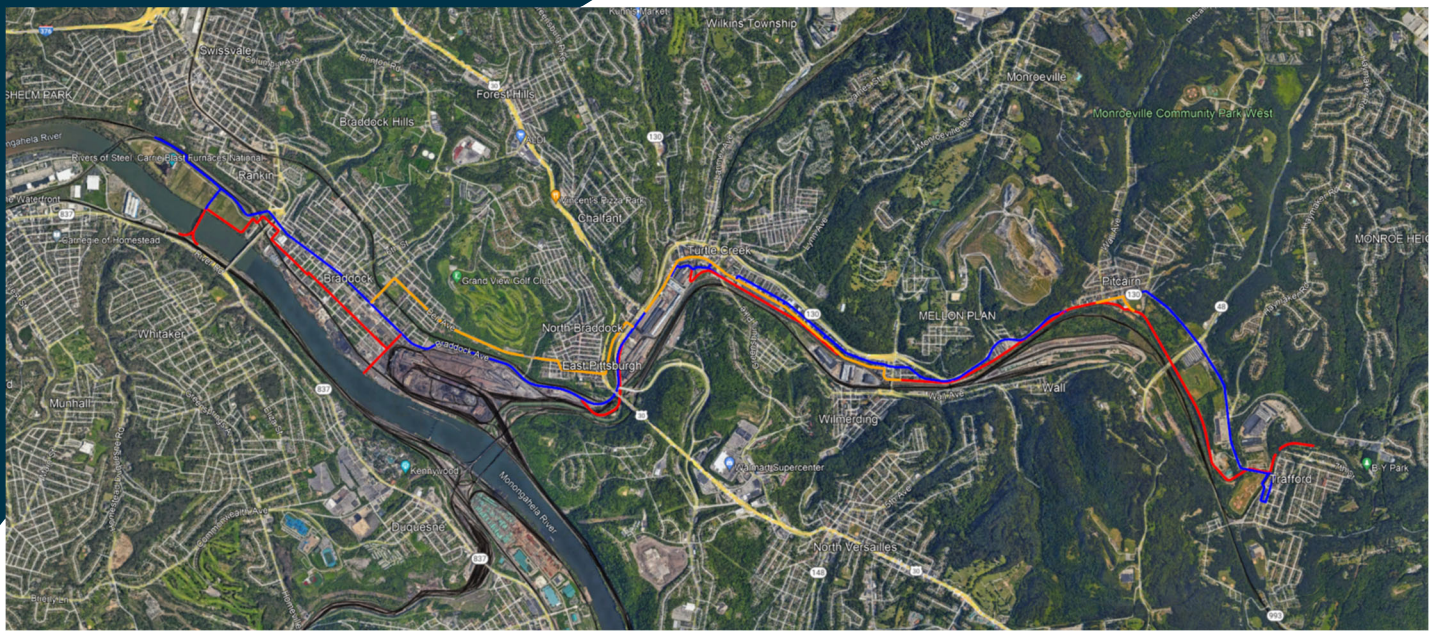
TURTLE CREEK CONNECTOR

December 2023

# ALTERNATIVE ANALYSIS REPORT

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# TABLE OF CONTENTS



# APPENDICES

## EXECUTIVE SUMMARY

Transystems was selected to provide the Alternatives Analysis for the Turtle Creek Connector Trail project. The project would provide a connection between the Westmoreland Heirtage Trail and the GAP trail. Transystems took the original three alternatives and broke them into comparable segments. The segments were then scored using 5 categories, given a stress level, a general cost estimate, and a yearly operations and maintenance (O&M) cost estimate. With the scored comparable segments, 5 alignments were constructed for an overall analysis with different targets in mind for each route. Of the long-term alignments, one rural favored alignment was created that utilized railroad property and less congested areas when possible and 2 long-term urban favored alignments were created that used a more direct route through congested areas. The reasoning for 2 long-term urban favored alignments was to have on alignment with high impacts and one with low impacts. The difference in the two would be that the higher impacts alignment would be the more comfortable alignment for the trail user but have a higher impact on private/public property (mostly parking) and the lower impacts alignment would utilize shared use lanes over impacting property. A short-term version of both the rural favored and urban favored alignments was created in case the schedule or the funds available are not adequate for the long-term alternative at the time of project. Of those alignments, the Long Term Rural Favored alignment has been chosen as the consultant recommendation with the caveat that if the funds or time needed to complete the recommended alignment are not adequate, pieces of the Short Term Rural Favored alignment are recommended to be used until the long-term alignment goal can be achieved.

## INTRODUCTION

In accordance with the Scope of Work, Transystems performed an Alternative Analysis of the proposed options to assess the connection of the Westmoreland Heirtage Trail to the GAP trail in Allegheny and Westmoreland Counties, Pennsylvania. In order to conduct the Alternative Analysis for this project, Transystems obtained plans, reports and project data from WSP. The feasibility study, conducted by WSP, was comprised of three alternatives: the yellow, blue and red alternatives.

## DESCRIPTION OF STUDY AREA

Within the project limits, a mixture of existing roads, parking lots, railroads, and private property were used for the trail alternatives. Depending on the chosen full-length route, the path will be approximately 10-11 miles long to connect the two trails and it will be traveling through 9 or 10 Boroughs/Townships. Going from west to east, the trail will cross Rankin Borough, Braddock Borough, North Braddock Borough, East Pittsburgh Borough, Turtle Creek Borough, Wilmerding Borough, the Municipality of Monroeville, North Versailles Township (depending on alternative chosen), Pitcairn Borough, back into the Municipality of Monroeville, and then it ends in Trafford Borough. A site location map has been included as **Appendix A – Project Location Map**.

# ALTERNATIVE ANALYSIS

Transystems performed an Alternative Analysis between the route options created by WSP. Each alternative was broken into segments in order to have more comparable sections and this also allows for pieces of each of the original options to be used for the final corridor. The segments were broken at locations of possible route changes and at locations of condition changes, while also maintaining segments that would be comparable to one another. Also, for most of the segments, a short-term version and a long-term version were created in order to give the best possible final corridor options. Typical sections were also considered for each segment break point, and in some cases, segment alternatives were added to give typical options if possible. Once the segments were separated and identified, they were grouped into pieces that could be fairly scored. Transystems created a matrix using five categories: Traffic, Safety, Design Impacts, Connectivity and Public Process. Each category was then split into sub-categories for scoring and are as follows:

- **Traffic**
  - **ADT** – Average daily traffic based on the PennDot TiRe website.

| ADT | ADT Score |
|---|---|
| 0 | 50 |
| 1-2000 | 30 |
| 2001-6000 | 10 |
| >6000 | 0 |

  - **Truck ADT** – Average daily truck traffic based on the truck percentage from the PennDot TiRe website.

| Truck ADT | Truck ADT Score |
|---|---|
| 0 | 50 |
| 1-200 | 30 |
| 201-600 | 10 |
| >600 | 0 |

  - **Posted Speed** – Signed speed limit (or assumed from nearby posts) Highest speed used for segment scoring.

| Posted Speed | Posted Speed Score |
|---|---|
| N/A & 0-15 | 50 |
| 16-25 | 40 |
| 26-35 | 20 |
| 36-45 | 10 |
| >45 | 0 |

- **Number of Intersections (Exposure Level Weighted)** – Number of intersections with relative weight to scale the pedestrian/bicyclist experience. The methodology reflects the number of potential conflict points users experience with vehicular turning movements at an intersection. To see the calculation used for Number of Intersections (Exposure Level Weighted), see **Appendix C-7 – Intersection Scoring Calculation**. The type of intersections have been categorized as follows:
  - **Major Intersection** – multiple legs/lanes of vehicular approach. The action of crossing multiple lanes increases the number of interactions with vehicles. The weight for this type of intersection is set at 6x.
  - **Minor Intersection** – multiple legs / single lanes of vehicular approach. The action of crossing multiple turning movement maintains user exposure. The weight for this type of intersection is set at 3.5x.
  - **Minimal Intersection** – simple turning movements of vehicular approach. The weight for this type of intersection is set at 1x.

| Number of Intersections (Exposure Level Weighted) | Number of Intersections Score |
|---|---|
| 0 | 50 |
| 1 to 6 | 40 |
| 7 to 12 | 30 |
| 13 to 20 | 20 |
| 20 to 30 | 10 |
| >30 | 0 |

- **Traffic Impacts** – Trail effects on traffic flow. No Impact – Trail is separated from traffic, Minor Impact – Trail is next to roadway, Moderate Impact – Shared use lanes, Major Impact – Lane reduction.

| Traffic Impacts | Traffic Impacts Score |
|---|---|
| No impact | 30 |
| Minor Impact | 20 |
| Moderate Impact | 10 |
| Major Impact | 0 |

- **Parking Impacts** – Existing parking reduction due to trail. No Impact – No parking effected, Minor Impacts – Small number of spaces impacted / reduction of unofficial parking, Major Impacts – Large number of spaces impacted.

| Parking Impacts | Parking Impacts Score |
|---|---|
| No Impact | 50 |
| Minor Impacts | 30 |
| Major Impacts | 0 |

- **Safety**
  - **SLM's** – Shared lane markings. Percentage of segment that utilizes shared use lanes.

| % of Segment SLMs | SLMs Score |
|---|---|
| 0% | 30 |
| 1-50% | 20 |
| 51-75% | 10 |
| 76-100% | 0 |

  - **Traffic Separation** – The relationship between the trail and traffic.

| Traffic Separation | Traffic Separation Score |
|---|---|
| Shared Use Path | 50 |
| Bike Lane With Buffer | 40 |
| Bike Lane With Out Buffer | 30 |
| Shared Use | 0 |

  - **Existing Sidewalks** – The condition of the existing sidewalk.

| Existing Sidewalks | Existing Sidewalks Score |
|---|---|
| Both Sides Good to Decent Condition | 25 |
| One Side Good to Decent Condition | 20 |
| Both Sides ok to poor condition | 15 |
| One side ok to poor condition | 10 |
| Minor incomplete | 5 |
| Major Incomplete | 0 |

  - **Proposed Sidewalks** – If sidewalks are being built / replaced by the alternative, this sub-category provides an additional score. If the alternative is not upgrading the sidewalk, match the existing score for the proposed score column. Score a separate path the same as top score.

| Proposed Sidewalks | Proposed Sidewalks Score |
|---|---|
| New Both Sides Good Condition | 50 |
| At Least One New Side Good Condition | 40 |
| No Change - Match Existing Score | |

- **Existing Road** – The condition of the existing road. A separate path with no roadway gets top score.

| Existing Road | Existing Road Score |
|---|---|
| Good Condition/ N/A | 25 |
| Decent Condition | 20 |
| Ok Condition | 15 |
| Fair Condition | 10 |
| Poor Condition | 5 |

- **At Grade Railroad Crossings** – Number of at grade railroad crossings along the segment.

| At Grade RR Crossings | RR Crossings Score |
|---|---|
| 0 | 40 |
| 1 | 20 |
| >=2 | 0 |

A safety related item not directly included in the Alternative Analysis Matrix is pedestrian related crashes. The matrix does include items such as incomplete sidewalk, traffic separation, ADT and posted speed which all would contribute to an area's likelihood of a crash and the matrix allows for enhancements to minimize the risk. A scroll plot with the last five years of pedestrian related crashes was included in **Appendix B-5 – Pedestrian related Crashes Scroll Plot** and a scroll plot of all crashes over the last five years in **Appendix B-6 – Project Area Crashes Scroll Plot** to identify any problem areas within the corridor that could benefit from a safety related upgrade.

## • Design Impacts

- **Environmental Impacts** – The amount of clearing needed to build the segment.

| Environmental Impacts | Environmental Impacts Score |
|---|---|
| None | 40 |
| Minor | 20 |
| Major | 0 |

- **Utility Impacts** – The number of utilities effected by the segment.

| Utility Impacts | Utility Impacts Score |
|---|---|
| None | 40 |
| Minor | 20 |
| Major | 0 |

- **Property/Right-of-Way Impacts** – The amount of property outside of existing Right-of-Way that would be needed for the segment.

| Property/ROW Impacts | Property/ROW Impacts Score |
|---|---|
| None | 40 |
| Minor | 20 |
| Major | 0 |

- **Connectivity**
  - **Destination Areas** – Number of areas that the segment passes that would be a potential stop for trail users. Does not include Business District stops.

| Destination Areas | Destination Areas Score |
|---|---|
| 2+ | 40 |
| 1 | 20 |
| 0 | 0 |

  - **Business District** – Does the trail go through, or close to, the area's business district.

| Business District | Business District Score |
|---|---|
| Yes | 40 |
| Close | 20 |
| No | 0 |

  - **Public Transit Stops** – Number of public bus stops along the trail.

| Public Transit Stops | Public Transit Stops Score |
|---|---|
| 2+ | 40 |
| 1 | 20 |
| 0 | 0 |

  - **Profile Grade** – The profile grade of the tail. Profiles were calculated using 2' contours and worst case was used for each segment.

| Profile Grade | Profile Grade Score |
|---|---|
| 0%-1.99% | 50 |
| 2%-3.99% | 40 |
| 4%-5.99% | 30 |
| 6%-7.99% | 20 |
| 8%-9.99% | 10 |
| 10%-14.99% | 0 |
| 15%+ | -20 |

  - **Aesthetics** – The appearance of the area around the trail.

| Aesthetics | Aesthetics Score |
|---|---|
| Above Average | 40 |
| Average | 20 |
| Below Average | 0 |

- **Public Process**
  - **Stakeholder Comment** – Comments received from Stakeholders.

| Stakeholder Comment | Stakeholder Comment Score |
|---|---|
| Positive | 100 |
| Neutral | 0 |
| Negative | -100 |

  - **Public Agency Comment** – Comments received from Public Agencies.

| Public Agency Comment | Public Agency Comment Score |
|---|---|
| Positive | 100 |
| Neutral | 0 |
| Negative | -100 |

  - **Public Comment** – Comments received from the Public.

| Public Comment | Public Comment Score |
|---|---|
| Positive | 100 |
| Neutral | 0 |
| Negative | -100 |

- **Level of Stress**
  - **Stress Level References** – Segment conditions that determine stress level score. Worst condition controls the score.
  - **Design User Profile** – The user type based on the level of stress for each segment.
  - **Stress Level Score** – The stress level assigned due to the conditions of the segment.
  - **Stress Level Score Multiplied by Number of Miles** – The stress level is multiplied by the number of miles to determine an average for the entire alignment.

| Stress Level References | | | | Design User Profile | Stress Level Score | Stress Level Score Multiplied by Number of Miles |
|---|---|---|---|---|---|---|
| ADT | Truck ADT | Posted Speed | Separation | | | |
| N/A | N/A | N/A | Shared Use path / Bike Lane with Buffer | Interested But Concerned | 3% | |
| 0-2000 | 0-200 | 0-25 | Bike Lane with out Buffer | Interested But Concerned | 5% | |
| 2001-6000 | 201-600 | 25-35 | Bike Lane with out Buffer | Somewhat confident | 20% | |
| >6000 | >600 | 35+ | Bike Lane with out Buffer | Highly Confident | 50% | |
| 0-2000 | 0-200 | 0-25 | Shared Lane | Interested But Concerned | 9% | |
| 2001-6000 | 201-600 | 25-35 | Shared Lane | Somewhat confident | 14% | |
| >6000 | >600 | 35+ | Shared Lane | Highly Confident | 90% | |

  - **Average Design User Profile** – Using the average stress level of the entire alignment, the average user type is determined from the below.
    - **Interested but Concerned – 0-10%**
    - **Somewhat Confident – 11-30%**
    - **Highly Confident – 31-60%**

    The Design User Profile Figure 6 from the Bikeway Selection Guide is shown on the following page to illustrate the relationship between the bicyclist confidence level and stress level of the alignment.

  - **Average Stress Level** – The sum of all the stress level scores multiplied by number of miles of each segment in the alignment divided by the number of miles in the overall alignment.

| Average Design User Profile | Average Stress Level |
|---|---|

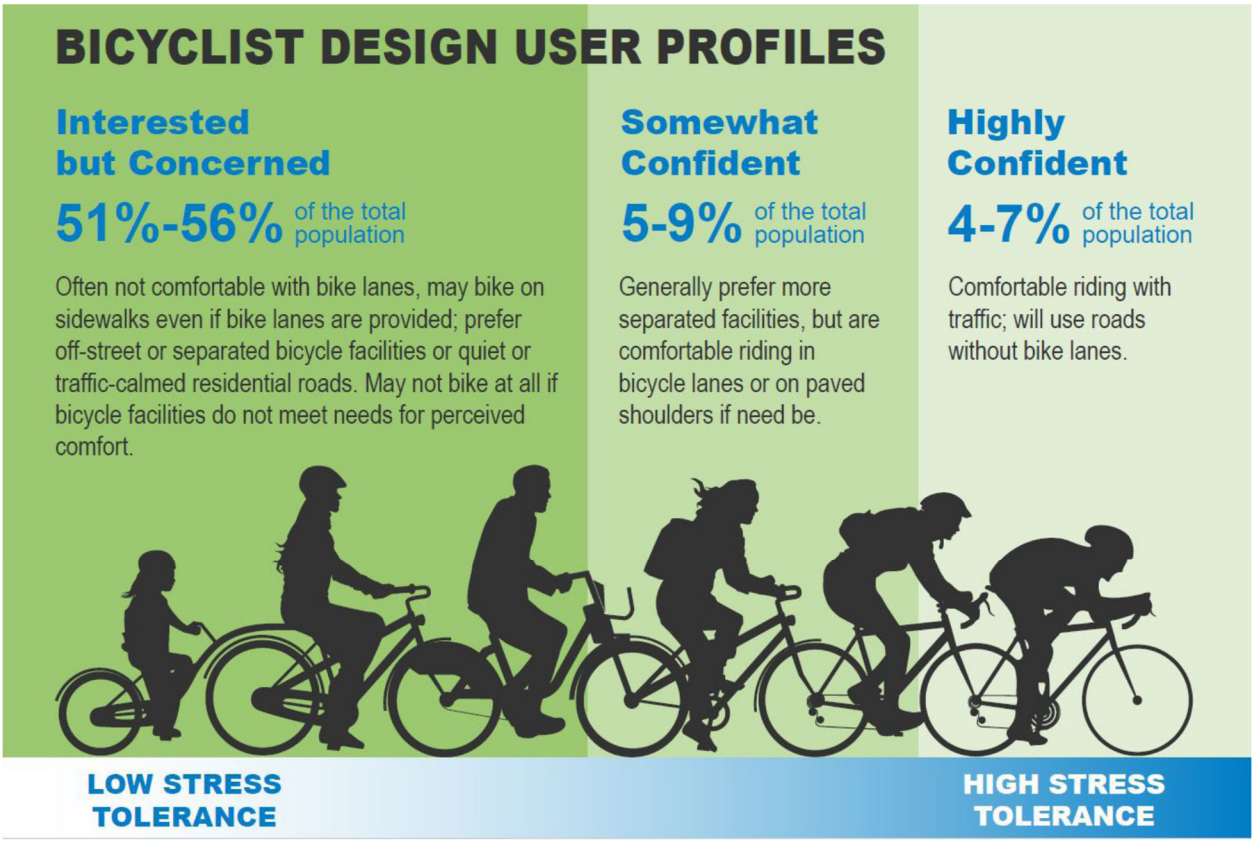


**Figure 6 (Bikeway Selection Guide February 2019)**

- **General Costs with Contingency**

Each segment was given a general cost estimate for comparison purposes, this estimate only includes new or restored pavement, sidewalks, curbs, barriers, paths, and bridges where applicable. It also includes a general cost for new line paint and signage of the trail. Costs do not include the rehabilitation of the hot metal bridge or the ramp tie to it. The estimate for each alignment includes an assumed 35% increase for additional incidental costs such as utilities and right of way, and a 20% increase for contingency purposes.

- **Operations and Maintenance (O&M) Costs with Contingency (Per Year)**

A yearly operations and maintenance cost estimate was also calculated for each segment. This estimate includes the regular maintenance costs of sweeping/blowing of debris, drainage maintenance, plowing, trash removal, tree trimming/landscaping, minor repairs, maintenance and supplies and equipment fuel and repairs. Also included in the O&M estimate was the resurfacing of the path along with replacement of path barrier every 15 years, trail line paint and signage replacement every 10 years, and trail bridges replaced every 50 years. These replacement costs were broken down into a yearly cost and added to the regular maintenance cost.

- ## Alternative Alignments

Once all the segments were scored and given a general cost, 5 alignments were built using the segments. The alignment names are: Long Term Rural Favored Alignment, Short Term Rural Favored Alignment, Long Term Urban Favored Alignment – Higher Impacts, Long Term Urban Favored Alignment – Lower Impacts and Short Term Urban Favored Alignment. The alignment paths were chosen based on the following:

- Rural favored – Utilizing railroad property and less congested areas when possible.
- Urban favored – Using a more direct route for the alignment but through congested areas.
- Long Term – Replacing/building new roads, sidewalks, paths and bridges where applicable.
- Short Term – To keep costs to a minimum, only utilizing line paint and signs on the alignment where possible.
- Higher Impacts – A more comfortable path for trail users but impacts more private/public property. Mostly parking.
- Lower Impacts – Impacts less property.

For a plan layout of the alignments, see **Appendix B– Alignment Plans**

The alternative matrixes, which include the planned typical sections and the general costs for each segment, can be found in **Appendix C – Alternative Matrix**, which have the following different tables:

  - Comparable Segments
  - Comparable Alignments
  - Comparable Alignments Reduced
  - Comparable Alignments by Borough
  - Comparable Alignments by Borough Reduced

The different tables allow for different levels of information to be viewed and separates the information by borough if desired. Since the alternative matrix was scored based upon separated segments (including segments not utilized in the chosen alignments), changes can be made within an alignment if necessary. This allows for different segments to be used if an unforeseen issue arises with a chosen segment. The manner the segments were scored also allows for adjustments to be made within the segments to adjust the final score or stress level of the alignment. For example, if it is desired to adjust the average stress level of an alignment down, and a segment within that alignment that currently has the designation “Bike Lane with out Buffer”, can be changed to “Bike Lane with Buffer” to see the impact it has in the average stress level of the alignment.

# CONCLUSION

As discussed within the preceding report, all of the segments were scored and given a general cost estimate. Once the alignments were determined, the scores and general costs can be combined for an overall alignment total. The scores and costs can be seen in the below table:

| Comparable Alignments | TOTAL Score With Public Process | TOTAL Score Without Public Process | Alignment Length (Miles) | Average Design User Profile | Average Stress Level | General Costs with Contingency | O&M Costs With Contingency (Per Year) |
|---|---|---|---|---|---|---|---|
| Long Term Rural Favored Alignment | 11160 | 10960 | 10.79 | Interested But Concerned | 10% | $ 28,601,282 | $ 263,562 |
| Short Term Rural Favored Alignment | 9780 | 9680 | 11.85 | Somewhat confident | 29% | $ 2,496,428 | $ 217,524 |
| Long Term Urban Favored Alignment - Higher Impacts | 9790 | 9990 | 10.40 | Highly Confident | 54% | $ 31,890,528 | $ 232,874 |
| Long Term Urban Favored Alignment - Lower Impacts | 9810 | 10110 | 11.12 | Highly Confident | 54% | $ 34,728,607 | $ 263,078 |
| Short Term Urban Favored Alignment | 9340 | 9640 | 11.12 | Highly Confident | 55% | $ 5,442,080 | $ 263,078 |

| Design User Profile Key | Note - Alignment length includes both directions when route is split on one-way streets. |
|---|---|
| Interested But Concernt 0-10% | |
| Somewhat Confident 11-30% | |
| Highly Confident 31-60% | |

From the table, it shows that for the Long Term Alignments, the Long Term Rural Favored Alignment has the highest score of 10960 without adding in the score of Public Process. A score with and without Public Process was completed in order to have a completely objective analysis and one with consideration of Public comments. The Long Term Rural Favored Alignment also has the lowest General Cost of the Long Term Alignments at $28,601,282 and a comparable O&M cost of $263,078. When considering stress level, the Long Term Rural Favored Alignment has the lowest level of the alignments, therefor it would be more likely to be used by a larger variety of riders. From this, the top recommendation of the Long Term Rural Favored alignment was chosen. However, due to the cost of this project, the assumption was made that a Short Term Alignment option may be favored due to cost or schedule by some or all of the boroughs involved. With this in mind, the Short Term Rural Favored Alignment had an overall score of 9680 without adding in the score of Public Process, and a General Cost of $2,496,428. This score is slightly higher than the Short Term Urban Favored Alignment score of 9640, but since the Long Term Rural Favored Alignment is the overall recommendation, the Short Term Rural Favored gains the recommendation for alignment connection reasons. It should be the goal for the entire overall recommended alignment to be achieved, but it is understood that parts may need to be scheduled later. Depending on which area of the alignment needs to be adjusted to short term for the project to get to construction, different segments from the chosen short term alignment can be used based on engineering judgement. When also considering Public Process the Long Term Rural Favored Alignment remained the highest score with a new total of 11160. Comments along the recommended alignment all seem possible and should allow for the project to continue ahead with Public Process buy in. There were a few locations along the other alignments with negative feedback that should be considered if the recommended alignment is not chosen to move forward.