evaluation Category	Criteria Weighting	Factors Under Consideration
Social and Community Impacts	 1 Engineering Considerations 2 Permitting and Community Impact Factors	**Anticipated impacts to the public and local business disruption considering:** • Traffic detours/delays • Ability to coordinate construction with other planned improvements • Emergency vehicle routes • Night-work disruption • Noise and dust pollution • Impacts to major planned developments • Proximity to hospitals, schools, etc. • Visibility of installed features Impact to existing businesses • Proximity of residential vs. commercial/non-residential
Environmental Impacts		**The ability to obtain the necessary permits to construct and operate the selected system considering:** • MDEQ or other environmental permitting • Local permitting • Other permitting
Tunneling Issues		**The ability to obtain the necessary permits and construct a tunnel considering:** • Access for portals • Impacts on existing businesses and traffic • Anticipated geology • Impacts on existing infrastructure such as bridges • Length of tunnel and orientation of tunnel relative to the freeway
Right of Way		**Difficulty obtaining required parcels, ROW and the number of parcels requiring easements for the construction of the selected systems considering:** • Relative complexity of obtaining easements • Type of Parcels (i.e., public, private, federal) • Schedule Impacts • Condemnation requirements • Ability to preserve ROW until construction • Ability to preserve ROW permanently • Conformance or compatibility with existing land use plans
Utility Conflicts		**Ability to construct the selected route considering existing or planned utilities:** • Crossings • Conflicts • Relocation/Reconstruction • Type of Utility • Number of Utilities
Operational Concerns		**Measure of "operator friendliness" associated with accessing the installed pipeline system and components for maintenance and repairs including:** • Hydraulic feasibility and impact on existing facilities • Surge protection • Pumping costs • Traffic impact during maintenance and repairs • Pipeline isolation distances (if required) • Air relief and vacuum valve installations • Blow-offs and blow-off discharge location
Traffic Concerns		**Measure of the impact to traffic considering:** • Avoid streets with higher traffic volumes • Avoid public buildings, schools, hospitals • Avoid freeway entrances • Avoid narrow streets which will require closure
Constructability		**Measure of the ability to construct the selected system when considering:** • Topography • Geological and other subsurface features • Construction access • Construction (trenching, tunneling, blasting, etc.) • Schedule Impacts • Staging/Spoils space requirements • Surface features and restoration • Additional ROW requirements • Traffic impact/control
Cost		**Measure to determine the relative cost for each alternative.** • Materials and other capital costs • Operating and maintenance costs • Cost uncertainty and contingencies



Twelve Alignments Evaluated



Twelve Alignments Evaluated

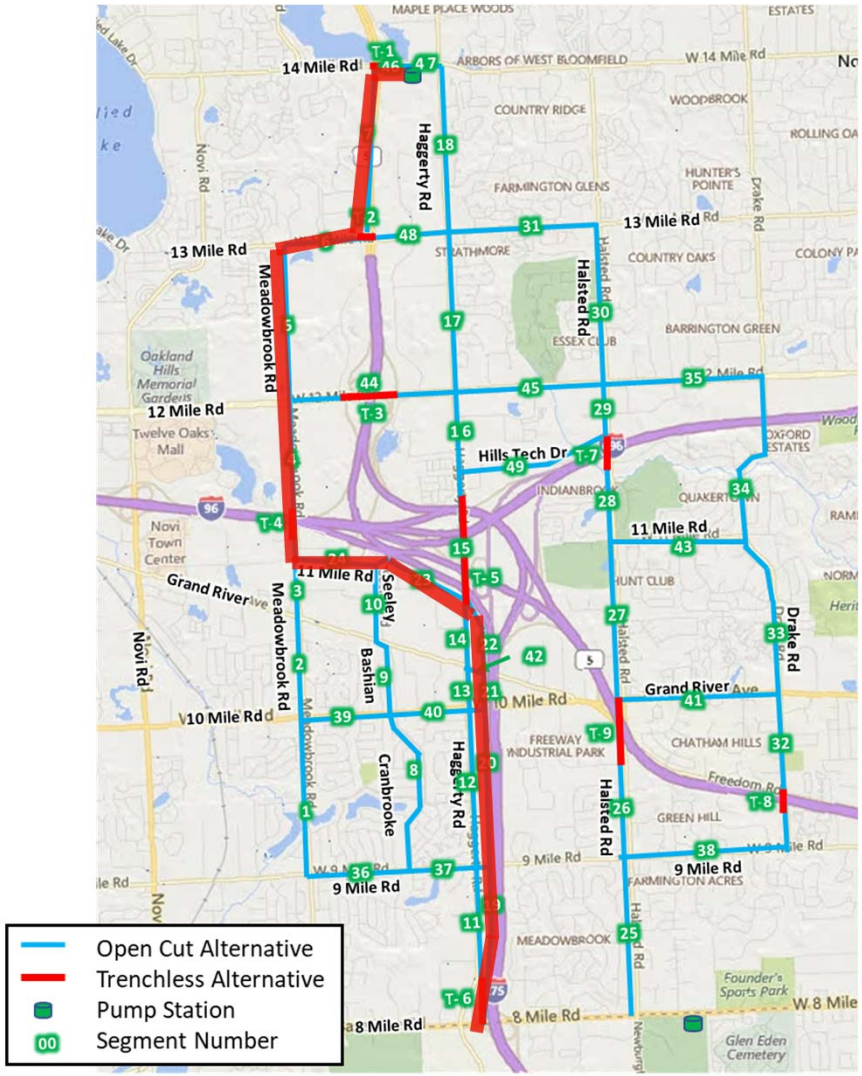


Twelve Alignments Evaluated

Alignment Rankings

Rank	Alignment Description	Pipe Size (In)	Cost (Millions)	Length (mi)	Score 1	Score 2
1	Alignment #4- I -275 / Meadowbrook	54	58.00	7.92	244.34	237.65
2	Alignment #6 - I -275 / Grand River/Meadowbrook	54	59.64	8.04	256.34	254.00
3	Alignment #5 - I -275 / Haggerty	48	57.88	6.46	286.16	265.26
4	Alignment #7- I -275 / Grand River/Haggerty	48	59.48	6.58	299.88	280.96
5	Alignment #2 -Haggerty / 10 Mile Rd/ Bashian/ Meadowbrook	54	63.04	8.00	293.55	304.93
6	Alignment #8 -Haggerty / 9 Mile Rd/ Meadowbrook	54	62.95	7.97	303.48	308.17
7	Alignment #3 -Haggerty / 10 Mile Rd/ Meadowbrook	54	63.00	7.97	301.38	312.89
8	Alignment #1 - Haggerty	48	60.85	6.35	334.55	317.85
9	Alignment #9 – Haggerty/9 Mile Rd/Cranbrook	54	66.90	8.34	329.39	347.97
10	Alignment #11 - Halsted Rd and Hills Tech	48	62.62	7.69	377.34	357.22
11	Alignment #10 - Halsted Rd and 12 Mile Rd	48	62.45	7.73	385.66	365.32

Route Study – Alignment 4



Length (mi)	Pipe Dia. (in)	Est. Cost (Millions)	Score 1	Score 2
7.92	54	58.00	244	237

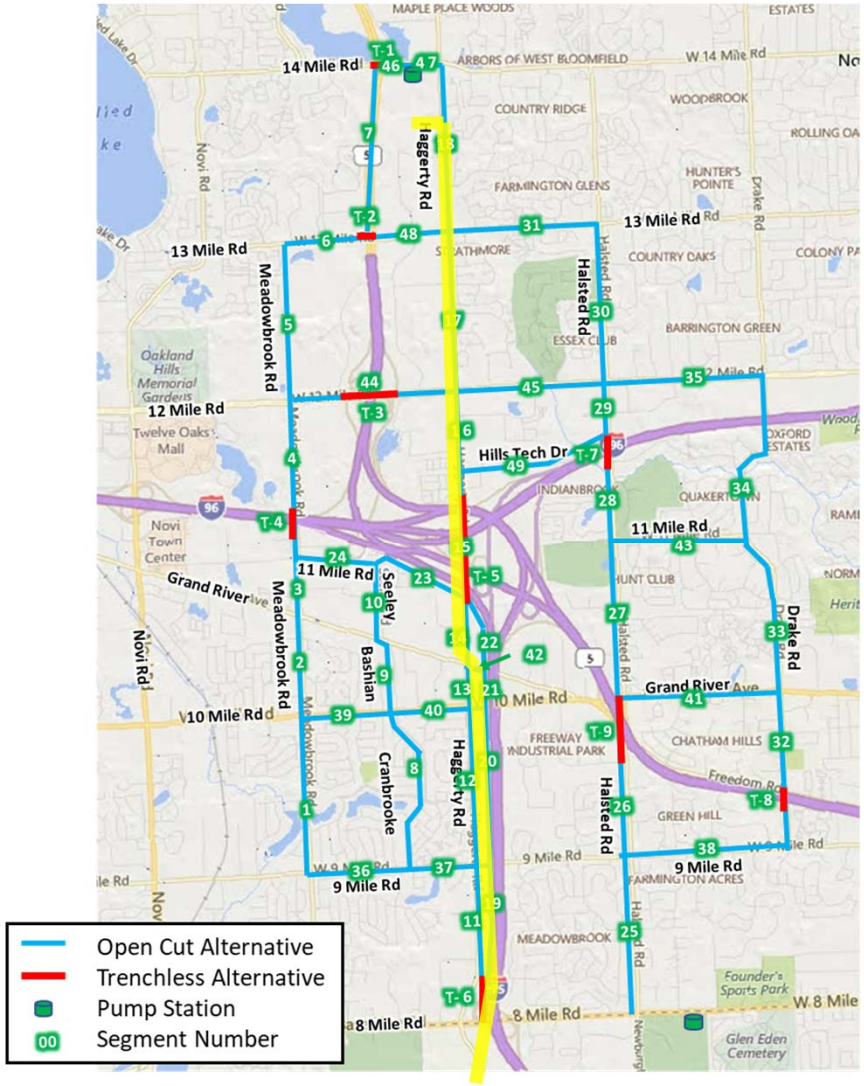
Advantages:

- Parallels Freeway for most of alignment
- Lowest traffic impacts
- Fewest utility conflicts
- Freeway crossings are low risk
- Lowest cost

Disadvantages

- Long Alignment
- Meadowbrook is narrow road in some places

Route Study – Alignment 5



Length (mi)	Pipe Dia. (in)	Est. Cost (Millions)	Score 1	Score 2
6.46	48	57.88	286	265

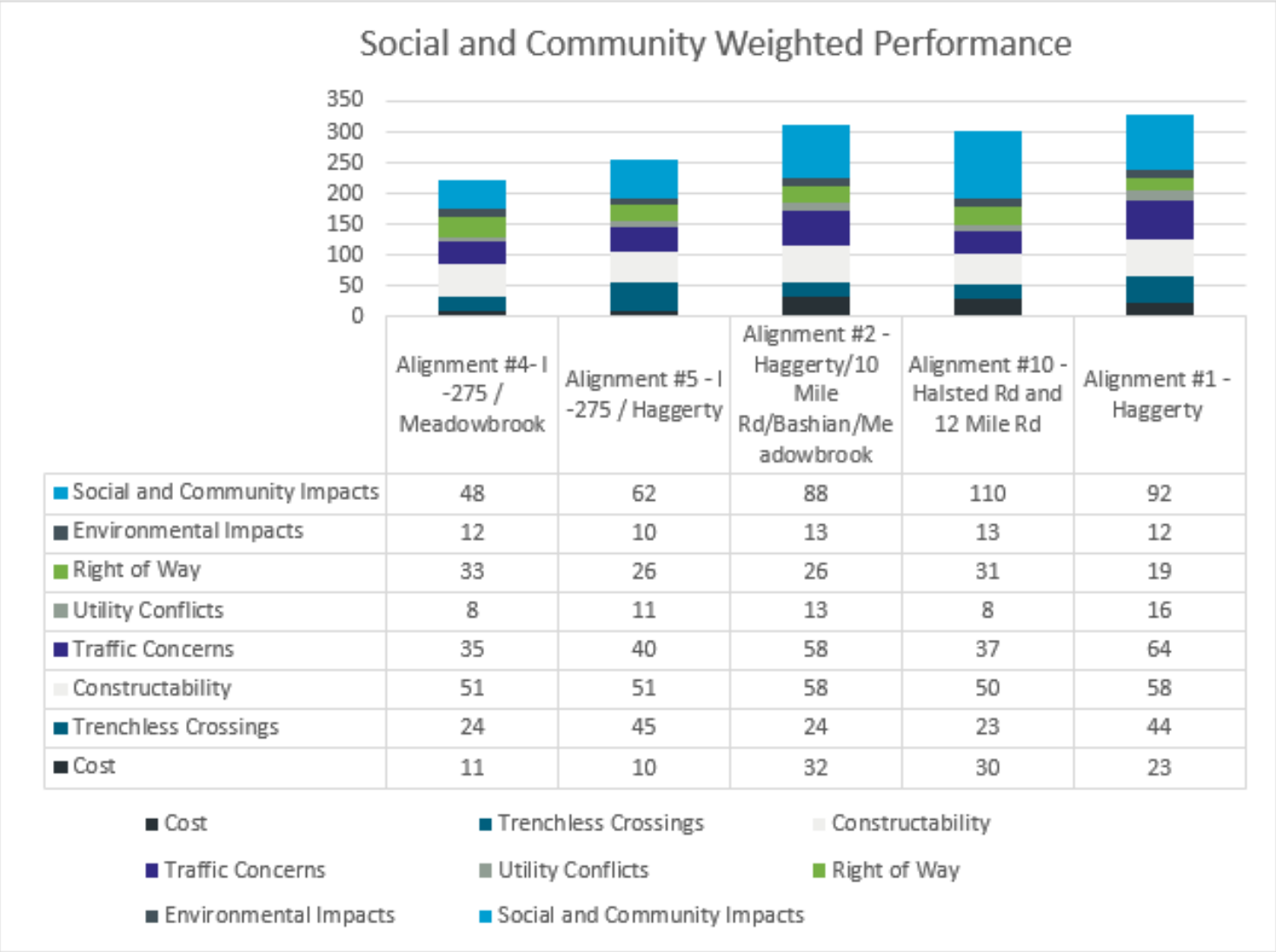
Advantages:

- Parallels Freeway for most of alignment
- Lowest Cost

Disadvantages

- Mixing Bowl Crossing is high risk
- Traffic disruptions on Haggerty
- Utility conflicts on Haggerty
- Haggerty repaved in last 3 yrs.
- More disruptive to the public

Sensitivity Analysis of Top Alignments



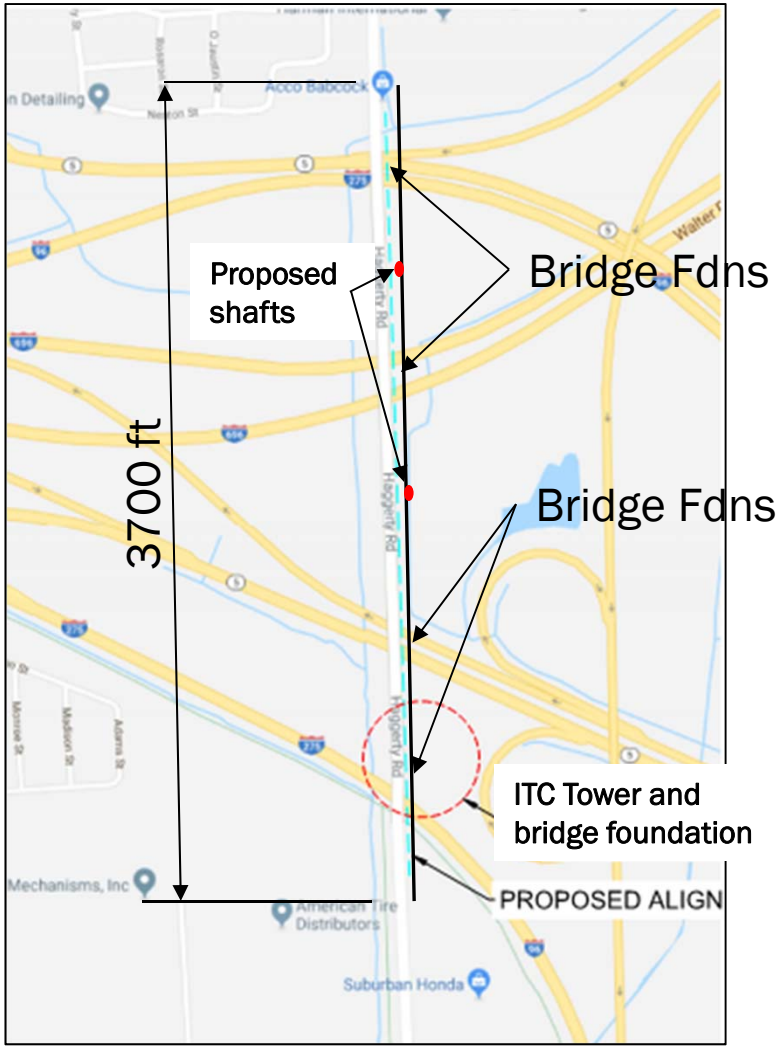
	Alignment #4- I -275 / Meadowbrook	Alignment #5 - I -275 / Haggerty	Alignment #2 - Haggerty/10 Mile Rd/Bashian/Meadowbrook	Alignment #10 - Halsted Rd and 12 Mile Rd	Alignment #1 - Haggerty
Social and Community Impacts	48	62	88	110	92
Environmental Impacts	12	10	13	13	12
Right of Way	33	26	26	31	19
Utility Conflicts	8	11	13	8	16
Traffic Concerns	35	40	58	37	64
Constructability	51	51	58	50	58
Trenchless Crossings	24	45	24	23	44
Cost	11	10	32	30	23

- Sensitivity Analysis shows Meadowbrook alignment is best

Comparing the Top Two Alignments

- Focus on:
  - Trenchless Crossings

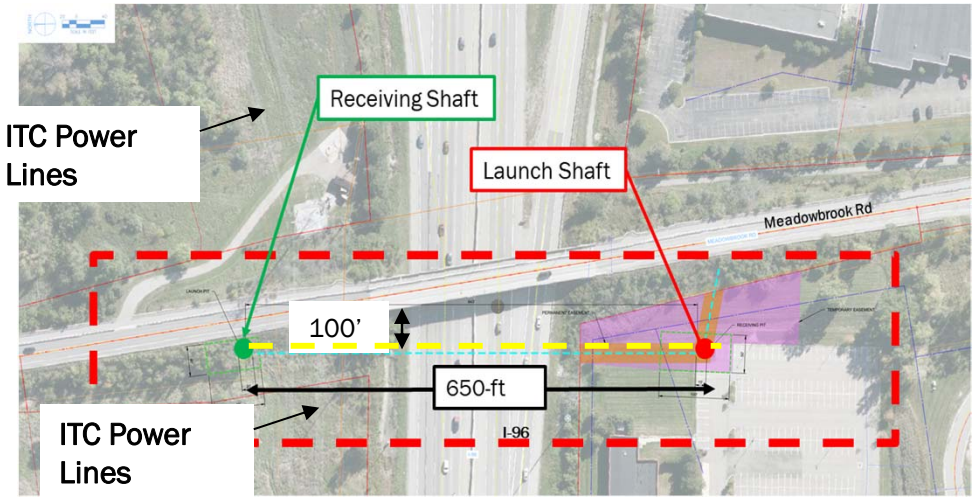
Tunnel Crossing at I-696/I-96/M-5



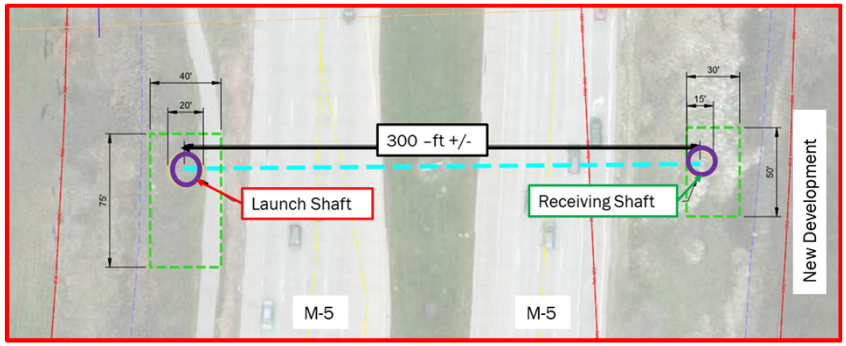
High Risk Tunnel:

- Impacts multiple highways
- Impacts Honda and Harley Davidson parking lot during construction
- Two Shafts required off Haggerty Rd
- Passes between ITC towers and bridge foundation
- Smaller Contractor pool due to length and diameter of tunnel
- Multiple stakeholders
- Groundwater anticipated

Tunnel Crossings on Meadowbrook Alignment



I-696 at Meadowbrook



M-5 near 14 Mile Rd

Low Risk Tunnels:

- Short tunnels
- Tunnel is about 100 feet from bridge foundations
- Minimal impact to community

Comparing the Top Two Alignments

- Focus on:
  - Pipeline Segments

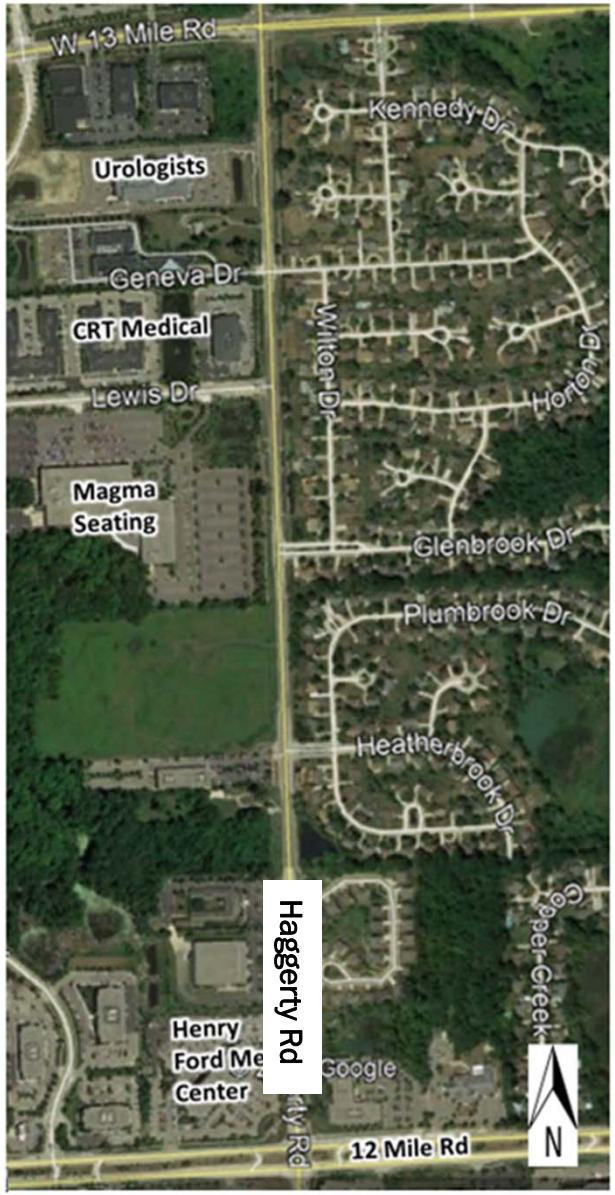
Haggerty Pipeline vs Meadowbrook –

- 11 Mile Rd to 12 Mile Rd

- Haggerty has more traffic
- Haggerty has more businesses.
- Haggerty has more public facilities
- Haggerty has more residential housing.
- Haggerty has more utilities:
  - -Hazardous liquid pipeline
  - -Buckeye Pipeline

Haggerty Pipeline vs Meadowbrook –

- 12 Mile Rd to 13 Mile Rd



- Haggerty has more traffic
- Haggerty has more businesses.
- Haggerty has more residential housing.
- Haggerty has more utilities:

  -Hazardous liquid pipeline

  -Buckeye Pipeline

Recommended Option: Meadowbrook

Advantages vs Haggerty:

- Cost is equivalent
- Low risk trenchless crossings compared to high risk trenchless crossing
- Less traffic
- Fewer utilities conflicts
- Less disruption to the community
- Lower overall risk

Disadvantages:

- Longer alignment


Questions?