Northern Integrated Supply Project

Route Alternatives Analysis

for

Pipelines within Larimer County

Introduction

DRAFT

May 2019

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DECISION MODEL AND CRITERIA

Dewberry/HDR and Northern Water (NW) developed a decision model to evaluate alternative pipeline routes for all of the alignments within Larimer County that will comprise the Northern Integrated Supply Project. These pipelines include: Northern Tier, Poudre Delivery, and County Line Pipelines. The general location of these three alignments can be seen in **Figure 1**.

The decision model considers multiple criteria including cost and non-cost criteria to determine a preferred alignment. The non-cost criteria considered include the following:

- Conduit Length
- Easement Difficulty
- Right-of-Way Impact
- Landowner Impact
- Proximity to Occupied Dwellings
- Environmental Impacts
- Existing Utilities
- Hazardous/Permitted Crossings
- Surface and Street Impacts
- Traffic Impacts
- Water Storage Reservoirs Impacts
- Construction Durations and Relative Constructability
- Required Trenchless Crossings
- Development Pressure
- Operation and Maintenance (O&M) Access
- O&M Requirements
- Natural Resources Impacts

Dewberry/HDR and NW established the criteria based on the project scope, key differentiators, and relative importance to NW. After identifying and defining criteria, a relative performance system was established where alternative alignments were evaluated against the criteria and given a rating of "Green" for good performance, "Yellow" for moderate performance and "Red" for poor performance under the criteria. **Table 1** lists the evaluation criteria applied as well as a description of the criteria and its performance metrics.

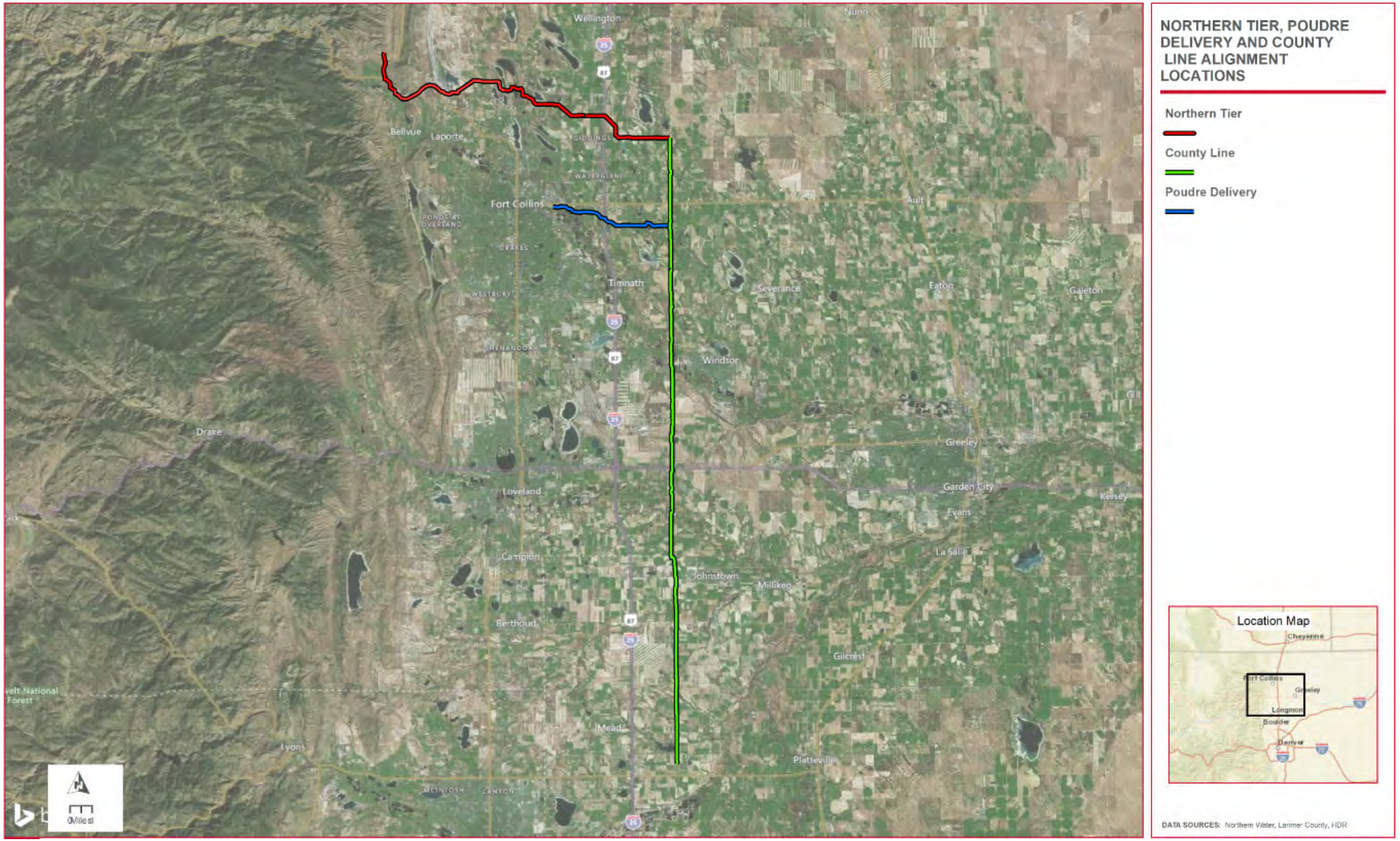

Figure 1 - Overview of alignments located in Larimer County: Northern Tier, Poudre Delivery and County Line

Table 1 – Matrix Evaluation Criteria, Description, and Metrics

Evaluation Criteria	Description	Performance Metrics - Green	Performance Metrics - Yellow	Performance Metrics - Red
Capital Cost	Construction cost for the proposed route, including tunneling, surface improvements, appurtenances, and type of roadway etc. Based on cost curves developed by the project team using similar projects. Additional costs were estimated for specific construction elements such as major dewatering, tunnels, or major crossings	Significantly less expensive alignments	Mid-range or moderately more expensive than lowest cost alignment	Significantly higher cost alignments
Conduit Length	Total length of pipeline	Alignment with the shortest total length in each project area	Alignment with length between the shortest and longest value for each project area	Alignment with the longest total length in each project area
Easement Difficulty	Relative difficulty of acquiring a 100 foot wide easement and the relative quantity of easements required	Alignment crosses the least amount of parcels and/or most of the parcels are rural	Crosses between the least and most amount of parcels and/or a mix of urban and rural parcels	Alignment crosses the most amount of parcels and/or most of the parcels are urban
Right-of-Way Impact	Use of public right-of-way vs private easement for alignments	Alignment uses a relatively low amount of public right-of-way for pipeline	Alignment uses a relatively moderate amount of public right-of-way for pipeline	Alignment uses a relatively high amount of public right-of-way for pipeline
Land Owner Impact	Level of anticipated land owner impact, including land interference and roadway access	Alignment near parcel perimeter, no access impacts	Alignment causes minor parcel division, minor access impacts	Alignment causes major parcel division and/or requires temporarily blocking access
Proximity to Occupied Dwellings	Proximity of alignment to all occupied dwellings	Alignment is less than 100 feet from the least number of occupied dwellings	Alignment is between less than 100 feet from the least and most number of occupied dwellings	Alignment is less than 100 feet from the most number of occupied dwellings
Environmental Impacts	Number and length of 404 crossings (streams, wetlands, etc.) and proximity to riparian areas. National databases were used for wetland and riparian boundaries, site surveys have not been performed	Alignment has relatively low amount of environmental/cultural impacts	Alignment causes relatively low amount of environmental/cultural impacts	Alignment has relatively high amount of environmental/cultural impacts
Existing Utilities	Anticipated utility relocations and level of coordination required with adjacent and crossing utilities	Alignment expected to affect the least amount of utilities due to amount of street crossings	Alignments with relatively moderate amounts of utilities due to number of streets crossed	Alignment expected to affect the most amount of utilities due to amount of street crossings
Hazardous/ Permitted Crossings	Known or anticipated groundwater or soil remediation requirements based on publicly available databases of known sites and their areas of influence	Relatively low number of hazardous/permitted crossing	Relatively moderate number of hazardous/permitted crossings	Relatively high number of hazardous/permitted crossings

Table 1 – Matrix Evaluation Criteria, Description, and Metrics

Evaluation Criteria	Description	Performance Metrics - Green	Performance Metrics - Yellow	Performance Metrics - Red
Surface and Street Impacts	Level of impact to public infrastructure (street crossings/cuts, use of public roads for haul)	Alignment crosses the least amount of streets	Alignment crosses between the least and most amount of streets	Alignment crosses the most amount of streets
Traffic Impacts	Anticipated impacts to flow of traffic and level of traffic control needed	Relatively minor traffic impacts	Relatively moderate traffic impacts	Relatively major traffic impacts
Water Storage Reservoirs Impacts	Mitigation requirements for proximity to reservoir conduits, dam toe drains and other hydraulic structures	Alignment impacts the smallest number of water storage reservoirs	Alignment is between the least and most of water storage reservoir impacts	Alignment impacts the greatest number of water storage reservoirs
Construction Duration and Relative Constructability	Route complexity due to Length, available construction corridor/access and terrain challenges. Based on similar projects, a daily production rate was estimated	Alignment creates the lowest number of specific construction challenges/shortest construction duration	Alignment creates between the lowest and highest number of specific construction challenges	Alignment creates the highest number of specific construction challenges
Required Trenchless Crossings	Relative quantity and anticipated difficulty of tunneled crossings	Alignment requires the least amount of trenchless crossings in each project area	Alignment requires between the least and the most amount of trenchless crossings in each project area	Alignment requires the most amount of trenchless crossings in each project area
Development Pressure	Presence of current or near term (within 2 years) development within corridor	Alignment with lowest number of development areas nearby or crossed in each project area	Alignment is between the lowest and highest number of development areas nearby or crossed in each project area	Alignment with highest number of development areas nearby or crossed in each project area
Operation and Maintenance (O&M) Access	Accessibility to the pipeline corridor to maintain appurtenances and make repairs and additional cathodic protection required to protect the line due to foreign crossings	Relatively easy O&M access	Relatively moderate O&M access	Relatively difficult O&M access
O&M Requirements	Length of pipeline relative to other alternatives and quantity of anticipated AV/AR and BO facilities relative to other alignments	Alignment contains the least number of air vac and blow off pairs (10 foot sawtooth elevation change)	Alignment contains between least and most number of air vac and blow off pairs	Alignment contains the most number of air vac and blow off pairs (10 foot sawtooth elevation change)
Natural Resources Impacts	Amount of natural areas (ex: trees, wildlife areas) that are impacted due to the specified alignment	Alignment causes the least amount of natural area impacts	Alignment causes between the least and most natural area impacts	Alignment causes the most amount of natural area impacts

DEVELOPMENT OF ALIGNMENT ALTERNATIVES FOR ANALYSIS

Dewberry/HDR utilized multiple resources to develop GIS based mapping to begin identifying potential pipeline routes for the project. Resources used included:

- Publicly available aerial imagery
- Property boundary information available from Larimer County
- National Databases for wetland and riparian areas
- Publicly available topography information
- Local databases for existing underground utilities

Alternative routes for each alignment were developed following detailed review of aerial mapping and multiple site visits. The following paragraphs provide additional information regarding key issues impacting development of routes for analysis.

Private Easement vs Public Right-of-Way

Public ROW is used extensively for distribution of local drinking water, natural gas, wastewater conveyance, telephone, cable TV and fiber optic lines. These local utilities are excavated and modified with some frequency and each time one of these utilities is modified or extended, the utilities surrounding them are put at elevated risk of damage. Unlike local water distribution pipe networks, the NW system does not have a redundant pathways for system conveyance, so it is imperative that the pipelines be located in privately owned easements where NW can better control when and how excavations near their pipelines are performed. This added layer of safety not only protects NW's pipelines but also the general public.

NW's pipeline infrastructure is typically larger in diameter and operates at higher pressures than typical municipal underground utilities. Damage to a NW pipeline by a contractor modifying small local underground utilities will result in greater local collateral damage than would occur with typical municipal water distribution pipelines.

Additional benefits associated with locating NW's pipelines in private easements include:

- NW strives to be a good neighbor and preserving public Rights-of-Way for local infrastructure is in line with that objective.
- Provides for simpler and safer maintenance and operations access for NW staff.
- Since public ROW is heavily utilized for local buried infrastructure, there is typically inadequate space to accommodate construction of the large diameter pipelines required by this project.
- It is preferable to impact specific landowners, as opposed to impacting an entire community with extensive roadway reconstruction, utility relocations and traffic detours.

For the above noted reasoning, NW generally considers acquiring private easements to be preferable to acquiring/constructing in public Rights-of-Way.

Fatal Flaw Analysis and Construction Corridor

If a proposed alignment alternative contained an issue which was determined to be a "fatal flaw" then a complete analysis was not carried out. Examples of fatal flaws include crossing an excessive number of parcels, bisecting natural areas, extensive length in public Right-of-Way, and excessive pipeline length, which would be detrimental to pipeline hydraulics.

When assessing these criteria, a 100 foot construction corridor was considered. This is made up of a 60 foot permanent easement and a 40 foot temporary construction easement. For example, when assessing impacts to parcels in close proximity to the alignment, a distance of 100 feet was measured from the alignment to the occupied dwelling to determine if it would or would not be affected.

Reconciliation of End Points

It was also decided that a correction factor would be used to reconcile differences in end points. This applies to alignments with multiple project areas. An initial assessment would be performed and if the winning alternatives in different project areas required reconciliation in order to connect, then the additional length/other criteria would be applied to the alternatives in both area and the analysis re-run with the connecting pipelines considered in the analysis.

IMPACTS MINIMIZATION PLAN

A comprehensive Impacts Minimization Plan was utilized for this analysis. This plan included steps to decrease impacts on public and private resources. When developing the criteria in **Table 1**, emphasis was placed on mitigating negative impacts and enhancing the area if possible throughout the construction process. The specific steps taken were as follows:

1. Identifying pipeline alignment alternatives within private Right-of-Way as much as possible to minimize general public impact (road closures and blocked access)
2. Developing pipeline alignments that are adjacent property lines and avoid splitting a property
3. Routing alignment options to avoid occupied dwellings/homes
4. Assessing environmental impacts to wetlands and adjusting routes to cause as little disturbance as possible
5. Routing alignment options to minimize number of street crossings, potential utility conflicts, and traffic disturbances
6. Routing alignment options to minimize impacts to water storage reservoirs by avoiding dam toes
7. Pipeline alignments were drawn to avoid or minimize conflicts with future developments
8. Promote pipeline routing that minimizes construction impact on trees and other natural resources

Northern Integrated Supply Project

Northern Tier Delivery Pipeline Alternatives Analysis

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ROUTE COMPARISONS

Each of the alternatives developed was subjected to the evaluation criteria and metrics described in **Table 1** in the Introduction. The Northern Tier segment was broken into 3 Project Areas, which made for easier comparison of alternatives. The Project Areas also enabled the project team to look at combinations of alternatives for each Project Area and facilitated a thorough analysis for the final Preferred Alignment.

An overview of all of the Project Areas and the alternative options can be seen in **Figure N.1**. Detailed fact sheets for each alternative alignment compare its performance against the evaluation criteria and figures illustrating each individual alignment alternative are provided on the following pages. Included on the fact sheet for each alternate is a table demonstrating the ranking assigned for each criterion. In the end, the alternate with the best overall performance (least reds, most greens) was chosen to be the Preferred Alternate. This Preferred Northern Tier Alignment can be seen in **Figure N.17** at the end of this document.

In total, three (3) alternates were assessed for Project Area 1, three (3) alignment alternates were assessed for Project Area 2, and four (4) alignment alternates were assessed for Project Area 3. However, additional alignment options for each project area are present in **Figure N.1** and are shaded different colors of grey. These alignments were considered to contain a "fatal flaw" and a complete analysis was not completed. These alignments still have their own map and fact sheet which explain in more detail the reasons why they were not selected or evaluated further.

There is also a segment called "Common Segment" which can be seen on the individual alignment alternative maps, as well as on the overall maps. This segment is symbolized as a dashed red line and is not included in the matrix comparisons as it is shared by every alternate. The "Common Segment" connects the Proposed Glade Reservoir with the alignment alternates in Project Area 1.

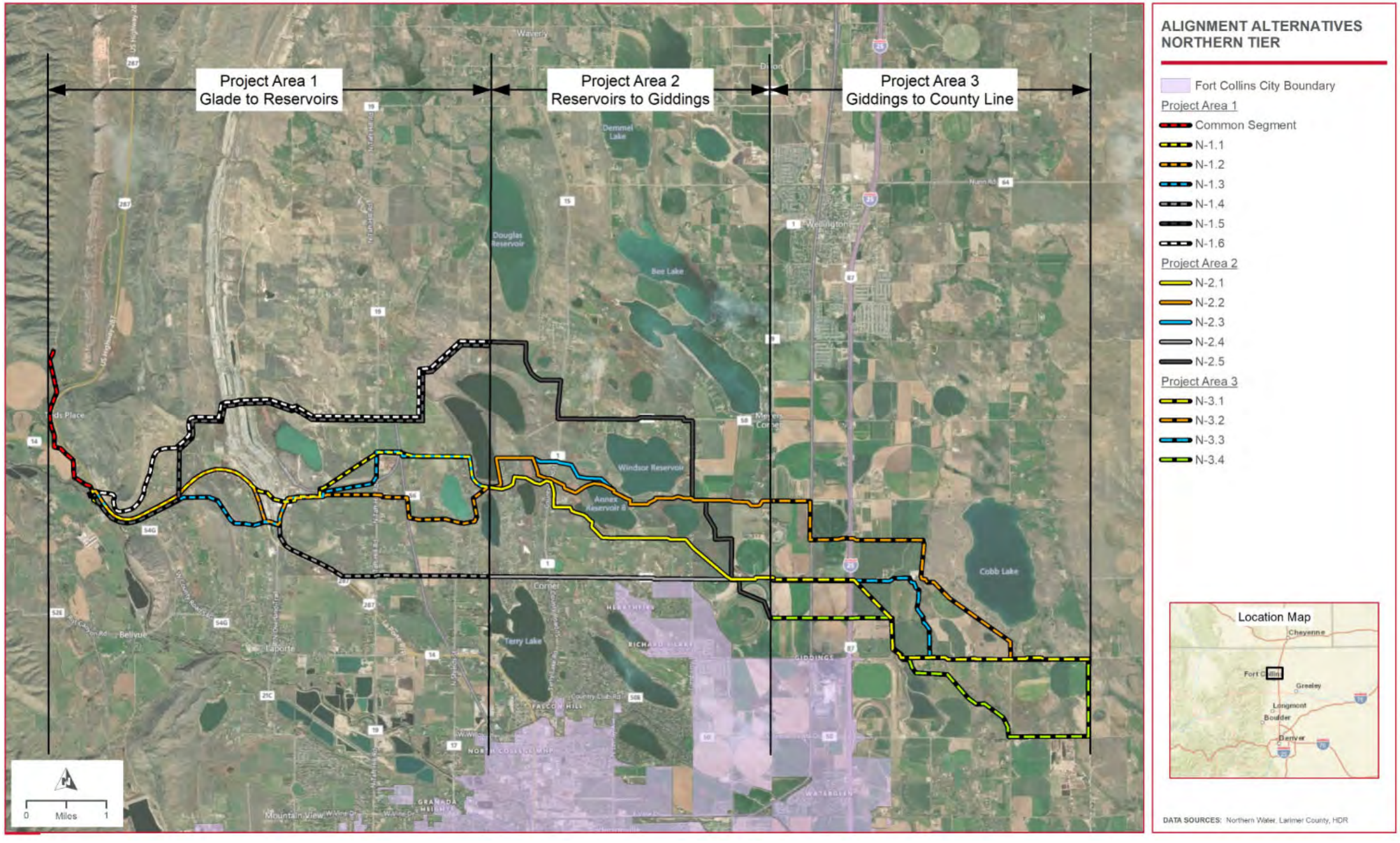


Figure N.1 – Northern Tier Project Areas and Alternatives

Alternative Name	N-1.1
Alternative Location & Description	This alignment begins on the north side of Hwy 14 approximately 1,500 feet northwest of the intersection with CR 54E. Alignment N-1.1 parallels the north side of Hwy 14 until it turns to the southwest over a ridge and passes through the concrete plant. This alignment follows the proposed ROW of the Hwy 287 relocation. It continues east passing diagonally until reaching the back of Homes of Distinction development. From there, it turns east and crosses the Union Pacific Railroad before paralleling the southern edge of Water Supply and Storage Reservoir 3.

Criteria	Ranking	Comments
Capital Cost	Green	Estimated cost $19,048,000
Conduit Length	Green	Estimated 6.01 miles, 31,732 feet
Easement Difficulty	Yellow	Estimated 18 parcels crossed
Right-of-Way Impact	Yellow	Alignment is in Hwy 14 ROW for significant portion
Land Owner Impact	Yellow	About 4 parcels are split. One is expected to amenable to diagonal crossing
Proximity to Occupied Dwellings	Green	Less than 100 feet from an estimated 1 dwelling
Environmental Impacts	Yellow	Six (6) wetland crossings
Existing Utilities	Yellow	Moderate impact to utilities due to location in ROW for a portion and street crossings
Hazardous/Permitted Crossings	Yellow	Crosses old cement plant which is indicated to be a "Solid Waste Facility"
Surface and Street Impacts	Yellow	Estimated 7 road crossings.
Traffic Impacts	Yellow	Moderate traffic impacts for section in ROW and road crossings
Water Storage Reservoirs Impacts	Green	Not in the vicinity(less than 100 feet) of water storage reservoir toe dam
Construction Duration and Relative Constructability	Green	Estimated Total Active Days: 186 days Estimated Total Days: 266 days
Required Trenchless Crossing	Yellow	Highway 14 and UP RR twice
Development Pressure	Green	No significant development pressure identified
Operation and Maintenance Access	Yellow	Moderate access, both close and far proximity to roadways
O&M Requirements	Yellow	Significant elevation changes to be resolved with re-routing of Hwy 287. Decent elevation change around Hwy 14. About 2 pairs
Natural Resources Impacts	Green	Minimal impacts. Some trees impacted along roadway and in wetland crossing

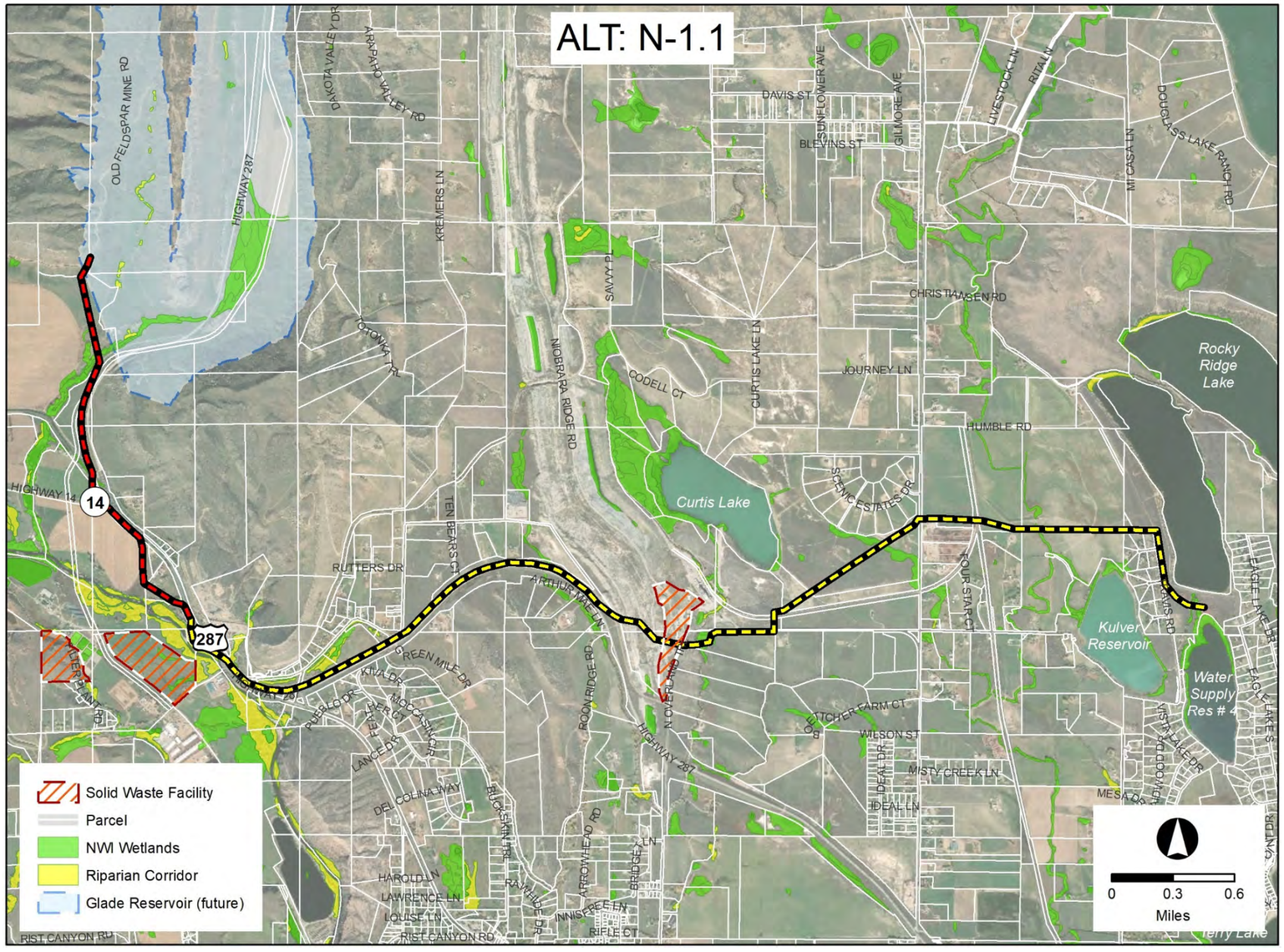


Figure N.2 – Alternative N-1.1

Alternative Name	N-1.2
Alternative Location & Description	This alignment begins on the north side of Hwy 14 approximately 1,500 feet northwest of the intersection with CR 54E, at the same location as the other alignments. Alignment N-1.2 begins following the same route as the previous alignment, however continues south before skirting the southern edge of the concrete plant. It follows up the eastern side of the plant, where it then follows residential property lines, while heading east until crossing Union Pacific Railroad. After crossing, it ends south, then east towards Water Supply and Storage Reservoir 4 where it crosses a channel between Kluver Reservoir and Storage Reservoir 4, before ending in the same location as the previous alignment.

Criteria	Ranking	Comments
Capital Cost	Yellow	Estimated cost $20,380,000
Conduit Length	Red	Estimated 6.51 miles. 34,362 feet
Easement Difficulty	Yellow	Estimated 20 parcels crossed
Right-of-Way Impact	Yellow	Alignment is in Hwy 14 ROW for significant portion
Land Owner Impact	Yellow	About 3 parcels are split
Proximity to Occupied Dwellings	Yellow	Less than 100 feet from an estimated 2 dwellings
Environmental Impacts	Yellow	Five (5) wetland crossings
Existing Utilities	Red	Relatively high impact to utilities due to location in ROW for large portion and high number of street crossings
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossings
Surface and Street Impacts	Red	Estimated 9 road crossings.
Traffic Impacts	Red	Relatively high due to amount of road crossings
Water Storage Reservoirs Impacts	Yellow	Not in the vicinity(less than 100 feet) of water storage reservoir toe dam. Alignment does pass through deep connection channel between Kluver Reservoir and Water Supply and Storage Reservoir 4
Construction Duration and Relative Constructability	Green	Estimated Total Active Days: 184 days Estimated Total Days: 264 days
Required Trenchless Crossing	Yellow	Highway 14 and UP RR once. Possibly one additional tunnel, if one needed for deep reservoir connection
Development Pressure	Green	No significant development pressure identified
Operation and Maintenance Access	Yellow	Moderate access, both close and far proximity to roadways
O&M Requirements	Red	Decent elevation change around HW 14. Moderate need for air vac and blow off pairs. Also, longer length for more maintenance
Natural Resources Impacts	Green	Minimal impacts. Some trees impacted along roadway and in wetland crossing

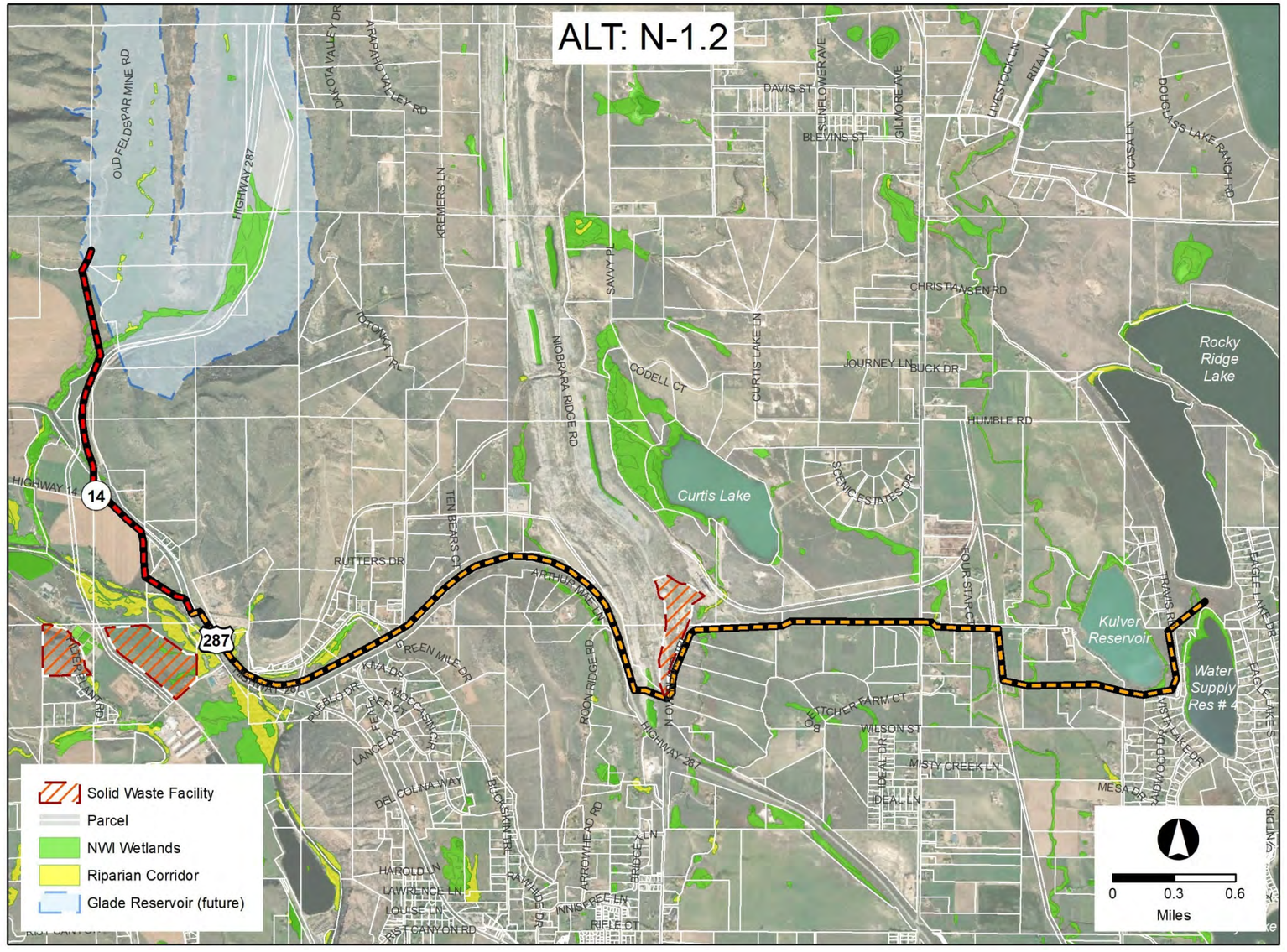


Figure N.3 – Alternative N-1.2

Alternative Name	N-1.3
Alternative Location & Description	This alignment begins on the north side of Hwy 14 approximately 1,500 feet northwest of the intersection with CR 54E. Alignment N-1.3 parallels the north side of Hwy 14 until it crosses the highway just west of the intersection with Green Mile Drive. It then parallels the south side of Hwy 14 until it turns east and southeast through rural residential parcels. It passes over a large rocky hillside which would likely require a long tunnel to make it hydraulically feasible. The alignment then crosses Hwy 14 again as it passes through the steep ridge along current CR 56E, south of the concrete plant and then continues to the north along the east side of CR 56. It continues east paralleling the north side of the Union Pacific Railroad ROW to Taft Hill Road. From there, it heads north and then east where it ends between Water Supply and Storage Reservoir 3 and Reservoir 4.

Criteria	Ranking	Comments
Capital Cost	Red	Estimated cost $23,634,000
Conduit Length	Yellow	Estimated 6.30 miles, 33,261 feet
Easement Difficulty	Red	Estimated 25 parcels crossed
Right-of-Way Impact	Yellow	Alignment is in Hwy 14 ROW for portion
Land Owner Impact	Yellow	About 5 parcels are split.
Proximity to Occupied Dwellings	Yellow	Less than 100 feet from an estimated 2 dwellings
Environmental Impacts	Yellow	Six (6) wetland crossings
Existing Utilities	Yellow	Moderate impact to utilities due to location in ROW for a portion and street crossings
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossings
Surface and Street Impacts	Yellow	Estimated five (5) road crossings.
Traffic Impacts	Yellow	Moderate traffic impacts for section in ROW and road crossings
Water Storage Reservoirs Impacts	Green	Not in the vicinity(less than 100 feet) of water storage reservoir toe dam
Construction Duration and Relative Constructability	Red	Estimated Total Active Days: 380 days Estimated Total Days: 460 days
Required Trenchless Crossing	Red	Five (5) tunnels needed. Highway 14 three times, Rocky ridge and UP RR twice
Development Pressure	Green	No significant development pressure identified
Operation and Maintenance Access	Red	Alignment passes through hard to access areas and is not near roadways for much of the length
O&M Requirements	Red	Significant elevation change through rocky ridge. Tunnel needed. Moderate need for air vac and blow off pairs.
Natural Resources Impacts	Green	Minimal impacts. Some trees impacted along roadway and in wetland crossing

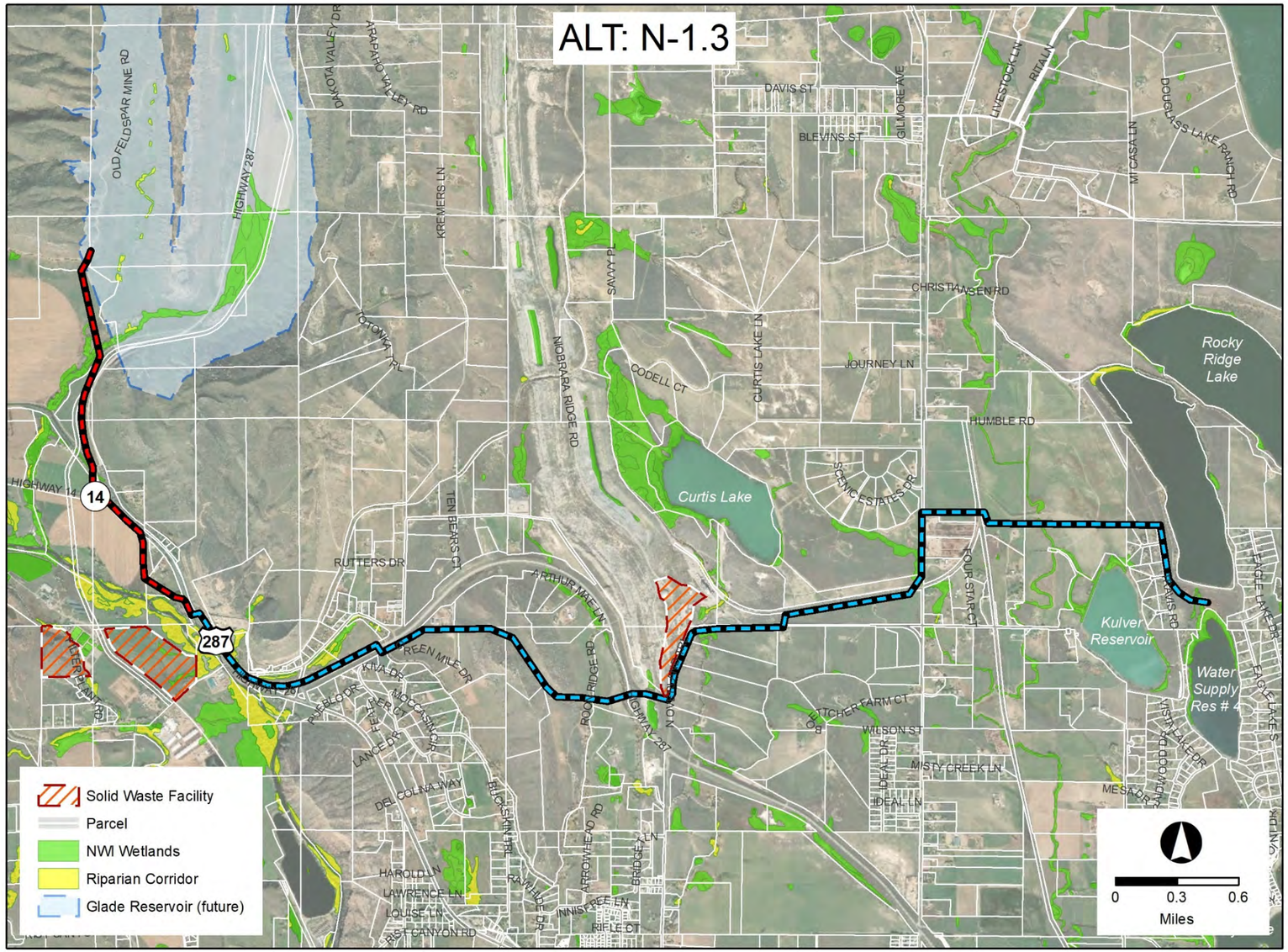


Figure N.4 – Alternative N-1.3

Alternative Name	N-1.4
Alternative Location & Description	This alignment begins on the north side of Hwy 14 approximately 1,500 feet northwest of the intersection with CR 54E. It runs parallel to Hwy 14 until it turns to the east at CR 56E through the steep ridge, south of the concrete plant and then turns south back to Hwy 14. It parallels the north side of Hwy 14 until it reaches what would be an extension of Douglas Road and continues to the east paralleling Douglas Road until it ends at the same longitude as the as the other alignment, between Water Supply and Storage Reservoir 3 and Reservoir 4. This alignment was removed in the initial screening process. This alignment is within the Douglas Road Right-of-Way for the portion of the length. The continuation of this alignment in Project Area 2 impacts an extensive amount of roadway, traffic and landowners. Since the continuation of this alignment is definitely getting removed from screening, there was no purpose to assess this alternative as it does not connect to any other proposed alignment options.

Criteria	Ranking	Comments
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossing		
Development Pressure		
Operation and Maintenance Access		
O&M Requirements		
Natural Resources Impacts		

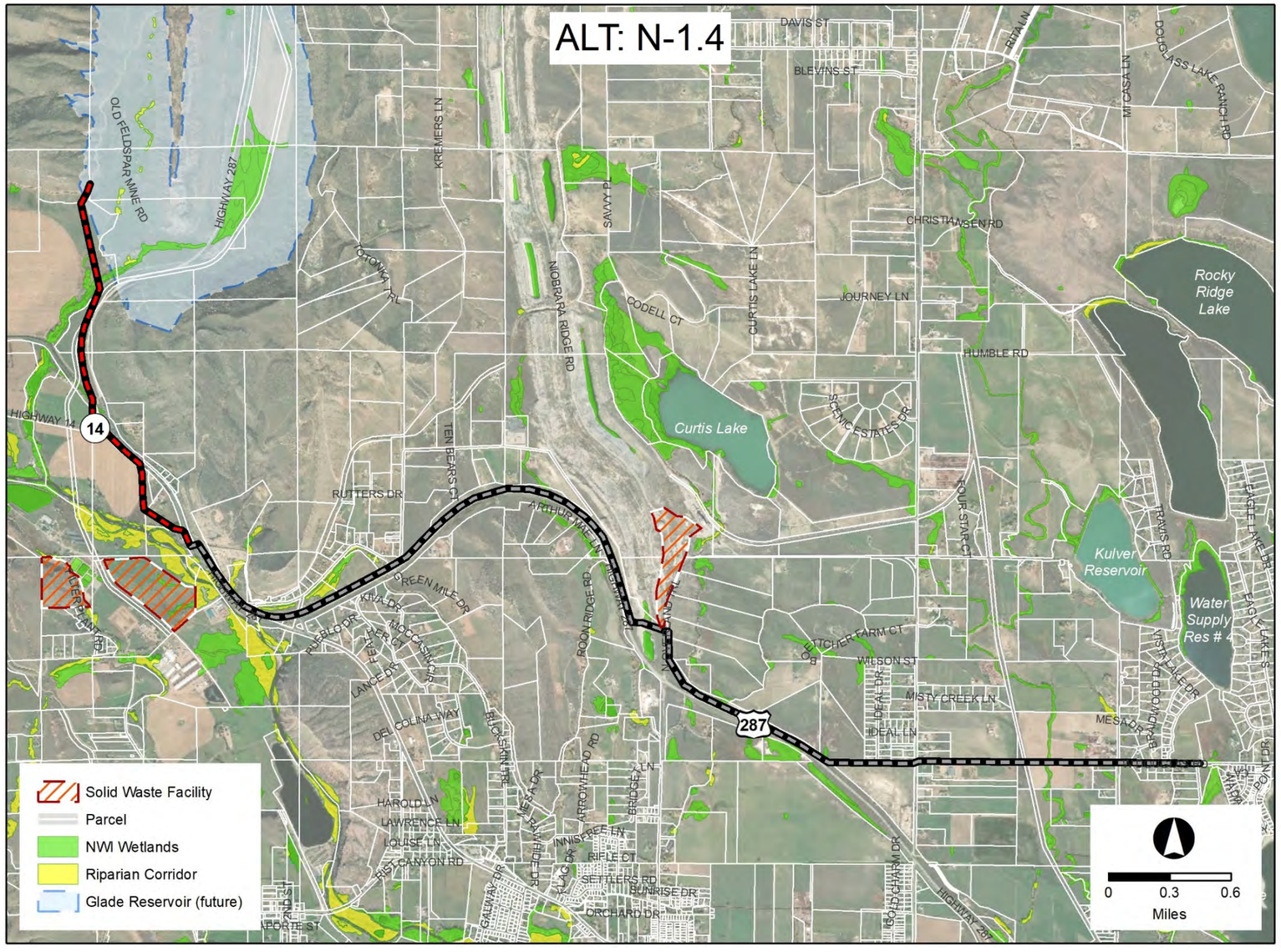


Figure N.5 – Alternative N-1.4

Alternative Name	N-1.5
Alternative Location & Description	This alignment begins on the north side of Hwy 14 approximately 1,500 feet northwest of the intersection with CR 54E. Alignment N-1.5 parallels the north side of Hwy 14 for a section. It turns to the north and follows the east side of CR 23E before turning to the east through the steep ridge. It continues east through the open space north of Curtis Lake and follows along the north side of Humble Road past Taft Hill Road. About a half mile past Taft Hill Road, the alignment veers north and then northeast to skirt the edges of the property lines surrounding the reservoirs. It ends at the same longitude as previous alignments, between Water Supply and Storage Reservoir 3 and Reservoir 4. This alignment was removed in the initial screening process. This is due to the fact that it is significantly longer than other viable alternatives. A longer length means negative hydraulic impacts and more maintenance in the future. The continuation of this alignment is also not considered further due to its excessive roadway, traffic and landowner impacts. Since the continuation of this alignment is definitely getting removed from screening, there was no purpose to assess this alternative as it does not connect to other proposed alignment options.

Criteria	Ranking	Comments
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossing		
Development Pressure		
Operation and Maintenance Access		
O&M Requirements		
Natural Resources Impacts		

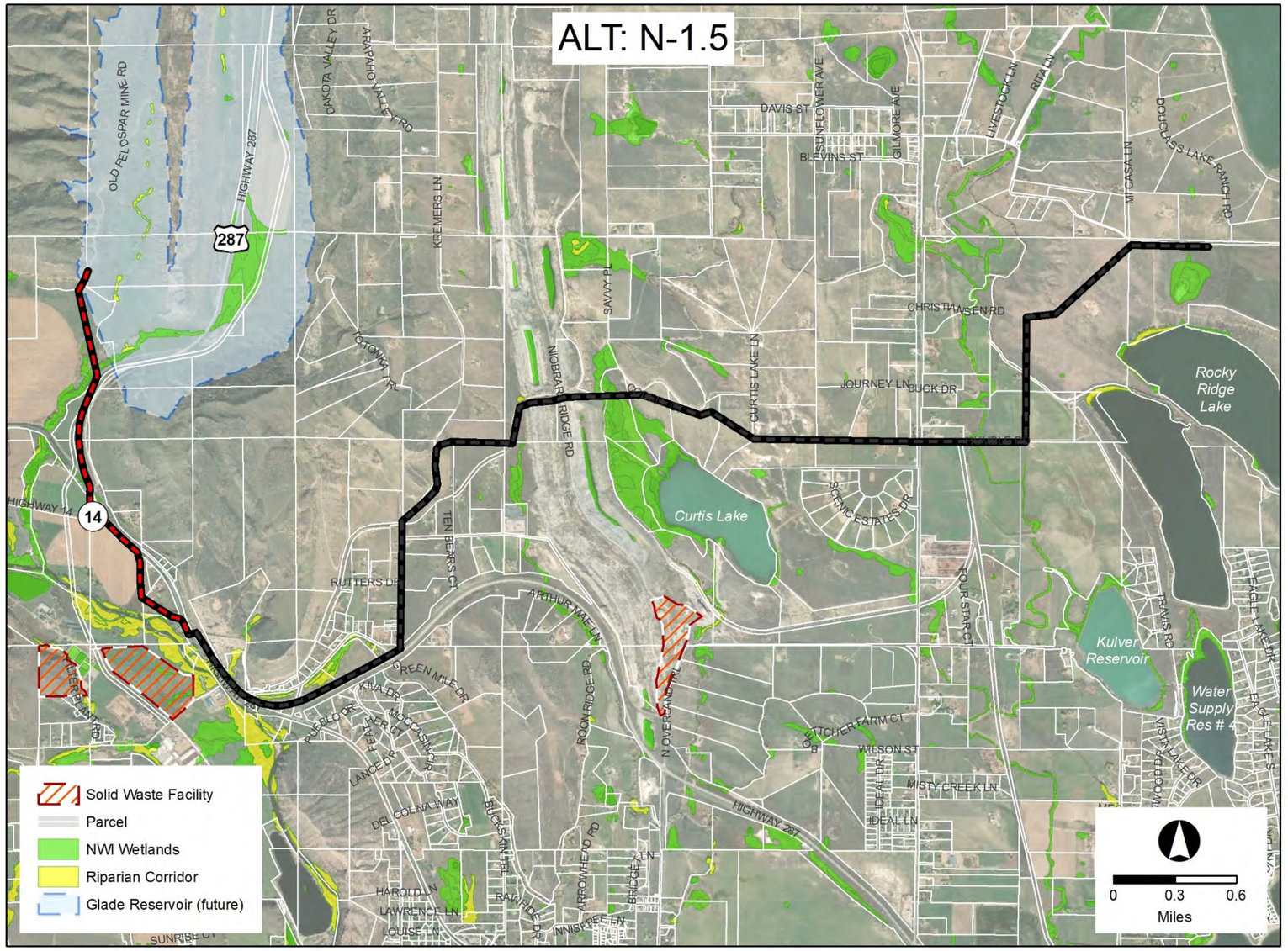


Figure N.6 – Alternative N.1.5

Alternative Name	N-1.6
Alternative Location & Description	This alignment begins on the north side of Hwy 14 approximately 1,500 feet northwest of the intersection with CR 54E. Alignment N-1.6 begins following the south side of Willow Nook Road then continues to the northeast paralleling the South Poudre Canal to CR 23E. It follows the east side of CR 23 E before turning to the east through the steep ridge. It continues east through open space north of Curtis Lake and follows along the north side of Humble Road to Taft Hill Road. About a half mile past Taft Hill Road, the alignment veers north and then northeast to skirt the edges of the property lines surrounding the reservoirs. It ends at the same longitude as previous alignments, between Water Supply and Storage Reservoir 3 and Reservoir 4. This alignment was removed in the initial screening process. The reasons are largely the same as Alternate N-1.5 due to the similarities in their location.

Criteria	Ranking	Comments
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossing		
Development Pressure		
Operation and Maintenance Access		
O&M Requirements		
Natural Resources Impacts		

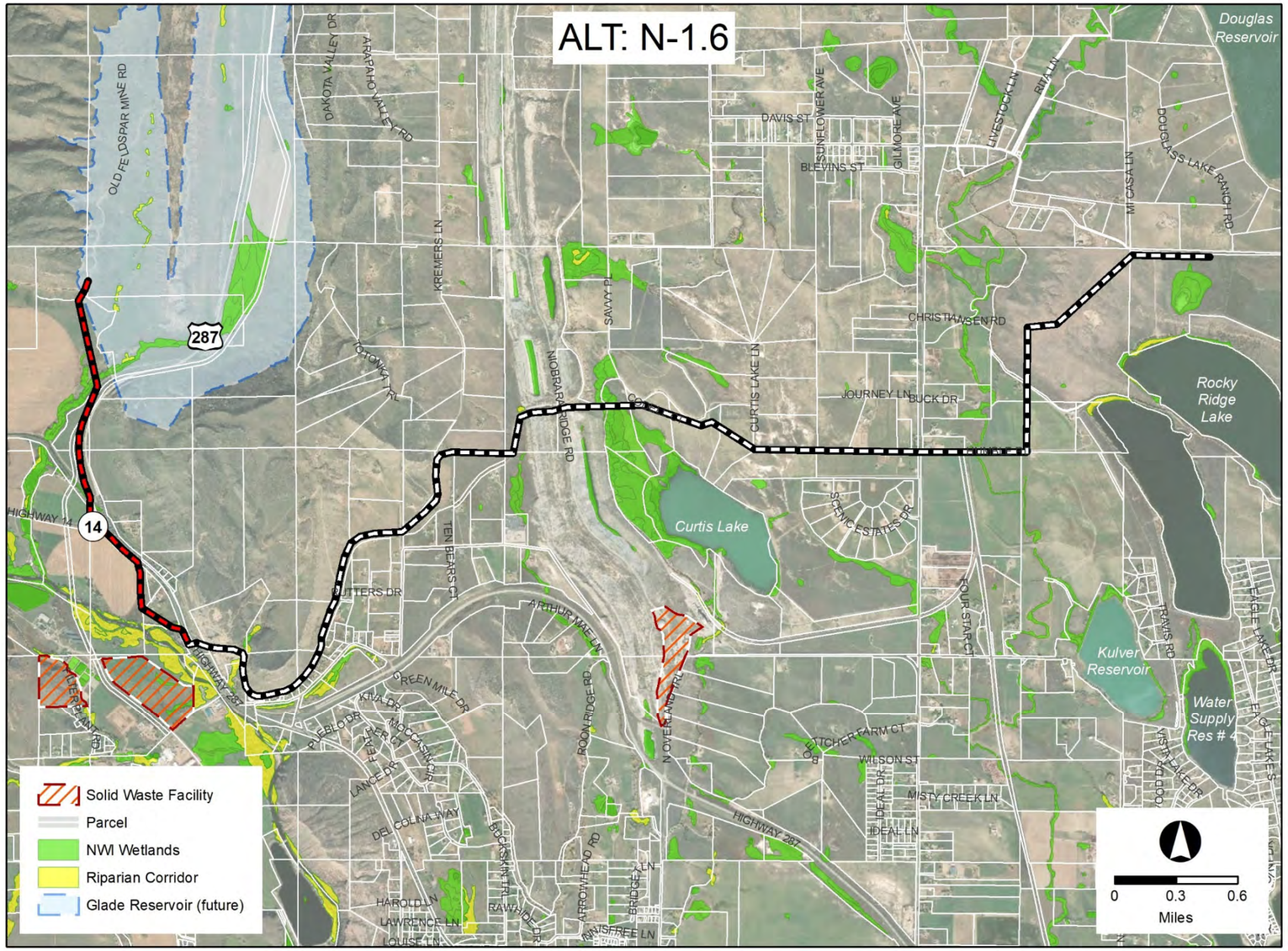


Figure N.7 – Alternative N-1.6

Alternative Name	N-2.1
Alternative Location & Description	Alignment N-2.1 begins in-between Kulver Reservoir and Water Supply Reservoir #4 and then heads northeast in-between Water Supply Reservoir #3 and #4 and north of Dixon Reservoir. It turns south east of Dixon Reservoir before heading east at CR 56. It continues southeast through rural residential and agricultural properties, adjacent to Annex Reservoir #8 to Grey Rock Drive. It turns east and parallels Grey Rock Drive until it crosses Thornton farm diagonally, and then follows CR 54 until the intersection with Giddings Rd.

Criteria	Ranking	Comments
Capital Cost	Green	Estimated cost $13,083,000
Conduit Length	Green	Estimated 4.36 miles, 23,012 feet
Easement Difficulty	Yellow	Estimated 26 parcels crossed
Right-of-Way Impact	Green	Not in ROW for almost all of the alignment, except street crossings and small portion if CR 56 to avoid residences
Land Owner Impact	Yellow	Close to parcels on Eagle Lake Ct and CR 15. Splits parcels north of Dixon Reservoir. Only one parcel with diagonal crossing. Landowner amenable to diagonal crossing
Proximity to Occupied Dwellings	Yellow	Less than 100 feet from an estimated 8 parcels (Eagle Lake Court, CR 15, Grey Rock Dr)
Environmental Impacts	Green	One (1) wetland crossing
Existing Utilities	Green	Minimal impacts to existing utilites because not in public ROW for majority. Only at street crossings
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossings expected
Surface and Street Impacts	Yellow	Estimated eight (8) road crossings and in CR 56 for small portion to avoid residences.
Traffic Impacts	Yellow	Moderate traffic impacts from small section in ROW and road crossings
Water Storage Reservoirs Impacts	Green	Close to the side of Annex Reservoir 8
Construction Duration and Relative Constructability	Green	Estimated Total Active Days: 94 Estimated Total Days: 174
Required Trenchless Crossing	Yellow	One (1) (Highway 1)
Development Pressure	Green	No development pressure expected
Operation and Maintenance Access	Yellow	Moderate access, both close and far proximity to roadways
O&M Requirements	Green	Relatively moderate amount of air vac and blow off pairs
Natural Resources Impacts	Green	Minimal-moderate impact. A few tree areas affected

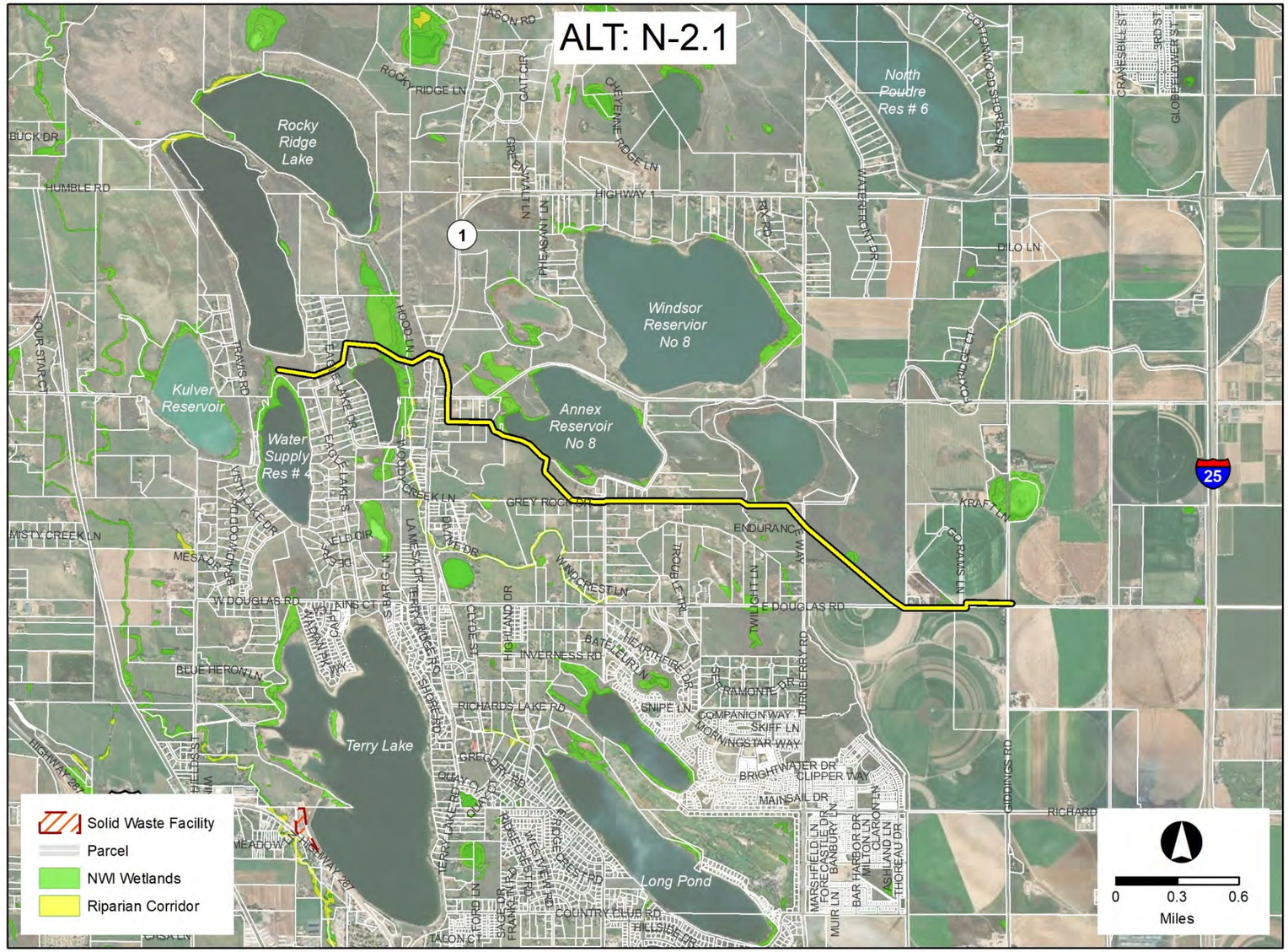


Figure N.8 – Alternative N-2.1

Alternative Name	N-2.2
Alternative Location & Description	Alignment N-2.2 begins between the toe of Water Supply Reservoir #3 dam and the north shore of Water Supply Reservoir #4. It then turns north along the east shore of Reservoir #3 and the back of rural residential lots. It turns east beyond the residential lots to Hood Lane and heads south on the west side of Hood Lane. It turns to the east in between Windsor Reservoir #8 dam and the north shore of Annex Reservoir Number 8 to CR 56. It continues east down CR 56 until the intersection with Giddings Road.

Criteria	Ranking	Comments
Capital Cost	Yellow	Estimated cost $13,435,000
Conduit Length	Yellow	Estimated 4.44 miles, 23,417 feet
Easement Difficulty	Green	Estimated 17 parcels crossed
Right-of-Way Impact	Green	Not in ROW for almost all of the alignment, except street crossings
Land Owner Impact	Yellow	Estimated 2 parcels split. In backyard of residences
Proximity to Occupied Dwellings	Green	Less than 100 feet from an estimated 2 parcels (Eagle Lake Drive)
Environmental Impacts	Yellow	Two (2) wetland crossings
Existing Utilities	Green	Minimal impacts to existing utilities because not in public ROW for majority. Only at street crossings
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossings expected
Surface and Street Impacts	Yellow	Estimated seven (7) road crossings.
Traffic Impacts	Yellow	Moderate traffic impacts from road crossings
Water Storage Reservoirs Impacts	Yellow	Less than 100 feet from side of Storage Reservoir 3. Less than 100 feet from edge of Annex Reservoir 8
Construction Duration and Relative Constructability	Yellow	Estimated Total Active Days: 99 Estimated Total Days: 179
Required Trenchless Crossing	Yellow	1 (Highway 1)
Development Pressure	Green	No development pressure expected
Operation and Maintenance Access	Yellow	Moderate access, both close and far proximity to roadways
O&M Requirements	Green	Relatively moderate amount of air vac and blow off pairs
Natural Resources Impacts	Yellow	Moderate impact, some trees affected

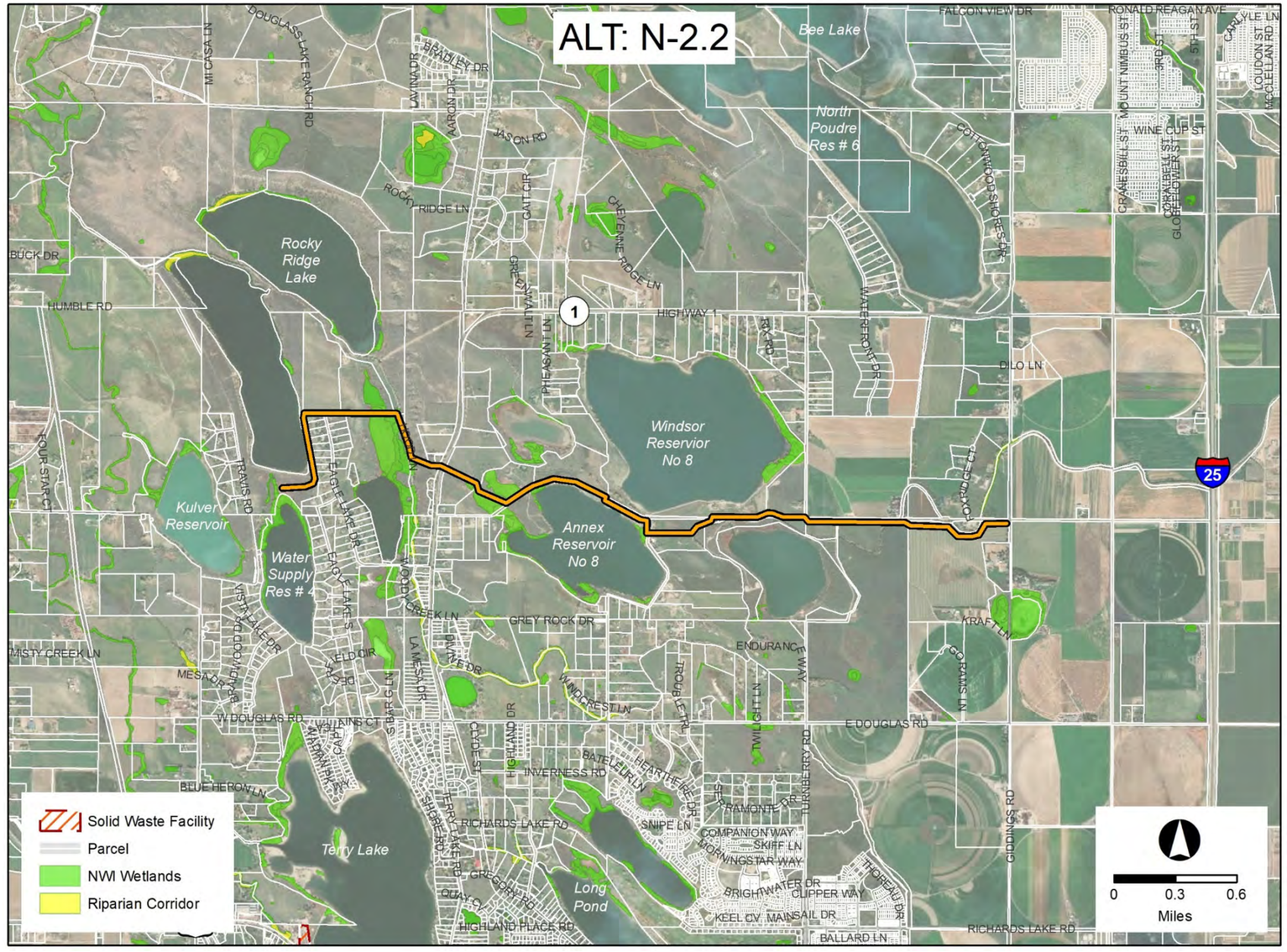


Figure N.9 – Alternative N-2.2

Alternative Name	N-2.3
Alternative Location & Description	Alignment N-2.3 to very similar to N-2.2 with modifications to the alignment from Hood Lane to Windsor Reservoir to achieve better performance in the evaluation criteria.

Criteria	Ranking	Comments
Capital Cost	Yellow	Estimated cost $13,116,000
Conduit Length	Green	Estimated 4.32 miles, 22,819 feet
Easement Difficulty	Green	Estimated 15 parcels crossed
Right-of-Way Impact	Green	Not in ROW for almost all of the alignment, except street crossings
Land Owner Impact	Yellow	Estimated 3 parcels split. In backyard of residences
Proximity to Occupied Dwellings	Green	Less than 100 feet from an estimated 2 parcels (Eagle Lake Drive)
Environmental Impacts	Green	1 wetland crossing
Existing Utilities	Green	Minimal impacts to existing utilities because not in public ROW for majority. Only at street crossings
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossings expected
Surface and Street Impacts	Yellow	7 road crossings. 21 crew days for crossings
Traffic Impacts	Yellow	Moderate traffic impacts from road crossings
Water Storage Reservoirs Impacts	Yellow	Less than 100 feet from side of Storage Reservoir 3. Less than 100 feet from edge of Annex Reservoir 8. Close to North Poudre Reservoir 10
Construction Duration and Relative Constructability	Yellow	Estimated Total Active Days: 97 Estimated Total Days: 177
Required Trenchless Crossing	Yellow	1 (Highway 1)
Development Pressure	Green	No development pressure expected
Operation and Maintenance Access	Yellow	Moderate access, both close and far proximity to roadways
O&M Requirements	Green	Relatively moderate amount of air vac and blow off pairs
Natural Resources Impacts	Yellow	Moderate impact, some trees affected

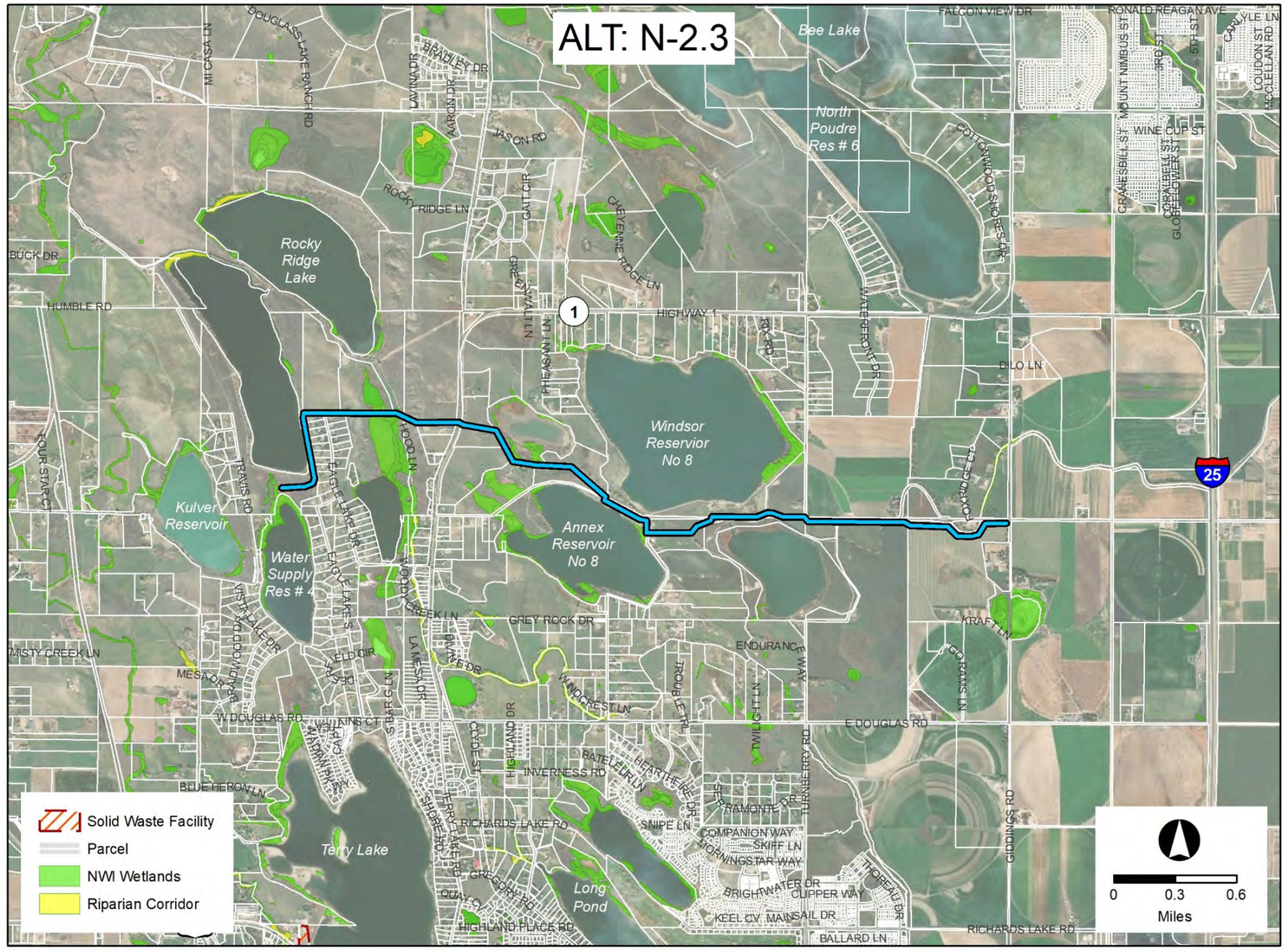


Figure N.10 – Alternative N-2.3

Alternative Name	N-2.4
Alternative Location & Description	Alignment N-2.4 begins at the same longitude as previous alignments ended, between Water Supply and Storage Reservoir 3 and Reservoir 4, but further south, along Douglas Road. It continues east following Douglas Road to Giddings Road. This alignment was removed in the initial screening process. This alignment is within the Douglas Road Right-of-Way for the majority of the length. It also causes an extensive amount of landowner impact due to the number of parcels it is nearby and road closures. It would be much more expensive to construct due to extended construction duration caused by proximity to existing dwellings, cost of easements and utility relocation.

Criteria	Ranking	Comments
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossing		
Development Pressure		
Operation and Maintenance Access		
O&M Requirements		
Natural Resources Impacts		

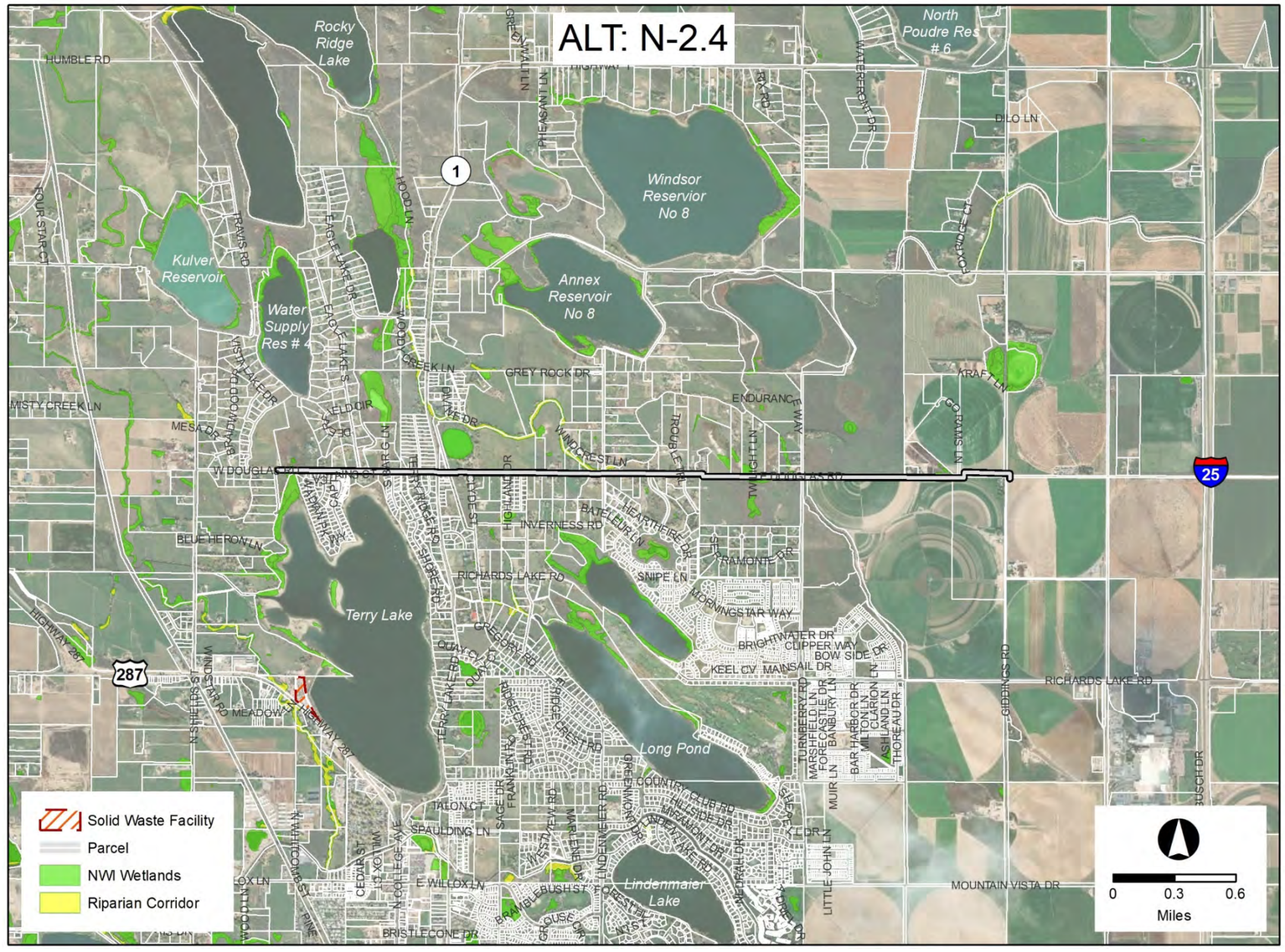


Figure N.11 – Alternative N-2.4

Alternative Name	N-2.5
Alternative Location & Description	Alignment N-2.5 begins at the same longitude as previous alignments ended, between Water Supply and Storage Reservoir 3 and Reservoir 4, but further north, north of Rocky Ridge Lake Reservoir 1. It then begins by turning east around Rocky Ridge Lake through rural residential and agricultural properties to Terry Lake Road. It continues to follow the west side of Terry Lake Road to the south before turning east at CR 58. It continues east down CR 58 and then turns south at CR 11. It continues south down CR 11 and then south east through agricultural and rural residential properties to Giddings Road. This alignment was removed in the initial screening process. This alignment has a significantly longer length than any other alternative in this Project Area. The alignment also passes through a highly urban area along CR 58, which also contributed to the fatal flaw assessment. Additionally, the extended length would contribute to higher maintenance costs. There was no need to consider this alternative further when there are other shorter, viable options which will impact less landowners and require less maintenance.

Criteria	Ranking	Comments
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossing		
Development Pressure		
Operation and Maintenance Access		
O&M Requirements		
Natural Resources Impacts		

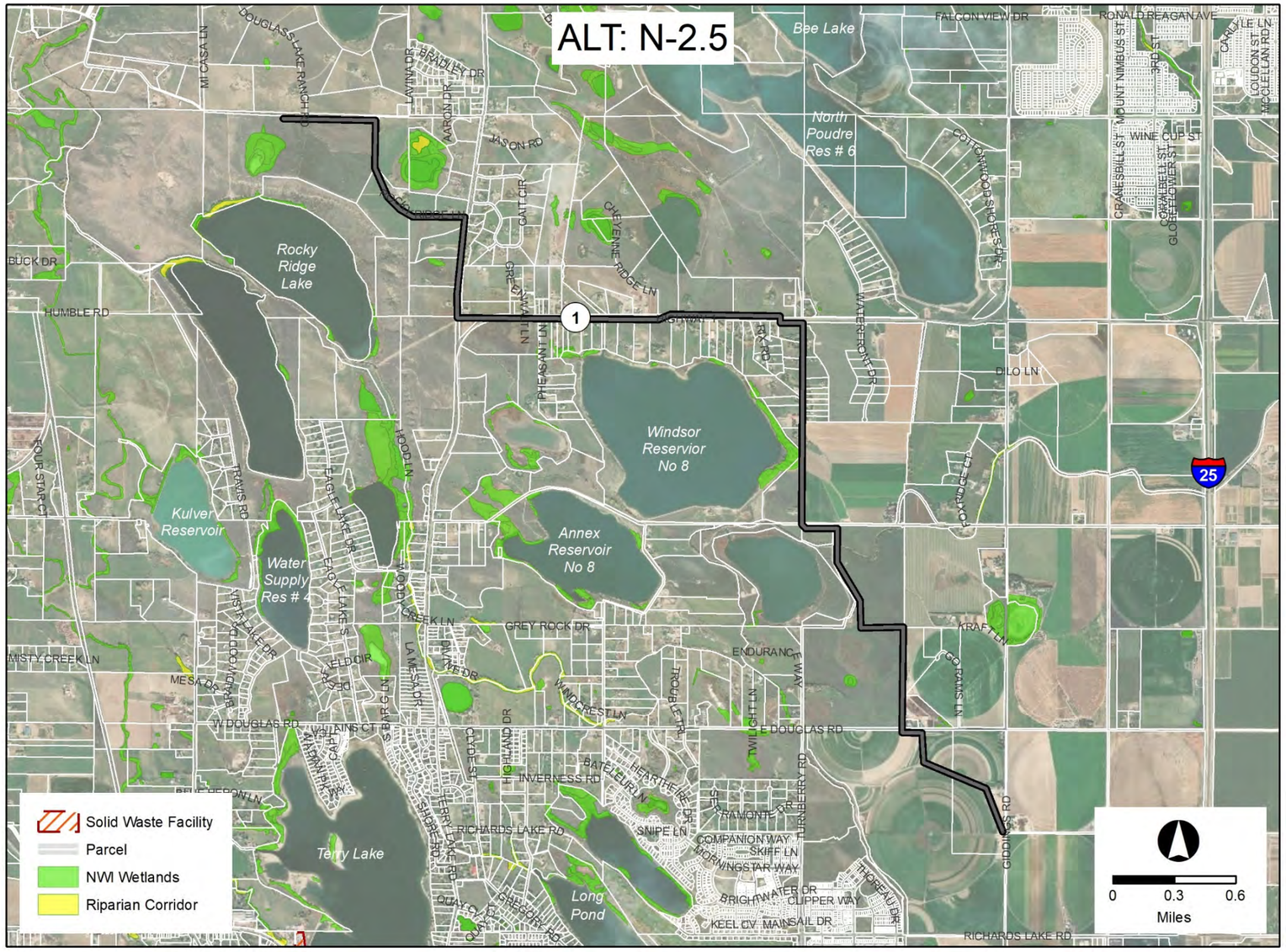


Figure N.12 – Alternative N-2.5

Alternative Name	N-3.1
Alternative Location & Description	Alignment N-3.2 begins at the Giddings Road and CR 54 intersection and continues east following CR 54 for a mile before heading southeast through agricultural property. It then heads south until reaching CR 52, which it follows until the intersection with CR 1.

Criteria	Ranking	Comments
Capital Cost	Green	Estimated cost $14,203,000
Conduit Length	Green	4.64 miles, 24,515 feet
Easement Difficulty	Green	Estimated 11 parcels crossed. Majority rural
Right-of-Way Impact	Yellow	CR 52 ROW for small section to avoid residences
Land Owner Impact	Yellow	Only one parcel with diagonal crossing. Landowner amenable to diagonal crossing. Close to residences on CR 52
Proximity to Occupied Dwellings	Yellow	Less than 100 feet from an estimated 4 dwellings (CR 52)
Environmental Impacts	Green	No wetland crossings
Existing Utilities	Green	Minimal impacts to existing utilities because not in public ROW for majority. Only at street crossings
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossings expected
Surface and Street Impacts	Yellow	Five (5) road crossings. In CR 52 ROW for small section to avoid residences. 15 crew days for crossings
Traffic Impacts	Yellow	Moderate traffic impacts from small section in ROW and road crossings
Water Storage Reservoirs Impacts	Green	No impact to water storage reservoir expected
Construction Duration and Relative Constructability	Green	Estimated Total Active Days: 119 days Estimated Total Days: 199 days
Required Trenchless Crossing	Yellow	Two (2) (I-25 and BNSF), 375 LF
Development Pressure	Green	No development pressure expected
Operation and Maintenance Access	Green	Decent access. Near roadways for large portions
O&M Requirements	Green	Between 3-5 pairs
Natural Resources Impacts	Green	Minimal impacts. Some residential trees impacted

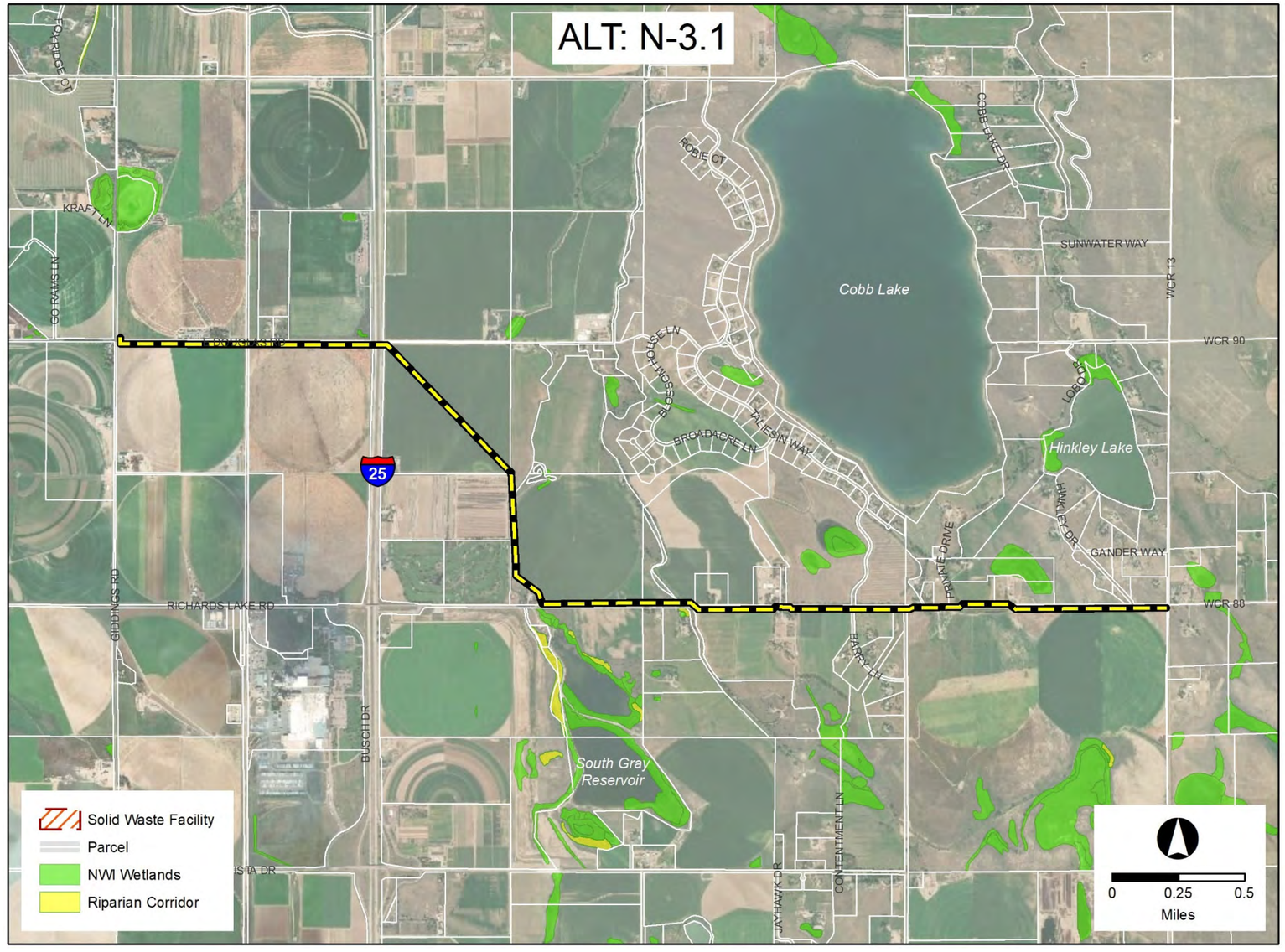


Figure N.13 – Alternative N-3.1

Alternative Name	N-3.2
Alternative Location & Description	Alignment N-3.2 begins at the Giddings Road and CR 56 intersection and continues east following CR 56 for a half mile before heading south and then east through agricultural property toward Cobb Lake. It then heads south and then southeast through rural residential parcels in a currently expanding development to CR 52. It turns east following CR 52 until it intersects with CR 1.

Criteria	Ranking	Comments
Capital Cost	Red	Estimated cost $16,828,000
Conduit Length	Red	5.49 miles, 28,978 feet
Easement Difficulty	Yellow	Estimated 15 parcels crossed. Passes through development
Right-of-Way Impact	Yellow	Not in ROW, but would likely need to be for sections to avoid residences
Land Owner Impact	Red	Passes through development. Very close or in parcels. Close to residences on CR 52
Proximity to Occupied Dwellings	Yellow	Less than 100 feet from an estimated 3 dwellings (CR 52)
Environmental Impacts	Green	No wetland crossings
Existing Utilities	Green	Minimal impacts to existing utilities because not in public ROW for majority. Only at street crossings
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossings expected
Surface and Street Impacts	Yellow	5 road crossings. Two to be constructed. 15 crew days for crossings
Traffic Impacts	Yellow	Moderate traffic impacts from small section likely to be in ROW and road crossings
Water Storage Reservoirs Impacts	Green	No impact to water storage reservoir expected
Construction Duration and Relative Constructability	Red	Estimated Total Active Days: 141 days Estimated Total Days: 221 days
Required Trenchless Crossing	Yellow	2 (I-25 and BNSF), 375 LF
Development Pressure	Yellow	Passes through development
Operation and Maintenance Access	Red	Difficult access. Not near major roadways for large portions
O&M Requirements	Red	Between 3-5 pairs. Significantly longer length equates to more maintenance
Natural Resources Impacts	Green	Minimal impacts. Some residential trees impacted

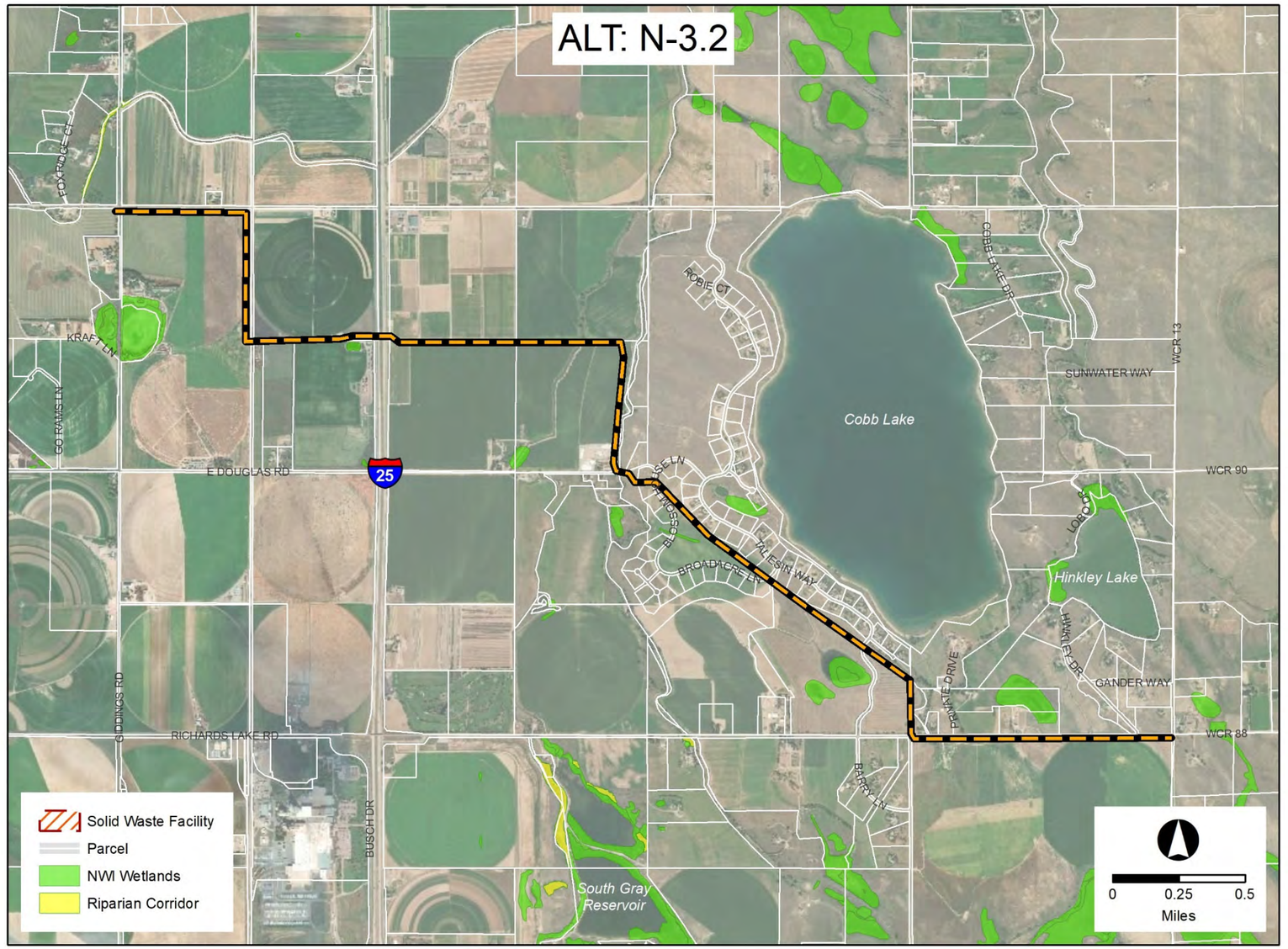


Figure N.14 – Alternative N-3.2

Alternative Name	N-3.3
Alternative Location & Description	Alignment N-3.3 begins at the Giddings Road and CR 54 intersection. It then heads east following CR 54 toward Cobb Lake. It turns south at Blossom House Lane through agricultural properties to CR 52. It then heads east following CR 52 to the intersection with CR 1.

Criteria	Ranking	Comments
Capital Cost	Yellow	Estimated cost $14,842,000
Conduit Length	Yellow	4.84 miles, 25,538 feet
Easement Difficulty	Green	Estimated 12 parcels crossed. Majority rural
Right-of-Way Impact	Yellow	Not in ROW, but would likely need to be for sections to avoid residences
Land Owner Impact	Yellow	Close to residences on CR 52
Proximity to Occupied Dwellings	Yellow	Less than 100 feet from an estimated 4 dwellings (CR 52)
Environmental Impacts	Green	No wetland crossings
Existing Utilities	Green	Minimal impacts to existing utilities because not in public ROW for majority. Only at street crossings
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossings expected
Surface and Street Impacts	Yellow	6 road crossings. 18 crew days for crossings
Traffic Impacts	Yellow	Moderate traffic impacts from small section likely to be in ROW and road crossings
Water Storage Reservoirs Impacts	Green	No impact to water storage reservoir expected
Construction Duration and Relative Constructability	Yellow	Estimated Total Active Days: 124 days Estimated Total Days: 204 days
Required Trenchless Crossing	Yellow	2 (I-25 and BNSF), 375 LF
Development Pressure	Green	No development pressure expected
Operation and Maintenance Access	Yellow	Moderate access, both close and far proximity to roadways
O&M Requirements	Green	Between 3-5 pairs
Natural Resources Impacts	Green	Minimal impacts. Some residential trees impacted

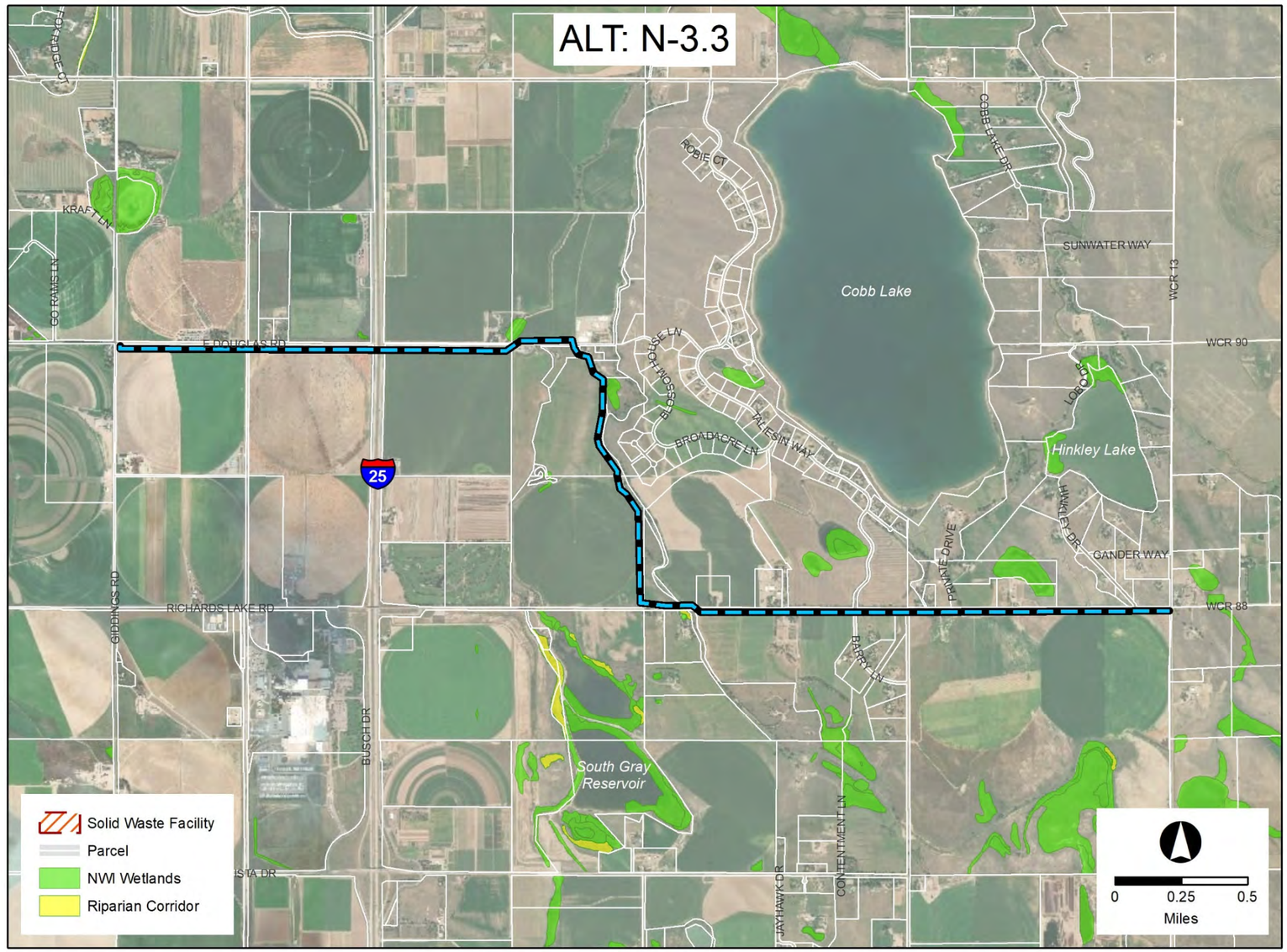


Figure N.15 – Alternative N-3.3

Alternative Name	N-3.4
Alternative Location & Description	Alignment 3D begins at the Giddings Road a half of a mile south of the CR 54 intersection and continues east through agricultural properties toward Cobb Lake. A half mile east of I-25 it heads south and then south east through agricultural properties to CR 50. It turns east at CR 50 through State of Colorado property to CR1. From there, it heads north to end at the same intersection as the previous alignments, CR 1 and CR 52.

Criteria	Ranking	Comments
Capital Cost	Red	Estimated cost $17,460,000
Conduit Length	Red	5.90 miles, 31,148 feet
Easement Difficulty	Green	Estimated 11 parcels crossed. Majority rural
Right-of-Way Impact	Green	Avoids public ROW for almost entire length
Land Owner Impact	Yellow	Splits two parcels near canal. Would need to avoid pig farm
Proximity to Occupied Dwellings	Green	Less than 100 feet from an estimated 1 dwellings (pig farm)
Environmental Impacts	Yellow	1 wetland crossing
Existing Utilities	Green	Minimal impacts to existing utilities because not in public ROW for majority. Only at street crossings
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossings expected
Surface and Street Impacts	Green	2 road crossings. 6 crew days for crossings
Traffic Impacts	Green	Minimal to no traffic impacts
Water Storage Reservoirs Impacts	Green	No impact to water storage reservoir expected
Construction Duration and Relative Constructability	Red	Estimated Total Active Days: 139 Estimated Total Days: 219
Required Trenchless Crossing	Yellow	Two (2) (I-25 and BNSF), 375 LF
Development Pressure	Green	No development pressure expected
Operation and Maintenance Access	Red	Difficult access. Not near major roadways
O&M Requirements	Red	Between 3-5 pairs. Significantly longer length equates to more maintenance
Natural Resources Impacts	Green	Minimal impacts. Some residential trees impacted

Figure N.16 – Alternative N-3.4

Table N.1 is a visual summary of the score given to every alternative for each criteria. **Table N.2** tabulates the number of greens, yellows, and reds given to each alternative.

Table N.1 – Visual Summary of Alternative Scoring

Evaluation Criteria	N-1.1	N-1.2	N-1.3	N-1.4	N-1.5	N-1.6	N-2.1	N-2.2	N-2.3	N-2.4	N-2.5	N-3.1	N-3.2	N-3.3	N-3.4
Capital Cost															
Conduit Length															
Easement Difficulty/Cost															
Use of Right-of-Way															
Land Owner Impact															
Proximity to Occupied Dwelling															
Environmental Impacts															
Existing Utilities															
Hazardous/Permitted Crossings															
Surface and Street Impacts															
Traffic Impacts															
Impacts to Water Storage Reservoirs															
Construction Duration and Relative Constructability															
Required Trenchless Crossings															
Development Pressure															
Operation and Maintenance (O&M) Access															
O&M Requirements															
Natural Area Impacts															

Table N.2 – Numeric Summary of Alternative Scoring

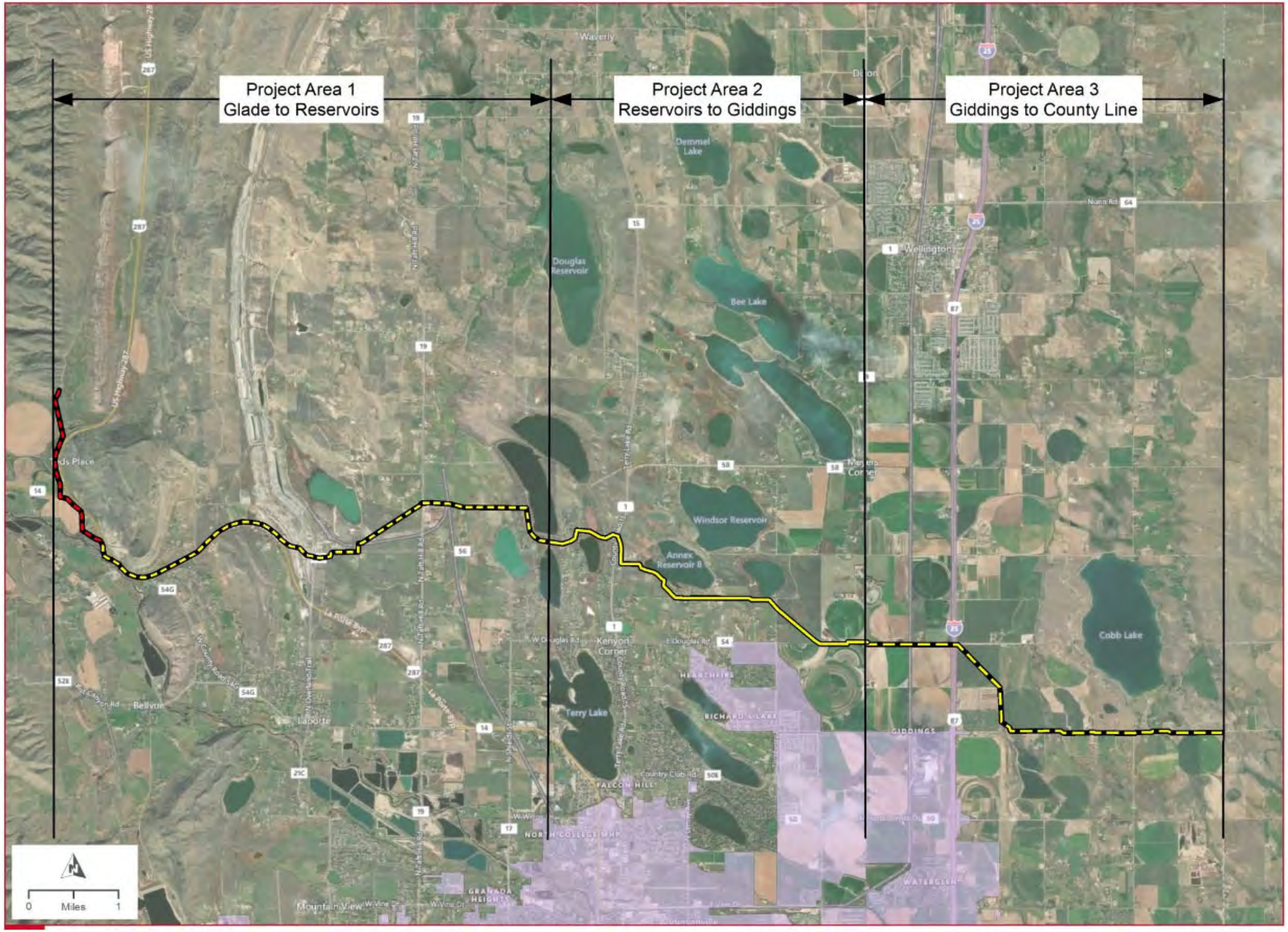
Evaluation Criteria	N-1.1	N-1.2	N-1.3	N-1.4	N-1.5	N-1.6	N-2.1	N-2.2	N-2.3	N-2.4	N-2.5	N-3.1	N-3.2	N-3.3	N-3.4
Red	0	5	6	-	-	-	0	0	0	-	-	0	6	0	5
Yellow	11	9	8	-	-	-	7	11	9	-	-	6	7	10	3
Green	7	4	4	-	-	-	11	7	9	-	-	12	5	8	10

PREFERRED ALIGNMENT

The preferred alignment consists of a combination of Alternate N-1.1, N-2.1 and N-3.1. **Table N.3** below summarizes the estimated features of the overall Preferred Alignment, broken down by Project Area segments. In the case of a tie, alternates were evaluated and the winner was selected based upon prioritization of factors, mainly cost and length.

Table N.3 – Preferred Alignment Characteristics

Characteristic	Common Segment	N-1.1	N-2.1	N-3.1	TOTAL
Pipe Diameter (inches)	54	54	54	54	**54**
Pipe Material	Mortar Lined Steel	Mortar Lined Steel	Mortar Lined Steel	Mortar Lined Steel	**Mortar Lined Steel**
Total Distance (miles)	2.1	6.0	4.4	4.6	**17.0**
Approximate Pipe Cost	$6,000,000	$19,048,000	$13,083,000	$14,203,000	**$52,334,000**
Length Tunnel (feet)	0	800	150	350	**1,300**
Estimated Number of Landowners	14	18	26	11	**69**
Number of Wetland Crossings	2	6	1	0	**9**



PREFERRED ALTERNATIVES NORTHERN TIER

Fort Collins City Boundary

Project Area 1

Common Segment

N-1.1

Project Area 2

N-2.1

Project Area 3

N-3.1

DATA SOURCES: Northern Water, Larimer County, HDR

Figure N.17 – Northern Tier Preferred Alignment

Northern Integrated Supply Project

County Line Road Delivery Pipeline Alternatives Analysis

May 2019

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ROUTE COMPARISONS

Each of the alternatives developed was subjected to the evaluation criteria and metrics described in **Table 1** in the introduction. The County Line segment was broken into 5 Project Areas, which made for easier comparison of alternatives. The Project Areas also enabled the project team to look at combinations of alternatives for each Project Area and facilitated a thorough analysis for the final Preferred Alignment.

An overview of all of the Project Areas and the alternative options can be seen in **Figure C.1**. Detailed fact sheets for each alternative alignment compare its performance against the evaluation criteria and figures illustrating each individual alignment alternative are provided on the following pages. Included on the fact sheet for each alternate is a table demonstrating the ranking assigned for each criterion. In the end, the alternate with the best overall performance (least reds, most greens) was chosen to be the Preferred Alternate. This Preferred County Line Alignment can be seen in **Figure C.17** at the end of this document.

In total, two (2) alternates were assessed for Project Area 1, one (1) alignment alternate was assessed for Project Areas 2 and 3, and two (2) alignment alternates were assessed for Project Areas 4 and 5. Project Areas 2 and 3 are two pieces of the same alignment that has no compatible alternative and were broken in two for readability/resolution for discussion in this report. Similarly, Project Areas 4 and 5 are also two pieces of the same alignment that were broken in two for readability/resolution, but contain two different alternatives for each area.

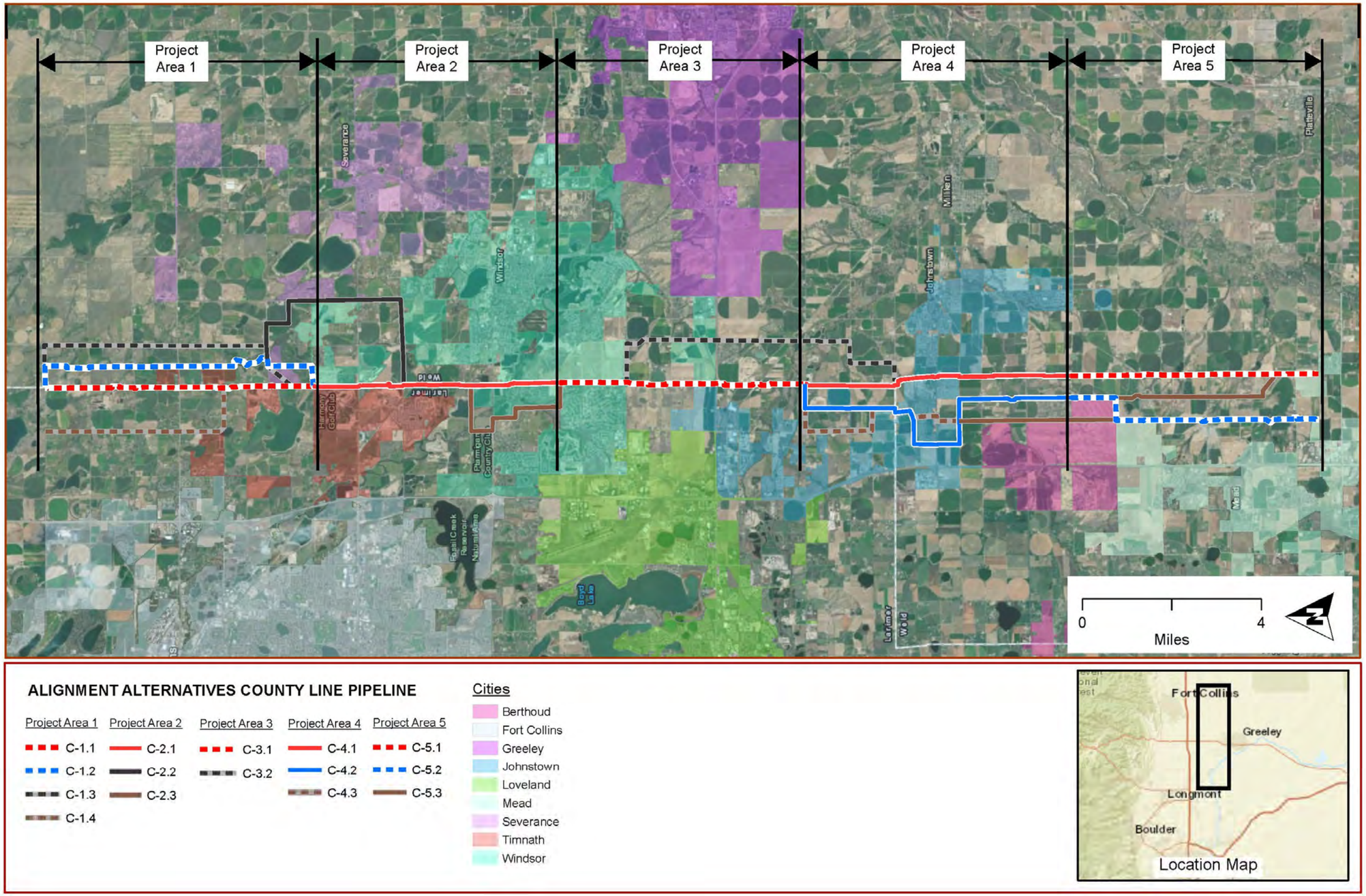

Figure C.1 – County Line Road Delivery Pipeline Project Areas and Alternatives

Alternative Name	C-1.1
Alternative Location & Description	County Line Alternative C-1.1 begins at the intersection of CR 52 and CR 13 and heads south paralleling the west side of CR 13. It traverses through a combination of agricultural, rural residential, and subdivision properties, crossing CR 13 three times throughout this reach. Moving south the alignment crosses Hwy 14, passes Timnath Reservoir, and ends at the intersection of CR 13 and CR 40.

Criteria	Ranking	Comments
Capital Cost	Green	$17,745,200
Conduit Length	Green	6.10 miles, 32,205 feet
Easement Difficulty	Yellow	28 parcels crossed, 0 split parcels
Right-of-Way Impact	Green	Mostly in private easements, traverses ROW at 8 road crossings
Land Owner Impact	Yellow	6 driveway crossings, 2 split parcels
Proximity to Occupied Dwellings	Green	Minimal, within 100-feet of 2 occupied dwellings
Environmental Impacts	Red	2,460 LF of wetlands
Existing Utilities	Yellow	More CR 13 road utilities, will cause more alignment shift into developed land
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossings known
Surface and Street Impacts	Green	Minimal construction under roadways, impact at 8 road crossings expected
Traffic Impacts	Yellow	Moderate traffic impacts expected due proximity to CR 13, additional impact likely at 8 road crossings
Water Storage Reservoirs Impacts	Yellow	Possible impacts to Timnath Reservoir outfall infrastructure
Construction Duration and Relative Constructability	Yellow	Traverses more constrained areas which will impact production rates. High groundwater in Timnath Reservoir area
Required Trenchless Crossing	Yellow	Hwy 14 (CDOT), 7 paved (county road) crossings
Development Pressure	Red	Moderate, high development pressure expected from subdivisions construction
Operation and Maintenance Access	Green	Convenient access due to proximity to roads
O&M Requirements	Yellow	Equal amounts of air vac and blow off pairs required
Natural Resources Impacts	Green	Minimal, land mostly subdivisions or agriculture avoiding natural areas

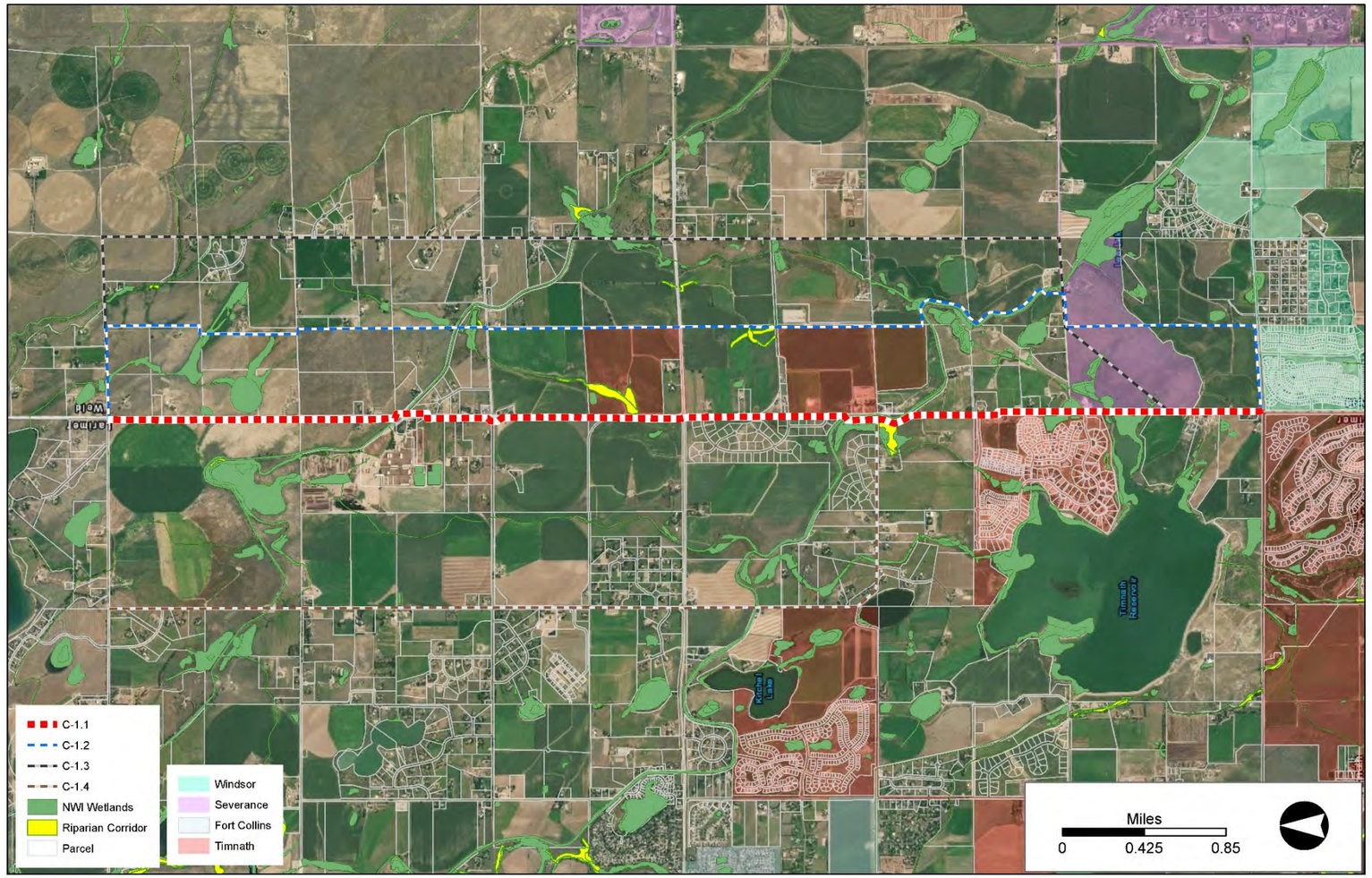

Figure C.2 – Alternative C-1.1

Alternative Name	C-1.2
Alternative Location & Description	County Line Alternative C-1.2 begins at the intersection of CR 52 and CR 13 and runs east paralleling the south side of CR 52 for about 2,500 feet before heading south through agricultural fields along parcel boundaries. Continuing south the alignment runs into a canal near Smith Reservoir, it parallels the canal until it approaches CR 78 where it crosses to the south side and continues through more agricultural fields until it meets CR 40. The alignment then turns west paralleling the north side of CR 40 until ending at the intersection of CR 13 and CR 40.

Criteria	Ranking	Comments
Capital Cost	Red	$19,266,800
Conduit Length	Yellow	7.38 miles, 38,991 feet
Easement Difficulty	Green	20 parcels crossed, 0 split parcels
Right-of-Way Impact	Green	Mostly in private easements, traverses ROW at 6 road crossings
Land Owner Impact	Yellow	2 driveway crossings, 3 split parcels
Proximity to Occupied Dwellings	Green	Minimal, within 100-feet of 2 occupied dwellings
Environmental Impacts	Yellow	1,565 LF of wetlands
Existing Utilities	Green	Less utilities expected due to proximity to roadways
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossings known
Surface and Street Impacts	Green	Minimal construction under roadways, impact at 6 road crossings expected
Traffic Impacts	Green	Minimal traffic impacts expected, most impact expected at 6 road crossings
Water Storage Reservoirs Impacts	Green	No impacts expected
Construction Duration and Relative Constructability	Yellow	Alignment is longer in length but traverses more rural/open areas for higher production rates
Required Trenchless Crossing	Green	Hwy 14 (CDOT), 5 paved (county road) crossings
Development Pressure	Green	Minimal
Operation and Maintenance Access	Red	Difficult access, does not parallel roads
O&M Requirements	Yellow	Equal amounts of air vac and blow off pairs required
Natural Resources Impacts	Green	Minimal, land mostly agriculture avoiding natural areas

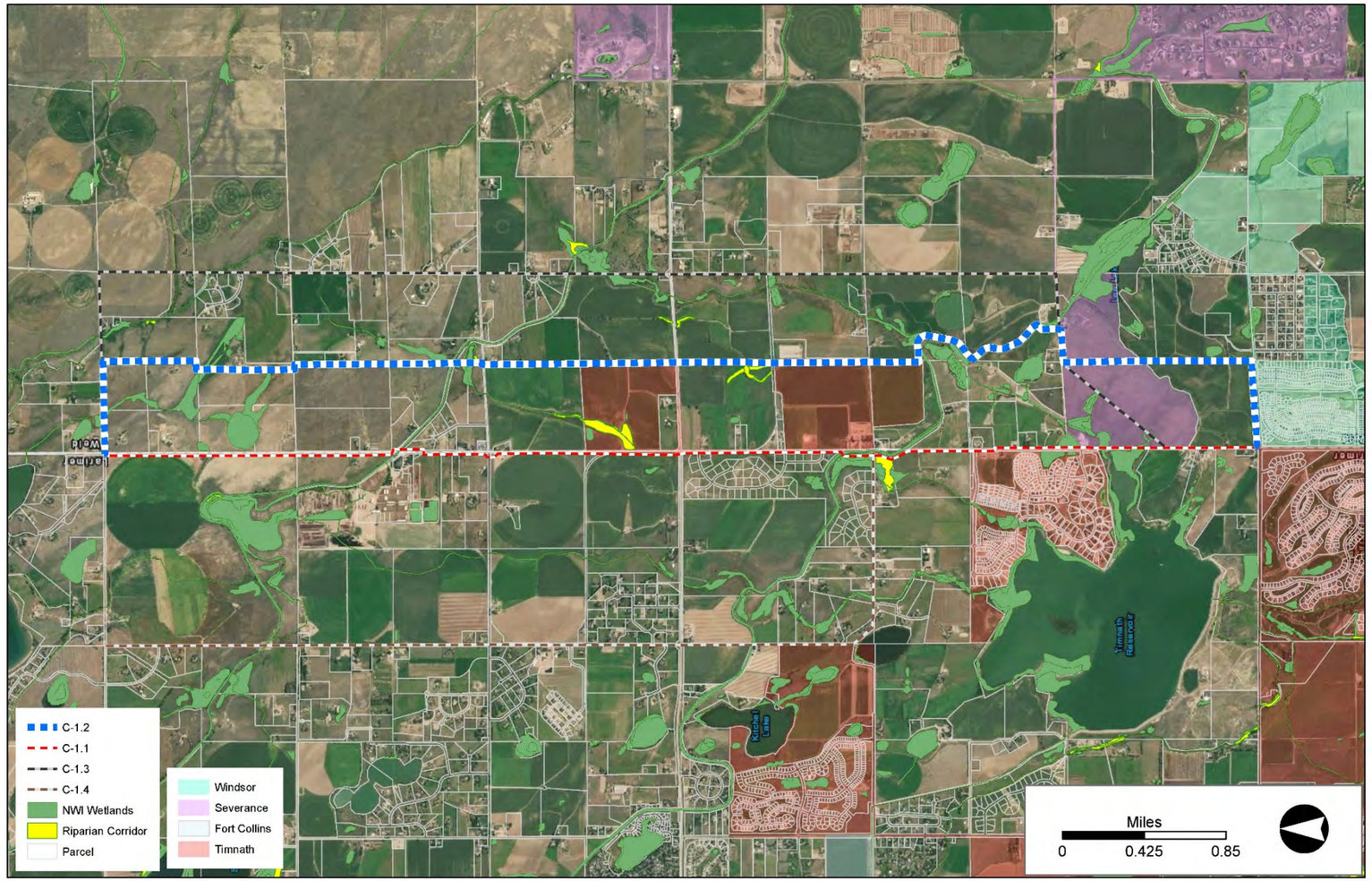

Figure C.3 – Alternative C-1.2

Alternative Name	C-1.3
Alternative Location & Description	County Line Alternative C-1.3 generally parallels the ROW of E. County Road 52/Weld County Road 88, Weld County Road 15, and Weld County Road 78. It begins at the southwest corner of the intersection of E. County Road 52/Weld County Road 88 and N. County Road 1/Weld County Road 13. The alignment crosses N. County Road 1/Weld County Road 13 on the south side of E. County Road 52/Weld County Road 88 ROW and parallels the south side of Weld County Road 88 eastwardly to the intersection of Weld County Road 88 and Weld County Road 15. The alignment turns south and parallels Weld County Road 15, crossing several county roads and Hwy 14, to the northwest corner of the intersection of Weld County Road 15 and Weld County Road 78. The alignment then turns west along the north side of Weld County Road 78. Approximately 2,440 feet west of the intersection the alignment turns southwest and bisects a parcel east of S. County Road 1/Weld County Road 13, intersecting with previous alternatives approximately halfway between Weld County Road 78 and Weld County Road 76 along N. County Road 1/Weld County Road 13. This alignment was removed in the initial screening process due to the fact that it is significantly longer than other viable alternatives described. A longer length means higher construction costs and maintenance costs. The east and west traverses of Weld County Road 88 and Weld County Road 78 resulted in a greater amount of ROW disturbance compared to other viable alternatives described.

Criteria	Ranking	Comments
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossing		
Development Pressure		
Operation and Maintenance Access		
O&M Requirements		
Natural Resources Impacts		

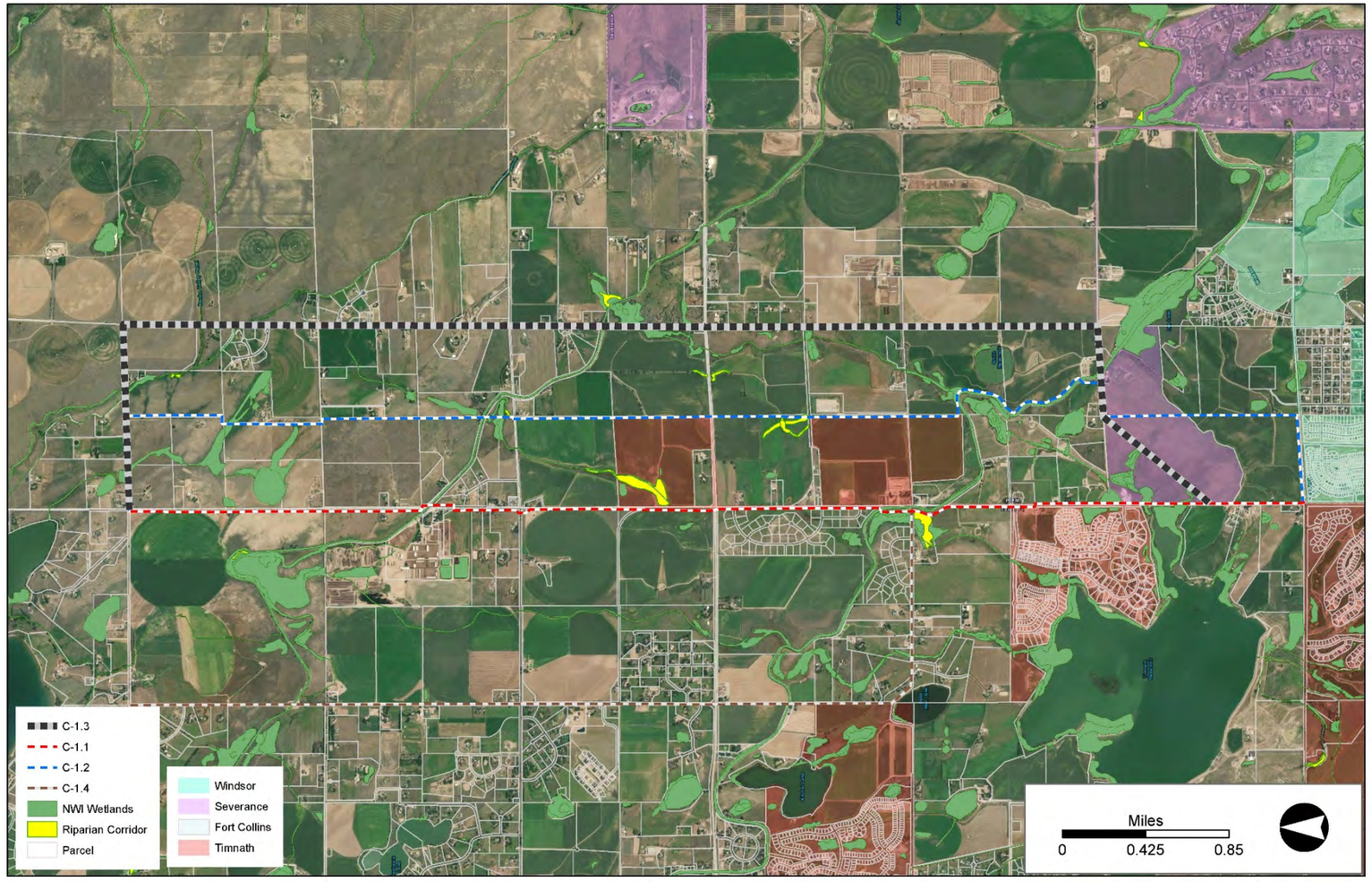

Figure C.4 – Alternative C-1.3

Alternative Name	C-1.4
Alternative Location & Description	County Line Alternative C-1.4 generally parallels the ROW of N. County Road 3/S. County Road 3 and E. Prospect Road, and E. County Road 44. It begins at the southwest corner of the intersection of E. County Road 52 and N. County Road 3 and traverses south parallel to N. County Road 3/S. County Road 3, across several county roads and Hwy 14 to the northwest corner of the intersection of S. County Road 3 and E. Prospect Road north of Deadman Lake. The alignment turns east and parallels E. Prospect Road, around a small portion of the lake. As E. Prospect Road turns into E. County Road 44, the alignment continues east paralleling E. County Road 44 to the intersection of E. County Road 44 and S. County Road 1/Weld County Road 13 where it intersects with previous alternatives. This alignment was removed in the initial screening process due to the proposed water treatment plant being located north of the intersection of intersection of E. County Road 52/Weld County Road 88 and N. County Road 1/Weld County Road 13. To connect to the water treatment plant additional pipeline parallel to the proposed Northern Tier pipeline would be needed creating complications in coordinating the pipeline systems and significantly increasing the length of the pipeline, making the alignment less favorable that other viable alternatives.

Criteria	Ranking	Comments
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossing		
Development Pressure		
Operation and Maintenance Access		
O&M Requirements		
Natural Resources Impacts		

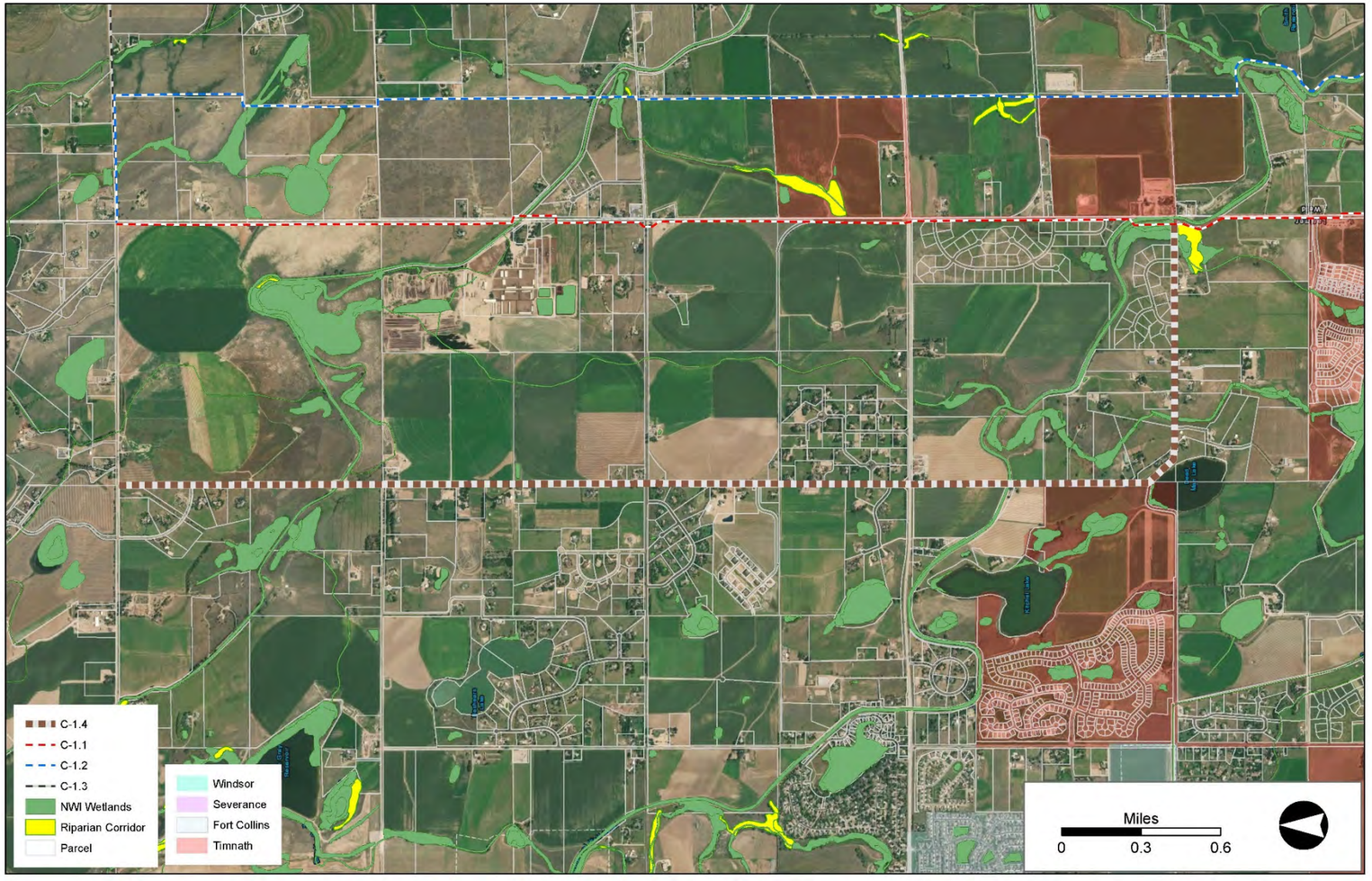

Figure C.5 – Alternative C-1.4

Alternative Name	C-2.1
Alternative Location & Description	County Line Alternative C-2.1 begins at the intersection of CR 40 and CR 13 and runs south paralleling CR 13 beginning on the west side. It travels in a southerly direction crossing CR 13 six times throughout this reach. It traverses through a combination of agricultural, rural residential, and subdivision properties. Heading south it enters a confined area where it crosses Hwy 392, three reservoirs, and the Poudre River. Continuing south the alignment ends roughly 5,600 feet south of the Poudre River on the east side of CR 13 near the Raindance Subdivision.

Criteria	Ranking	Comments
Capital Cost	Green	$16,832,900
Conduit Length	Green	5.64 miles, 29,801 feet
Easement Difficulty	Green	20 parcels crossed, 0 split parcels
Right-of-Way Impact	Green	Mostly in private easements, traverses ROW at 10 road crossings
Land Owner Impact	Green	3 driveway crossings, 0 split parcels
Proximity to Occupied Dwellings	Green	Minimal, within 100-feet of 3 occupied dwellings
Environmental Impacts	Yellow	1,025 LF of wetlands
Existing Utilities	Yellow	More CR 13 utilities, will cause more alignment shift into developed land
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossing known
Surface and Street Impacts	Green	Minimal construction under roadways, impact at 10 road crossings expected
Traffic Impacts	Yellow	Moderate traffic impacts expected due to proximity to CR 13, most impact expected at 10 road crossings
Water Storage Reservoirs Impacts	Red	Near multiple water bodies (names unknown), relatively high number of nearby reservoirs.
Construction Duration and Relative Constructability	Yellow	Alignment is shorter, but contains multiple constrained areas impacting production rates
Required Trenchless Crossing	Yellow	Hwy 392 (CDOT), 1 Railroad (OmniTRAX), 9 paved (county road) crossings
Development Pressure	Red	Development pressure expected from subdivisions construction
Operation and Maintenance Access	Green	Convenient access due to proximity to roads
O&M Requirements	Green	Relatively few air vac and blow off pairs required
Natural Resources Impacts	Yellow	Vegetation/natural areas may be impacted near Cache la Poudre River, and water bodies near CR 68/CR 13

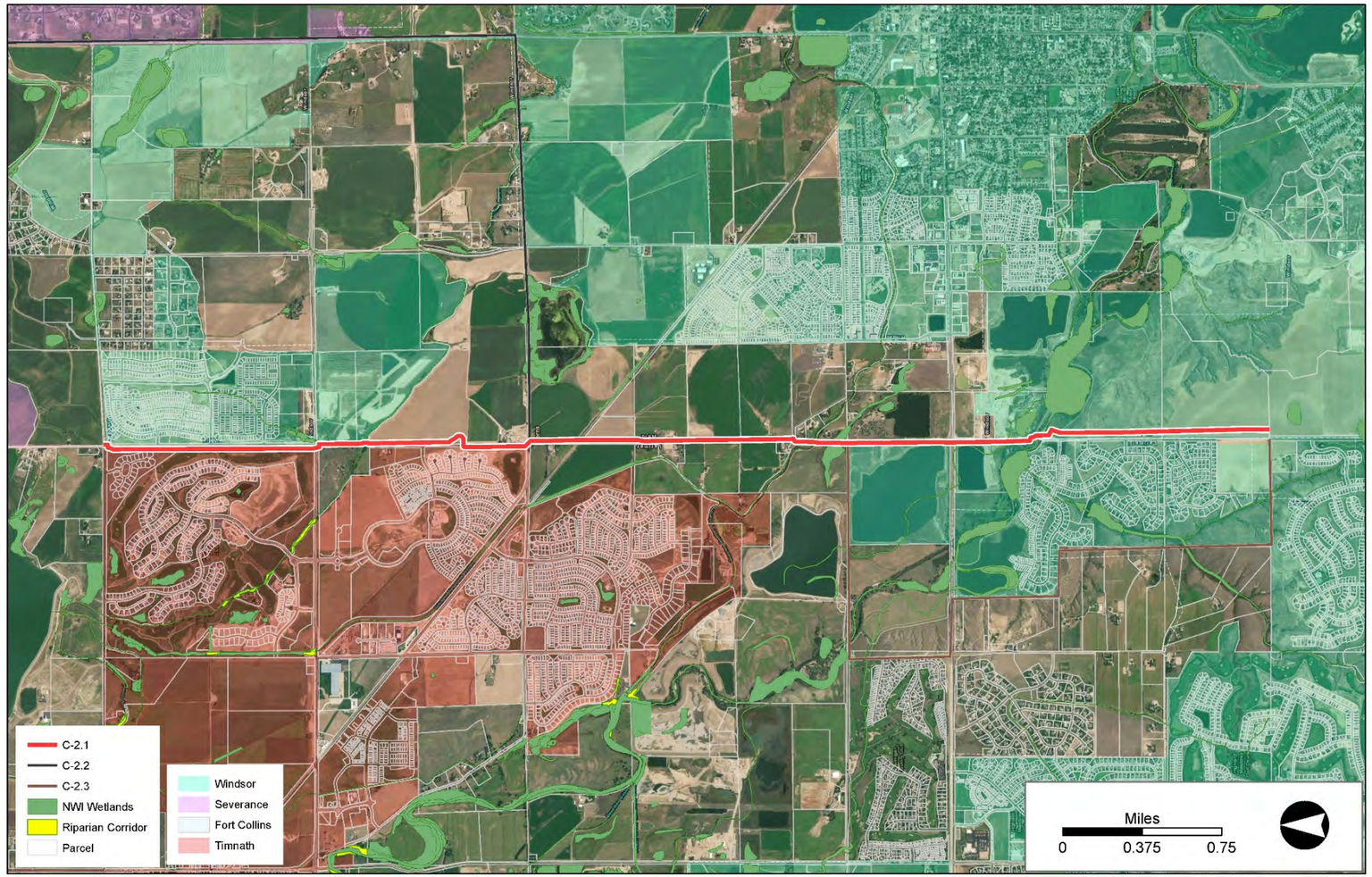

Figure C.6 – Alternative C-2.1

Alternative Name	C-2.2
Alternative Location & Description	County Line Alternative C-2.2 beginning for this alignment intersects alignments identified in the previous reach, approximately 2,440 feet west of the intersection of Weld County Road 78 and Weld County Road 15, north of the Weld County Road 78 ROW. The alignment parallels Weld County Road 78 to a parcel boundary south of the road approximately 2,640 feet east of the intersection of Weld County Road 78 and Weld County Road 15. From there the pipeline turns south and follows the parcel boundary south and then east to Weld County Road 17. The alignment turns south and parallels Weld County Road 17 to the intersection of Weld County Road 72. Southeast of the intersection, the alignment turns west and parallels Weld County Road 72 to the intersection of S. County Road 1/Weld County Road 13 where the alignment connects to previously discussed alternatives. This alignment was removed in the initial screening process due to the fact that it is significantly longer than other viable alternatives described. A longer length means higher construction costs and maintenance costs. A large portion of the continuation of this alignment overlaps previously described alignments which were more favorable over the greater length of Alternative C-2.2.

Criteria	Ranking	Comments
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossing		
Development Pressure		
Operation and Maintenance Access		
O&M Requirements		
Natural Resources Impacts		

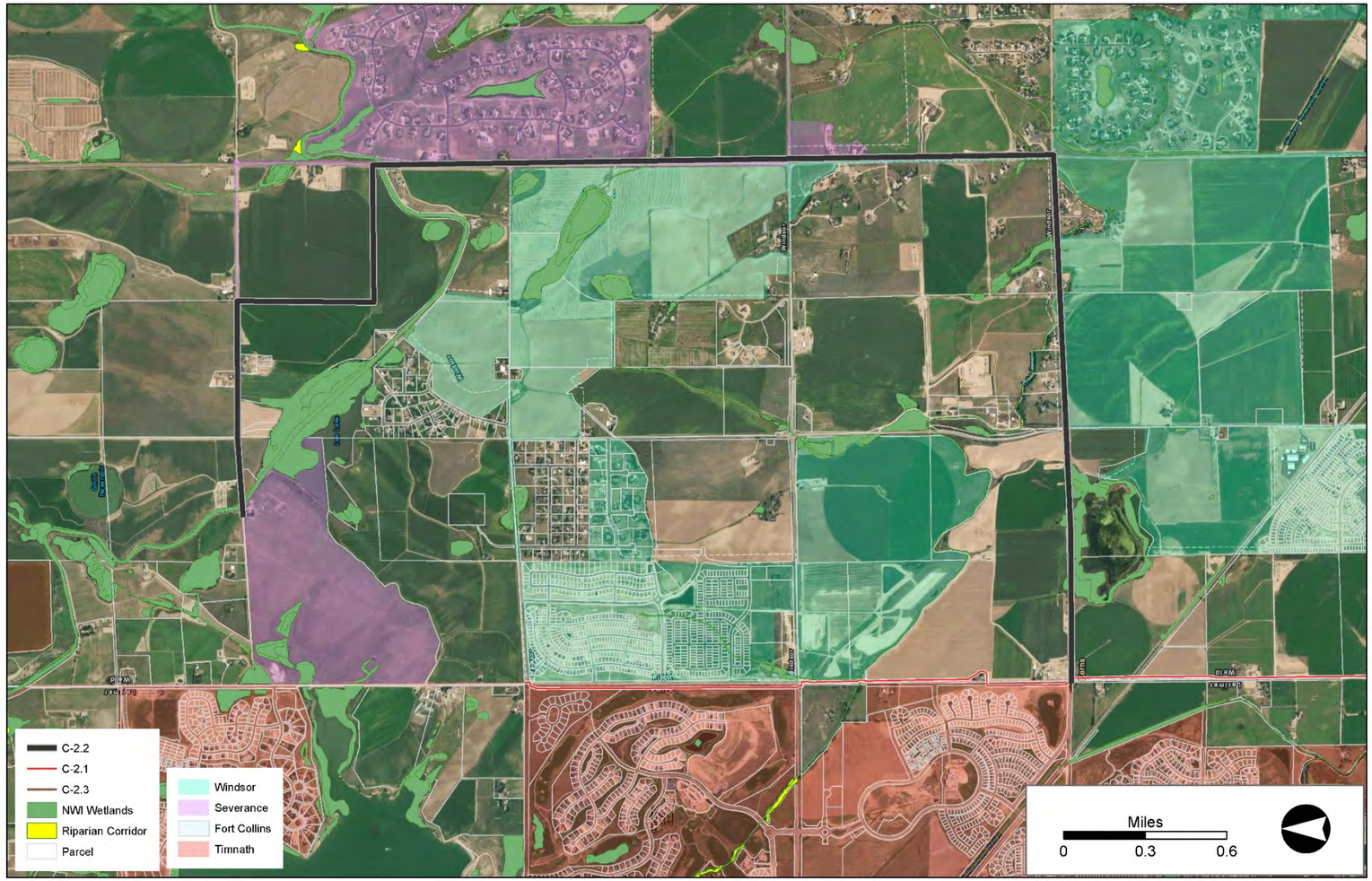

Figure C.7 – Alternative C-2.2

Alternative Name	C-2.3
Alternative Location & Description	County Line Alternative C-2.3 begins at the intersection of S. County Road 1/Weld County Road 13 and E. County Road 32E/Weld County Road 68 1/2, where the alignment intersects with previously described alignments. The alignment parallels E. County Road 32E to the west across the Poudre River southwest side of the intersection of E. County Road 32E and S. County Road 3. From the intersection the alignment turns south and parallels S. County Road 3 to the northwest side of the intersection of S. County Road 3 and E. County Road 32/Hwy 392. The alignment turns east and parallels the highway until it turns south at a parcel boundary south of E. County Road 32/Hwy 392 approximately 1,390 feet east of the intersection of S. County Road 3 and E. County Road 32/HWY 392. The alignment follows several parcel boundaries south and east ultimately ending up between Bison Ridge and High Pointe subdivisions. The alignments ends on an easterly bearing at the intersection with previously described alternatives along S. County Road 1/Weld County Road 13. This alignment was removed in the initial screening process due to the fact that it is significantly longer than other viable alternatives described. A longer length means higher construction costs and maintenance costs. Additionally, the portion parallel to E. County Road 32/HWY 392 could potentially impact the roadway and traffic. A large portion of the continuation of this alignment overlaps previously described alignments which were more favorable over the greater length and potential impacts of Alternative C-2.3.

Criteria	Ranking	Comments
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossing		
Development Pressure		
Operation and Maintenance Access		
O&M Requirements		
Natural Resources Impacts		

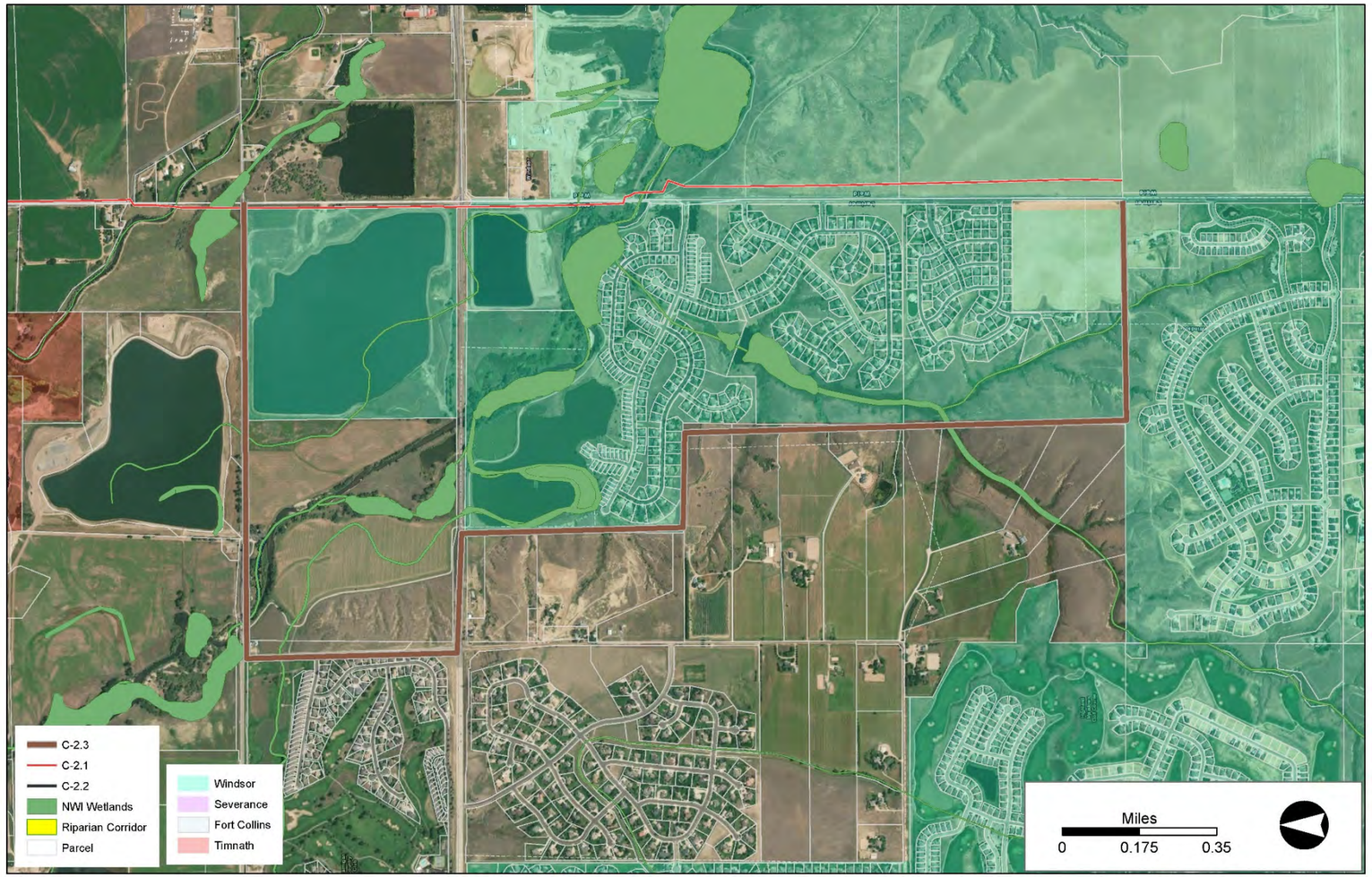

Figure C.8 – Alternative C-2.3

Alternative Name	C-3.1
Alternative Location & Description	County Line Alternative C-3.1 begins along the east side of CR 13 roughly 2,600 feet north of CR 64, near the Raindance subdivision. It travels south paralleling the east side of CR 13 and crossing it a total of six times throughout this reach. It traverses through a combination of agricultural, rural residential, and subdivision properties. Heading south it crosses Hwy 34, three railroad tracks, and the Big Thompson River. South of the railroad tracks the line continues ending at the intersection of CR 54 and CR 13.

Criteria	Ranking	Comments
Capital Cost	Green	$17,148,600
Conduit Length	Green	5.66 miles, 29,875 feet
Easement Difficulty	Yellow	28 parcels crossed, 0 split parcels
Right-of-Way Impact	Green	Mostly in private easements, traverses ROW at 11 road crossings
Land Owner Impact	Yellow	6 driveway crossings, 0 split parcels
Proximity to Occupied Dwellings	Green	Minimal, within 100-feet of 2 occupied dwellings
Environmental Impacts	Green	455 LF of wetlands
Existing Utilities	Yellow	More CR 13 utilities, will cause more alignment shift into developed land
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossing known
Surface and Street Impacts	Green	Minimal construction under roadways, impact at 11 road crossings expected
Traffic Impacts	Yellow	Moderate traffic impacts expected due to proximity to CR 13, most impact expected at 11 road crossings
Water Storage Reservoirs Impacts	Green	No reservoir impacts
Construction Duration and Relative Constructability	Green	Alignment is shortest distance, but contains some constrained areas impacting production rates
Required Trenchless Crossing	Yellow	3 Railroads (OmniTRAX, Union Pacific), HWY 34 (CDOT), 8 paved (county road) crossings
Development Pressure	Red	Pressure from subdivision construction
Operation and Maintenance Access	Green	Convenient access due to proximity to roads
O&M Requirements	Green	Relatively few air vac and blow off pairs required
Natural Resources Impacts	Yellow	May have some natural area impact near Big Thompson River

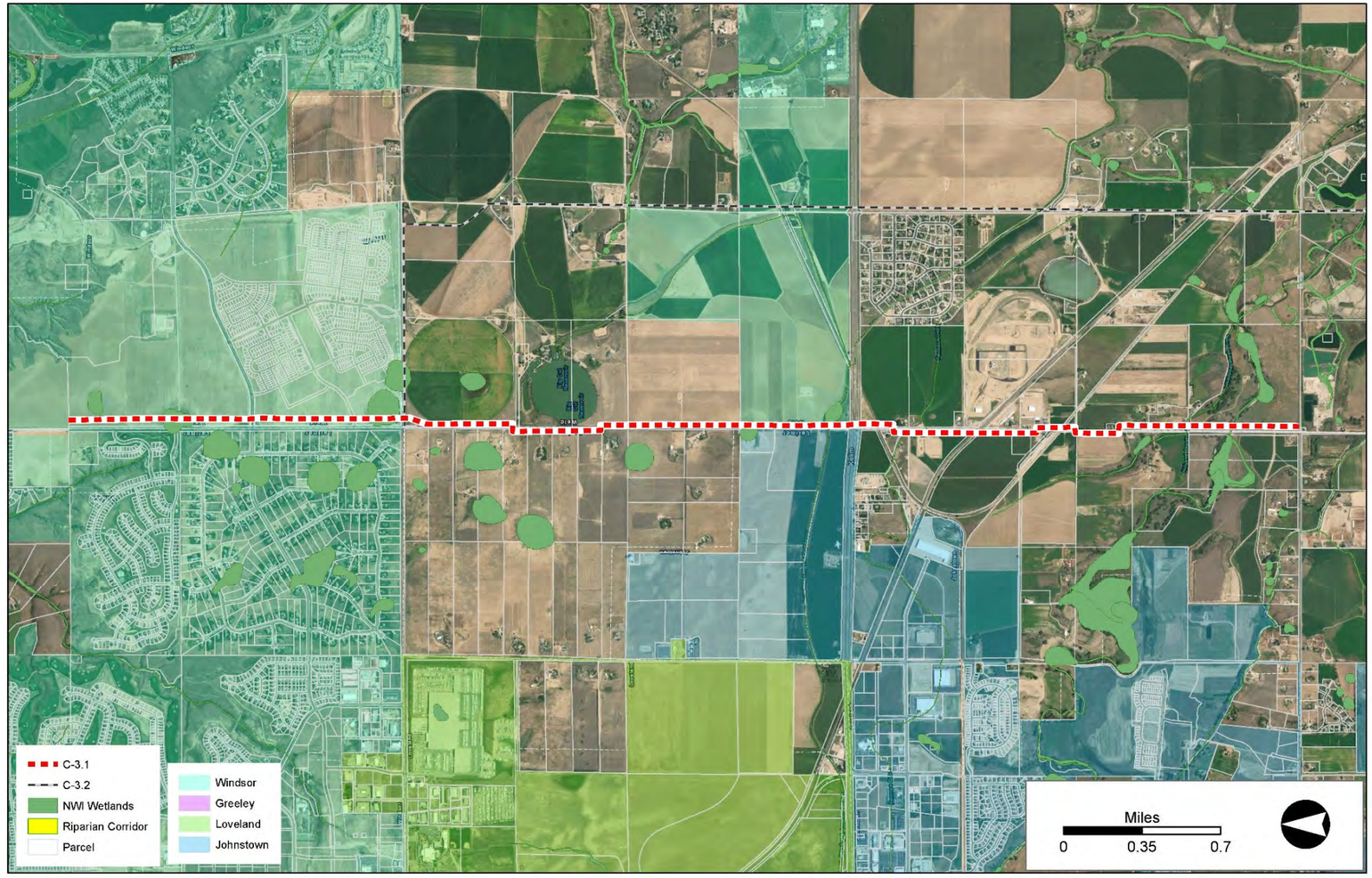

Figure C.9 – Alternative C-3.1

Alternative Name	C-3.2
Alternative Location & Description	County Line Alternative C-3.2 begins at the intersection of S. County Road 1/Weld County Road 13 and Crossroads Blvd/Weld County Road 62, where the alignment intersects with previously described alignments. The alignment parallels Weld County Road 62 east to parcel boundary south of the road approximately 530 feet west of the intersection of Weld County Road 62 and Weld County Road 15. The alignment turns south and follows the parcel boundary south then southeast, where it crosses Weld County Road 15. After crossing Weld County Road 15 the alignment turns south and parallels the road across several county roads and Hwy 34. The alignment continues south passed the dead end intersection of Weld County Road 15 with Weld County Road 54 along parcel boundaries and crosses the Big Thompson River. The alignment continues south of the river along parcel boundaries until it beings to parallel Weld County Road 15, north of Weld County Road 52. At the intersection of Weld County Road 52 and Weld County Road 15 the alignment turns west and parallels Weld County Road 52. Approximately 2,600 feet west of the intersection of Weld County Road 52 and Weld County Road 15 the alignment turns south paralleling parcel boundaries to Weld County Road 50, where the alignment turns west and terminates at the intersection of Weld County Road 50 and Colorado Blvd, where the alignment intersects with previously described alignments. This alignment was removed in the initial screening process due to the fact that it is significantly longer than other viable alternatives described. A longer length means higher construction costs and maintenance costs. Additionally, the alternative traverses into Project Area 4. Since the alternative was not favorable in Project Area 3, connecting favorable Project Area 4 alternatives would add unnecessary length and costs to the pipeline. These factors resulted in the other viable alternatives being more favorable than Alternative C-3.2.

Criteria	Ranking	Comments
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossing		
Development Pressure		
Operation and Maintenance Access		
O&M Requirements		
Natural Resources Impacts		

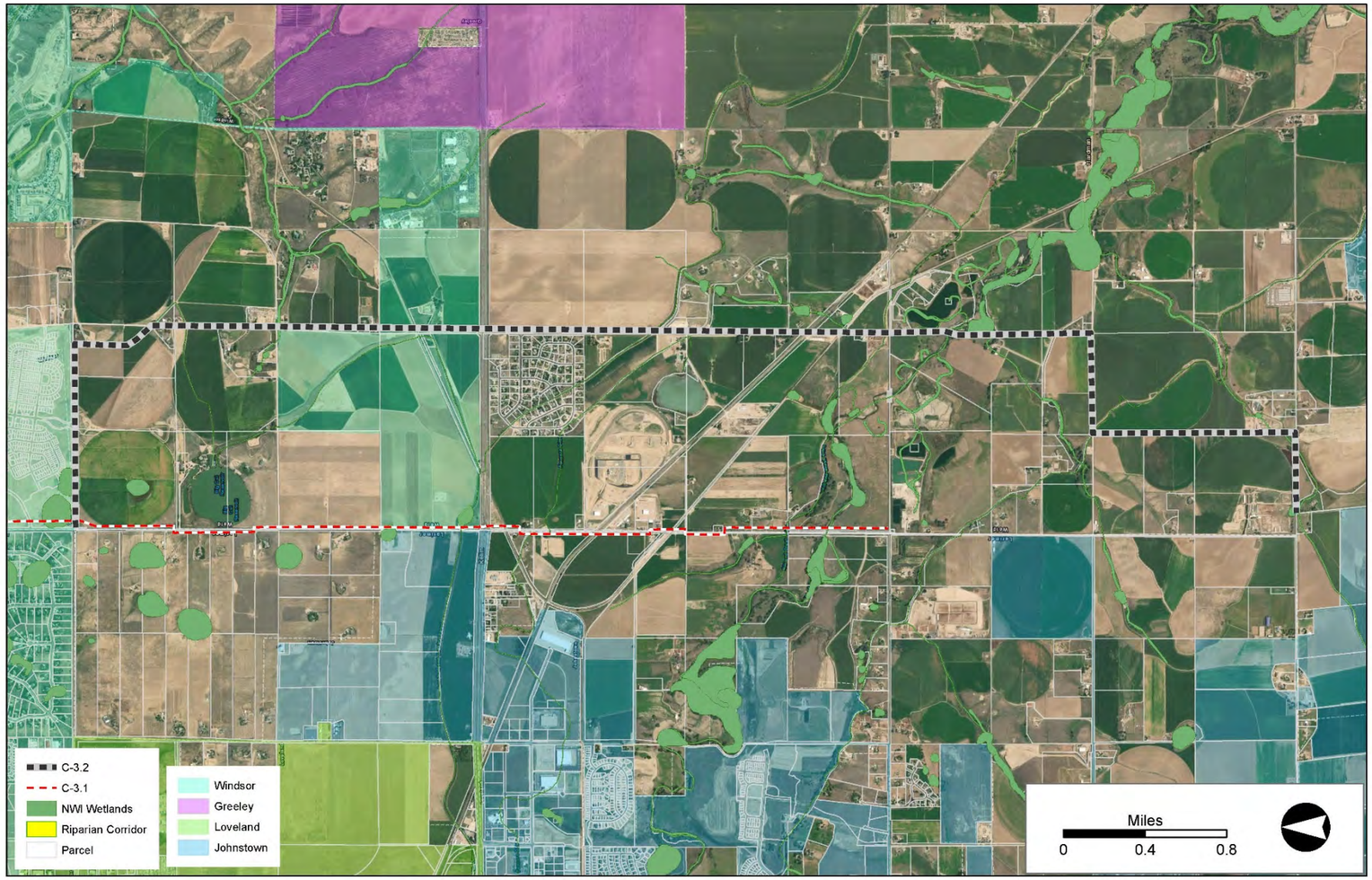

Figure C.10 – Alternative C-3.2

Alternative Name	C-4.1
Alternative Location & Description	County Line Alternative C-4.1 begins at the intersection of CR 13 and CR 54 and runs south paralleling the west side of CR 13. It travels in a southerly direction crossing CR 13 a total of eight times throughout this reach. It traverses through a combination of agricultural, rural residential, and subdivision properties. Headed south the alignment crosses CR 14, follows a parcel boundary, and then continues paralleling CR 13 to the south. The line continues passing through the Town of Johnstown, crossing Hwy 60, a railroad track, The Little Thompson River, and finally ending on the west side of the intersection of CR 13 and CR 42.

Criteria	Ranking	Comments
Capital Cost	Green	$18,616,400
Conduit Length	Green	6.20 miles, 32,728 feet
Easement Difficulty	Green	23 parcels crossed, 0 split parcels
Right-of-Way Impact	Yellow	Mostly in private easements, in ROW at 15 road crossings
Land Owner Impact	Yellow	5 driveway crossings, 0 split parcels
Proximity to Occupied Dwellings	Green	Minimal, within 100-feet of 5 occupied dwellings
Environmental Impacts	Green	760 LF of wetlands
Existing Utilities	Yellow	More CR 13 utilities, will cause more alignment shift into developed land
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossing known
Surface and Street Impacts	Yellow	Minimal construction under roadways, most impact expected at 15 road crossings
Traffic Impacts	Yellow	Moderate traffic impacts expected due to proximity to CR 13, most impact expected at 15 road crossings
Water Storage Reservoirs Impacts	Green	No impacts expected
Construction Duration and Relative Constructability	Yellow	Length shorter but traverses more constrained areas which will impact production rates, narrow section through Johnstown may be difficult for materials and equipment
Required Trenchless Crossing	Red	1 Railroad (OmniTRAX), HWY 60 (CDOT), 11 paved (county road) crossings
Development Pressure	Red	Multiple areas along the alignment have plans for development in near future
Operation and Maintenance Access	Green	Convenient access due to proximity to roads
O&M Requirements	Green	Relatively few air vac and blow off pairs required, roughly equal requirements at other alternative
Natural Resources Impacts	Yellow	Moderate due to natural areas near Little Thompson River

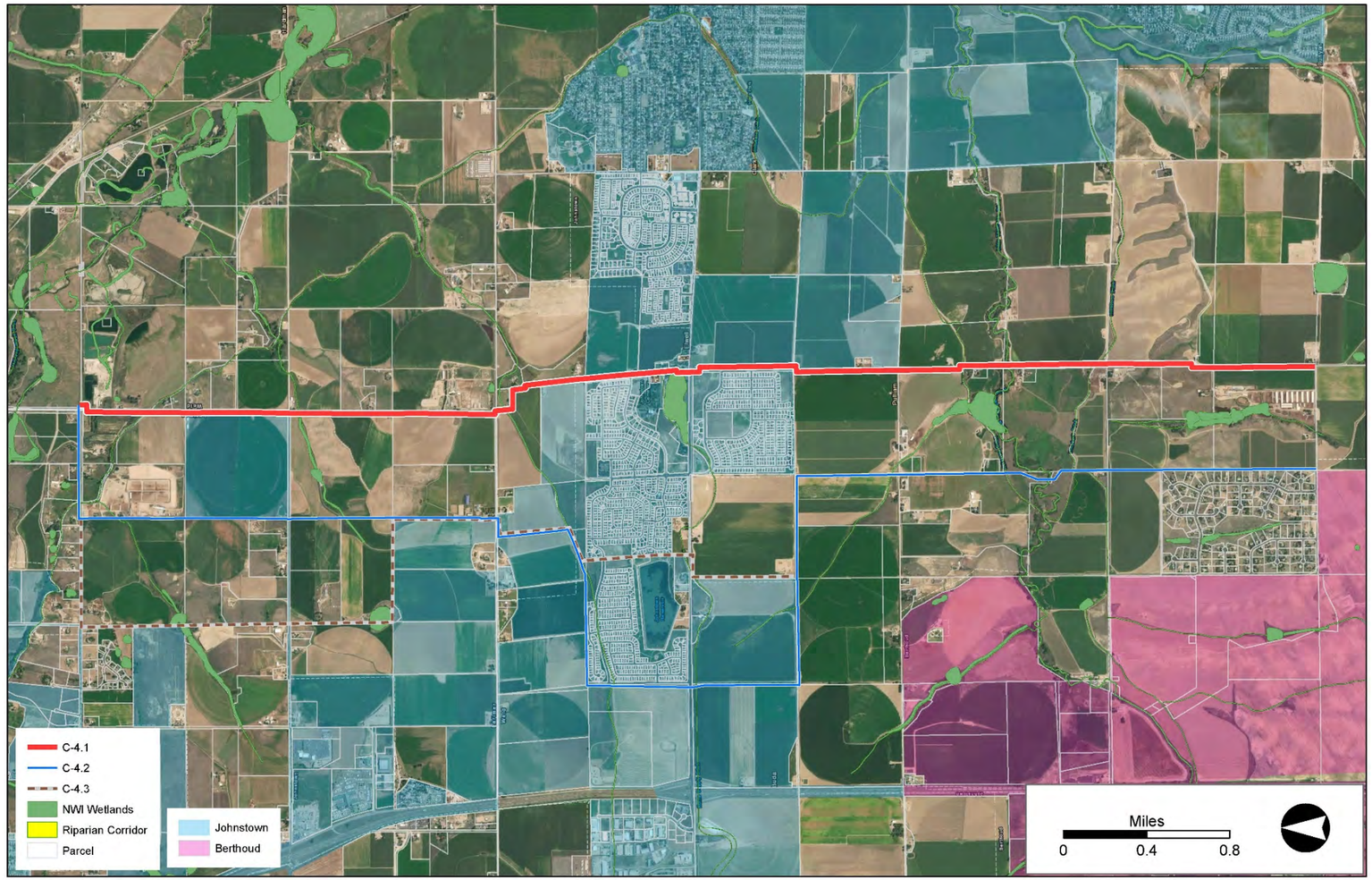

Figure C.11 – Alternative C-4.1

Alternative Name	C-4.2
Alternative Location & Description	County Line Alternative C-4.2 begins at the intersection of CR 13 and CR 54 and runs west paralleling the north side of CR 54 for about 2,800 feet before turning south through an agricultural field. It travels in a southerly direction along parcel boundaries until reaching existing subdivisions in the Town of Johnstown. The alignment turns west until reaching High Plains Blvd. where it turns south crossing HWY 60 followed by a railroad track. It then turns east paralleling the south side of the railroad tracks for approximately 5,200 feet before continuing south through more agricultural fields, crossing the Little Thompson River, and finally ending at CR 42. The alignment traverses agricultural fields as well as existing and planned developments.

Criteria	Ranking	Comments
Capital Cost	Red	$21,679,300
Conduit Length	Red	8.30 miles, 43,832 feet
Easement Difficulty	Yellow	32 parcels crossed, 0 split parcels
Right-of-Way Impact	Green	Mostly in private easements, in ROW at 7 road crossings
Land Owner Impact	Yellow	4 driveway crossings, 0 split parcels
Proximity to Occupied Dwellings	Red	Moderate/high, within 100-feet of 19 occupied dwellings
Environmental Impacts	Green	310 LF of wetlands
Existing Utilities	Green	Less utilities expected due to proximity to roadways
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossing known
Surface and Street Impacts	Green	Minimal construction under roadways, most impact expected at 7 road crossings
Traffic Impacts	Green	Minimal traffic impacts expected, most impact expected at 7 road crossings
Water Storage Reservoirs Impacts	Green	None
Construction Duration and Relative Constructability	Red	Alignment is significantly longer leading to much long duration times
Required Trenchless Crossing	Green	1 Railroad (OmniTRAX), Hwy 60 (CDOT), 5 paved (county road) crossings
Development Pressure	Yellow	Multiple areas along the alignment have plans for development in near future, but has fewer plans in near term
Operation and Maintenance Access	Red	Difficult access, does not parallel roads
O&M Requirements	Yellow	Relatively few air vac and blow off pairs required but due to longer alignment length it will result with more pairs
Natural Resources Impacts	Yellow	Moderate due to natural areas near Little Thompson River

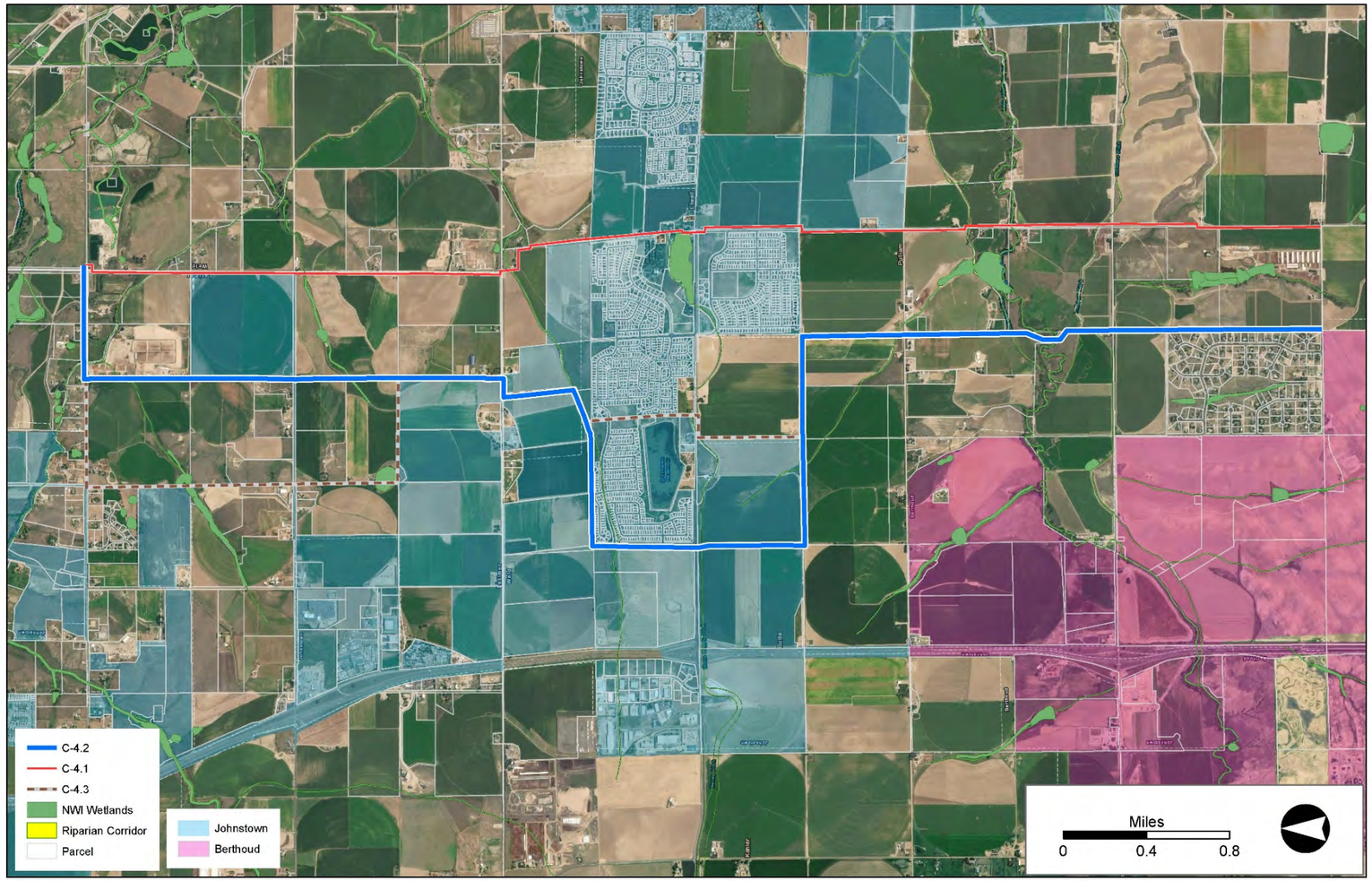

Figure C.12 – Alternative C-4.2

Alternative Name	C-4.3
Alternative Location & Description	County Line Alternative C-4.3 begins along E. County Road 18, at the intersection of previously described alignments, approximately 2,740 feet west of the intersection of E. County Road 18/Weld County Road 54 and S. County Road 1/Weld County Road 13. The alignment traverses east from this point to a parcel boundary south of E. County Road 18 at the intersection of E. County Road 18 and S. County Road 3. The alignment traverses in a southerly direction along parcel boundaries until reaching existing subdivisions in Johnstown. The alignment turns south and traverses passed the east end of Johnstown Reservoir, across Hwy 60 where it intersects with previously described alternatives approximately 2,640 feet west of the southwest corner of the Clearview Subdivision. This alignment was removed in the initial screening process because the corridor east of Johnstown Reservoir is not a constructible corridor. Large amounts of buried debris have been indicated within the corridor near Johnstown Reservoir. The length between E. County Road 18 and E. County Road 14 is significantly longer than other viable alternatives. Outside of the areas east of the reservoir and between the county roads, the alignment overlaps other viable alternatives. Therefore the alternative was not moved beyond the initial screening process.

Criteria	Ranking	Comments
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossing		
Development Pressure		
Operation and Maintenance Access		
O&M Requirements		
Natural Resources Impacts		

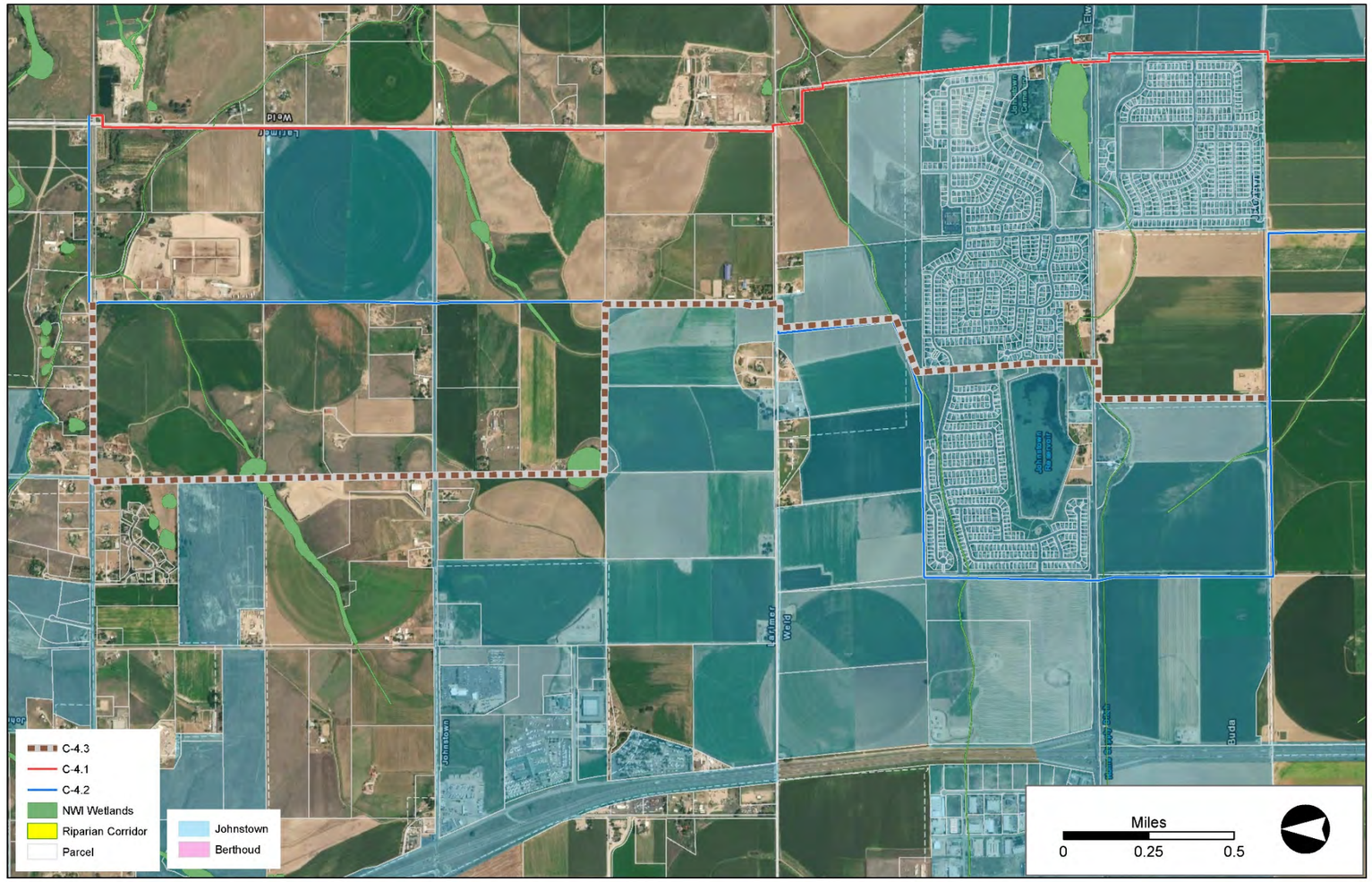

Figure C.13 – Alternative C-4.3

Alternative Name	C-5.1
Alternative Location & Description	County Line Alternative C-5.1 begins at the intersection of CR 13 and CR 42 and runs south paralleling the west side of CR 13. It travels in a southerly direction crossing CR 13 a total of three times throughout this reach. It traverses through a combination of agricultural, rural residential, and subdivision properties. Headed south the alignment runs adjacent to Lake Thomas Dam on the east side of CR 13, and continues until ending about 2,600 feet south of CR 32 where it ties in to the Fort Lupton/Hudson Pipeline.

Criteria	Ranking	Comments
Capital Cost	Green	$15,687,600
Conduit Length	Green	5.57 miles, 29,417 feet
Easement Difficulty	Green	22 parcels crossed, 0 split parcels
Right-of-Way Impact	Green	Mostly in private easements, in ROW at 8 road crossings
Land Owner Impact	Yellow	12 driveway crossings, 0 split parcels
Proximity to Occupied Dwellings	Yellow	Moderate, within 100-feet of 9 occupied dwellings
Environmental Impacts	Green	955 LF of wetlands
Existing Utilities	Yellow	More CR 13 utilities, will cause more alignment shift into developed land
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossing known
Surface and Street Impacts	Green	Minimal construction under roadways, most impact expected at 8 road crossings
Traffic Impacts	Yellow	Moderate traffic impacts expected due to proximity to CR 13, most impact expected at 8 road crossings
Water Storage Reservoirs Impacts	Yellow	Alignment in close proximity (across CR 13) to Lake Thomas Dam
Construction Duration and Relative Constructability	Green	Length is shorter but traverses a few confined areas which will impact production rates
Required Trenchless Crossing	Yellow	1 Railroad (OmniTRAX), 5 paved (county road) crossings
Development Pressure	Green	Minimal new development pressure in near term expected
Operation and Maintenance Access	Green	Convenient access due to proximity to roads
O&M Requirements	Green	Least amount of air vac and blow off pairs required
Natural Resources Impacts	Green	Minimal, land mostly in subdivisions or agriculture avoiding natural areas

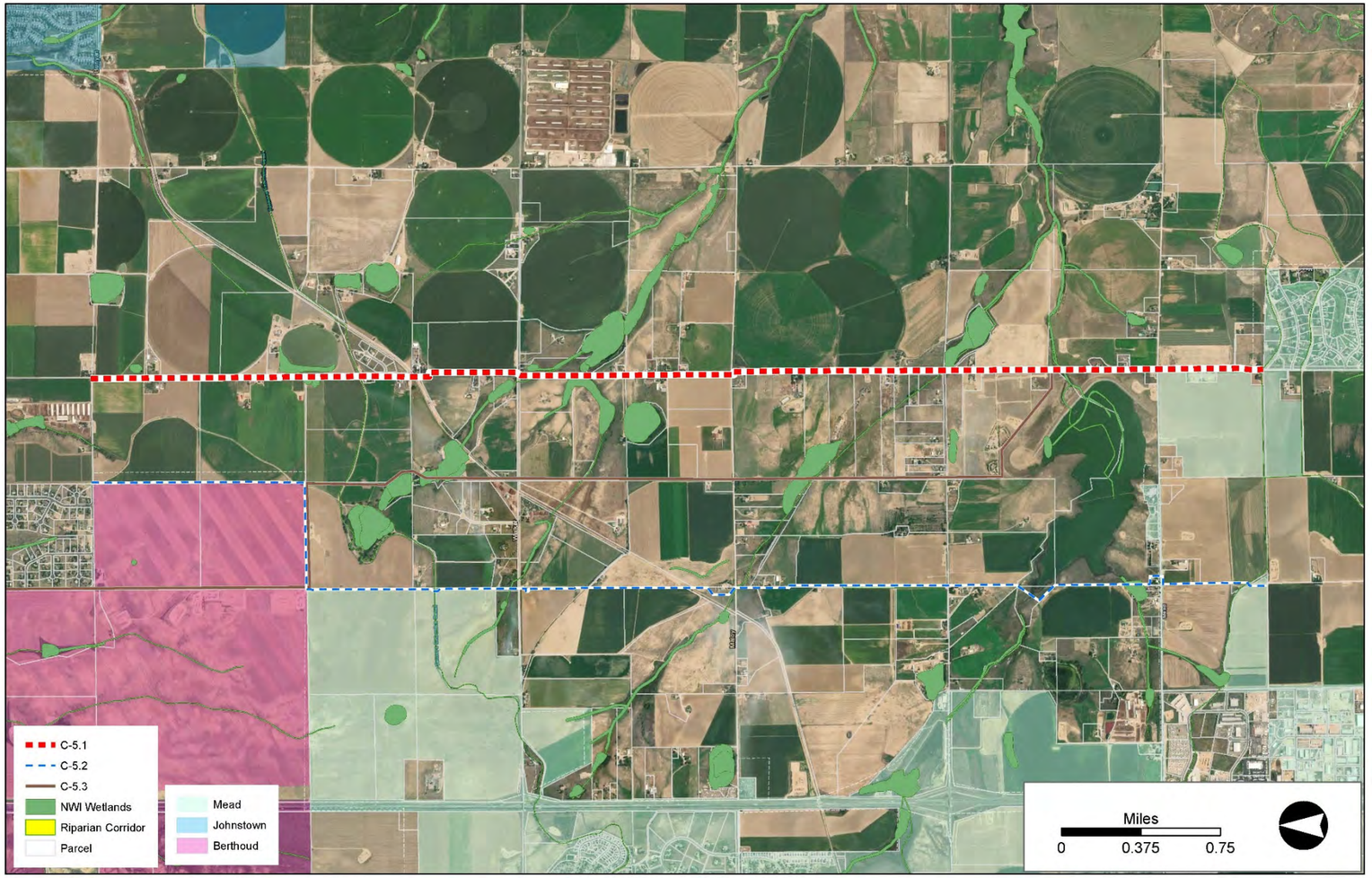

Figure C.14 – Alternative C-5.1

Alternative Name	C-5.2
Alternative Location & Description	County Line Alternative C-5.2 begins roughly 2,600 feet west of the intersection of CR 42 and CR 13. It travels south through agricultural fields along parcel boundaries until it turns west at CR 40 for approximately 2,700 feet, and then again south through more agricultural fields. Approaching Lake Thomas it jogs to the west, and then continues south ending approximately 2,600 feet south of CR 32 where it ties in to the Fort Lupton/Hudson Pipeline.

Criteria	Ranking	Comments
Capital Cost	Yellow	$16,057,700
Conduit Length	Yellow	6.25 miles, 33,018 feet
Easement Difficulty	Green	21 parcels crossed, 1 split parcel
Right-of-Way Impact	Green	Mostly in private easements, in ROW at 5 road crossings
Land Owner Impact	Green	0 driveways crossed, 1 split parcel
Proximity to Occupied Dwellings	Green	Minimal, within 100-feet of 2 occupied dwellings
Environmental Impacts	Yellow	1,075 LF of wetlands
Existing Utilities	Green	Less utilities expected due to proximity to roadways
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossing known
Surface and Street Impacts	Green	Minimal construction under roadways, impact at 5 road crossings expected
Traffic Impacts	Green	Minimal traffic impacts expected, most impact occurring at 5 road crossings
Water Storage Reservoirs Impacts	Yellow	Alignment runs near upper end of Lake Thomas opposite side of dam, some impacts are possible
Construction Duration and Relative Constructability	Green	Alignment is longer, but work traverses more rural areas increasing production rates
Required Trenchless Crossing	Green	1 Railroad (OmniTRAX), 3 paved (county road) crossings
Development Pressure	Green	Minimal new development pressure in near term expected
Operation and Maintenance Access	Red	Difficult access, does not parallel roads
O&M Requirements	Yellow	Most amount of air vac and blow off pairs required
Natural Resources Impacts	Green	Minimal, land mostly agricultural fields avoiding natural areas

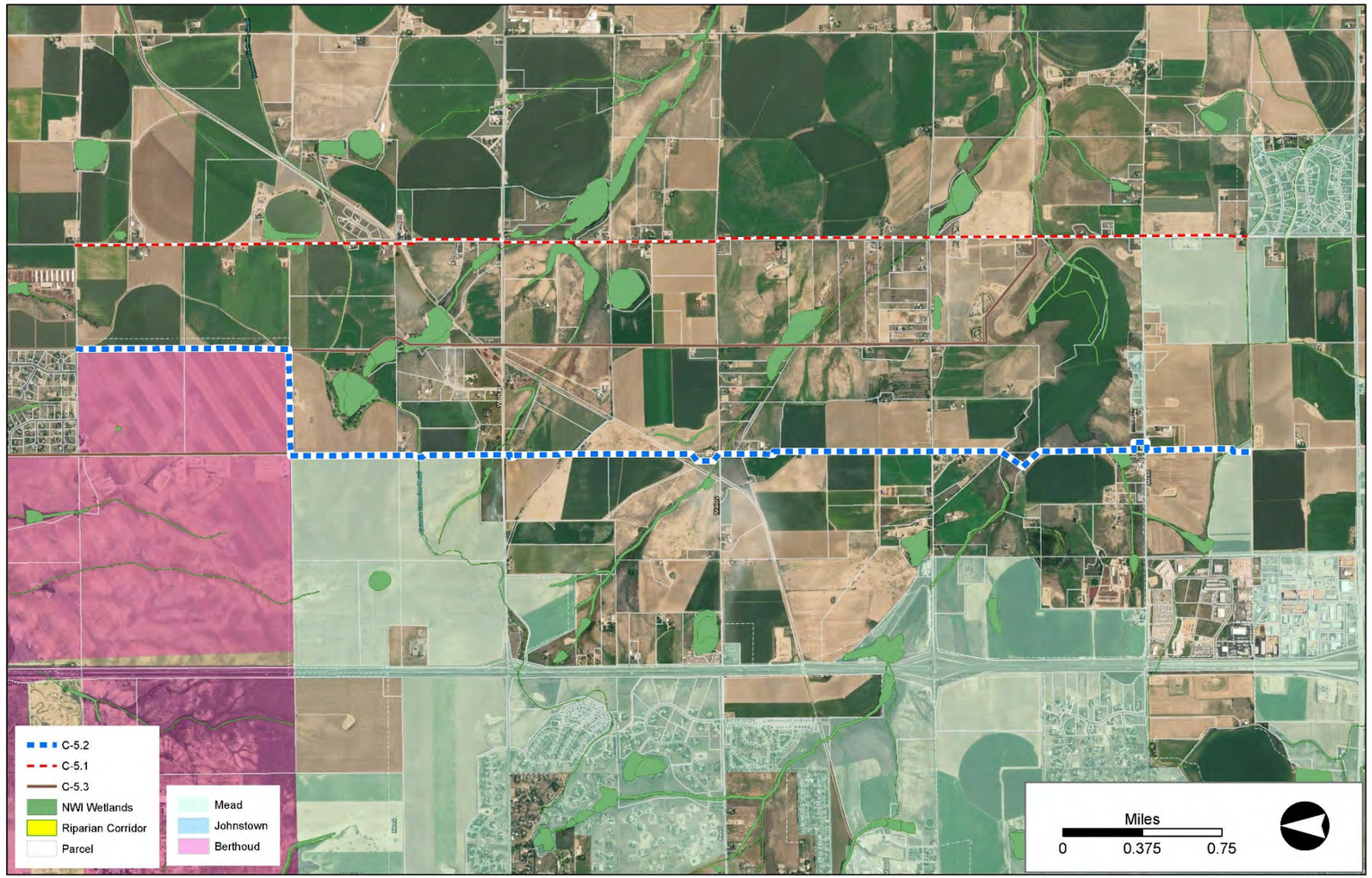

Figure C.15 – Alternative C-5.2

Alternative Name	C-5.3
Alternative Location & Description	County Line Alternative C-5.3 begins approximately 2,640 feet west of the southwest corner of the Clearview Subdivision where it intersects previously described alternatives. The alignment traverses south parallel to parcel boundaries across the Little Thompson River and several county roads, turning east at Weld County Road 40. It parallels Weld County Road 40 approximately 2,600 feet east where it turns south and parallels parcel boundaries, routing around the wetlands southeast of Davis Reservoir, and continuing south along parcel boundaries across several county roads, Weld County Road 34 being the last road crossed. Approximately 1,400 feet south of Weld County Road 34 the alignment traverses east and southeast to the intersection of previously described alternatives parallel to Colorado Blvd. north of Lake Thomas. This alignment was removed in the initial screening process due to the large amount of potentially conflicting existing oil and gas facilities north of Weld County Road 40. Additionally, the alignment is significantly longer in length than the other viable alternatives to which the alignment ultimately connects. The greater potential for existing utility conflicts and higher construction and maintenance costs resulted in the alignment being far less favorable than the other viable alternatives.

Criteria	Ranking	Comments
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossing		
Development Pressure		
Operation and Maintenance Access		
O&M Requirements		
Natural Resources Impacts		

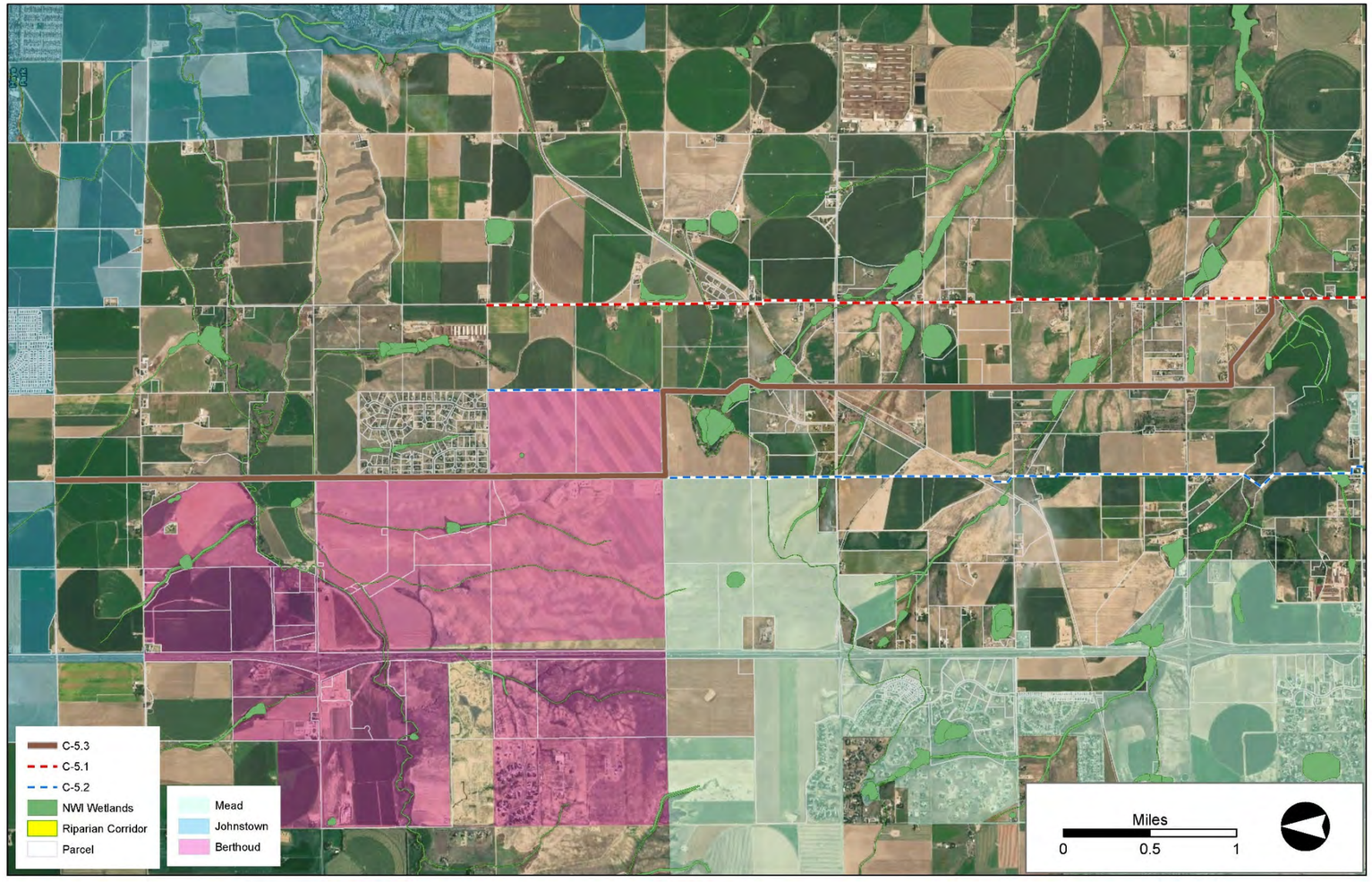

Figure C.16 - Alternative C-5.3

Table c.1 is a visual summary of the score given to every alternative for each criteria. **Table C.2** tabulates the number of greens, yellows, and reds given to each alternative.

Table C.1 – Visual Summary of Alternative Scoring

Evaluation Criteria	C-1.1	C-1.2	C-1.3	C-1.4	C-2.1	C-2.2	C-2.3	C-3.1	C-3.2	C-4.1	C-4.2	C-4.3	C-5.1	C-5.2	C-5.3
Capital Cost															
Conduit Length															
Easement Difficulty															
Right-of-Way Impact															
Land Owner Impact															
Proximity to Occupied Dwellings															
Environmental Impacts															
Existing Utilities															
Hazardous/Permitted Crossings															
Surface and Street Impacts															
Traffic Impacts															
Water Storage Reservoirs Impacts															
Construction Duration and Relative Constructability															
Required Trenchless Crossings															
Development Pressure															
Operation and Maintenance (O&M) Access															
O&M Requirements															
Natural Resources Impacts															

Table C.2 – Numeric Summary of Alternative Scoring

Evaluation Criteria	C-1.1	C-1.2	C-1.3	C-1.4	C-2.1	C-2.2	C-2.3	C-3.1	C-3.2	C-4.1	C-4.2	C-4.3	C-5.1	C-5.2	C-5.3
Red	2	2	-	-	2	-	-	1	-	2	5	-	0	1	-
Yellow	8	5	-	-	6	-	-	6	-	7	5	-	6	5	-
Green	8	11	-	-	10	-	-	11	-	9	8	-	12	12	-

PREFERRED ALIGNMENT

The preferred alignment consists of a combination of Alternative 1A, 2A, 3A, 4A and 5A and is presented in **Figure C.17**. **Table C.3** below summarizes the estimated features of the overall Preferred Alignment, broken down by Project Area segments. In the case of a tie, alternates were evaluated and the preferred alignment was selected based upon prioritization of factors, mainly cost and length.

Table C.3 – Preferred Alignment Characteristics

Characteristic	C-1.1	C-2.1	C-3.1	C-4.1	C-5.1	TOTAL
Pipe Diameter (inches)	48	48	48	48	48	**48**
Pipe Material	Mortar Lined Steel	Mortar Lined Steel	Mortar Lined Steel	Mortar Lined Steel	Mortar Lined Steel	Mortar Lined Steel
Total Distance (miles)	6.1	5.6	5.7	6.2	5.6	**29.2**
Pipe Cost	$17,745,200	$16,832,900	$17,148,600	$18,616,400	$15,687,600	**$86,030,700**
Length Tunnel (feet)	875	1,175	1,400	1,350	600	**5,400**
Number of Landowners	20	20	28	23	22	**113**
Wetland Crossings (feet)	2,460	1,025	455	760	955	**5,655**

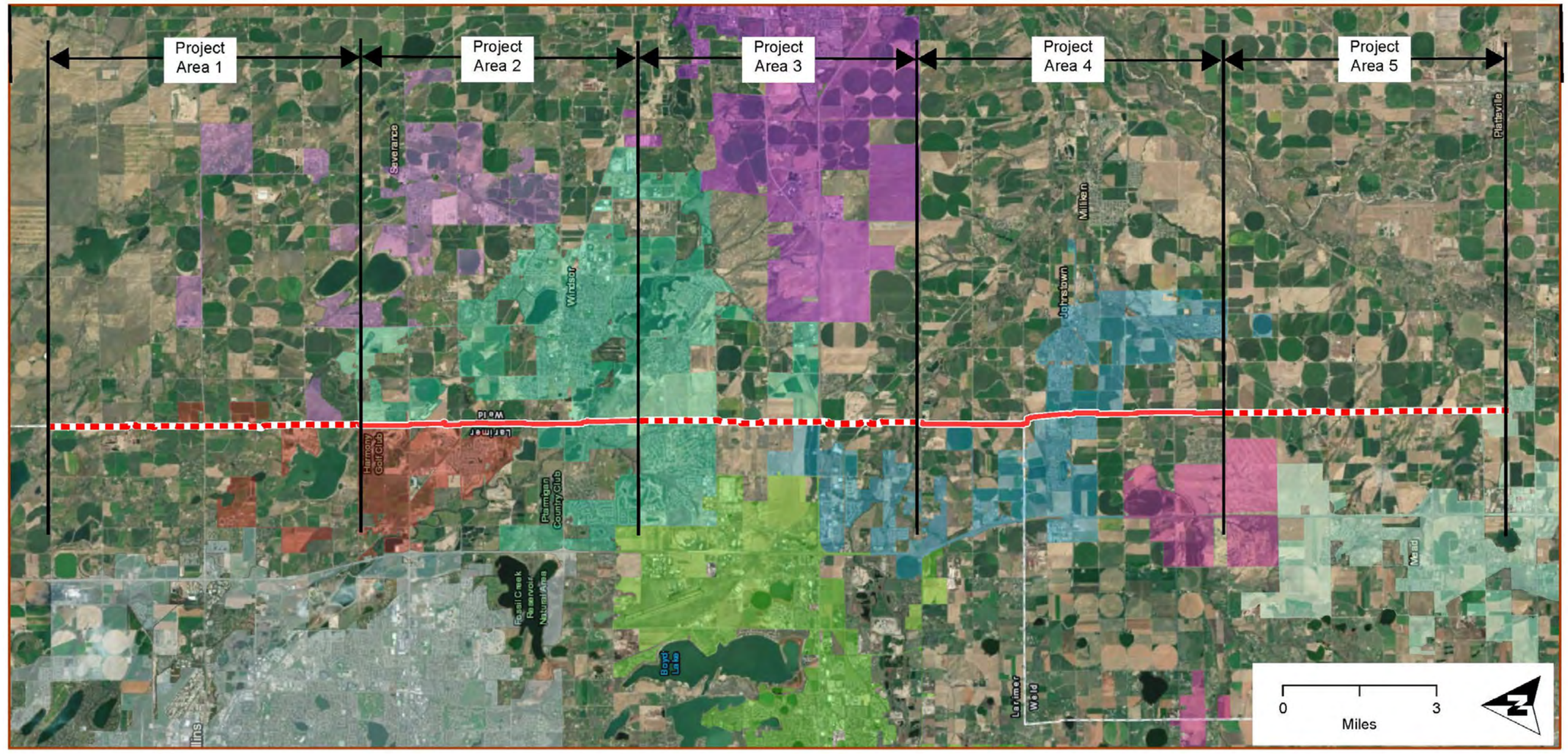

Figure C.17 – County Line Road Delivery Pipeline Preferred Alignment

Northern Integrated Supply Project

Poudre Delivery Pipeline Alternatives Analysis

May 2019

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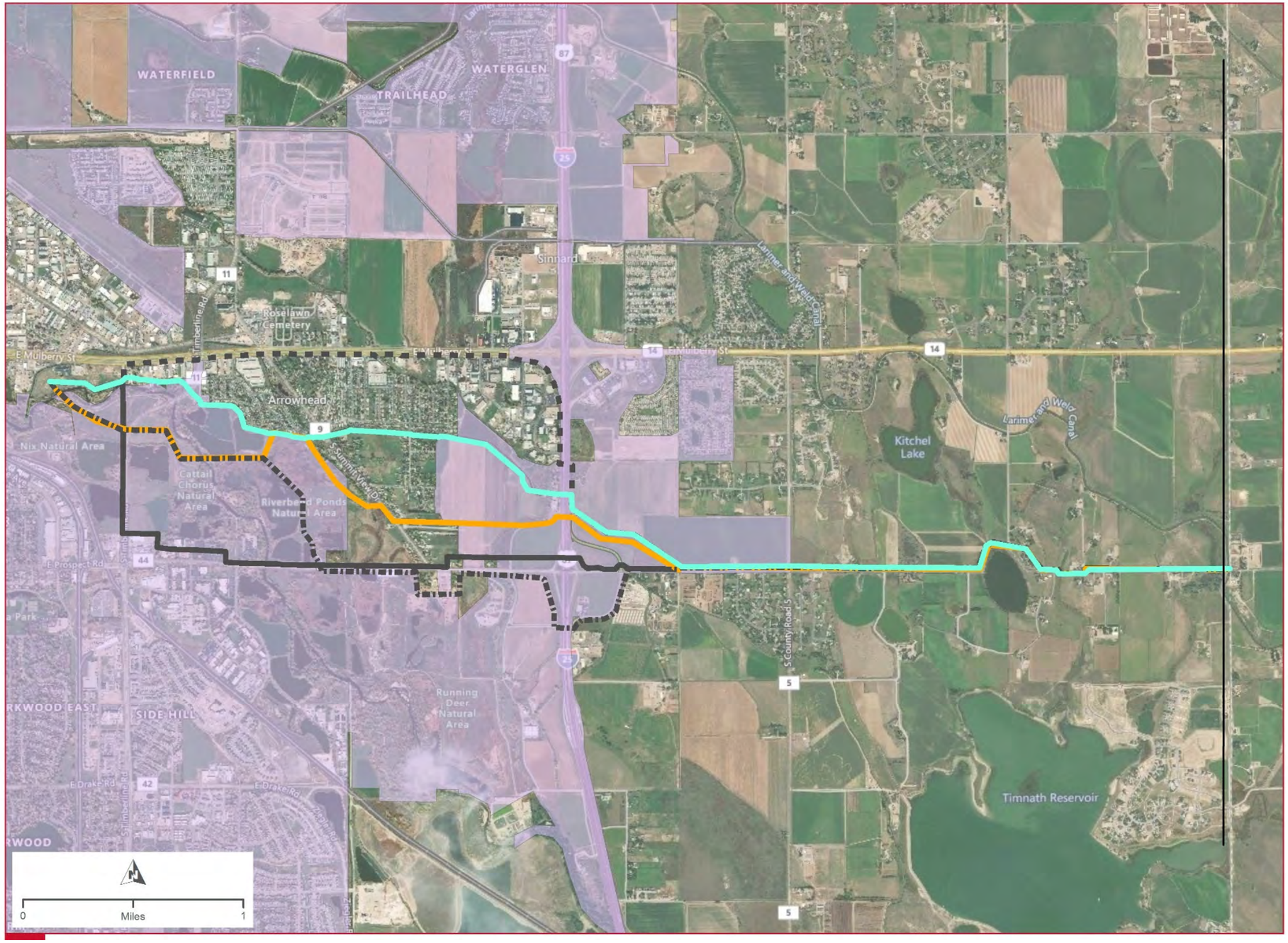
ROUTE COMPARISONS

Each of the alternatives developed for the Poudre Delivery segment were subjected to the evaluation criteria and metrics described in Table 1 in the introduction. The Poudre Delivery segment was assessed as a single project area. This was due to the fact that there were far fewer feasible alignment options than segments such as Northern Tier, so breaking up project areas did not allow for increased evaluation opportunities.

An overview of all of the alternative options can be seen in **Figure P.1**. Detailed fact sheets for each alternative alignment compare its performance against the evaluation criteria and figures illustrating each individual alignment alternative are provided on the following pages. Included on the fact sheet for each alternate is a table demonstrating the ranking assigned for each criterion. In the end, the alternate with the best overall performance (least reds, most greens) was chosen to be the Preferred Alternate. This Preferred Poudre Delivery Alignment can be seen in **Figure P.7** at the end of this document.

In total, two (2) alignment alternatives were fully assessed for the Poudre Delivery segment. However, three (3) additional alignments are present in **Figure P.1** and are shaded different colors of grey. These three alignments were considered to contain a "fatal flaw" and a complete analysis was not completed. These alignments still have their own map and fact sheet which explain in more detail the reasons why they were not selected or evaluated further.



ALIGNMENT ALTERNATIVES
POUDRE DIVERSION

Poudre Delivery Alternatives

- P-1
- P-2
- P-3
- P-4
- P-5
- Fort Collins City Boundary

DATA SOURCES: Northern Water, Larimer County, HDR

Figure P.1 – Poudre Delivery Alignment Alternates Overview

Alternative Name	P-1
Alternative Location & Description	Poudre Delivery Alternative P-1 begins at the approximate pump station location, just southeast of the canal. The alignment then stays north of the Poudre River, passes through the garden center property before crossing Timberline Rd. From there, it follows the curve between the backs of residences and the ponds in the Fort Collins Natural Areas. The alternate then follows the canal until it crosses the canal before tunneling I-25. East of I-25, the alternative stays on the north side of the canal, follows the bend around Deadman Lake. It crossed Prospect Rd twice to avoid residences before ending at the intersection of Prospect Rd and County Line Road, where it ties in with the proposed County Line Alignment.

Criteria	Ranking	Comments
Capital Cost	Green	Estimated cost $10,031,000
Conduit Length	Green	About 5.89 miles, or 31,100 feet
Easement Difficulty	Yellow	Estimated 36 parcels
Right-of-Way Impact	Green	Very little, if any, public ROW disturbance
Land Owner Impact	Yellow	Impact to garden center. Near large number of properties on Cherly St. Will need to be careful to avoid trees on property by canal. Impacting parcel by Deadman Lake.
Proximity to Occupied Dwellings	Red	Less than 100 feet from an estimated 48 dwellings
Environmental Impacts	Green	Four (4) wetland crossings
Existing Utilities	Green	Minimal impact to existing utilities because not in public ROW
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossings
Surface and Street Impacts	Yellow	Estimated 10 street crossings (3 to be built).
Traffic Impacts	Yellow	Moderate traffic impacts. Impacts are due to street crossings. Minimal parallel construction.
Water Storage Reservoirs Impacts	Green	Not in the vicinity of water storage reservoir toe dam
Construction Duration and Relative Constructability	Green	Estimated Total Active Days: 126 days Estimated Total Days: 206 days
Required Trenchless Crossing	Yellow	Two (Timberline Rd and I-25)
Development Pressure	Yellow	Passes through two future developments and one potential development parcel
Operation and Maintenance Access	Green	Relatively good access from existing trail system and ditch roads. East of I-25, proximity to Prospect makes for relatively easy access.
O&M Requirements	Green	Fewest number of air vac and blow off pairs.
Natural Resources Impacts	Green	Minimal to moderate impacts through the Natural Areas. Does not cross the Poudre River

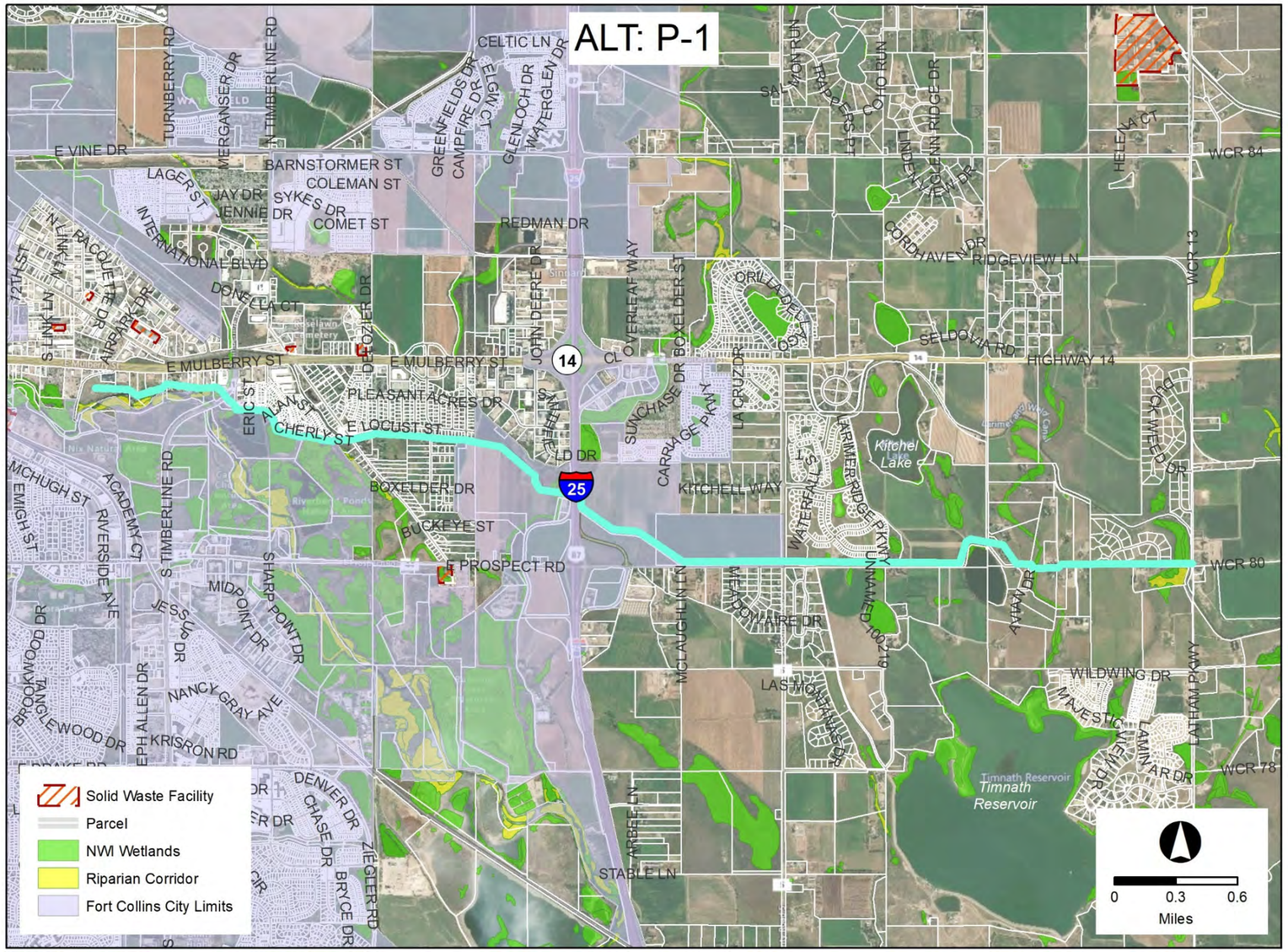


Figure P.2 – Alternative P-1

Alternative Name	P-2
Alternative Location & Description	Poudre Delivery Alternative P-2 begins at the same approximate pump station location as the other alternatives. The alignment then crosses the Poudre River and continues through Fort Collins Natural Areas for a while where it crosses the Poudre River again continues through the Natural Areas, until it veers east and crosses Summit View Drive. From there, the alternate attempts to follow property lines before tunneling I-25 The alignment then follows the same path east of I-25 as the other alignments.

Criteria	Ranking	Comments
Capital Cost	Yellow	Estimated cost $10,755,000
Conduit Length	Yellow	About 5.98 miles, or 31,574 feet
Easement Difficulty	Yellow	Estimated 35 parcels
Right-of-Way Impact	Green	Very little, if any, public ROW disturbance
Land Owner Impact	Green	Less impact to private parcels due to higher Natural Areas impact. Splitting parcel near Buckeye St. Impacting parcel by Deadman Lake.
Proximity to Occupied Dwellings	Yellow	Less than 100 feet from an estimated 15 dwellings
Environmental Impacts	Red	Five (5) wetland crossings, Poudre River Crossings (twice) and additional length in the Natural Areas
Existing Utilities	Green	Minimal impact to existing utilities because not in public ROW
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossings
Surface and Street Impacts	Yellow	Estimated 8 street crossings (3 to be built).
Traffic Impacts	Yellow	Moderate traffic impacts. Impacts are due to street crossings. Minimal parallel construction.
Water Storage Reservoirs Impacts	Green	Not in the vicinity of water storage reservoir toe dam
Construction Duration and Relative Constructability	Yellow	Estimated Total Active Days: 154 Estimated Total Days: 234
Required Trenchless Crossing	Yellow	Two (Timberline Rd and I-25)
Development Pressure	Yellow	Passed through two future developments and one potential development parcel
Operation and Maintenance Access	Yellow	Relatively good access with existing trail system and existing two-track west of Summit View Drive. May require new trails in natural areas some of which may be seasonally difficult to access due to mud. East of I-25, proximity to Prospect makes for relatively easy access.
O&M Requirements	Yellow	Relatively more air vac and blow off pairs due to river crossings
Natural Resources Impacts	Red	Moderate impacts through the Natural Areas. Does cross the Poudre River.

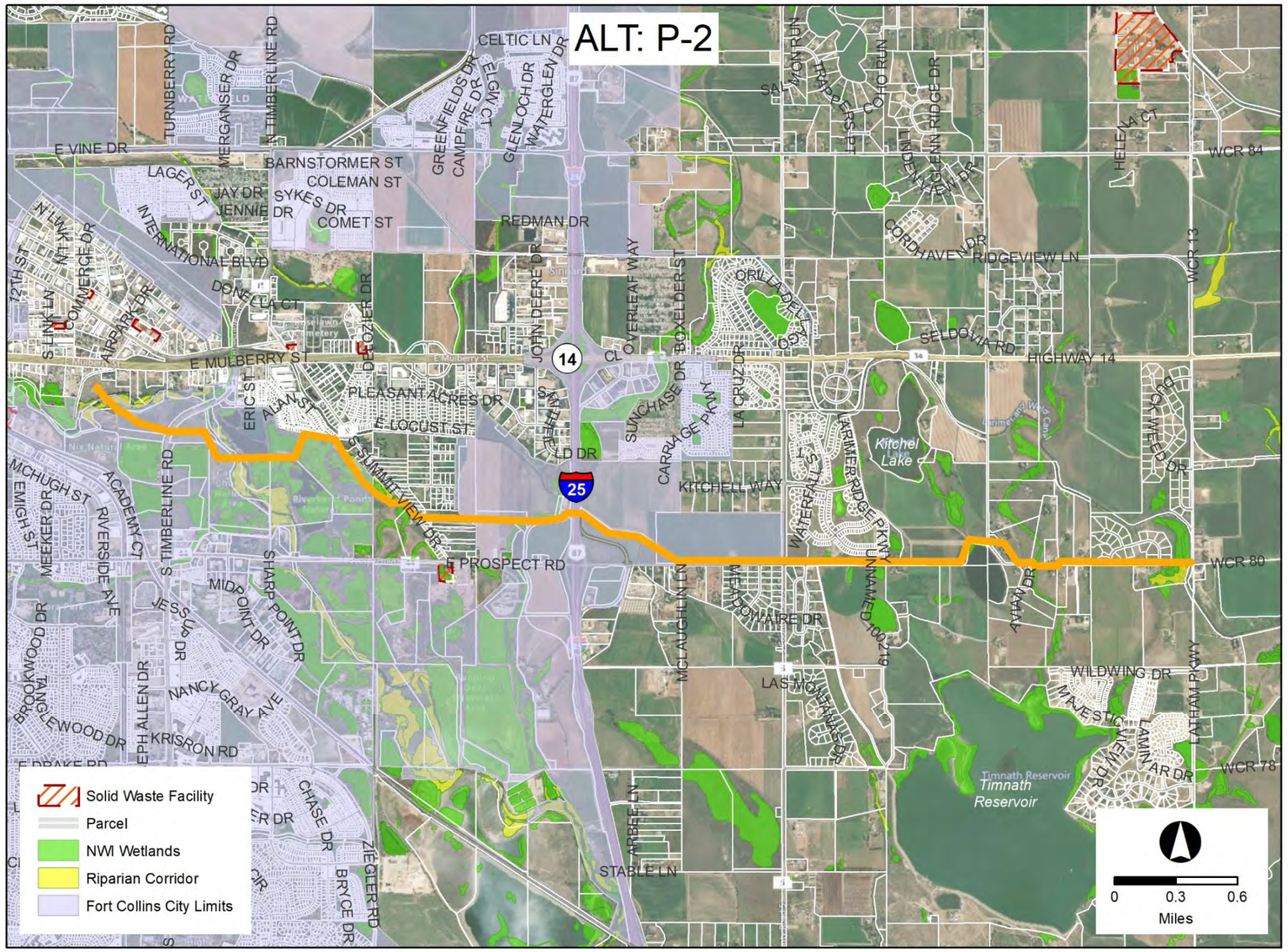


Figure P.3 – Alternative P-2

Alternative Name	P-3
Alternative Location & Description	Poudre Delivery Alternative P-3 begins at the same approximate pump station location as the other alternatives. This option crosses the Poudre River at a perpendicular angle and follows straight down Timberline Rd. Alternative P-3 then veers east through the parking lot of medical offices before following Prospect Rd and then tunneling beneath I-25 and on/off ramps. The alignment then follows the same path east of I-25 as the other alignments. This alternative was not evaluated further to the presence of a few "fatal flaws". The main issues with this alignment are: • Location parallel or very near multiple roadways causing significant traffic impacts. • Blocked access to offices/businesses along Prospect • Public health and safety risk due to construction through medical center • Large impact to significant amount of existing utilities • Significantly longer tunnel crossing for I-25 and difficult tunnel staging

Criteria	Ranking	Comments
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossing		
Development Pressure		
Operation and Maintenance Access		
O&M Requirements		
Natural Resources Impacts		

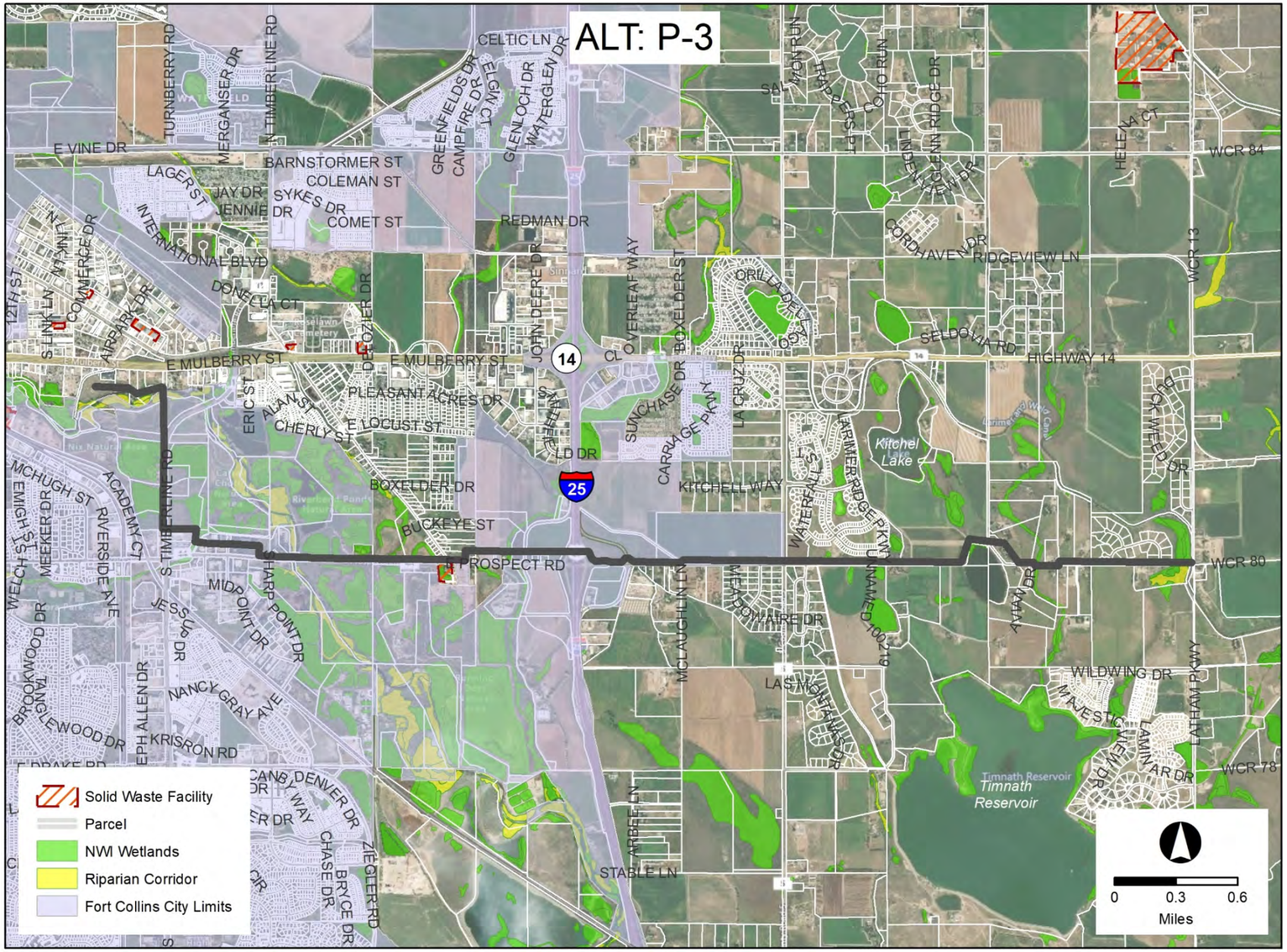


Figure P.4 – Alternative P-3

Alternative Name	P-4
Alternative Location & Description	Poudre Delivery Alternative P-4 begins at the same approximate pump station location as the other alternatives. This option crosses the Poudre River and continues through the City of Fort Collins Natural Areas until a tunneled crossing under I-25. The alignment then follows the same path east of I-25 as the other alignments. This alternative was not evaluated further to the presence of a few “fatal flaws”. The main issues with this alignment are: • Extensive impact to the Natural Resource/Environmental Areas • Extensive public impact due to trail closures during construction • Prohibitive construction dewatering

Criteria	Ranking	Comments
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossing		
Development Pressure		
Operation and Maintenance Access		
O&M Requirements		
Natural Resources Impacts		

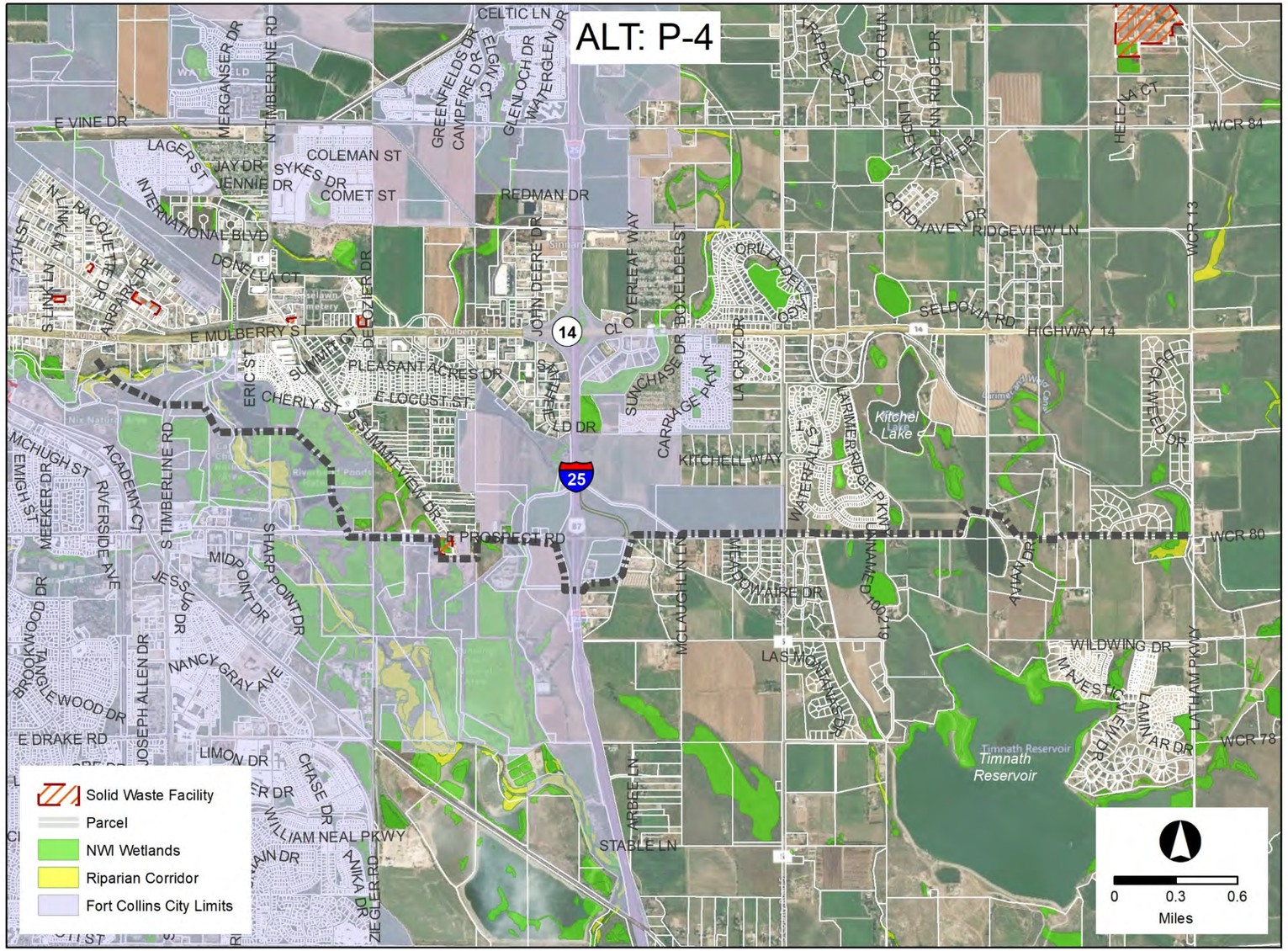


Figure P.5 – Alternative P-4

Alternative Name	P-5
Alternative Location & Description	Poudre Delivery Alternative P-5 begins at the same approximate pump station location as the other alternatives. This option does not cross the Poudre River and instead heads north, towards Highway 14. The alignment alternative continues in or near the Frontage Road South, following the curve south before it tunnels underneath I-25. The alignment then follows the same path east of I-25 as the other alignments. This alternative was not evaluated further to the presence of a few “fatal flaws”. The main issues with this alignment are: • Significant negative economic impact due to businesses along service road • Limited construction corridor resulting in significantly longer construction duration • Congested utilities in service road requiring relocation. Relocation negatively impacts business operations until completed • Safety of O&M staff servicing pipeline along busy street

Criteria	Ranking	Comments
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossing		
Development Pressure		
Operation and Maintenance Access		
O&M Requirements		
Natural Resources Impacts		

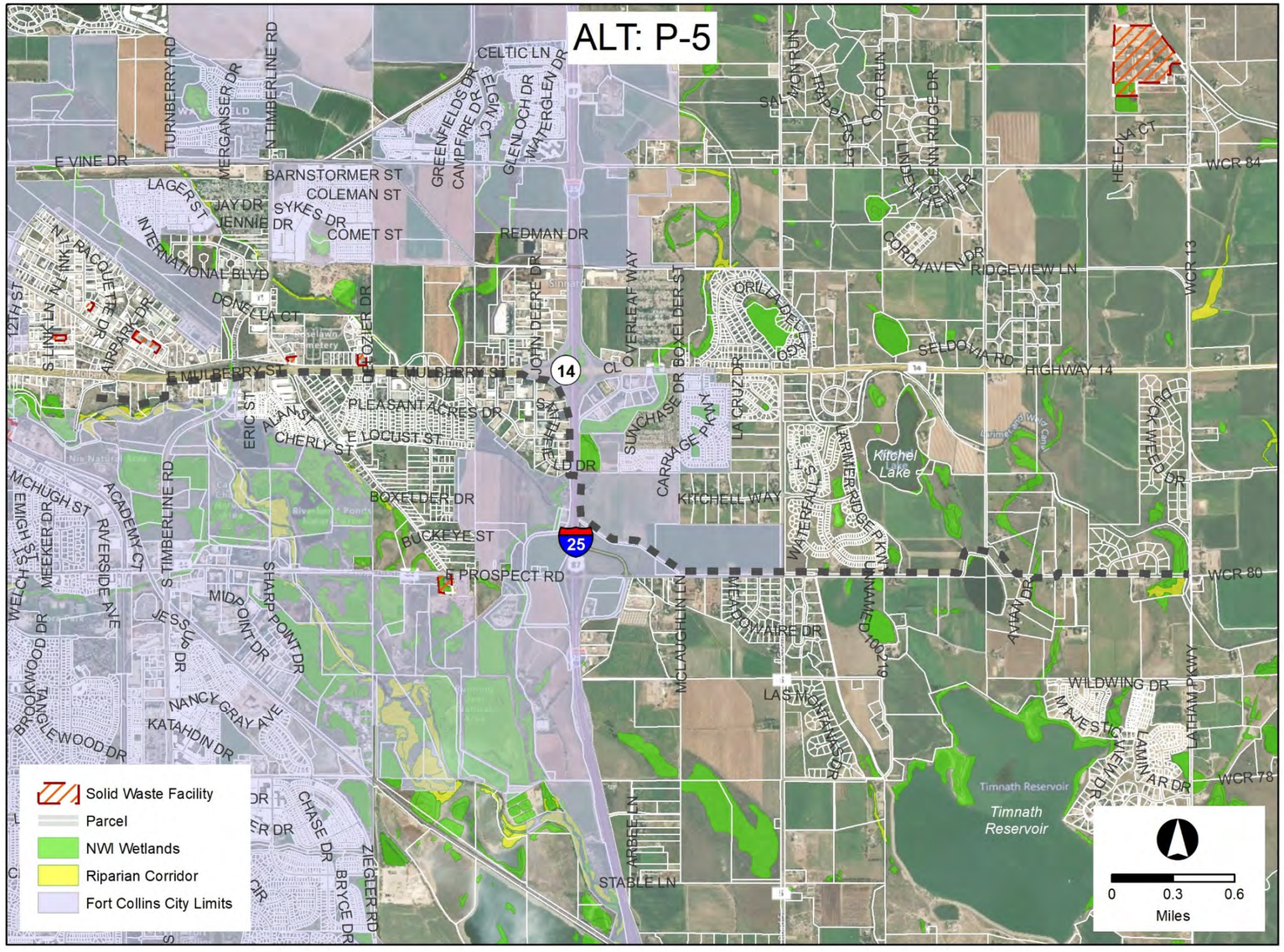


Figure P.6 – Alternative P-5

Table P.1 is a visual summary of the score given to every alternative for each criteria. **Table P.2** tabulates the number of greens, yellows, and reds given to each alternative.

Table P.1 – Visual Summary of Alternative Scoring

Evaluation Criteria	P-1	P-2	P-3	P-4	P-5
Capital Cost					
Conduit Length					
Easement Difficulty					
Right-of-Way Impact					
Land Owner Impact					
Proximity to Occupied Dwellings					
Environmental Impacts					
Existing Utilities					
Hazardous/Permitted Crossings					
Surface and Street Impacts					
Traffic Impacts					
Water Storage Reservoirs Impacts					
Construction Duration and Relative Constructability					
Required Trenchless Crossings					
Development Pressure					
Operation and Maintenance (O&M) Access					
O&M Requirements					
Natural Resources Impacts					

Table P.2 – Numeric Summary of Alternative Scoring

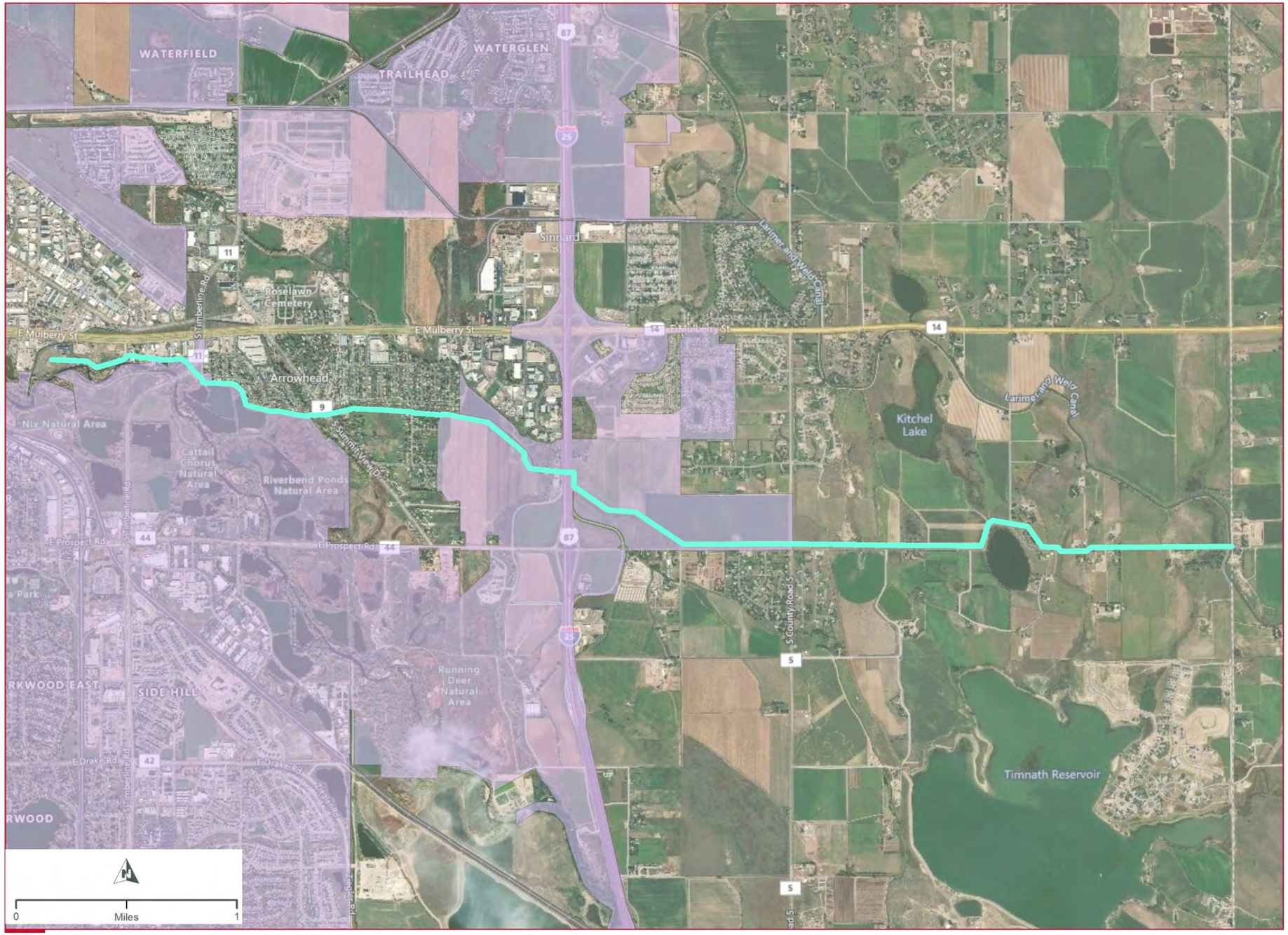
Evaluation Criteria	P-1	P-2	P-3	P-4	P-5
Red	1	2	-	-	-
Yellow	6	11	-	-	-
Green	11	5	-	-	-

PREFERRED ALIGNMENT

From analysis, it can be determined that the optimal/preferred alignment is alignment P-1. **Table P.3** below summarizes the estimated features of the overall Preferred Alignment. In the case of a tie, alternates were evaluated and the winner was selected based upon prioritization of factors, mainly conduit length, constructability and land-owner/environmental impacts. Preferred Alignment P-1 can be seen in **Figure P.7** on the following page.

Table P.3 – Preferred Alignment Characteristics

Characteristic	P-1
Pipe Diameter (inches)	**32**
Pipe Material	**Mortar Lined Steel**
Total Distance (miles)	**5.9**
Approximate Pipe Cost	**$10,031,000**
Length Tunnel (feet)	**350**
Number of Landowners	**35**
Number of Wetland Crossings	**4**



PREFERRED ALTERNATIVE POUDRE DELIVERY

Poudre Delivery Preferred Alignment

P-1

Fort Collins City Boundary

DATA SOURCES: Northern Water, Larimer County, HDR

Figure P.7 – Poudre Delivery Pipeline Preferred Alignment

Northern Integrated Supply Project

Poudre West Pipeline Alternatives Analysis

May 2019

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ROUTE COMPARISONS

Each of the alternatives developed was subjected to the evaluation criteria and metrics described in **Table 1** in the introduction. The Poudre West Pipeline segment was assessed as a single project area. This was due to the fact that the alignment is relatively short compared to other pipeline segments, allowing for easy readability/resolution with just one project area. As such, splitting up project areas did not allow Poudre increased evaluation opportunities for the final Preferred Alignment.

An overview of the Project Area and the alternative options can be seen in **Figure PW.1**. Detailed fact sheets for each alternative alignment compare its performance against the evaluation criteria and figures illustrating each individual alignment alternative are provided on the following pages. Included on the fact sheet for each alternate is a table demonstrating the ranking assigned for each criterion. In the end, the alternative with the best overall performance (least reds, most greens) was selected to be the Preferred Alternative. This preferred Poudre West Pipeline Alignment can be seen in **Figure PW.4** at the end of this document.

In total, two (2) alternatives were assessed for the Poudre West Pipeline segment all within a single project area. No alternatives were identified that contain a "fatal flaw" as seen in other route comparisons.

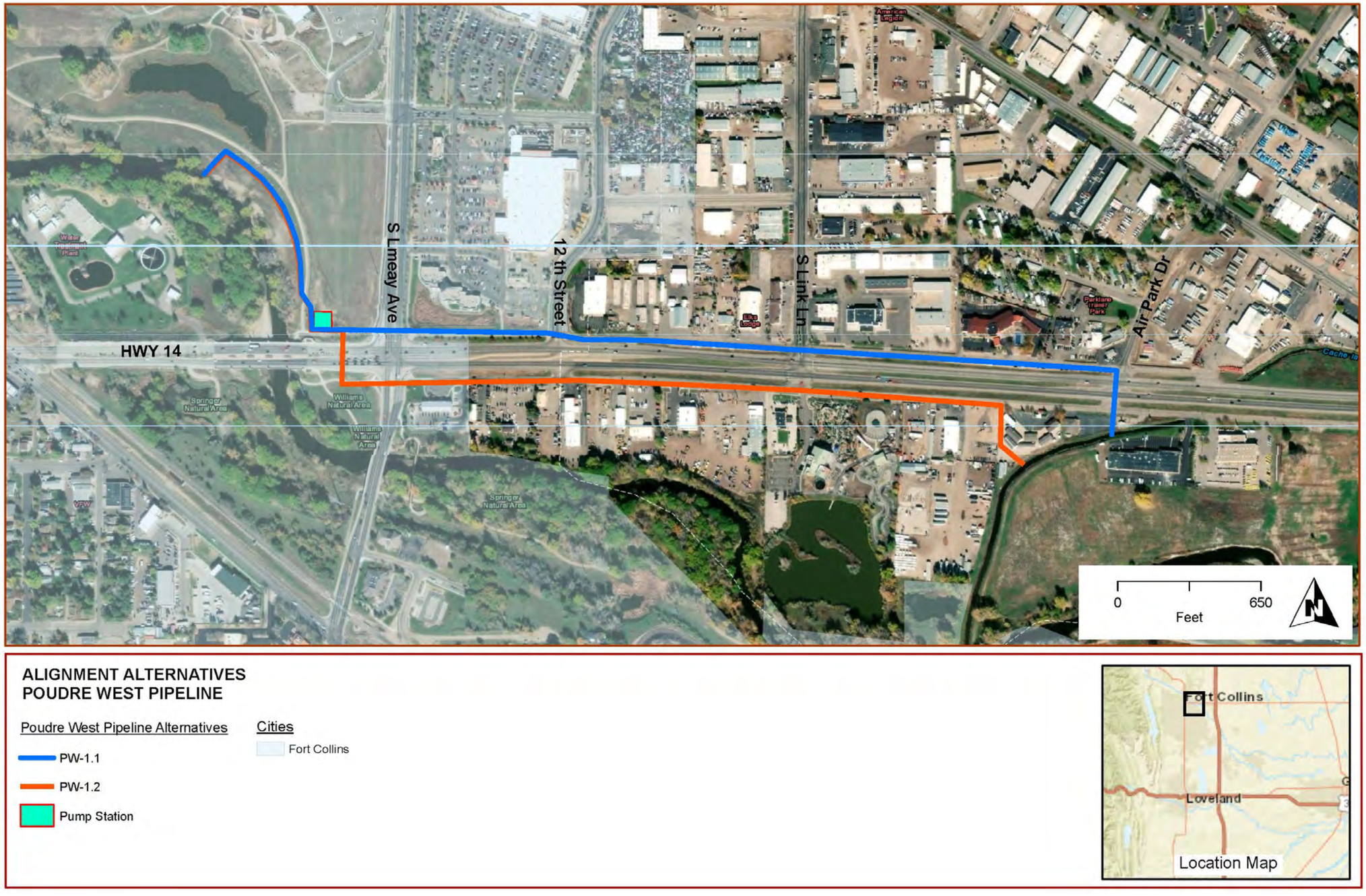

Figure PW.1 – Poudre West Pipeline Alternatives

Alternative Name	PW-1.1
Alternative Location & Description	Alignment Alternative PW-1.1 begins at the proposed diversion structure just northeast of the City of Fort Collins Mulberry wastewater facility and routes northeast away from the Poudre River. It turns southeast, paralleling the Poudre River, until reaching the proposed pump station. It then turns east, crosses S. Lemay Ave., and continues along Frontage Rd North until reaching Air Park Dr. From this point the alignment turns south across HWY 14, to its termination at the Timnath Reservoir Inlet Canal.

Criteria	Ranking	Comments
Capital Cost	Yellow	$ 2,762,800
Conduit Length	Yellow	5,050 feet
Easement Difficulty	Yellow	6 parcels crossed
Right-of-Way Impact	Yellow	Mostly in public ROW, roughly equal amounts with each alternative
Land Owner Impact	Green	Less business impacts expected due to frontage road access point availability, most businesses also have access from north side of proposed construction
Proximity to Occupied Dwellings	Yellow	Moderate, within 100-feet of an estimated 12 occupied businesses
Environmental Impacts	Green	No wetlands crossed
Existing Utilities	Yellow	Numerous existing utilities expected due to urban construction in urban area and location of alignment in road right-of-way
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossings known
Surface and Street Impacts	Red	Roughly equal lengths of pipe being constructed under/near roadways
Traffic Impacts	Yellow	Roughly equal amount of traffic impact expected due to proximity to major roadways, traffic impacts likely to be limited to frontage roads
Water Storage Reservoirs Impacts	Green	No impacts expected
Construction Duration and Relative Constructability	Yellow	Slightly longer construction duration expected due to longer overall length and one additional trenchless crossing
Required Trenchless Crossing	Yellow	HWY 14 (CDOT), Lemay Ave, 12th Street
Development Pressure	Green	Some development pressure possible at northwest corner of HWY 14 and Lemay Ave, no other new developments known/expected
Operation and Maintenance Access	Green	Similar access due to proximity to roadways
O&M Requirements	Green	Equal amount of air vac and blow off pairs required
Natural Resources Impacts	Green	Minimal, majority of alignment routed through urban setting with few natural areas

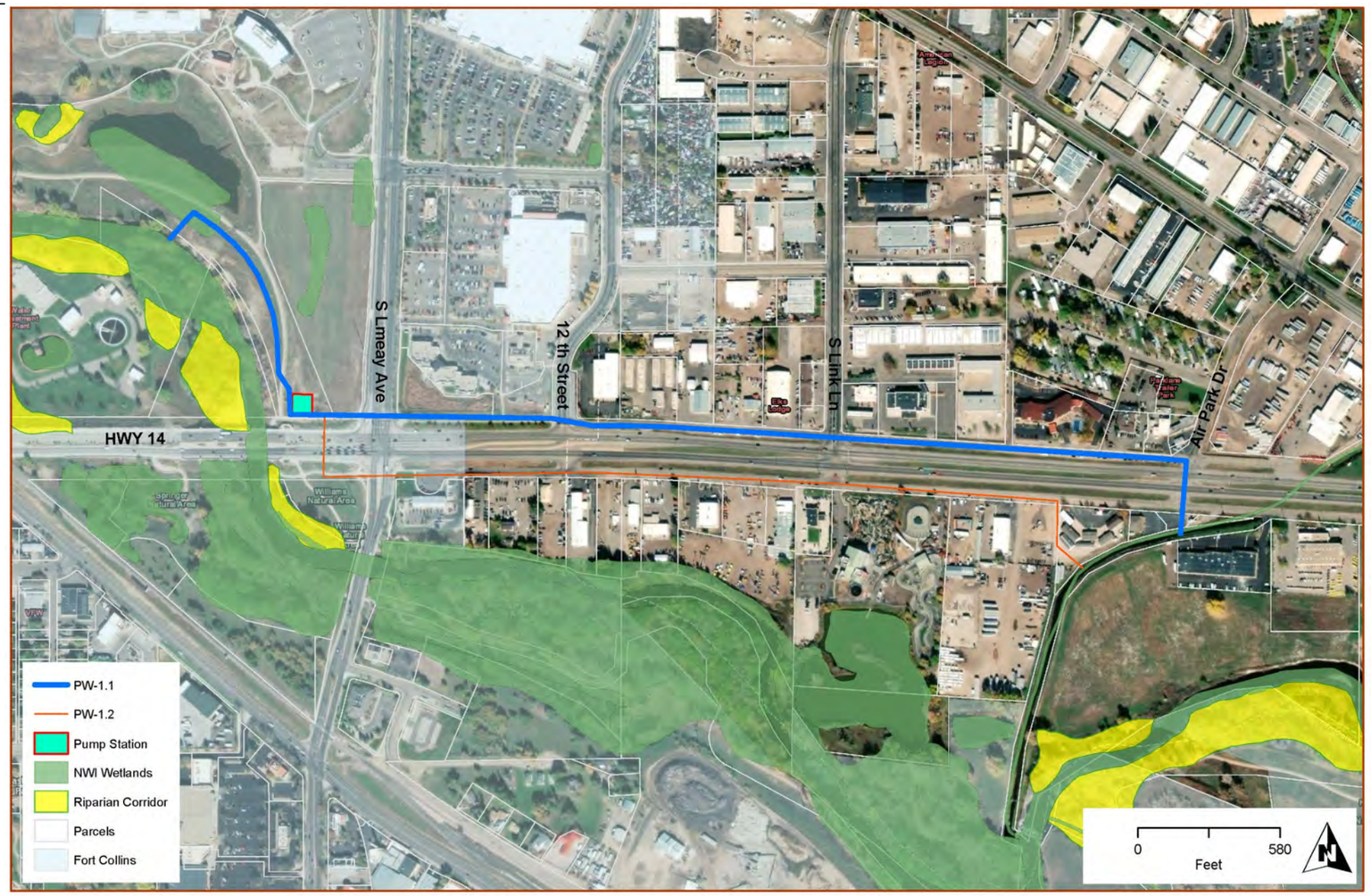

Figure PW.2 – Alternative PW-1.1

Alternative Name	PW-1.2
Alternative Location & Description	Alignment Alternative PW-1.2 begins at the proposed diversion structure just northeast of the City of Fort Collins Mulberry wastewater facility and routes northeast away from the Poudre River. It turns southeast, paralleling the Poudre River, until reaching the proposed pump station. It then turns east, until just past the pump station, where it then turns south crossing HWY 14. From this point the alignment turns east, crosses S. Lemay Ave., and continues along Frontage Rd. S. for approximately 2,600 feet before turning south towards its termination at the Timnath Reservoir Inlet Canal.

Criteria	Ranking	Comments
Capital Cost	Green	$2,420,800
Conduit Length	Green	4,790 feet
Easement Difficulty	Green	5 parcels crossed
Right-of-Way Impact	Yellow	Mostly in public ROW, roughly equal amounts with each alternative
Land Owner Impact	Yellow	More business impacts expected due to lack of available options to access locations other than frontage road, a few businesses also located at dead end of frontage road
Proximity to Occupied Dwellings	Yellow	Moderate, within 100-feet of an estimated 8 occupied businesses
Environmental Impacts	Green	No wetlands crossed
Existing Utilities	Yellow	Numerous existing utilities expected due to urban construction in urban area and location of alignment in road right-of-way
Hazardous/Permitted Crossings	Green	No hazardous/permitted crossings known
Surface and Street Impacts	Red	Roughly equal lengths of pipe being constructed under/near roadways
Traffic Impacts	Yellow	Roughly equal amount of traffic impact expected due to proximity to major roadways, traffic impacts likely to be limited to frontage roads
Water Storage Reservoirs Impacts	Green	No impacts expected
Construction Duration and Relative Constructability	Green	Alignment is slightly shorter and has one less trenchless crossing resulting in shorter duration and better constructability
Required Trenchless Crossing	Green	HWY 14 (CDOT), Lemay Ave
Development Pressure	Green	Some development pressure possible at northwest corner of HWY 14 and Lemay Ave, no other new developments known/expected
Operation and Maintenance Access	Green	Similar access due to proximity to roadways
O&M Requirements	Green	Equal amount of air vac and blow off pairs required
Natural Resources Impacts	Green	Minimal, majority of alignment routed through urban setting with few natural areas

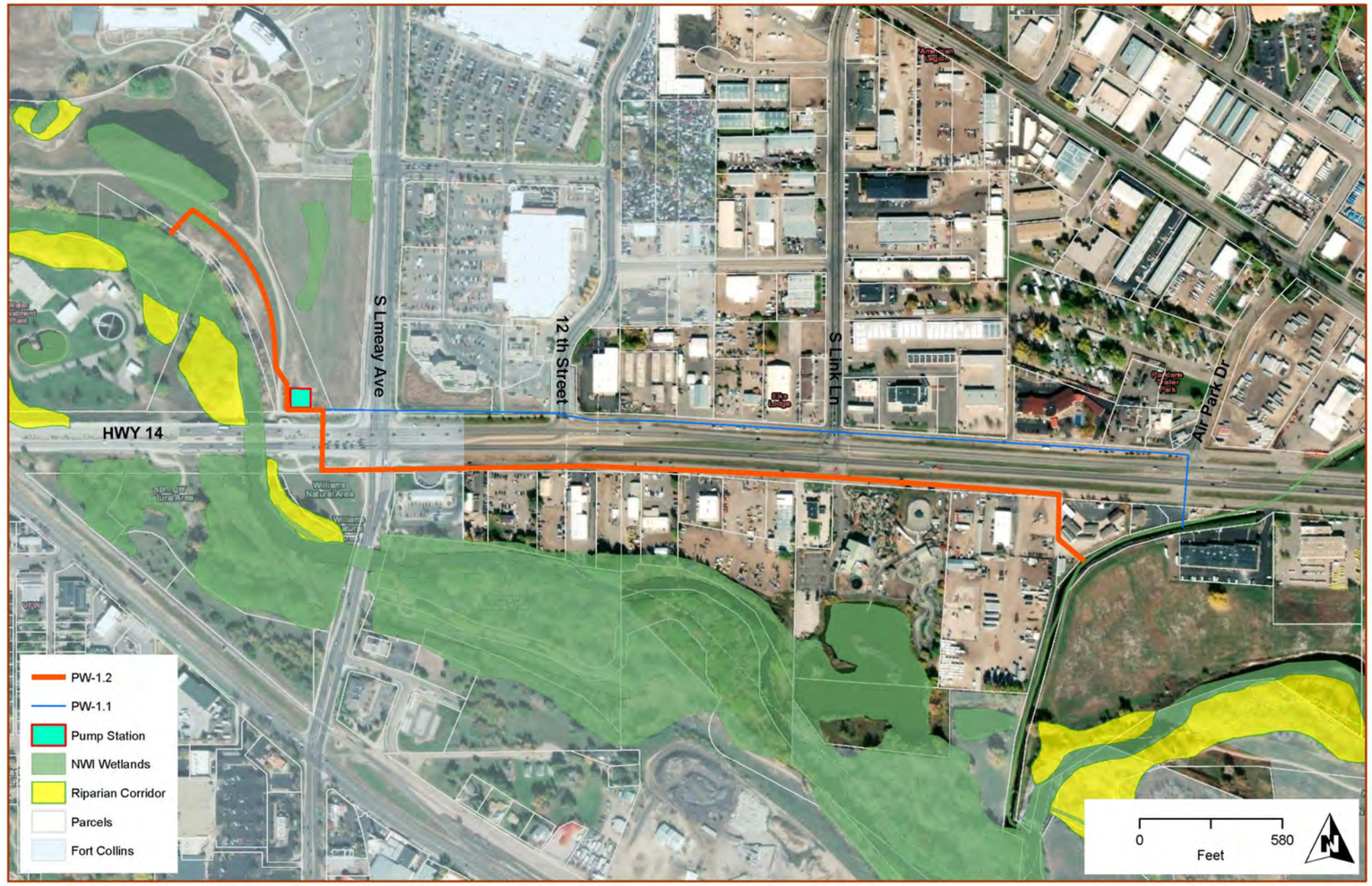

Figure PW.3 – Alternative PW-1.2

Table PW.1 is a visual summary of the score given to the two alternatives for each criteria. **Table PW.2** tabulates the number of greens, yellows, and reds given to each alternative.

Table PW.1 – Visual Summary of Alternative Scoring

Evaluation Criteria	PW-1.1	PW-1.2
Capital Cost		
Conduit Length		
Easement Difficulty		
Right-of-Way Impact		
Land Owner Impact		
Proximity to Occupied Dwellings		
Environmental Impacts		
Existing Utilities		
Hazardous/Permitted Crossings		
Surface and Street Impacts		
Traffic Impacts		
Water Storage Reservoirs Impacts		
Construction Duration and Relative Constructability		
Required Trenchless Crossings		
Development Pressure		
Operation and Maintenance (O&M) Access		
O&M Requirements		
Natural Resources Impacts		

Table PW.2 – Numeric Summary of Alternative Scoring

Evaluation Criteria	PW-1.1	PW-1.2
Red	1	1
Yellow	9	5
Green	8	12

PREFERRED ALIGNMENT

From analysis, it can be determined that the optimal/preferred alignment is alignment PW-1.2. **Table PW.3** below summarizes the estimated features of the overall preferred alignment. In the case of a tie, alternates were evaluated and the preferred alignment was selected based upon prioritization of factors, mainly conduit length, constructability and land-owner/environmental impacts. Preferred Alignment PW-1.2 can be seen in **Figure PW.4** on the following page.

Table PW.3 – Preferred Alignment Characteristics

Characteristic	PW-1.2
Pipe Diameter (inches)	**32**
Pipe Material	**Mortar Lined Steel**
Total Distance (feet)	**4,790**
Pipe Cost	**$2,420,800**
Length Tunnel (feet)	**455**
Number of Landowners	**5**
Wetland Crossings (feet)	**0**

Figure PW.4 – Poudre West Diversion Pipeline Preferred Alignment